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NEBRASKA PUBLIC POWER DISTRICT

R-Project

Final Habitat Conservation Plan

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ACRONYMS AND ABBREVIATIONS

%	percent
ABB	American burying beetle
ACSR	Aluminum Conductor Steel Reinforced
APLIC	Avian Power Line Interaction Committee
ATV	all-terrain vehicle
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
CFR	Code of Federal Regulations
cm	centimeters
CWS	Canadian Wildlife Service
EIS	Environmental Impact Statement
ESA	Endangered Species Act
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FR	Federal Register
GIS	geographic information system
HCP	Habitat Conservation Plan
ITP	Incidental Take Permit
ITP10	Integrated Transmission Plan
kcmil	circular mils
kg/cm^2	kilograms per square centimeter
km	kilometer
km^2	square kilometers
kV	kilovolt
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NESCA	Nebraska Nongame and Endangered Species Conservation Act
NGPC	Nebraska Game and Parks Commission
NHD	National Hydrography Dataset
NMFS	National Marine Fisheries Service
NNHP	Nebraska Natural Heritage Program
NPPD	Nebraska Public Power District
NRCS	Natural Resources Conservation Service
NTC	Notice to Construct
NWI	National Wetlands Inventory
OPGW	optical ground wire
P.L.	Public Law
ROD	Record of Decision
ROW	right-of-way
SCADA	Supervisory Control and Data Acquisition
SHPO	State Historic Preservation Office
SPP	Southwest Power Pool
SWPPP	Stormwater Pollution Prevention Plan
TVMP	Transmission Vegetation Management Program
U.S.	United States
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service

USGS	United States Geological Survey
UTV	Utility Task Vehicle
Western	Western Area Power Administration

1.0 INTRODUCTION AND BACKGROUND

1.1 Overview and Background

Nebraska Public Power District (NPPD) plans to construct a 345,000 volt transmission line from NPPD's Gerald Gentleman Station Substation (GGS Substation) near Sutherland to a new substation to be sited adjacent to NPPD's existing substation east of Thedford. The new line will then proceed east and connect to the proposed Holt County Substation to be sited in Holt County at the intersection of Holt, Antelope, and Wheeler counties. See Section 1.4 for a map of this project, referred to as the R-Project.

The R-Project is an approximately 225-mile-long line that will help enhance operation of NPPD's electric transmission system, relieve congestion from existing lines within the transmission system, and provide additional opportunities for development of renewable energy projects. The area traversed by the R-Project transmission line includes Nebraska Sandhills grassland.

This Habitat Conservation Plan (HCP) serves as the basis of an application to the U.S. Fish and Wildlife Service (USFWS) for an Endangered Species Act (ESA) Section 10(a)(1)(B) Incidental Take Permit (ITP) authorizing take of one federally listed species (see Section 4.0):

- American burying beetle (*Nicrophorus americanus*, endangered; ABB)

Incidental take of this species has the potential to occur in connection with Covered Activities described in Section 2.0. The HCP includes biological goals and objectives that are the guiding principles to avoid, minimize, and mitigate the impacts of the potential taking of the Covered Species within the Permit Area, the area in which take may occur and for which ITP coverage is desired for Covered Activities. To meet these goals and objectives, and to comply with the applicable requirements of the ESA, this HCP includes measures to minimize and mitigate to the maximum extent practicable the impacts of the "take" of ABB that may result from the otherwise lawful construction and emergency repair of the R-Project (see Section 6.0) within the Permit Area.

The application for an ITP and development of this HCP are voluntary steps that have been undertaken by NPPD to obtain authorization for incidental take resulting from otherwise lawful construction and operation of the R-Project within the Permit Area.

This HCP was prepared in accordance with ESA Section 10(a)(2), the HCP Handbook (USFWS and National Marine Fisheries Service [NMFS] 2016), and 50 Code of Federal Regulations (CFR) Part 17 and Part 13 and has been developed in coordination with the USFWS and Nebraska Game and Parks Commission (NGPC).

1.2 Purpose and Need

1.2.1 R-Project Purpose and Need

Southwest Power Pool's Notices to Construct the R-Project

NPPD is a member of the Southwest Power Pool (SPP), a Regional Transmission Organization that is responsible for ensuring a reliable electrical grid and operating a day-ahead and real-time energy market. In 2015, the SPP region was expanded to include all or parts of 14 states throughout the Central Great Plains stretching from Texas to North Dakota. In administering its responsibilities, SPP conducts planning studies to ensure the electrical grid will continue to meet the standards set by the North American Electric Reliability Corporation (NERC), meet the needs of its member utilities and their customers, and operate in an efficient and reliable manner.

Every three years, SPP evaluates transmission facilities that will be needed within the 10- and 20-year time horizons. Projects identified in the 10-year horizon are included in the 10-year Integrated Transmission Plan (ITP10). Through this planning process, SPP identifies when and where new transmission is needed or where upgrades to the current electrical system must be conducted. When SPP identifies a need for new transmission infrastructure, it directs a Designated Transmission Owner to construct the needed infrastructure. These directives are known as Notices to Construct. Once it receives a Notice to Construct, the Designated Transmission Owner then completes the required routing, environmental studies and permitting, engineering design, right-of-way (ROW) acquisition, construction, and construction management of the project.

Based on requirements identified in SPP's 2012 ITP10 planning study, NPPD received a conditional Notice to Construct from SPP on April 9, 2012, for a new 345 kilovolt (kV) transmission line that will extend from NPPD's GGS Substation north to a new 345 kV substation to be located in or near Cherry County, and then extend eastward to another new 345 kV substation to be located in Holt County, which is to interconnect with Western Area Power Administration's (Western's) existing Fort Thompson to Grand Island 345 kV line that is located on the eastern border of Holt County. NPPD received a final Notice to Construct from SPP in March 2013. On May 19, 2014, as a result of SPP's High Priority Incremental Load Study, SPP issued another Notice to Construct to NPPD that required the installation of a new 345/115 kV transformer at the Thedford Substation. The issuance of this 2014 Notice to Construct resulted in the selection of the Thedford Substation as the intermediate terminal point between GGS Substation and the interconnection with the new substation located in Holt County.

The SPP's ITP10 planning study identified the need date for the R-Project as January 1, 2018. The following sections describe the specific purposes and needs for the R-Project.

Reliability Improvements

One purpose of the R-Project is to provide for significant reliability benefits to the existing western Nebraska area transmission system by addressing the worst-case Nebraska area stability issues, taking into account extreme weather events, and providing for significant increases in west–east power transfer capability across the NPPD system. The R-Project will also address thermal and voltage issues identified in the Gentleman–Grand Island/Hastings corridor directly related to new wind power injection in Nebraska and external to Nebraska. Power-flow studies conducted by NPPD and SPP have shown that, under contingency events for 345 kV lines in this area, thermal overloads occur on the parallel transmission elements. The R-Project involves a new 345 kV line that parallels the existing Gentleman–Grand Island/Hastings transmission corridor and will address these contingency overloads on the existing transmission system.

During the ice storm in December 2006, 37 different transmission circuits were out of service as they experienced physical damage due to heavy ice loads. As a result, NPPD could not deliver much power from the GGS Substation into or through the impacted area. During the summer of 2012, NPPD's wholesale service area experienced severe drought and temperature conditions that resulted in extreme transmission system loading in the north-central region. Since NPPD must plan for similar intense weather events in the future, additional high-capacity transmission feeds into the north-central region are needed in order maintain the reliability for load deliveries into this region.

Congestion Relief

Gerald Gentleman Station Stability is a defined NERC Flowgate limited by transient stability, transient voltage, and post-contingent thermal overloads.[1] One result of the Gerald Gentleman Station Stability Flowgate limits, which must always be maintained to meet the NERC Standards, is congestion. Likewise, the Gentleman–Red Willow 345 kV line is also a defined NERC Flowgate to protect for thermal overloads and voltage depression on underlying networked facilities following the loss of the Gentleman–Red Willow 345 kV line. The limits imposed by the Gentleman–Red Willow (or Western Nebraska–Western Kansas) Flowgate also result in congestion. Under certain system conditions, the Gerald Gentleman Station and Laramie River Station resources are required to reduce generation to maintain the established reliability limits. In addition, the transmission capacity in western Nebraska is currently fully subscribed due to transient stability limitations defined by the Gerald Gentleman Station Stability Flowgate. There is no available existing transmission capacity to interconnect any new generating resources in western Nebraska without exceeding the Gerald Gentleman Station Stability Flowgate limits.

Thus, a second purpose of the R-Project is to reduce the significant congestion associated with NERC Flowgate constraints by providing an additional outlet path from Gerald Gentleman Station. Furthermore, in order to allow new generation interconnections in this region, additional transmission facilities must be constructed. The R-Project will allow for significant new generation resource injection in this area while still maintaining required stability margins and reliability criteria.

Renewable Resource Access

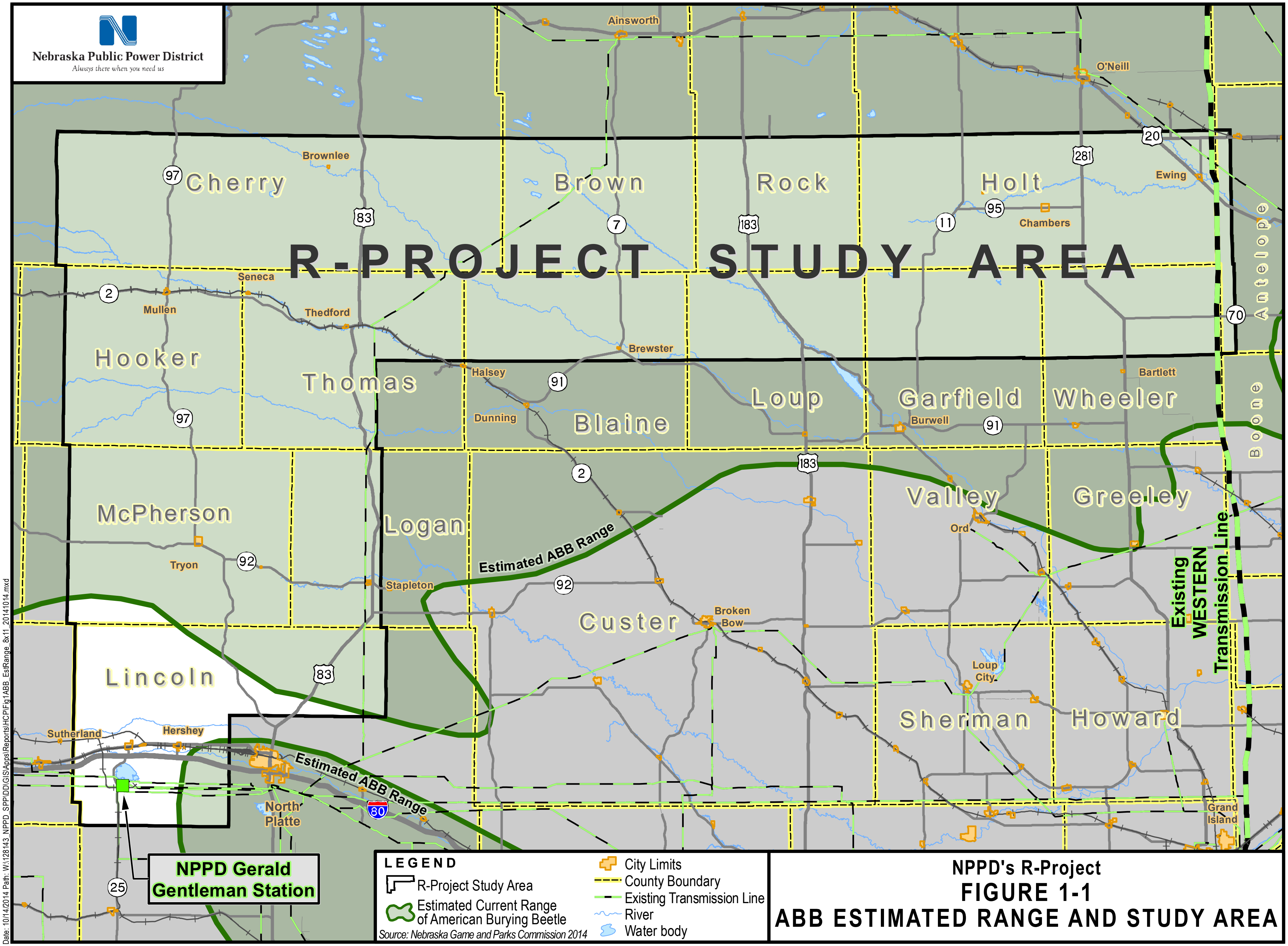
A third purpose of the R-Project is to provide transmission capacity and access for the future development of renewable resources in one of the main areas in Nebraska with quality wind resources. The R-Project will provide capacity and access for renewable project development across a large area of Nebraska and is not biased to favor any specific wind development or developer. The R-Project will be designed to meet or exceed the minimum capacity requirements that are defined in any Notice to Construct received from SPP. The minimum capacity requirements for the R-Project defined in the SPP Notice to Construct received by NPPD on March 11, 2013, are 1,792 mega volt amps. When the R-Project is constructed and in service, future renewable project development in this area will be determined by extensive detailed study work that addresses all current and future generation interconnection projects that would impact the R-Project. The capacity for generation interconnection into the R-Project is governed by the entire transmission system and cannot be determined by the capacity of only one transmission line, such as the R-Project. The interconnection of all of the transmission lines in the interconnected grid system would need to be carefully studied to determine the available interconnection capacity on the R-Project. As time goes on, and new projects request generation interconnection on or adjacent to the R-Project, capacity is used, and there may be system limitations that would prevent new interconnection capacity until new network upgrades are considered in the interconnected grid system to address the limitations identified.

1.2.2 HCP Purpose and Need

NPPD anticipates that its proposed construction and reasonably anticipated emergency repairs of the R-Project may harm or kill (i.e., “take”) species listed by the USFWS as threatened or endangered under the ESA. The original Study Area identified by NPPD early in the project development phase for the R-Project includes portions of the ABB estimated range, and complete avoidance of the species is not likely (Figure 1-1; NGPC and USFWS 2014a). Therefore, NPPD is seeking a permit pursuant to Section 10 of the ESA for the take of ABB during construction and anticipated emergency repairs of the R-Project.
An HCP is a required component of a Section 10 ITP application. The overall purpose of an HCP is to develop and implement a conservation plan that will avoid, minimize, and compensate for the incidental

[1] NERC defines a “flowgate” as a mathematical construct, comprised of one or more monitored transmission facilities and optionally one or more contingency facilities, used to analyze the impact of power flows upon the bulk electric system. See Glossary of Terms Used in NERC Reliability Standards, updated January 31, 2018, available at http://www.nerc.com/pa/stand/Pages/default.aspx.

take of federally listed species and species that could become listed during implementation of an HCP. Therefore, NPPD has prepared the HCP as part of its R-Project ITP application.



NPPD's R-Project
FIGURE 1-1
ABB ESTIMATED RANGE AND STUDY AREA

1.3 Permit Holder / Permit Duration

As described in Section 1.1, the applicant for an ITP is NPPD, who will also be the ITP holder upon issuance. NPPD is requesting an ITP with a 50-year duration. The estimated life of the R-Project transmission line is 50 years, and take of ABB may occur from emergency repairs at any point throughout this time period. A 50-year permit duration provides take coverage for construction of the R-Project, as well as emergency repairs that may be required throughout the life of the transmission line. If the transmission line remains in operation at the end of the ITP duration, NPPD will coordinate with the USFWS to renew or amend the ITP as needed.

1.4 Permit Area

The Permit Area for this HCP is defined as the geographical area within which incidental take resulting from Covered Activities is expected to occur. The Permit Area begins where the R-Project crosses Nebraska Highway 92 at the town of Stapleton, Nebraska and continues north to the Thedford Substation and then east to the new Holt County Substation (Figure 1-2). The Permit Area includes all portions of the R-Project that fall within areas with a greater than 1.0% probability of ABB occurrence based on the species distribution model for ABB in Nebraska's Sandhills described in Jorgensen et al. (2014). The model was developed using a logistic regression model for presence/absence data and a number of climate, soil texture, and land-cover variables. The USFWS considers ABB to be present in all areas with a greater than 1.0% probability of occurrence to reduce the likelihood an area is erroneously classified as unoccupied.

The Permit Area from Stapleton to the Thedford Substation includes one mile on either side of the R-Project centerline (two miles wide total), while the Permit Area from the Thedford Substation to the Holt County Substation includes four miles on either side of the R-Project centerline (eight miles wide total). The varying Permit Area width incorporates all potential impacts occurring outside the transmission line ROW including construction access and construction yards.

The Permit Area is narrow between Stapleton and the Thedford Substation because the R-Project largely follows United States (U.S.) Highway 83 along this segment and all temporary disturbances will be within one mile of the transmission line. This includes those portions of the route between Stapleton and the Thedford Substation where the R-Project is not adjacent to U.S. Highway 83. Conversely, from the Thedford Substation to the new Holt County Substation, existing access is limited, and the Permit Area must be wider to encompass all construction access. The Permit Area does not include or extend east beyond the new Holt County Substation because the R-Project terminates at the new substation and no disturbance will occur to the east of it. The Holt County Substation site is excluded from the Permit Area because it is an agricultural field that is unsuitable for ABB.

This HCP assumes ABB presence throughout all portions of the Permit Area.

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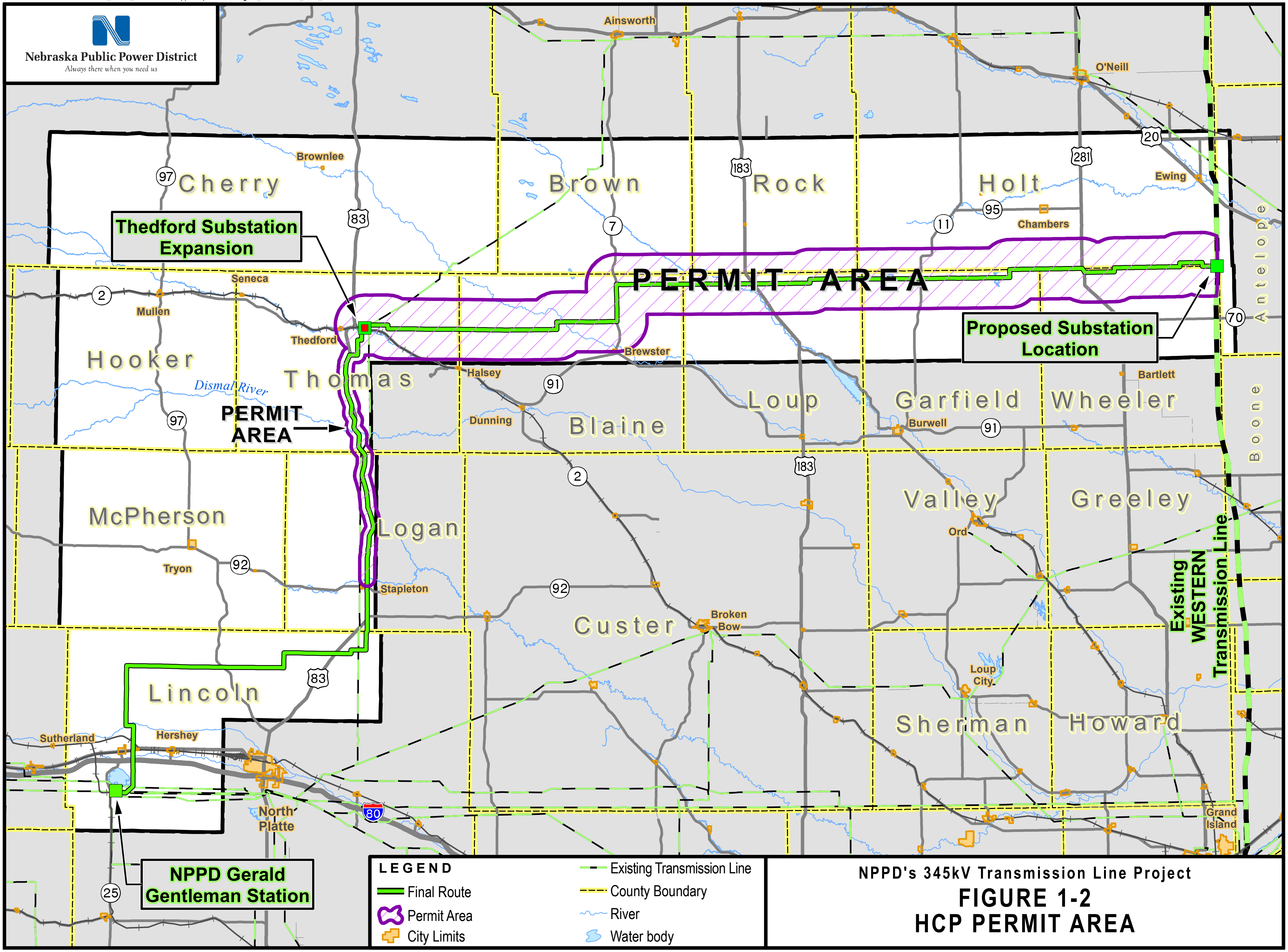


NPPD's 345kV Transmission Line Project
FIGURE 1-2
HCP PERMIT AREA

1.5 Considered Species

Species considered during development of this HCP are presented in Table 1-1. This list of species was developed in coordination with the USFWS's Nebraska Field Office and NGPC. Species include those listed, proposed to be listed, or under review as to whether to be listed as threatened or endangered (16 United States Code [U.S.C.] §§ 1532(6), 1532(20); 50 CFR §§ 17.11, 17.12) and those listed as candidate species under the ESA (80 Federal Register 80584 (Dec. 2, 2016)), as well as species protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. §§ 668-668d).

The only species categorized as a Covered Species is the ABB. By definition, Covered Species are those species included in an HCP for which authorization of incidental take is being requested and subsequently will be included in the ITP. All remaining species are categorized as "Evaluated Species." Evaluated Species are those for which authorization of incidental take is not being requested because take will be avoided through measures described in Section 4.0 of this HCP.

TABLE 1-1 CONSIDERED SPECIES

SPECIES	FEDERAL STATUS[1]	STATE STATUS[2]	COVERED SPECIES	EVALUATED SPECIES
Insects				
American burying beetle (*Nicrophorus americanus*)	Endangered	Endangered	X	
Birds				
Whooping crane (*Grus americana*)	Endangered	Endangered		X
Interior least tern (*Sterna antillarum*)	Endangered	Endangered		X
Piping plover (*Charadrius melodus*)	Threatened	Threatened		X
Bald eagle (*Haliaeetus leucocephalus*)	Bald and Golden Eagle Protection Act	None		X
Golden eagle (*Aquila chrysaetos*)	Bald and Golden Eagle Protection Act	None		X
Rufa red knot (*Calidris canutus rufa*)	Threatened	Threatened		X
Mammals				
Northern long-eared bat (*Myotis septentrionalis*)	Threatened	Threatened		X
Reptiles				
Blanding's turtle (*Emydoidea blandingii*)	Under Review	None		X
Fish				
Topeka shiner (*Notropis topeka*)	Endangered	Endangered		X
Plants				
Blowout penstemon (*Penstemon haydenii*)	Endangered	Endangered		X
Western prairie fringed orchid (*Platanthera praeclara*)	Threatened	Threatened		X

[1] Federal status includes species listed as threatened, endangered, or candidate under the ESA, under review of the ESA, and species protected under BGEPA.
[2] State status includes species listed as threatened or endangered under the Nebraska Nongame and Endangered Species Conservation Act.

1.6 Regulatory Framework

1.6.1 Federal Endangered Species Act

Section 9 of the ESA and regulations pursuant to ESA Section 4(d) prohibit the take of endangered and threatened wildlife species, respectively, without authorization or exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined by the USFWS to include substantial habitat modification or degradation that results in death or injury to listed species by impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the USFWS as intentional or negligent actions that create the likelihood of injury to listed species by annoying them to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Pursuant to ESA Sections 11(a) and (b), any person who knowingly violates ESA Section 9, or any permit, certificate, or regulation related to Section 9, may be subject to civil penalties of up to $51,302 for each violation or criminal penalties up to $50,000 and/or imprisonment of up to one year.

Individuals and state and local agencies proposing an action that is expected to result in the take of federally listed species are encouraged to apply for an ITP under ESA Section 10(a)(1)(B). Such permits are issued by USFWS when issuance criteria are met. The five issuance criteria for an ITP are as follows:

1. Taking will be incidental.
2. The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking.
3. The applicant will ensure that adequate funding for the plan will be provided.
4. Taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.
5. Other measures, as required by the Secretary of the Interior, will be met.

Section 7 of the ESA requires federal agencies to ensure that their actions, including the issuance of permits, are not likely to jeopardize the continued existence of listed species or destroy or adversely modify listed species' critical habitat. The USFWS has defined "jeopardize the continued existence of" as to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. Issuance of an ITP under Section 10(a)(1)(B) of the ESA by the USFWS is a federal action subject to Section 7 of the ESA. As a federal agency issuing a discretionary permit, the USFWS is required to consult with itself (i.e., conduct an internal consultation).

The requirements of Section 7 and Section 10 substantially overlap. Elements unique to Section 7 include analyses of impacts on designated critical habitat, analyses of impacts on listed plant species, if any, and analyses of indirect and cumulative impacts on listed species. Under Section 7, cumulative effects are effects of future state, tribal, local, or private actions not involving federal activities that are reasonably certain to occur in the action area. The analyses regarding evaluated species (Table 1-1) are included in this HCP to assist the USFWS with its internal Section 7 consultation.

1.6.2 The Section 10(a)(1)(B) Process - Habitat Conservation Plan Requirements and Guidelines

The Section 10(a)(1)(B) process for obtaining an ITP has three primary phases: (1) the HCP development phase; (2) the formal permit processing phase; and (3) the post-issuance phase. During the HCP development phase, the project applicant prepares a plan that integrates the proposed project or activity with the protection of listed species. An HCP submitted in support of an ITP application must include the following information:

- Impacts likely to result from the proposed taking of the species for which permit coverage is requested.
- Measures that will be implemented to monitor, minimize, and mitigate impacts; funding that will be made available to undertake such measures; and procedures to deal with unforeseen circumstances.
- Alternative actions to such taking the applicant considered and the reasons why such alternatives are not proposed to be utilized.
- Additional measures USFWS may require as necessary or appropriate for purposes of the plan.

The HCP development phase concludes and the permit processing phase begins when a complete application package is submitted to the appropriate permit-issuing office. A complete application package consists of: (1) a draft HCP, (2) a permit application, and (3) a $100 fee from the applicant. The USFWS also prepares an Intra-Service Section 7 Biological Opinion and a Set of Findings, which evaluates the Section 10(a)(1)(B) permit application in the context of permit issuance criteria (see Section 1.6.1 above). The USFWS must also prepare the appropriate environmental analysis to comply with the National Environmental Policy Act (NEPA). Note that while the applicant is developing the HCP, the USFWS may be drafting the NEPA analysis. Once the draft HCP and NEPA analysis are complete, they are concurrently noticed in the Federal Register for public review. Using the comments received during public review, both documents are revised and finalized. A Section 10(a)(1)(B) ITP is granted upon a determination by the USFWS that all issuance criteria have been met.

During the post-issuance phase, the permittee and other responsible entities implement the HCP and the permit, and the USFWS monitors the permittee's compliance with the HCP and permit as well as the long-term progress and success of the HCP. The public is notified of permit issuance by means of the Federal Register.

1.6.3 National Environmental Policy Act

The purpose of NEPA is two-fold: to ensure that federal agencies examine the environmental impacts of their proposed actions (in this case deciding whether to issue an ITP) and to utilize public participation. NEPA serves as an analytical tool to identify the direct, indirect, and cumulative impacts of the proposed action and its alternatives as part of USFWS's processing of the permit application. A NEPA document must be prepared for each HCP as part of the ITP application process. An Environmental Impact Statement (EIS) has been prepared by the USFWS in association with this HCP.

1.6.4 National Historic Preservation Act

All federal agencies are required to examine the impacts of their undertakings (e.g., issuance of a permit) on historic properties. This may require consultation with the State Historic Preservation Office (SHPO) and appropriate American Indian tribes. As part of the consultation process, the applicants may be required to conduct cultural resource surveys and implement measures to minimize or mitigate impacts to historic properties.

1.6.5 Bald and Golden Eagle Protection Act

Under BGEPA, it is unlawful to take or possess any bald or golden eagle, except as authorized by the USFWS. BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." 16 U.S.C. § 668c. Disturb means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (50 CFR § 22.3).

Upon delisting of the bald eagle from the ESA in 2007, the USFWS issued the National Bald Eagle Management Guidelines, which intended to publicize the continued protection for bald eagles, advise the public about the possibility of disturbing bald eagles (which is prohibited under BGEPA), and to encourage land management activities that benefit bald eagles. Under BGEPA, the criminal fines for the first violation can be up to $100,000 for individuals and $200,000 for corporations; fines for subsequent violations (with each take deemed to be a separate violation) can be up to $250,000 for individuals and $500,000 for corporations. BGEPA also allows for civil penalties up to $12,964.

Federal regulations set forth in 50 CFR § 22.26 provide for issuance of permits to take bald eagles and golden eagles where the take (1) is compatible with the preservation of the bald eagle and the golden eagle, (2) is necessary to protect an interest in a particular locality, (3) is associated with but not the purpose of the activity and (4) cannot practicably be avoided. The R-Project is not expected to result in the take of a bald eagle through electrocution or collision. Correspondence with USFWS states that the expected risk to bald eagles is low, so long as the R-Project follows the guidance described in Avian Power Line Interaction Committee (APLIC 2006) and APLIC (2012), and take of a bald eagle is not anticipated (Kritz, Kevin. Biologist, USFWS Region 6 Migratory Bird Management Office. Personal communication via email with Jim Jenniges, May 27, 2016). See Section 4.0 for the potential effects analysis of bald and golden eagles and how those effects will be minimized.

1.6.6 Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA; 16 U.S.C. §§ 703-712) protects migratory birds in the United States. The MBTA states "unless and except as permitted by regulation . . . it shall be unlawful at any time, by any means, or in any manner to pursue, hunt, take, capture, kill . . . any migratory bird, any part, nest, or eggs of such a bird . . . ." Take is defined as "pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to" do any of the foregoing acts. Any individual, which includes a corporation or other organization, who violates the MBTA may be fined up to $15,000 and/or imprisoned for up to six months for a misdemeanor conviction. The MBTA has no provision for permitting incidental or accidental take, other than for military-readiness activities (50 CFR Part 21). The current position of the Department of the Interior is that the MBTA does not prohibit incidental take.[2]

The MBTA protects the majority of birds that nest in North America. Based on revisions to the list in 2013, 1,026 bird species are protected under the MBTA, including raptors, waterfowl, shorebirds, seabirds, and songbirds (50 CFR § 10.13). The MBTA does not protect non-migratory species including upland game birds or introduced species such as house sparrow (*Passer domesticus*), rock pigeon (*Columba livia*), European starling (*Sturnus vulgaris*), monk parakeet (*Myiopsitta monachus*), and 121 other less commonly encountered species.

1.6.7 Nebraska Nongame Endangered Species Conservation Act

The intent of the Nebraska Nongame and Endangered Species Conservation Act (NESCA) (Nebraska Revised Statutes §§ 37-801 to -811) is to conserve plant and animal species in the state of Nebraska for human enjoyment and scientific purposes and to ensure their perpetuation as viable components of their ecosystems. Under NESCA, NGPC has created a list of species that are protected as either threatened or endangered within the state of Nebraska. Any species that occurs in Nebraska and is federally listed as threatened or endangered under the ESA is automatically listed under NESCA. Under NESCA, state

[2] See Solicitor's Opinion M-37050, *The Migratory Bird Treaty Act Does Not Prohibit Incidental Take* (Dec. 22, 2017).

agencies are required to ensure actions authorized, funded, or carried out by them do not jeopardize the continued existence of such endangered or threatened species or result in the destruction or modification of habitat of such species that is determined by the NGPC to be critical.

Unlike Section 10(a)(1)(B) of the ESA, NESCA has no formal process for issuing an ITP. Under NESCA, take can only be allowed if mitigation for such take will ultimately enhance the survival of the species. For this reason, NPPD worked with NGPC individually and through development of this HCP to ensure actions taken by NPPD first avoided and minimized impacts to listed species to the maximum extent practicable and then mitigated unavoidable impacts in compliance with the provisions of NESCA. Following a review of potential project impacts, NGPC issued a letter to the Nebraska Power Review Board on September 11, 2014, which stated the R-Project “may affect but is not likely to adversely affect” species protected under NESCA, so long as avoidance, minimization, and mitigation measures outlined in that letter were followed. NPPD has agreed to follow the measures described in the September 2014 letter to ensure compliance with NESCA. Specific avoidance, minimization, and mitigation measures identified for HCP covered and evaluated species have been incorporated into this HCP.

2.0 PROJECT DESCRIPTION / ACTIVITIES COVERED BY PERMIT

Section 2.0 of this HCP is divided into four sections. Sections 2.1 through 2.7 describe the R-Project transmission line and substation design, construction, and operation and maintenance activities. Section 2.8 provides a description of those activities that are considered Covered Activities under this HCP. Only those activities likely to result in take of ABB are included as Covered Activities. Therefore, not all design, construction, and operation and maintenance activities are included as Covered Activities. Section 2.9 provides a brief description of the Avoidance and Minimization measures that may be implemented to reduce potential effects to ABB. Section 2.10 provides a description of the alternatives evaluated and why these alternatives were not proposed to be utilized.

2.1 Transmission Line Design

The R-Project involves the construction of a 225-mile-long 345 kV transmission line in two segments. The north/south segment is 100 miles long and starts at the GGS Substation near Sutherland, proceeds north across the South Platte and North Platte rivers and continues north for approximately eight miles before turning east for 30 miles, crosses Birdwood Creek and extends eastward to meet with U.S. Highway 83. The north/south segment then parallels U.S. Highway 83 to connect to a new substation to be sited adjacent to NPPD's existing substation east of Thedford. The east/west segment is 125 miles long and starts at the new substation at Thedford and proceeds east to State Highway 7 north of Brewster. The east/west segment then proceeds north along State Highway 7 for approximately five miles then turns east to its terminus at Western's Fort Thompson to Grand Island line where the Holt County Substation will be built in the Holt County at the intersection of Holt, Antelope, and Wheeler counties.

2.1.1 Structure Types and Foundations

Two types of structures will be used for this transmission line: tubular steel monopoles and steel lattice towers (Figure 2-1). Tubular steel monopoles are typically employed on most NPPD projects but require large equipment to install and will be used along the transmission line route where major access roads exist, including U.S. Highway 83. Tubular steel monopole structures will be placed approximately 1,350 feet apart (average ruling span) with a nominal structure height of 150 feet. The average ruling span means the "standard, typical, or expected" span distance while specific spans may be increased or decreased depending on a specific situation or condition.

Steel lattice towers will be used in areas of the Sandhills where existing access roads are limited or do not exist, due to construction advantages in transportation and installation of these structures. Lattice towers can be constructed with less overall impact to the surrounding area with the use of smaller equipment and helicopter construction. Span lengths between lattice towers will be the same as monopoles with a nominal structure height of 130 feet. Figure 2-2 identifies the locations along the R-Project transmission line where tubular steel monopoles and steel lattice towers will be used.

Both tubular steel monopoles and lattice towers can be designed for angles or dead-ends (where line changes direction) to withstand the increased lateral stress of conductors pulling in two different directions.

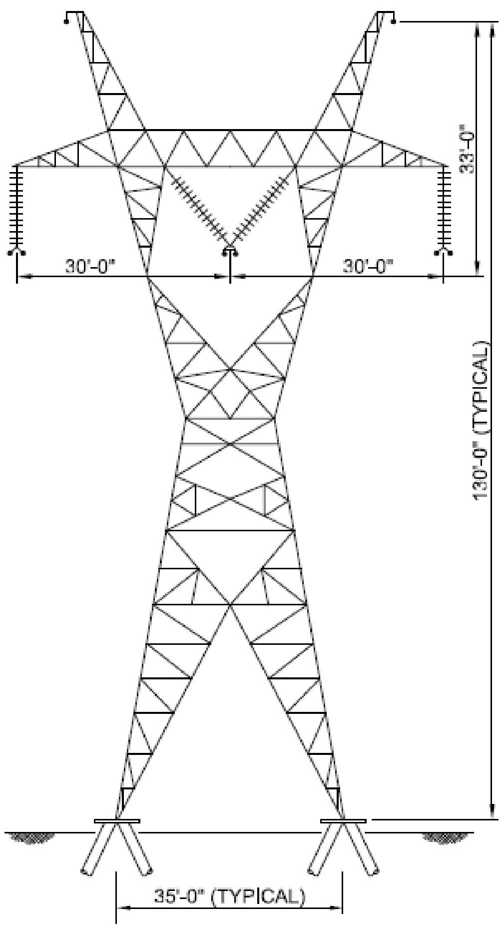
Tubular steel monopoles require cast-in-place concrete foundations. In areas where sloughing or water-compromised soils are present, underground temporary steel casings may be used to hold excavated walls for monopole foundations. Cast-in-place concrete foundations are typically seven feet in diameter and will include one foundation per structure. Lattice tower foundations will employ the use of helical pier foundations that do not require concrete or temporary casings. The purpose of a helical pier foundation is to transfer the load of a structure through the pier to a suitable depth of soil. A helical pier foundation is an extendable deep-foundation system with helical plates welded or bolted to a central shaft. Load is transferred from the shaft to the soil through the bearing plates. Each lattice tower will require several helical piers per leg of the structure. Once installed, the helical piers will be cut off at ground level and a square metal plate will be welded to the top of the piers. In total, the portion of the helical pier foundations above ground will include four 16-square-foot plates, one plate for each leg of the structure.

2.1.2 Right-of-Way

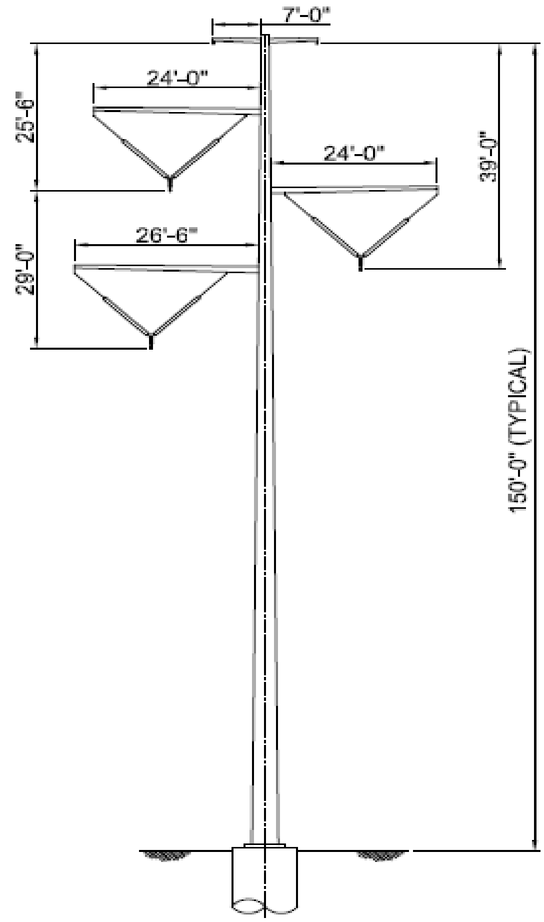
Right-of-way (ROW) width will typically be 200 feet (100 feet each side of centerline) for the entire transmission line unless otherwise specified.

FIGURE 2-1 PROPOSED STRUCTURE TYPES

Lattice Tower



Tubular Steel Monopole



Date: 1/22/2016 Path: W:\128143_NPPD_SPP\DD\GIS\Apps\Reports\HCP\Fig2-2_StructureType_8x11_20160122.mxd

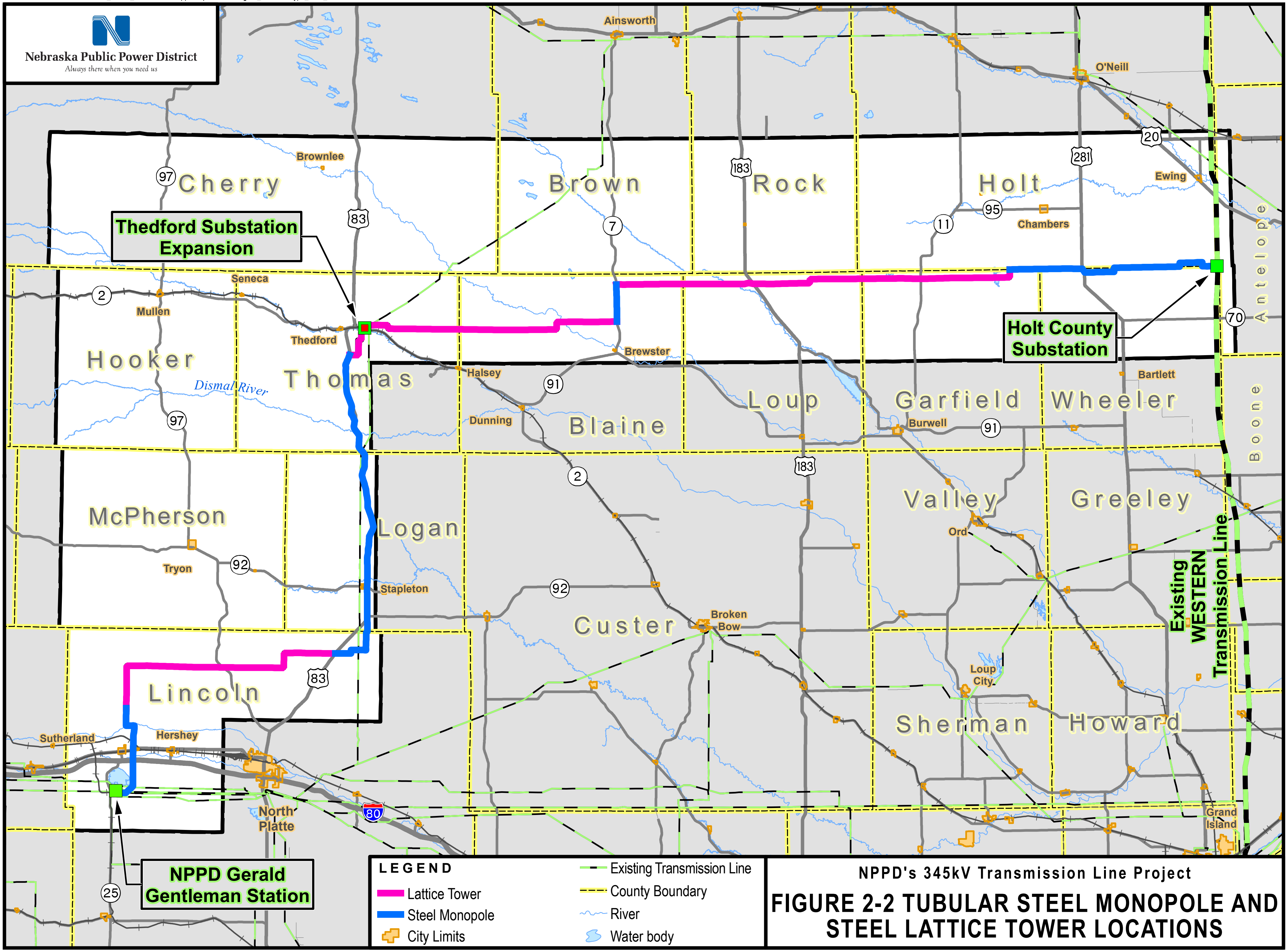


FIGURE 2-2 TUBULAR STEEL MONOPOLE AND STEEL LATTICE TOWER LOCATIONS

2.1.3 Conductors and Associated Hardware

Selection of the conductor's mechanical strength primarily is dictated by the ice and wind loading expected to occur in the region where the transmission line is built. There is a risk of extreme icing events and severe weather in Nebraska and, due to this risk, the conductor will be Aluminum Conductor Steel Reinforced (ACSR), which is common for many power lines in the state. The conductor's strength in a steel-reinforced stranding is a function of the percentage of steel within the conductor area. The aluminum carries most of the electrical current, and the steel provides tensile strength to support the aluminum strands. The conductors being considered for the R-Project are a 1.405-inch-equivalent diameter, bundled conductor (T2-ACSR 477 kcmil "T2-Hawk" conductor), which consists of two twisted conductors, each having 26 strands of aluminum and seven strands of steel, and a 1.196-inch diameter, bundled conductor (ACSR 954 kcmil 54/7 "Cardinal" conductor), which consists of 54 strands of aluminum and seven strands of steel. T2-ASCR has been designated for use in conjunction with the monopoles due to the propensity for galloping to occur along the line during Nebraska ice and wind events. Galloping on a transmission line is the oscillation or wave motion of conductors and shield wires during low to moderate winds when ice has accumulated on the wire. T2-ASCR mitigates this phenomenon, which is of paramount importance on monopole structures where structural geometry makes galloping unacceptable. The conductor system will consist of three electrical phases, with two bundled conductors for each phase. Minimum conductor height above ground will be approximately 28 to 33 feet, which exceeds the National Electrical Safety Code (NESC) standards. Greater clearances may be required in areas accessible to oversized vehicles or over center-pivot irrigation systems. Minimum conductor clearance will dictate the exact height of each structure based on topography and safety clearance requirements. Minimum conductor clearances in some instances may be greater based on specific NESC requirements (e.g., minimum clearance above a roadway, trees in forested areas, or above farm equipment in agricultural areas).

Insulator assemblies for 345 kV tangent structures[3] for each structure type will consist of insulators normally in the form of a "V" for tubular steel monopole structures and in the form of an "I" and "V" for lattice towers. These insulator strings are used to suspend each conductor bundle from the structure, maintaining the appropriate electrical clearance between the conductors, ground, and structure. The V-shaped configuration of the 345 kV insulators also restrains the conductor so that it will not swing into contact with the structure during high winds.

2.1.4 Overhead Shield (Ground) Wires

To protect the 345 kV transmission line conductors from direct lightning strikes, two lightning-protection shield wires, also referred to as ground wires, will be installed on the tops of each structure utilizing specialized shield wire connection brackets or arms. Electrical current from the lightning strikes will be transferred through the shield wires and structures into the ground.

One of the shield wires will be composed of extra-high-strength steel wire approximately 0.45 inch in diameter. The second shield wire will be an optical ground wire (OPGW) constructed of aluminum and steel, which will carry 24 glass fibers within its core. The OPGW will have a diameter of approximately 0.65 inch. The OPGW will be used to facilitate internal NPPD communications between substations.

2.1.5 Grounding Rods

A grounding system will be installed at the base of each transmission structure and will consist of copper ground rods embedded in each concrete structure foundation and connected to the structure by a buried copper lead or by use of the helical pier foundations. After the foundations have been installed, the

[3] Tangent structures are also referred to as "in-line structures" and are used where little to no angle is required between structures. They are in contrast to "dead-end" structures, which are used when the transmission line turns a large angle or terminates.

grounding will be tested to determine the resistance to ground. If the resistance to ground for a transmission structure is excessive, then additional ground rods will be installed to lower the resistance.

2.1.6 Minor Additional Hardware

In addition to the conductors, insulators, and overhead shield wires, other associated hardware will be installed on the structures as part of the insulator assembly to support the conductors and shield wires. This hardware will include clamps, shackles, links, plates, and various other pieces composed of galvanized steel and aluminum.

Other hardware not associated with the transmission of electricity may be installed as part of the R-Project. This hardware may include large-diameter aerial marker balls near airports or aircraft warning lighting as required for the conductors or structures per Federal Aviation Administration (FAA) regulations. Aircraft warning lighting is typically only required on structures over 200 feet tall. Structure proximity to airports and structure height are the determinants of whether FAA regulations will apply based on an assessment of FAA criteria. NPPD does not anticipate that structure lighting will be required because proposed structures will be less than 200 feet tall and will be located to avoid airport impacts to the greatest extent practicable. However, if special circumstances (e.g., tall crossings) require structures taller than 200 feet, FAA regulations regarding lighting and marking will be followed.

Potential options for marking transmission lines to reduce avian collisions are described in APLIC's *Reducing Avian Collisions with Power Lines: State of the Art 2012* (APLIC 2012). NPPD has a substantial successful track record of working with state and federal agencies to appropriately mark transmission lines to reduce avian collisions and will continue to work proactively in this regard on the R-Project. NPPD's standard marking device implemented on previous projects is the spiral bird flight diverter, though as described further in Section 4.1, NPPD intends to use two types of bird flight diverters for the R-Project.

2.2 Substation Design

The R-Project will require construction of: (1) a new 345 kV bay within the existing GGS Substation footprint; (2) a new 345 kV substation section expansion to the existing Thedford 115 kV substation; and (3) a new 345 kV substation at the new Holt County Substation site.

2.2.1 Gerald Gentleman Station Substation

The GGS Substation is located in Lincoln County, just south of Sutherland Reservoir State Recreation Area and north of West Power Road. The substation will be expanded within its existing footprint. Expansion will include installation of the following major equipment: 345 kV breaker, 345 kV reactor, and 345 kV dead-end structure.

2.2.2 Thedford Substation

The Thedford Substation expansion site is located in Thomas County, east of Thedford, west of the existing Thedford 115 kV Substation and north of State Highway 2. The current land use of the site is pasture/rangeland. The substation expansion will encompass approximately 13 acres. The major components of the substation will include 345 kV breakers and associated disconnect switches, 345 kV reactors, 345 kV dead-end structures, 345 kV bus and associated support structures, fencing, grounding, and a control building with protection and control devices.

2.2.3 Holt County Substation

The new Holt County Substation will be located in Holt County on the northwest corner of the intersection of 846th Road and 510th Avenue. The current land use of the site in Holt County is center-pivot irrigated cropland. The substation will encompass up to 12 acres. The major components of the substation will include 345 kV breakers and associated disconnect switches, 345 kV reactors, 345 kV dead-end structures, 345 kV bus and associated support structures, fencing, grounding, a microwave dish, and a control building with communications, protection, and control devices.

2.3 Communications System

The R-Project will require a number of critical telecommunications support systems. These systems will be configured and designed to support the overall availability and reliability requirements for the operation of the line and the supporting substations. To provide secure and reliable communications for the control system real-time requirements, protection, and day-to-day operations and maintenance needs, a mix of telecommunications systems will be used. The primary communications for protection will be Power Line Carrier over the power line. The secondary communications for protection and control is proposed to be provided via the one OPGW installed in a shield wire position on the transmission line.

In addition to protection and control, the communications system will be used for Supervisory Control and Data Acquisition (SCADA). The SCADA system is a computer system for gathering and analyzing real-time data that are used to monitor and control the transmission system (substation equipment and the line itself). A SCADA system gathers information, such as the status of a transmission line, transfers the information back to a central site, alerts the central site if the line has de-energized, carries out necessary analysis and control, such as determining if outage of the line is critical, and displays the information in a logical and organized fashion.

The secondary communications will be an all-digital fiber system utilizing the OPGW located on the transmission line structures. The optical data signal degrades with distance as it travels through the optical fiber cable. Consequently, signal-regeneration sites are required to amplify the signals if the distance between stations or regeneration sites exceeds approximately 40 to 70 miles. In total, three regeneration sites will be required for the proposed R-Project. Regeneration communication sites will be located within the transmission line ROW, along existing roads, and along existing distribution power lines. Each site will consist of a cabinet (72 inches high, 45 inches wide, 27 inches deep) placed within the transmission line ROW. Power will be supplied to each regeneration site by existing adjacent distribution power lines. One regeneration site will be located in Lincoln County at the intersection of U.S. Highway 83 and Auble Road. One regeneration site will be located along State Highway 7 where the R-Project proceeds east away from the road. The third regeneration site will be at the intersection of State Highway 11 and the R-Project.

A third communications link that will be located within the Holt County Substation is a microwave set up that will allow for microwave communications between the Holt County Substation and NPPD's existing Antelope Substation located northeast of Neligh, Nebraska. This communications link will require the installation of four microwave dishes to establish the microwave hop between the Holt County Substation and the Antelope Substation. One microwave dish will be installed in the new Holt County Substation. Two microwave dishes will be installed on an existing communication tower located near Neligh, Nebraska. One microwave dish will be installed on an existing above ground structure located within the existing Antelope Substation.

2.4 Transmission Line Construction

2.4.1 Sequence of Construction

Construction of the 345 kV transmission line is scheduled to start after the ITP and Record of Decision (ROD) are issued. Electrification of the transmission line would occur approximately 21 to 24 months after initiation of construction. The general sequence of construction for the R-Project is described below.

Various phases of construction will occur at different locations throughout the construction process. This will require several crews operating at the same time at different locations.

2.4.2 Surveying and Staking

Construction survey work for the R-Project consists of determining or refining the centerline location through updated electronic and aerial survey techniques, specific pole locations (also called structure spotting), ROW boundaries, and temporary work areas (fly yards/assembly areas and materials storage yards) boundaries. Centerline and final alignment design and staking will adhere to the conditions outlined in the NESC and NPPD policies and specifications. Equipment used in surveying and staking may include, but is not limited to, light vehicles and all-terrain vehicles (ATV) and similar-type vehicles.

2.4.3 Noxious Weed Management

Management of noxious weeds is addressed in the Restoration Management Plan to prevent and control the spread of noxious and invasive weeds during construction of the R-Project. Examples of noxious weed control measures that could be implemented during construction of the R-Project include: avoiding driving through weed-infested areas to prevent spread; inspecting material sources used on the construction site to ensure they are weed-free before use and transport; and cleaning construction equipment and vehicles to prevent noxious weeds from spread or invasion. Large patches of noxious weeds that threaten restoration efforts may also be treated with herbicides. Any use of herbicides would be applied by a licensed applicator and would follow the specific directions for that herbicide. Restricted-use herbicides would be approved by USFWS and NGPC prior to use in restoration areas. Restricted-use herbicides are not available for purchase or use by the general public and must be applied by a certified applicator.

2.4.4 ROW Tree Clearing

Since the Sandhills landscape is primarily grassland, vegetation removal within the 200-foot-wide ROW will be minimal. Removal of mature trees under or near the conductors will be done to provide adequate electrical clearance as required by NPPD's Transmission Vegetation Management Standard No. OG-T&D-St-002. This standard is based on NERC and NESC standards for maintaining reliability of electrical facilities. Tree clearing will be completed outside of the migratory bird nesting season to the extent practicable. If clearing must be completed during the migratory bird nesting season, clearance surveys conducted by a qualified biologist will be completed prior to tree removal to identify occupied nests for avoidance. Equipment used to clear trees under or near conductors may include, but is not limited to, ATVs, brush mower/shredders, light vehicles, mechanized feller/bunchers, and grapple skidders. Feller/bunchers are motorized vehicles with an attachment that can rapidly cut and gather trees before felling them. A skidder is a vehicle used for pulling cut trees out of an area.

After the ROW boundaries are staked and pole locations are marked, trees within the ROW zone that have the potential to come into contact with the line will be cleared. In addition, danger trees will be identified and removed during initial ROW clearing. "Danger trees" are trees or tree limbs that, although located off of the transmission line ROW (and thus outside of normal clearing limits), are of such height; condition (e.g., leaning, rotted); location (e.g., side hill, proximity to transmission lines, soil characteristics); and/or species type that they represent a threat to the integrity of the transmission line conductors, pole structures, or other facilities. Tree stumps will be cut to grade and remain unless the landowner requests removal. Herbicides may be applied directly to tree stumps to prevent regeneration. Application of restricted-use herbicides would be approved by USFWS and NGPC and would be applied by a licensed applicator.

2.4.5 Access for Construction

The R-Project will maximize use of existing roads and two-tracks wherever feasible for accessing structure locations during construction to minimize ground disturbance. Large areas of the Sandhills do not have an existing road network, such as section line roads. In these areas, overland access and temporary access easements will be required in order to access structure locations and work areas during construction and maintenance. Overland access will be used to the greatest extent possible where existing access is not available to avoid soil disturbance and compaction. Overland access will utilize existing two-tracks where available; will be conducted with low-ground-pressure tracked or rubber-tired equipment; will not require improvements (blading or fill); and will drive over vegetation rather than remove it. Even though vegetation may be damaged, this creates vertical mulch upon the surface soil and leaves the seed bank in place. Crushed vegetation facilitates revegetation because it typically re-sprouts after temporary use is done. Temporary access routes may require improvements such as blading, and where required, placement of fill material. A combination of these access scenarios may be required to access a structure work area. The alignment of any new overland or temporary access routes will follow the existing landform contours in designated areas where practicable, providing that such alignment does not impact other sensitive resources.

Consideration of access begins where construction equipment leaves the existing maintained road network. Access to structure locations, fly yard/assembly areas, pulling and tensioning sites, and other temporary work areas is broken down into three access categories:

- Access Scenario 1 includes the use of existing two-tracks and greenfield overland travel with no improvements. Access Scenario 1 will not create any new disturbances. Existing vegetation will be left in place. Access Scenario 1 is reserved for ATVs, light vehicles, and low-ground-pressure equipment that can travel with no improvements to the path.
- Access Scenario 2 includes new temporary access routes, existing two-tracks that will require some improvement, and overland travel with large or heavy vehicles and equipment that may require improvements for access. Improvements to existing access (including two-tracks) and new access routes may require blading and the placement of fill material on geofabric where required.
- Access Scenario 3 includes new permanent access routes that will be left in place following the completion of construction activities. Access Scenario 3 predominantly will be used at substation locations and specific circumstances where a route may be left in place at the landowner's request.

Low-ground-pressure equipment is defined as equipment used during construction that can travel overland with no improvements to the access path. Low-ground-pressure equipment will not require the removal of vegetation and will not disturb the landscape, other than crushing vegetation. The exact locations that may require improvements for access are not known at this time. Therefore, all access to pulling and tensioning sites, fly yard/assembly areas, material storage yards, and tubular steel monopole structures has been classified as Access Scenario 2. All access that will be used for the installation of lattice towers only (i.e., does not also proceed to a pulling and tensioning site) has been classified as Access Scenario 1 because the equipment necessary to install the foundations and structures will use existing two-tracks and greenfield overland travel with no improvements as described above.

Equipment used in the construction of Access Scenarios 2 and 3 may include, but is not limited to, bulldozers, front-end loaders, dump trucks, backhoes, excavators, graders, roller compactors, water trucks, crane trucks, and light vehicles.

Bridges and/or culverts installed for stream crossings will typically be removed upon completion of construction. Culverts at ditch crossings may be installed to get from existing roadways onto private land. These crossings may be left in place after construction for future access for maintenance or removed upon request. Any culverts installed will maintain the existing hydrology of the drainage and will not alter or impede flow. Use of low-ground-pressure equipment, matting, or other disturbance-minimizing techniques will be considered and utilized as needed.

A final Access Plan will be completed for the R-Project once final design of transmission structures and a ground-based inspection of potential access are completed. Access Scenarios 1, 2, and 3 used to estimate potential effects to species in this HCP are based on preliminary design and may require changes. The final Access Plan will delineate the location and types of access to each structure and the type of equipment allowed for each type of access. NPPD will complete and submit the final Access Plan to USFWS and NGPC for review, once ground-based inspection of potential access is completed.

2.4.6 Fly Yards / Assembly Areas and Materials Storage Yards

Temporary work areas will be required for materials and equipment storage and staging for construction activities. The materials storage yards will serve as field offices, reporting locations for workers, parking space for vehicles and equipment, storage of construction materials, and fabrication and assembly. Fly yards will be used for helicopter construction where materials and equipment are loaded into slings or choker cables for transport and placement at structure locations via helicopter. Fly yards will be located within the same footprint of lattice tower assembly areas. Fly yards/assembly areas and materials storage yards will be located along existing access roads and in previously disturbed areas when practicable. Grading and fill of these sites may be required. Due to the heavy equipment use and traffic within the confines of these sites, gravel will be placed on the ground surface to prevent soil erosion and sediment runoff. Equipment used to construct and operate within fly yards/assemble areas and materials storage yards may include, but is not limited to, earthmoving equipment, a heavy crane, semi-trucks, helicopters, and support vehicles. Upon completion of R-Project construction, all fill including gravel will be removed, soils decompacted, and the area revegetated to the appropriate specifications.

2.4.7 Batch Plants and Borrow Areas

Concrete batch plants may be necessary for foundation construction of steel monopole structures along existing access for a portion of the transmission line. Commercial ready-mix concrete may be used when access to structure locations is economically feasible. Existing concrete batch plants and borrow areas will be used to the maximum extent practicable. If needed, any new batch plants or borrow areas will be sited in previously disturbed locations, where available, and will not be located in environmentally sensitive areas, including threatened and endangered species habitat, wetlands, or cultural resource areas.

2.4.8 Structure Work Areas

At each structure location, a temporary work area will be needed for construction lay-down, structure assembly, and structure erection. To the extent necessary, the work area will be cleared of vegetation and bladed to create a safe working area for placing equipment, vehicles, and materials. In grassland areas, little if any clearing of vegetation will be needed. The ground disturbance required for lattice tower work areas is 100 feet by 100 feet and for steel monopole work areas is 200 feet by 200 feet. After line construction, all areas not needed for normal transmission line maintenance will be graded to blend as near as possible with the natural contours, then revegetated.

Equipment that may be used to prepare structure work areas varies depending on the structure type. Lattice towers can be constructed with lighter equipment and helicopters, and thus may not require a prepared structure work area. Steel monopole structures require heavier equipment in relation to lattice towers and will likely require some improvement to the structure work area to support construction.

Equipment used to prepare structure work areas may include, but is not limited to, small Bobcat-sized earthmoving equipment.

2.4.9 Pulling and Tensioning Sites

Wire pulling and tensioning sites are locations where specialized equipment, including winch trucks, light crawler tractors, or excavators, is used to spool out and tension the conductors and shield wires. Along tangent sections of the line, pulling and tensioning sites will be located approximately every two to four miles for steel monopoles and four to six miles for lattice towers. Pulling and tensioning sites will require two acres of temporary disturbance. Additional pulling sites are needed where major turns in the line occur. These angle structure or point-of-intercept sites will require pulling and tensioning in two directions to allow for the angle in the line. Wire pulling and tensioning sites will be cleared and bladed only to the extent necessary to perform construction activities safely. Equipment used at pulling and tensioning sites may include, but is not limited to, semi-trucks, tensioner pullers (large machine winch), heavy cranes to move reels, and matting to level the site. The use of helicopters to support pulling and tensioning is currently being evaluated.

2.4.10 Foundation Excavation and Installation

Excavation will be required for the steel monopole structure foundations. Foundation holes will be excavated using a truck- or excavator-mounted auger. The poles will be installed on drilled pier concrete foundations to a depth of approximately 25 to 45 feet depending on load and soil characteristics. All monopole structures will utilize cast-in-place concrete footings. Cast-in-place footings will be installed by placing reinforcing steel in excavated foundation holes and encasing it in concrete. Concrete will be delivered to the site in concrete trucks. Chute debris from concrete trucks will be washed at an approved location, and the debris will be hauled offsite and disposed of in non-environmentally sensitive areas after it hardens. Equipment that may be used to excavate and install steel monopole foundations may include, but is not limited to, truck- or excavator-mounted augers, dump trucks (remove spoils from site), concrete trucks, trucks and trailers to drop off rebar and anchor bolt cage, heavy cranes, backhoes, water trucks (for dewatering), and light support vehicles.

Excavated holes left open or unguarded will be covered and/or fenced where needed to protect the public, livestock, and wildlife. Any remaining spoils will be stockpiled at the localized work site and used to backfill holes. All remaining spoils not used for backfill will be hauled offsite and disposed of in non-environmentally sensitive areas.

For lattice tower structures, screw-in helical pier foundations will be used in areas of the Sandhills where existing access roads do not exist. Helical pier foundations do not require excavation. Each leg of the lattice tower will require a helical pier foundation (four legs total). Final designs have not been completed, but it is anticipated that each foundation will consist of three or four 7- to 12-inch diameter piles that are 20 to 40 feet in length. The helical piers are installed with an excavator that has a torque head where the bucket usually is located. The piers are screwed into the ground and no spoils need to be removed from the site. Once the piers are installed, the piers are cut to the correct grade and elevation, and then a cap that connects to the tower leg is welded or bolted on. Anchor bolts or stub angles are used to secure the structure to the foundation. Due to the cutting and welding that has to be performed at each site, NPPD will require the construction contractor to provide fire protection. It is anticipated that the construction contractor will have a water tank and fire extinguishers onsite during these activities along with using additional prevention measures such as fireproof roll-up mats and welding tents. Equipment that may be used to install screw-in helical pier foundations may include, but is not limited to, tracked excavators, light trucks and trailers, weld trucks, water trucks (for fire suppression), and light support vehicles.

2.4.11 Transmission Structure Assembly and Erection

Generally, tubular steel structures will be assembled and framed at each structure work area. For tubular steel monopoles, work areas need to be large enough to accommodate laying down the entire length of the poles while pole sections are assembled and cross-arms are mounted. Typically, insulators, strings, and stringing sheaves are then installed at each conductor and ground wire position while the pole is on the ground. Stringing sheaves are used to guide the conductor during the stringing process for attachment onto the insulator strings. The assembled pole will then be placed on the foundations and erected into place by a crane. Equipment used to erect steel monopole structures may include, but is not limited to, heavy cranes, bulldozers, bucket trucks, semi-trucks to deliver structure tubes, and light support vehicles.

For lattice tower construction, the typical sequence begins with delivery of the materials needed to construct the base to the structure location. Material will be delivered in bundles, and the base will be erected in place with a small crane. The remainder of the lattice tower will be assembled, in sections, at the fly yard/assembly areas. In addition, the structures will have the insulator strings and stringing sheaves pre-assembled and attached at each shield (ground) wire and conductor position. These sections will then be flown to the structure site with a helicopter. Depending on the construction contractor’s work plan, two or three sections will be needed to complete the entire tower. Assembly of the lattice tower sections and hardware in a fly yard/assembly area negates the need to have a large crane and heavier equipment at each structure location. Equipment that will be used to assemble the lattice tower sections within the fly yard/assembly area may include, but is not limited to, small cranes and additional support equipment such as a forklift.

2.4.12 Stringing of Conductors, Shield Wire, and Fiber Optic Ground Wire

Once the structures are in place, a “sock-line” will be pulled (strung) from structure to structure and threaded through the stringing sheaves on each structure by helicopter. If necessary in longer, high-tension stringing sections, a second larger-diameter and stronger line will be attached to the sock-line and strung prior to the attachment of the conductor and the shield wires. This process will be repeated until the shield wire, OPGW, and conductor are pulled through all sheaves.

Shield wires, OPGW, and conductors will be strung using powered pulling equipment at one end and powered braking or tensioning equipment at the other end of a conductor segment. These sites may differ in size and dimensions depending on the structure’s purpose (e.g., mid-span or dead-end), site-specific topography, and whether anchoring of the shield wire or conductor will be located at these sites. The tensioner, in concert with the puller, will maintain tension on the shield wires or conductor while they are fastened to the towers. Once each type of wire has been pulled in, the tension and sag will be adjusted, stringing sheaves will be removed, and the shield wires and conductors will be permanently attached to the insulators.

Splicing will be required at the end of conductor and shield wire spools during stringing. Compression fittings or implosive-type fittings will be used to join the conductors and shield wires. Implosive splicing technology is a splicing technique where a small amount of explosive is placed around an aluminum sleeve. The layer of explosive is designed with the right properties of detonation velocity, pressure, and geometry so that it will create the required compression to connect two lengths of conductor or shield wire together in a controlled manner. The detonation of a compression fitting creates a flash and a loud boom similar to the sound at the end of a barrel of a 12-gauge shotgun blast or a thunderclap (about 150 decibels) with the decibel level reducing with distance (Tyburski and Moore 2008; Carlsgaard and Klegstad 2012). Implosive-type fittings are commonly used in the transmission industry. The location of implosive splicing is unknown at this time and will be determined during construction depending on the length of each conductor reel. OPGW fibers will be spliced together in an enclosure mounted on a structure. The splicing will occur at structure work areas or pulling and tensioning sites. Caution also will be exercised during construction to avoid scratching or nicking the conductor surface to avoid introducing points where corona could occur. Corona-generated noise in the atmosphere near the conductor can occur during operation of the transmission line, particularly if the conductor surface is damaged. Changes to local atmospheric pressure may result in a hissing or cracking sound that may be heard directly under the transmission line or within a few feet of the ROW, depending on weather, altitude, and system voltage, with the level of corona noise receding with distance.

At tangent and small-angle towers, the conductors will be attached to the insulators using clamps. At the larger-angle dead-end structures, the conductors are cut and attached to the insulator assemblies by "dead-ending" the conductors, either with a compression fitting or an implosive-type fitting. Both are industry-recognized methods. When utilizing the implosive-type fitting, private landowners and public safety organizations will be notified before proceeding with this method.

For safety and efficiency reasons, wire stringing and tensioning activities are typically performed during daylight hours and are scheduled to coincide to the extent practical with periods of least road traffic in order to minimize traffic disruptions. For protection of the public during stringing activities, temporary guard structures will be erected at road and overhead line crossing locations where necessary. Guard structures will consist of H-frame wood poles placed on either side of the crossing to prevent ground wires, conductors, or equipment from falling on underlying facilities and disrupting road traffic. Typically, guard structures are installed just outside of the road ROW. Although the preference is for access to each of these guard structures to be located outside the road ROW, it may be necessary for access to be within the road ROW depending on topography and access restrictions imposed by the regulatory agency (Nebraska Department of Roads, county road and bridge department, etc.). Access use within the road ROW will be performed in compliance with the stipulations of the crossing permit and regulatory agency requirements.

Part of standard construction practices prior to conductor installation will involve measuring the resistance of the ground to electrical current near the structures. If the measurements indicate a high resistance, additional ground rods will be installed.

2.4.13 Construction Waste Disposal

Construction sites, material storage yards, and access routes will be kept in an orderly condition throughout the construction period. Refuse and trash will be removed from the sites and disposed in an approved manner. No open burning of construction trash will occur. In remote areas, trash and refuse will be removed to a construction staging area and contained temporarily until such time as it can be hauled to an approved site. Oils or chemicals will be hauled to an approved site for disposal. Potential contaminants such as oils, hydraulic fluids, antifreeze, and fuels will not be dumped on the ground, and all spills will be cleaned up. The construction contractor will prepare a Spill Prevention and Response Plan that will describe the measures that will be implemented during construction to prevent, respond to, and control spills of hazardous materials, as well as measures to minimize a spill's effect on the environment.

2.4.14 Site Restoration

The R-Project's restoration planning team, private landowners, local Natural Resources Conservation Service (NRCS) offices, and other rangeland experts were consulted regarding the appropriate methods, seed mixes, and rates to restore vegetation in areas disturbed by construction activities. All practical means will be used to restore the land, outside the minimum areas needed for safe operation and maintenance, to its original contour and natural drainage patterns.

NPPD will establish an Escrow Account to ensure the implementation and success of restoration efforts. The Escrow Agreement will be submitted to USFWS for review. The Restoration Management Plan includes stipulations for successful restoration criteria and steps that would be taken in the event restoration does not meet the stipulations. Additional details regarding restoration monitoring and milestones to identify when restoration has been achieved are described in Section 6.4.

2.5 Substation Construction

Construction of the substations will initially consist of survey work and geotechnical sample drillings to determine foundation requirements and soil resistivity measurements that will be used in the final design phases of the station. Once the final design of the station has been completed, a contractor will mobilize to perform site development work, including grubbing and then reshaping the general grade to form a relatively flat (1.0% slope) working surface. This effort also will include the construction of permanent all-weather access roads. An eight-foot-tall chain link fence will be erected around the perimeter of the substation to prevent unauthorized personnel from accessing the construction and staging areas. The perimeter fence will be a permanent feature to protect the public from accessing the facility. The excavated and fill areas will be compacted to the required densities to allow structural foundation installations. Oil containment structures to prevent oil from transformers, reactors, circuit breakers, etc., from getting into the ground or water bodies in the event of rupture or leak will be installed as required.

Following the foundation installation, underground electrical raceways and copper ground grid installation will take place, followed by steel structure erection and area lighting. The steel structure erection will overlap with the installation of the insulators and bus bar, as well as the installation of the various high-voltage apparatus typical of an electrical substation. The installation of the high-voltage transformers will require special high-capacity cranes and crews (as recommended by the manufacturer) to be mobilized for the unloading, setting into place, and final assembly of the transformers. While the above-mentioned activities are taking place, the enclosures that contain the control and protection equipment for the substation will be constructed, equipped, and wired. A final crushed rock surface will be placed on the subgrade to make for a stable driving and access platform for the maintenance of the equipment. After the equipment has been installed, testing of the various systems will take place, followed by electrical energization of the facility. The energization of the facility generally is timed to take place with the completion of the transmission line work and other required facilities.

2.6 Special Construction Practices

2.6.1 Helicopter Construction

The type of helicopters needed and the duration that they may be used is dependent on the selected contractor's overall approach to project construction and the availability of equipment. Because a construction contractor has not been selected at this time, the quantity, type, duration, and timing of helicopter construction cannot be predicted.

Helicopter construction techniques will be used for the erection of lattice towers (see Figure 2-2), stringing of conductor and shield wire sock line, and other R-Project construction activities. The use of helicopters for other structure erection is evaluated based on site- and region-specific considerations including access to structure locations, sensitive resources, permitting restrictions, construction schedule, weight of structural components, time of year, elevation, availability of heavy lift helicopters, and/or construction economics. Helicopter erection of structures is a viable option for all locations that do not prohibit or restrict helicopter use. Helicopter fly yards will be located within the same footprint of lattice tower assembly areas and will be referred to as fly yards/assembly areas.

When helicopter construction methods are employed, the structure assembly activities will be based at a fly yard/assembly area. Optimum helicopter methods of erection will be used. Optimum helicopter methods are those that are the best or most favorable for the safe and practical use of helicopters.

Prior to installation, each lattice tower will be assembled in multiple sections at the fly yard/assembly area. Bundles of steel members and associated hardware are transported to the appropriate fly yard/assembly area by truck and stored. The steel bundles are opened and laid out by component section and then assembled into structure subsections of convenient size and weight according to the helicopter's lifting capabilities.

After assembly at the fly yard/assembly area, the complete tower or tower section will be attached by cables from the helicopter to the top of the tower section and airlifted to the tower location. The lift capacity of helicopters is dependent on the elevation of the fly yard/assembly area, the tower site, local weather conditions, and the intervening terrain. The heavy lift helicopters that could be used to erect the complete towers or sections of a tower will be able to lift a maximum of 15,000 to 20,000 pounds per flight, depending on elevation.

Helicopter flights used in the construction of power lines are covered under visual flight rules and do not require the filing of formal flight plans with the FAA. However, the helicopter pilots and construction contractor will develop an internal daily flight plan for the preferred flight path of that day's activities. Daily flight plans will likely be developed one to two days prior to the placement of structures and are heavily dependent on local weather conditions and topographic features. The daily flight plan will follow the safest and most direct route possible between the fly yard/assembly area and structure locations. Sensitive features that will be avoided by the daily flight plan may include, but are not limited to, occupied homes, businesses, concentrations of cattle, active bald eagle nests, and large concentrations of waterfowl or cranes. Flight altitudes are dependent on weather conditions, topography, and the load being lifted; however, they are typically between 500 and 1,000 feet.

Upon arrival at the tower location, the section will be placed directly onto the foundation or atop the previous tower section. Guide brackets attached on top of each section will assist in aligning the stacked sections. Two to three trips will be required to complete each structure depending on the lift capacity of the helicopter. Once aligned correctly, line crews will climb the towers to bolt the sections together permanently. Current estimates are that a single helicopter could successfully erect seven to nine structures in one day. Multiple helicopters may be employed at one time to facilitate construction activities at different locations along the route. The use of multiple helicopters is dependent on the contractor and may or may not be employed.

Helicopters will use temporary work areas such as fly yards and staging areas for landing, overnight storage between flights, and refueling. Each fuel truck will be equipped with automatic shutoff valves and will carry spill kits. In addition to the required preventive spill measures, matting or the use of a water truck may be required to spray the site to reduce dust.

Other R-Project construction activities potentially facilitated by helicopters may include delivery of personnel, equipment, and materials to structure work areas, hardware installation, and pulling shield wire and conductor sock lines. Helicopters will also be used to support the inspection and management of the R-Project by NPPD. The use of helicopters for pulling shield wire and conductor sock lines is the normal and expected construction technique for wire stringing on both lattice tower and tubular steel monopole sections of the line. Helicopters used for pulling shield wire and conductor sock lines are typically much smaller than the heavy-lift helicopters used to set lattice structures. Helicopters could be used to deliver fly-in portable water tanks (large collapsible bladders) to each lattice tower during periods of active construction to assist with fire prevention.

2.6.2 Distribution Power Line Relocation

The selected route for the R-Project overlaps with approximately 28 miles of existing overhead distribution power lines owned and operated by various rural utility providers. Of these 28 miles of existing distribution power lines, 20 miles will be relocated as overhead and eight miles will be relocated underground. Due to power line spacing regulations required for maintaining facilities, the existing distribution power lines will be relocated outside the R-Project ROW or to the extreme edge of the R-Project ROW. These lines will not be moved far from their current location. For example, those lines along public roads will be moved to the other side of the road.

Distribution power line poles are much smaller than those used for transmission lines and have smaller ROW and span lengths. The average span length for distribution power poles is 200 feet. Relocation of existing overhead distribution lines will require a single line truck called a digger-derrick truck. The digger-derrick truck includes an auger to drill the hole for a three-foot-diameter wood power pole and a small crane to lift the pole into place. Each distribution structure will require a 2,400-square-foot (40 x 60 feet; 0.06 acre) work area where the digger-derrick truck will be parked and the wood pole structure and insulators will be assembled. The digger-derrick truck will move down the distribution line ROW via overland travel and will not require access improvements.

Installation of underground distribution lines will require a small tracked trenching machine, which will dig a six-inch-wide trench where the conductor will be placed. A 14-foot-wide travel path is assumed for the trenching machine to move down the underground distribution line ROW.

2.6.3 Well Relocation

NPPD will relocate four existing wells that serve livestock watering tanks and irrigation pivots along the R-Project centerline. Existing wells will be capped, and new wells will be drilled. New wells likely will be relocated approximately 150 feet from their current location to provide electrical clearance during installation and future maintenance by the landowner. A well drilling truck will be required for the installation of the relocated wells. Each well will require a 2,400-square-foot (40 x 60 feet; 0.06 acre) work area. A small tracked trenching machine will be used to run a pipe from the relocated well to the livestock watering tank. Each pipe will be approximately 150 feet long. A 14-foot-wide travel path is assumed for the trenching machine to move along the pipe.

2.7 Operation and Maintenance

2.7.1 Permitted Uses

After the transmission line has been energized, land uses compatible with safety regulations, operation, and maintenance will be allowed.

2.7.2 Safety

Safety is a primary concern in the design of this ROW and transmission line. An alternating current transmission line is protected with power circuit breakers and related line relay protection equipment. If conductor failure or grounding (tree contact) occurs, power will be automatically removed from the line. Lightning protection will be provided by overhead shield wires along the line. All fences, metal gates, pipelines, etc., that cross or are within the transmission line ROW will be grounded to prevent electrical shock. If applicable, grounding outside the ROW may also occur.

2.7.3 ROW Vegetation Management Program

NPPD has developed a Transmission Vegetation Management Program (TVMP) that directs operation and maintenance personnel on how to manage vegetation to ensure the safety of transmission lines. The TVMP is used to prevent outages from vegetation located on transmission ROW, minimize outages from vegetation located adjacent to ROW, and maintain clearances between transmission lines and vegetation on and along transmission ROW. In addition to the management of vegetation, the TVMP also provides guidance on how NPPD will report vegetation-related outages of the transmission systems to the appropriate regional entity and NERC.

Woody vegetation such as trees and shrubs that may grow within or adjacent to the ROW could interfere with the continuous safe operation of the transmission line and cause outages. These trees and shrubs will be removed by manual or mechanized clearing. Stumps will be cut as close to the ground as practical but will not be removed unless requested by the landowner. NPPD will work with landowners to make arrangements for the disposal of brush and wood. Since the ROW is mainly grassland, little to no vegetation management will be required in the ROW.

ROW vegetation management may include the limited use of herbicides. Herbicides would be applied directly to cut tree stumps to prevent regeneration. Temporarily disturbed areas in the ROW will be restored, which may require treatment of noxious weeds in these areas with herbicides. Application of restricted-use herbicides would be approved by USFWS and NGPC and would be applied by a licensed applicator. Herbicide use is included in the Restoration Management Plan. Once the area is restored to goals described in the Restoration Management Plan, NPPD will no longer be responsible for noxious weed control as that is a responsibility of the landowner.

2.7.4 Transmission Line Inspection

NPPD uses helicopter, fixed-wing aircraft, or ground patrols to inspect NPPD’s transmission system twice per calendar year. A calendar year is defined as beginning on January 1 and ending on December 31. Ground patrols are typically conducted using light ATVs or foot patrol. Inspections are conducted by transmission line technicians for line hardware, conductor and shield wire, structural steel, vegetation management encroachments, and ROW encroachments/clearance issues.

Unscheduled aerial patrols may be required during emergency or storm conditions. Under these circumstances, an NPPD employee familiar with the lines in question will accompany the aerial patrol pilot.

2.7.5 Routine Maintenance and Repairs

Routine scheduled maintenance and repairs will not begin until 30 years after the in-service date and will occur once every 10 years for the remainder of the life of the transmission line. Routine maintenance and repairs require a detailed inspection that involves sending personnel to each structure to check the stability of the structure and hardware associated with the transmission line. Maintenance and repairs noted during the detailed inspection can be scheduled in advance and do not require an immediate response.

Routine maintenance and repairs will use ATVs, light vehicles, and low-ground-pressure equipment where possible. Improvements to access paths required to reach each structure will not be required for routine maintenance and repairs. Routine maintenance and repairs will be scheduled in advance from October through April to avoid the spring and fall avian migration periods to the maximum extent practicable.

2.7.6 Emergency Repairs

Emergency repairs include those which require an immediate response by NPPD personnel to ensure the safe and efficient operation of the transmission line. Emergency repairs may be required to respond to events that remove the line from service, such as severe weather events or a broken conductor. They may also include repairs to isolated damage that is identified during annual inspections but does not take the line out of service, such as single insulators or weak points on conductors. Both types of repairs will be addressed after discovery and cannot be predicted. Repairs will be made as soon as NPPD can obtain parts and necessary equipment and ensure compliance with applicable measures in the HCP to the maximum extent practicable.

Smaller, yet essential, repairs are typically noted during the transmission line inspections described above. Equipment utilized to repair the transmission line in an emergency situation will use any means necessary to repair the line in a reasonable timeframe. Equipment may include helicopters and tracked and/or rubber-tire vehicles.

Emergency repairs may be completed at any time of the year, including the ABB active season, and may include the use of any equipment necessary to complete the repair. Any potential effects from emergency repairs would be temporary and would be restored by NPPD if conditions require restoration efforts. The majority of effects from emergency repairs, if any, will result from the need to obtain access to structures. Emergency repairs will follow the same final Access Plan identified for construction in Section 2.4.5. Necessary access for emergency repairs will follow the same access scenarios identified for construction, to the extent practicable. Instances where the same access identified for construction may not be used include: repairs that require larger equipment than was used during construction, stream crossings that have changed due to changes in stream course during permit duration, and landowner construction of a new road or two-track that is more efficient for emergency repair access.

While the exact location of emergency repairs cannot be predicted, NPPD can estimate the acres potentially disturbed. NPPD estimates that the acres that will be temporarily disturbed from emergency repairs will be equal to 20% of the total temporary disturbance that will occur during construction. This 20% estimate includes repairs to isolated damages, such as single insulators or weak points on conductors noted during annual inspection, as well as large-scale repairs following severe weather events. Data from NPPD records on lattice tower transmission lines of similar design to and in the vicinity of the R-Project were reviewed to determine the extent of past storm damage and other emergency repair needs identified during annual inspections. These records indicate that emergency repairs were required for an average of 15% of an overall line's length. The vast majority of storm damages requiring emergency repairs occurred to lines east of GGS Substation. Lines west and north of GGS Substation had minimal storm damage and required little to no emergency repairs. Storm damage maps displayed at the R-Project public meetings support this analysis. Because the R-Project is located in an area with historically lower occurrences of emergency repairs, the use of a value of 20% to account for temporary disturbances to complete emergency repairs is likely an overestimate. In addition to being located in areas less likely to be affected by major storms compared to other parts of the state, the R-Project is designed to have storm structures installed every eight to ten miles to further limit storm damage and emergency repairs. Storm structures are specifically designed to contain damage to the transmission line to one section and prevent damage from continuing down the line. The use of storm structures is another measure that will limit the amount of emergency repairs required over the life of the R-Project.

2.8 Covered Activities

Activities that will be covered by the ITP are described below and will be referred to as Covered Activities. Only those activities likely to result in take of ABB are included as Covered Activities. Table 2.1 provides a summary of each activity associated with the R-Project and whether it is or is not a Covered Activity. Table 2.1 was developed in close coordination with the USFWS and NGPC.

Routine maintenance and repairs are not included as a Covered Activity. All routine maintenance and repairs will not take place until 30 years after construction of the transmission line. Routine maintenance and repairs can be scheduled ahead of time and do not immediately threaten the continued operation of the transmission line. All routine maintenance and repairs will be scheduled to take place within the ABB non-active season (October – April), will use low-ground-pressure equipment when possible, and will not require any ground improvements (temporary fill or other improvements that would disturb ABB habitat) for access. By following these avoidance and minimization measures, routine maintenance will have no effect on individual ABB or habitat and are not included as a Covered Activity. See Section 6.2.1 for additional details regarding these applicable avoidance and minimization measures.

TABLE 2-1 COVERED ACTIVITIES

ACTIVITY	DESCRIPTION	ADDITIONAL DETAILS	EQUIPMENT LIST	ABB POTENTIAL EFFECTS	TAKE OF ABB LIKELY (YES/NO)	COVERED ACTIVITY (YES/NO)
Access – Departure from existing hard-surfaced roads						
Scenario 1 – Overland Travel Access (including Greenfield and existing two-tracks) (Section 2.4.5)	Drive and crush, no improvements (i.e., no blading or fill material)	Access location and distance to be identified in Access Plan at preliminary and final design (field verified). Access for ATVs, light vehicles, and low-ground-pressure equipment. Stream and wetland crossings will be avoided to the greatest extent practicable. No disturbance, grading, or fill of stream banks.	NA	Minimal level of occupied habitat disturbance unlikely to result in effects to ABB.	NO	NO
Scenario 2 – Temporary Access Routes (Section 2.4.5)	Temporary access routes include improvements, such as blading, and placement of fill material on geofabric where required	Access location and distance to be identified in Access Plan at preliminary and final design (field verified). Access required for large, heavy equipment that may require improvement for access. Temporary bridges and/or culverts installed for stream or wetland crossings will be removed upon completion of construction. Culverts will be installed to maintain the existing hydrology of the drainage. Vegetation in areas of temporary disturbance will be restored following completion of construction activities.	Bulldozers, front-end loaders, dump trucks, backhoes, excavators (both tracked and rubber-tired), graders, roller compactor, water trucks, crane trucks, and light vehicles used to construct temporary access routes.	Temporary disturbance to occupied habitat.	YES	YES
Scenario 3 – Permanent Access Roads (Section 2.4.5)	Permanent access roads – blade, fill, surface Predominantly used at substations or roads left at landowner's request.	Access location and distance to be identified in Access Plan at preliminary and final design (field verified). Bridges and/or culverts installed for stream or wetland crossings will remain in place upon completion of construction. Culverts will be installed to maintain the existing hydrology of the drainage.	Bulldozers, front-end loaders, dump trucks, backhoes, excavators (both tracked and rubber-tired), graders, roller compactor, water trucks, crane trucks, and light vehicles used to construct permanent access roads.	Permanent loss of occupied habitat.	YES	YES
ROW Preparation						
ROW Clearing (Section 2.4.4)	Complete removal of trees and tall brush. No ground disturbance within grassland areas. Potential to cut stump to grade unless removed at landowner's request.	Location and acres to be determined upon final route selection and field verified prior to construction. Removal methods will employ standard NPPD tree-removal methods. Avoid migratory bird nesting season, if possible. If not possible, preconstruction surveys will identify migratory bird nests for avoidance.	ATV, brush mower/shredder, light vehicles, mechanized feller/buncher, and grapple skidder or similar equipment.	Permanent alteration of occupied habitat from tree removal. Will be calculated using the same method as that for temporary habitat removal.	YES	YES
Temporary Work Areas						
Fly Yards/Assembly Areas (Section 2.4.6)	Locate in previously disturbed areas, where possible.	Approximately 10 acres each. Located approximately every 5 – 10 miles.	Earthmoving equipment required to prepare area. Heavy crane, helicopter, support vehicles.	Temporary disturbance to occupied habitat.	YES	YES

ACTIVITY	DESCRIPTION	ADDITIONAL DETAILS	EQUIPMENT LIST	ABB POTENTIAL EFFECTS	TAKE OF ABB LIKELY (YES/NO)	COVERED ACTIVITY (YES/NO)
	Grade pad and fill with gravel or geotextile and gravel where required.	Vegetation in areas of temporary disturbance will be restored following completion of construction activities.				
Construction Yards/Staging Areas (Section 2.4.6)	Locate along existing hard surface access roads and in previously disturbed areas, where possible. Grade pad and fill with gravel or geotextile and gravel, where required.	Approximately 20 acres each. Located approximately every 50 miles. Vegetation in areas of temporary disturbance will be restored following completion of construction activities.	Earthmoving equipment required to prepare area. Heavy crane, support vehicles.	Temporary disturbance to occupied habitat.	YES	YES
Borrow Areas (Section 2.4.7)	Likely use previously existing pits. Any borrow pits created for R-Project will not be located in environmentally sensitive areas, including threatened and endangered species habitat, wetlands, or cultural resource areas.	NA	NA	No effect. Borrow pit not located in ABB habitat or other environmentally sensitive area.	NO	NO
Batch Plant (Section 2.4.7)	Use existing batch plants and/or previous disturbed locations. Any batch plants created for R-Project will not be located in environmentally sensitive areas, including threatened and endangered species habitat, wetlands, or cultural resource areas.	NA	Generators, concrete trucks, front-end loaders, Bobcat loaders, dump trucks, transport trucks and trailers, water tanks, concrete storage tanks, scales, and job site trailers. Rubber-tired trucks and flatbed trailers will be used to assist in relocating the portable plant along the ROW.	No effect. Batch plant not located in ABB habitat or other environmentally sensitive area.	NO	NO
Structures						
Structure staking (Section 2.4.2)	Drive stake(s) at structure locations	Number of stakes required depends upon structure type. Stakes consist of wood lathe or rebar.	ATV, light vehicle.	Minimal level of occupied habitat disturbance unlikely to result in effects to ABB.	NO	NO
Helical Piers – Lattice Tower						
Structure work areas (Section 2.4.8)	Work areas for screw-in helical pier foundations to be used in Sandhills where existing access roads not available.	Limits of ground disturbance: 100 feet x 100 feet (0.23 acre) One structure work area required at each structure. Majority of structure work areas temporary disturbance. Permanent disturbance dependent on local topography. Vegetation in areas of temporary disturbance will be restored following completion of construction activities.	Preparation of structure work area completed by small Bobcat-sized earthmoving equipment, if necessary. Dependent on local topography.	Temporary disturbance to occupied habitat.	YES	YES
Foundation installation (Section 2.4.10)	Screw-in helical pier foundations to be used in Sandhills where existing access roads not available. Anchor bolt or stub angles to secure structure to foundation.	Permanent habitat loss limited to footprint of each foundation. Four helical pier foundations required per lattice structure.	Tracked excavator, light truck/trailer, or helicopter to deliver helical piers, support vehicle, weld truck, and water truck (for fire suppression).	Temporary disturbance to occupied habitat accounted for under Structure Work Areas above. Permanent loss of occupied habitat.	YES	YES
Structure erection (Section 2.4.11)	Install base plate and leg extensions. Structure assembled at fly yard/assembly area and flown to structure work area.	Structures flown in two or three pieces depending on local conditions and helicopter lift capacity.	Light crane, truck/trailer, and lightweight support vehicles at structure work area.	Permanent and temporary disturbance to occupied habitat accounted for under Structure Work Areas and Foundation Installation above.	YES	YES
Standard Foundation – Steel Monopole						
Structure work areas (Section 2.4.8)		Limits of ground disturbance: 200 feet x 200 feet (0.92 acre).		Temporary disturbance to occupied habitat.	YES	YES

ACTIVITY	DESCRIPTION	ADDITIONAL DETAILS	EQUIPMENT LIST	ABB POTENTIAL EFFECTS	TAKE OF ABB LIKELY (YES/NO)	COVERED ACTIVITY (YES/NO)
	Work area for steel monopole with standard foundation to be used along major existing access roads.	One structure work area required at each structure. Vegetation in areas of temporary disturbance will be restored following completion of construction activities.	Preparation of structure work area completed by small earthmoving equipment, if necessary.			
Foundation excavation/installation (Section 2.4.10)	Auger hole, temp casing for poured concrete. Any spoils removed will not be disposed in environmentally sensitive areas, including threatened and endangered species habitat, wetlands, or cultural resource areas.	Permanent habitat loss limited to footprint of each foundation.	Auger rig, dump trucks (remove spoils from site), concrete trucks, truck with trailer to drop off rebar and anchor bolt cage, heavy crane, backhoe, water truck (for dewatering).	Temporary disturbance to occupied habitat accounted for under Structure Work Areas above. Permanent loss of occupied habitat.	YES	YES
	Anchor bolt to secure structure to foundation. Guy anchors for select dead-end structures.	One foundation required per steel monopole structure.				
Structure erection (Section 2.4.11)	Install structure with base plate onto poured-concrete foundation.	Structures assembled at structure work area and lifted into place with heavy crane.	Heavy crane, dozer, bucket truck, support vehicles, truck to transport structure tubes.	Permanent and temporary disturbance to occupied habitat accounted for under Structure Work Areas and Foundation Installation above.	YES	YES
Stringing, Pulling, and Tensioning						
Stringing, pulling, and tensioning (Sections 2.4.9 and 2.4.12)	String sock line with helicopter or light vehicle.	Necessary equipment will require Access Scenario 2 or Scenario 3 (above). Monopole sites located approximately two to four miles apart. Lattice tower sites located approximately four to six miles apart.	Helicopter, semi-trailers, tensioner puller (big machine winch), heavy crane to move reels, mats to level sites and light vehicles.	Temporary disturbance to occupied habitat.	YES	YES
	Heavy equipment required for pulling and tensioning.	Two acres of temporary disturbance at tangent sites, four acres of temporary disturbance at dead-end structures. Vegetation in areas of temporary disturbance will be restored following completion of construction activities.				
Substations						
Substations (Section 2.5)	Expansion of existing substation at Gerald Gentleman Station.	Gerald Gentleman Station located outside Permit Area.	NA	No effect. Substation located outside Permit Area (i.e., outside ABB habitat).	NO	NO
	Expansion of existing Thedford Substation.	Expansion of Thedford Substation by 13 acres. Permanent access from Highway 2 adjacent to substation.	Heavy earthmoving equipment to prepare site, dump trucks (remove spoils from site and deliver gravel), concrete trucks, truck with trailer to drop off substation equipment, heavy crane, backhoe, support vehicles.	Permanent loss of ABB habitat.	YES	YES
	Construction of new Holt County Substation at Western 345 kV transmission line.	Holt County Substation will be constructed on 12 acres of cultivated agricultural land, which does not provide ABB habitat.	NA	No effect. Substation located in non-ABB habitat.	NO	NO
Distribution Power Line Relocation						
Distribution power line relocation (Section 2.6.2)	Relocation of existing overhead distribution power lines to outside ROW.	Necessary equipment will require Access Scenario 1 (above).	Digger-derrick truck, tracked trencher	Temporary disturbance to occupied habitat.	YES	YES
Well Relocation						

ACTIVITY	DESCRIPTION	ADDITIONAL DETAILS	EQUIPMENT LIST	ABB POTENTIAL EFFECTS	TAKE OF ABB LIKELY (YES/NO)	COVERED ACTIVITY (YES/NO)
Well relocation (Section 2.6.3)	Relocation of existing livestock and center-pivot irrigation wells to outside ROW.	Necessary equipment will require Access Scenario 1 (above).	Well truck, tracked trencher	Temporary disturbance to occupied habitat.	YES	YES
Operation and Maintenance						
Energization and operation of line and substation (Section 2.7)	Operating transmission line and substation.	NA	NA	No effect to ABB habitat or individuals. All construction complete at this stage. No ABB habitat affected.	NO	NO
Routine inspection (Section 2.7.4)	Inspection to occur twice per year – alternating between foot/light vehicle equipment inspection and aerial inspection. One fly-by will be completed each fall.	NA	ATV or light vehicle, foot patrol, fixed-wing aircraft, helicopter.	Minimal level of occupied habitat disturbance unlikely to result in effect to ABB.	NO	NO
Routine maintenance and repairs (Section 2.7.5)	Routine maintenance and repairs will use ATVs, light vehicles, and low-ground-pressure equipment where possible, will not require access improvements, and will occur during the ABB non-active period (October through April).	It is estimated that routine scheduled maintenance will not begin until 30 years after the in-service date and will occur once every 10 years after that on lines constructed on steel structures. Includes normal maintenance, which can be scheduled and does not require immediate action.	Light support vehicle, ATV, aerial truck, helicopter.	Minimal level of occupied habitat disturbance unlikely to result in effects to ABB.	NO	NO
Emergency repairs (Section 2.7.6)	Emergency repair equipment will access structures as necessary to repair line as per NPPD's Emergency Restoration Plan. Emergency repairs may include repairs to isolated damages, such as single insulators or weak points on conductors, as well as large-scale repairs following severe weather events.	Unscheduled aerial patrols may be required during emergency or storm conditions. The line will be designed according to NESC.	Equipment utilized to repair the transmission line in an emergency situation will use any means necessary to repair the line in a reasonable timeframe. Equipment may include helicopter, tracked and/or rubber tire vehicles.	Temporary disturbance to occupied habitat.	YES	YES

2.9 Avoidance and Minimization Measures

The following list of potential avoidance and minimization measures were developed in coordination with USFWS and NGPC to reduce potential effects to ABB. These measures are meant to be a tool box to be used in specific areas and may not be applied to all Covered Activities. Avoidance and minimization measures are discussed in greater detail in Section 6.0.

- Helicopter use for erecting lattice structures, stringing sock line, and mobilizing certain equipment.
- Use of low-ground-pressure equipment (see above).
- Use of helical pier foundations in Sandhills with no existing access to reduce disturbance.
- Use of existing access roads including two-tracks to the extent practicable.
- Winter construction in specified areas.
- Limited mowing and windrowing of vegetation in specified areas (Section 6.0).
- Limited removal of road kill (carrion) at structure locations along existing roads in specified areas.
- Siting of disturbance areas on previously disturbed lands or unsuitable habitat to the extent practicable.
- Sodium vapor lighting and downshield lighting at substations and temporary work areas, if necessary.
- Limited nighttime construction during periods when ABB are active.

2.10 Alternatives

Pursuant to Section 10(a)(2)(A)(iii), the ESA requires that HCPs include a description of "what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized." Guidance provided by the HCP Handbook (USFWS and NMFS 2016) states that alternatives to the proposed action commonly considered are those that would reduce take below levels anticipated for the proposed action and a no-action alternative, where the applicant would not proceed with its proposed project or would modify it to avoid take altogether. Moreover, selection of the alternative carried forward is at the applicant's discretion, and the HCP Handbook indicates that the applicant does not have to justify the impracticability of any alternative. However, the USFWS retains the authority to deny an application for an ITP if it does not satisfy the requirements of the ESA.

NPPD's comprehensive alternatives evaluation process included the identification and consideration of numerous alternatives to the proposed action. These alternatives would result in differing levels of ABB take compared to the level anticipated for the proposed action, but they were eliminated based on inherent flaws that precluded attainment of NPPD's project purpose and need and/or presented costs rendering the project infeasible. NPPD evaluated five additional alternatives to the proposed action: (1) No-Take Alternative; (2) Steel Monopole Structures Only Alternative; (3) Lattice Tower Structures Only Alternative; (4) Winter Construction Only Alternative; and (5) Proposed Alternative with Capture and Relocation Conservation Measures.

2.10.1 No-Take Alternative

Under the No-Take Alternative, NPPD would complete the R-Project in such a way that take of ABB was not likely, and an ITP covering the construction, operation, and maintenance of the R-Project would not be necessary. Completion of the R-Project under the No-Take Alternative would require complete avoidance of ABB and its suitable habitat within the current estimated range (NGPC and USFWS 2014).

The current estimated range of the species overlaps nearly all of the R-Project Study Area identified early in the project development phase (see Figure 1-1).

Avoiding the current estimated range of ABB and suitable habitat within that range is not feasible in meeting the purpose and need of the R-Project. The SPP's 2012 Integrated Transmission Plan 10-Year Assessment Report called for NPPD to construct a new 345 kV transmission line that originated at GGS Substation and proceeded north to a new substation in or near Cherry County, then east to a new 345 kV substation along the Fort Thompson to Grand Island 345 kV transmission line. In 2014, SPP completed a High Priority Incremental Loads Study that resulted in a second subsequent Notice to Construct (NTC) directing NPPD to build a new substation near Thedford and connect the R-Project to that substation. The purpose and need of the R-Project is to increase reliability of the electric transmission system, relieve congestion from existing lines within the transmission system, and provide additional opportunities for development of renewable energy projects. To improve reliability of the electric transmission system, the R-Project will create a northern transmission path separate from the existing electrical infrastructure to connect with the existing Fort Thompson to Grand Island 345 kV transmission line and provide for an intermediate connection along the line to NPPD's existing 115 kV transmission system at a substation east of Thedford. To enable future renewable energy development, the R-Project will provide capacity and access to the transmission system in north-central Nebraska. To meet this purpose and need, avoidance of ABB habitat is not possible.

2.10.2 Steel Monopole Structures Only Alternative

Under this alternative, NPPD would construct the R-Project using only steel monopole structures. Steel monopoles require concrete foundations and access roads as erection does not include use of helicopters. Access routes must support the heavy equipment necessary (e.g., concrete trucks, cranes) to pour concrete foundations and erect the structures into place. Where roads do not exist, temporary access roads must be constructed to access each structure. This alternative would result in greater temporary disturbance resulting from additional work areas and temporary access routes, greater restoration requirements, and increased construction costs. The increased area of ground disturbance needed for this alternative would affect more acres of suitable ABB habitat, resulting in a greater level of take of ABB than for the proposed action, and was thus not pursued as the proposed action.

2.10.3 Lattice Tower Structures Only Alternative

Under this alternative, NPPD would construct the R-Project using only lattice tower structures. Lattice towers will be installed using helical pier foundations and helicopter erection. During the public-involvement process, NPPD documented that the public prefers steel monopole structures to lattice structures to reduce impacts to visual and agricultural resources. Thus, using only lattice towers for the entire R-Project would result in greater impacts to other resources, such as visual and agriculture. Lattice structures also would have a greater impact on agricultural operations along the transmission line alignment due to their larger base footprint. The use of lattice towers with helical pier foundations along major existing roads would not be as economical as the use of steel monopoles with concrete foundations. While this alternative would likely reduce the effects on ABB by reducing the acres of temporary disturbance due to the smaller structure work area for lattice structures, the difference in ABB take is minimal considering the Proposed Alternative only uses steel monopole structures for 35 miles along major existing roads in the Permit Area.

2.10.4 Winter Construction Only Alternative

Under this alternative, NPPD would construct the entire lattice tower/helical pier foundations portion of the Proposed Alternative during the ABB inactive period (when the ABB is below ground). All Covered Activities associated with structures including work areas, foundation installation, structure erection, and stringing, pulling, and tensioning would occur during the ABB inactive period of October – April (approximately seven months). If all Covered Activities were completed during the ABB inactive period, effects to individual ABB would be reduced to a very low level because individuals would be buried to their overwinter depth beneath the frost line. Heavy equipment accessing structure work areas and pulling and tensioning sites do not compact the ground to a degree that would impact overwintering ABB due to the frozen soil surface.

Restricting all construction activities along the lattice tower/helical pier foundations portion of the R-Project to the ABB inactive period does not meet the R-Project construction schedule and is not feasible given the lack of schedule flexibility and allowance for contingencies. Construction progression is much slower during the winter due to shortened daylight hours and lower temperatures, both of which increase construction costs. While it may be possible to install all helical pier foundations during the ABB inactive period, it is not possible to complete structure erection and stringing, pulling and tensioning during the ABB inactive period. This requires additional equipment in these areas during the ABB active period and thereby negates any avoidance of the ABB achieved during the installation of the helical pier foundations. Because this alternative does not meet the construction schedule, would require a second pass during the ABB active period, and would not result in a net avoidance to ABB, it was not offered as the proposed action.

2.10.5 Proposed Alternative with Capture and Relocation Conservation Measures

Under this alternative, NPPD would apply capture and relocation efforts described in the joint USFWS and NGPC *Conservation Measures for the American Burying Beetle (ABB)* document (USFWS and NGPC 2008). These conservation measures include the application of "capture and relocation" efforts followed by designated "maintaining-clear" activities defined in the conservation measures document (USFWS and NGPC 2008). Maintaining-clear activities include mowing vegetation to less than eight inches and removing carrion at proposed disturbance areas after that area has been cleared of ABB. Capture and relocation followed by maintaining-clear activities is not a viable alternative to reduce take of ABB for the R-Project because:

- Certain areas along the proposed line route have some of the highest potential ABB densities. Results of clearing efforts for other construction projects in these areas indicate that clearing ABB from these areas may not be achievable (for an area to be "cleared" of ABB there must be no captures for three consecutive trap nights).
- Maintaining-clear activities in the remote areas of the Sandhills is not feasible due to lack of suitable access and potential wind erosion caused by travel and mowing vegetation.
- Capture and relocation of ABB is considered take of ABB, so all ABB captured and relocated must be included in the total take estimate for the project, thus increasing the amount of take substantially. ABB would be captured and relocated from an entire trap radius (500 acres) and would not be limited to those individuals that occur within and would be impacted by the proposed disturbance areas.
- Relocating large numbers of ABB may increase resident beetle competition for limited availability of carrion resources at release sites.
- This alternative would likely result in an increase in ABB mortality when applying the conservative estimate of mortality associated with capture and relocation efforts (USFWS 2013a).

3.0 ENVIRONMENTAL SETTING/BIOLOGICAL RESOURCES

3.1 Environmental Setting

Background on the existing habitats and species are described at the Study Area level (Figure 1-1). The R-Project Study Area was established at the start of project development and encompasses 4.5 million acres (7,039 square miles) of the Nebraska Sandhills. The study area is much larger than the R-Project footprint; however, it reflects the habitat types and species assemblages at both a regional and project-level scale. Almost the entire R-Project Study Area occurs within the Environmental Protection Agency's Nebraska Sandhills Level III Ecoregion, which covers approximately 20,000 square miles of central Nebraska (Chapman et al. 2001; Kaul et al. 2006; Schneider et al. 2011). The Nebraska Sandhills represent the largest area of sand dunes in the western hemisphere and the largest area of vegetated dunes in the world. Level IV Ecoregions that fall within the Study Area include the Sandhills, Wet Meadow and Marsh Plain, and Lakes Area (Chapman et al. 2001). Biologically Unique Landscapes designated by the Nebraska Natural Legacy Project that fall within the Study Area include the Platte River Confluence, Dismal River, Middle Loup River, North Loup River, Calamus River, Cherry County Wetlands, and Elkhorn Headwaters. The general physical and vegetative characteristics of the Study Area are described below.

3.1.1 Climate

The climate of the Nebraska Sandhills is semiarid with annual precipitation ranging from 23 inches per year in the eastern portions to 17 inches per year in the western portions. Approximately 75% of the precipitation falls between April and September, with 50% occurring in May, June, and July (Bleed and Flowerday 1998). Snowmelt provides an important source of groundwater recharge throughout the region. Temperature varies, with cooler temperatures observed in the western portion and warmer temperatures in the eastern portion. The average freeze-free season in the east is 150 days, compared to 120 days in the west (Bleed and Flowerday 1998). When averaged across the Sandhills, summertime high temperatures average 88 degrees Fahrenheit (°F), and wintertime lows average 9°F (Schneider et al. 2011).

The disparity in precipitation from east to west can be indirectly observed by noting the density of wetlands within the Wet Meadow and Marsh Plain Level IV Ecoregion (located in the eastern portion of the Study Area) versus the relatively dry areas of the Sandhills Level IV Ecoregion (located in the western portion of the Study Area) (Chapman et al. 2001). The Wet Meadow and Marsh Plain Level IV Ecoregion closely aligns with the Elkhorn Headwaters Biologically Unique Landscape.

3.1.2 Topography / Geology

The Nebraska Sandhills Ecoregion comprises one of the most distinct and homogeneous landscapes in North America and is one of the largest areas of grass-stabilized sand dunes in the world. Size, pattern, and alignment of dunes typically follow a west-to-east trend (Chapman et al. 2001). Larger dunes in the western portions of the Study Area may reach up to 400 feet tall and stretch up to 20 miles (Bleed and Flowerday 1998). The sandy dune soils are poorly developed and have only a thin layer of topsoil containing organic matter.

Blowouts, a form of wind erosion, are a natural occurrence in the Sandhills. However, blowouts can also form due to human-caused disturbances such as impacts associated with cattle grazing, vehicle travel, and other activities that disturb vegetation and soil. Blowouts develop when vegetative cover is removed and sand is blown from the exposed windward side of the slope to be deposited onto the leeward side. As the erosion becomes more active and the blowout deepens, roots of the adjacent vegetation are exposed, until whole plants blow away. As the crater deepens, adjacent sands fall into the depression creating sharp, steep edges. These edges caused by the sliding sand catch the wind and cause increased turbulence, breaking more sand particles free, thus growing the blowout. The loose sand is quickly blown out and deposited on the leeward side of the crater (Stubbendieck et al. 1989). Blowouts are a naturally occurring part of the Sandhills landscape and provide habitat for rare plants, including the blowout penstemon *(Penstemon haydenii)*.

The Lakes Area Level IV Ecoregion, which closely mirrors the Cherry County Wetlands Biologically Unique Landscape, is located in the northwestern portion of the Study Area and consists of long linear dunes with interdunal valleys. Many of these valleys within this region contain lakes, marshes, wet meadows, and fens (Schneider et al. 2011). Fens are peat-forming, groundwater-fed wetlands typically covered by grasses, sedges, or rushes. Further east in the Study Area, the dunes of the Nebraska Sandhills Ecoregion begin to transition to more gravelly and loamy regions to the east and north in the Wet Meadow and Marsh Plain Level IV Ecoregion and the Elkhorn Headwaters Biologically Unique Landscape (Chapman et al. 2001; Schneider et al. 2011). This eastern portion is much flatter and is dominated by subirrigated meadows and wetlands. Low-profile rolling sand dunes with interspersed marshes and lakes are scattered throughout the area (Schneider et al. 2011).

3.1.3 Hydrology / Streams, Rivers, Drainages

Because of the sandy nature of the soils in the Nebraska Sandhills, water infiltrates rapidly before accumulating on a solid layer of bedrock. Rain and snowmelt percolate downward, supplying extensive aquifers. While the process of groundwater recharge occurs in all precipitation events throughout the year, most recharge occurs during larger precipitation events in the spring (Bleed and Flowerday 1998). These aquifers come together to form the Ogallala Aquifer, which contains an estimated 700 to 800 million acre-feet of groundwater (Schneider et al. 2011). The Ogallala Aquifer extends throughout western Nebraska, Kansas, eastern Colorado, and the panhandle of Texas and is used heavily as a source of drinking and irrigation water in those areas (High Plains Water District 2013). Because of the presence of such a large source of groundwater, the Sandhills are typically less susceptible to short periods of drought.

Numerous lakes and wetlands have formed where the region’s high water table meets the ground surface in valleys and subirrigated meadows. There are approximately 1.3 million acres of wetlands in the Nebraska Sandhills Ecoregion, ranging in size from less than one acre to 2,300 acres with greater than 80% of all wetlands estimated to be 10 acres or less in size (Wolfe 1984). These shallow wetlands occur in depressions where there is poor surface drainage and a high water table. They are fed by precipitation from melting snow and spring rains as well as the underlying aquifer. Although precipitation is low and evaporation rates are high, the Ogallala Aquifer provides a water table at or near the surface for discharge into a vast array of wetlands, even during drought (LaGrange 2005). Unique wetland types located within the Sandhills are fens and highly alkaline wetlands. The fen wetlands are characterized by slightly acidic water and peat soils that form in areas fed with a nearly constant supply of groundwater. Several rare plant species are associated with fen habitats. These species are typically distributed in colder regions north of Nebraska (LaGrange 2005) but could occur where fen habitats are present. The highly alkaline wetlands harbor unusual plant and invertebrate life and are located in the western portion of the Sandhills. The Elkhorn Headwaters Biologically Unique Landscape within the Study Area is one of the largest wetland complexes in the Sandhills region.

Rivers located within the Study Area include the South Platte River, North Platte River, Dismal River, South Loup River, Middle Loup River, North Loup River, Calamus River, Cedar River, and Birdwood Creek. The South Platte River and North Platte River originate in the Rocky Mountains of Colorado before continuing across the central plains where they join to form the Platte River and eventually flow into the Missouri River. The Study Area is located approximately nine miles west of where the North Platte River and South Platte River join. These two large prairie rivers consist of shallow, braided channels and are separated by approximately four miles of cultivated agricultural lands within the Study Area. The area denoted as the Platte River Confluence Biologically Unique Landscape includes portions of Birdwood Creek, which flows into the North Platte River from the Sandhills to the north. The wet meadows and sandbars within the Platte River Confluence Biologically Unique Landscape support large numbers of sandhill cranes (*Grus canadensis*), trumpeter swans (*Cygnus buccinators*), and numerous species of waterfowl. Rivers and streams within the Sandhills Ecoregion differ from those of other regions in that they have unique groundwater origins, little to no tributaries, and flow at a remarkably steady rate (Bleed and Flowerday 1998). The Dismal River, South Loup River, Middle Loup River, North Loup River, Calamus River, Elkhorn River, and Cedar River all originate within the Nebraska Sandhills Ecoregion, although only the South Loup River and Cedar River originate within the Study Area. These rivers flow through the Study Area in a southeasterly direction and drain much of the central and eastern Sandhills. Flows of these rivers are supplied almost entirely by groundwater as little precipitation makes it to stream channels as runoff before soaking into the sandy soils. Because of the large influence of groundwater, flow of these rivers remains consistent for much of the year (Schneider et al. 2011).

Most of the lakes are small and only a few in the Study Area approach 1,000 acres. Large named lakes that occur in the Study Area include Willow Lake, Swan Lake, and Goose Lake, which are relatively shallow depressions and no deeper than ten feet. Sandhill lakes such as these typically attract a wide variety of waterfowl during the spring and fall migration; some of these lakes are managed as State Wildlife Management Areas while others are privately owned.

3.1.4 Vegetation

Vegetation within the Study Area consists of dune prairie and valley wetland plant communities. Tall and short rhizomatous grasses, bunchgrasses, and numerous species of forbs are present throughout the Sandhills. Ground is typically visible between plants, as the species are not as dense here as in adjacent regions of tallgrass and mixed grass prairies (Kaul et al. 2006). The eastern portions of the Study Area begin to transition away from the typical dunes of the Sandhills into more flat and non-gravelly soils. Plant species restricted to pure sand soils are typically absent. The dune prairie plant communities consist of a mixture of grasses adapted to the sandy conditions and may include sand bluestem (*Andropogon hallii*), prairie sandreed (*Calamovilfa longifolia*), little bluestem (*Schizachyrium scoparium*), and hairy grama (*Bouteloua hirsuta*). Forbs include stiff sunflower (*Helianthus rigidus*), bush morning glory (*Ipomoea leptophylla*), annual buckwheat (*Eriogonum annuum*), and dotted gayfeather (*Liatris punctata*). Shrubs include sand cherry (*Prunus pumila*), leadplant (*Amorpha canescens*), prairie rose (*Rosa arkansana*), and yucca (*Yucca glauca*) (Kaul et al. 2006; Schneider et al. 2011).

Wet meadows typically occur in riparian valleys where the water table is at the surface. Freshwater wet meadows are commonly dominated by sedges (*Carex* spp.), spike-rushes (*Eleocharis* spp.), prairie cordgrass (*Spartina pectinata)*, switchgrass (*Panicum virgatum*), woolly sedge (*Carex pellita*), bulrush (*Schoenoplectus* spp.), ironweed (*Vernonia fasciculata*), sawtooth sunflower (*Helianthus grosseserratus*), sand-bar willow (*Salix exigua* ssp. *interior*), and wild-indigobush (*Amorpha fruticosa*). Alkaline wet meadows, characterized by salts and carbonates, are more prevalent west of the Study Area and are indicated by species such as saltgrass (*Distichlis spicata*), foxtail barley (*Hordeum jubatum*), and scratchgrass (*Muhlenbergia asperifolia*). Freshwater marshes are areas with shallow standing water that are commonly dominated by common reed, smartweeds (*Polygonum* spp.), hardstem bulrush (*Schoenoplectus acutus*), broad-leaf cattail (*Typha latifolia*), arrowhead (*Sagittaria* spp.), bur-reed (*Sparganium* spp.), and duckweeds (*Lemna* spp.). Alkaline marshes have relatively less vegetation cover than freshwater marshes and are dominated by saltmarsh bulrush (*Bolboschoenus maritimus* ssp. *paludosus*) and other alkaline-tolerant plants (Schneider et al. 2011).

Fens, or groundwater-fed wetlands with saturated, nutrient-rich peat or muck soils, are typically dominated by meadow species and are associated with stream headwaters and the upper end of lakes and marshes. Playa wetlands may include flatsedge (*Cyperus* spp.), nodding smartweed (*Polygonum lapathifolium*), spike-rush, cattail, river bulrush, and plains coreopsis (*Coreopsis tinctoria*). Submersed or floating plant communities may be characterized by greater bladderwort (*Utricularia macrorhiza*), floating-leaf pondweed (*Potamogeton nodosus*), and duckweed (*Lemna* spp.). Riparian wetlands may include switchgrass (*Panicum virgatum*), scouring-rush (*Equisetum* spp.), and bedstraw (*Galium* spp.) (Kaul et al. 2006; Schneider et al. 2011).

Wooded areas in the Study Area are largely limited to planted shelter belts and forested riparian areas along the rivers, although many of these rivers do not supported densely forested riparian areas. Trees and shrubs that may occur in wooded riparian areas include plains cottonwood (*Populus deltoides* var. *occidentalis*), green ash (*Fraxinus pennsylvanica*), hackberry (*Celtis occidentalis*), and eastern red-cedar (*Juniperus virginiana*), growing with shrubs such as sandbar willow (*Salix exigua* ssp. *interior*), peach-leaf willow (*Salix amygdaloides*), rough-leaf dogwood (*Cornus drummondii*), chokecherry (*Prunus virginiana*), American plum (*Prunus americana*), and western snowberry (*Symphoricarpos occidentalis*) (Kaul et al. 2006; Schneider et al. 2011).

3.1.5 Existing Land Use

The Nebraska Sandhills historically has been used for cattle grazing, a practice that dominates the Study Area today (Kaul et al. 2006). Most early ranches were large, and cattle grazed freely over the landscape. However, in the early 1900s, lands within the Sandhills were broken up into smaller portions in an effort to provide additional settlement of the region under the Kinkaid Act. The Kinkaid Act encouraged settlement of the Sandhills by increasing the maximum land claim from 160 to 640 acres, and between 1910 and 1917 nearly nine million acres were claimed (Schneider et al. 2011). Today, approximately 95% of the Nebraska Sandhills are native grasslands primarily used for livestock production. Cattle ranches average between 4,000 and 6,000 acres (Bleed and Flowerday 1998) and utilize rotational grazing to retain the productivity of the landscape. Rotational grazing, if used properly, can be compatible with biological conservation, thus allowing for the large amount of biological diversity still existing in the Sandhills.

Crop production is largely limited throughout the bulk of the Study Area due to the poor soil quality. Row crop agriculture occurs along the North Platte and South Platte rivers and in the extreme eastern portions of the Study Area. A large number of the subirrigated meadows in the Elkhorn Headwaters Biologically Unique Landscape are cut annually for hay production.

3.2 Covered Species

3.2.1 American Burying Beetle (Nicrophorus americanus)

<u>Status and Distribution</u>: The ABB was listed as federally endangered under the ESA in July 1989 (54 Federal Register [FR] 29652). NESCA states that a species occurring in the state of Nebraska protected under the ESA will also be listed under NESCA. Therefore, the ABB is also protected as a state of Nebraska endangered species under NESCA. No critical habitat has been designated for the ABB.

The historical range of the ABB included portions of 35 states covering the temperate regions of eastern and central North America. However, over the early twentieth century, the ABB disappeared from the majority of its range, with the last known specimens being collected along the eastern seaboard in the 1940s. At the time of listing, only two disjunct natural populations were known, one population on Block Island in Rhode Island, and one population in Latimer County, Oklahoma (USFWS 1991). After the species was listed as federally endangered, additional populations were discovered in the Midwest, particularly in Oklahoma, South Dakota, and Nebraska. Natural, extant populations of ABB have now been identified in Rhode Island, South Dakota, Nebraska, Kansas, Oklahoma, Texas, and Arkansas (USFWS and NGPC 2008). Populations of ABB have been reintroduced into portions of southwestern Missouri (77 FR 16712), Ohio, and Penikese and Nantucket Islands in Massachusetts. While the Penikese Island reintroduction efforts have not been successful, there has been limited success noted from reintroduction efforts in Missouri.

In Nebraska, the ABB currently occurs in two distinct populations. One is located in the Loess Hills of south central Nebraska primarily south of the Platte River. The Loess Hills population occurs in Lincoln, Dawson, Frontier, and Gosper counties. The larger ABB population in Nebraska occurs in the Sandhills and Loess Prairies Ecoregions of north central Nebraska (NGPC 2014). This population occurs throughout all or a portion of Logan, McPherson, Hooker, Thomas, Cherry, Custer, Blaine, Loup, Rock, Brown, Keya Paha, Boyd, Holt, Knox, Antelope, Boone, Valley, Greeley, Wheeler, and Garfield counties. Trapping efforts of the two populations within the last ten years have confirmed ABB occurrence within 17 Nebraska counties (USFWS 2011). Recent efforts to model areas of high probability of ABB occurrence indicate that ABB are most likely to be encountered in Holt, Rock, Brown, and northern Loup counties (Jorgensen et al. 2014).

<u>Habitat Characteristics/Use</u>: The ABB is approximately one to two inches long and the largest member of the genus *Nicrophorus*. The ABB is characterized by a black body with two distinct orange markings on each elytra, the covering over the wings. The best distinguishing mark is the large orange marking on the pronotum, as this is the only *Nicrophorus* beetle with orange on the pronotum. Sex of individual ABB can be determined through markings on the clypeus, located just above the mouth. Male ABB have a large, orange, rectangular marking on the clypeus while females have a small orange triangular marking (Ratcliffe 1996).

Throughout its range, the ABB is largely restricted to areas mostly undisturbed by human activity. The ABB was previously believed to require mature forests with deep, humic soils (Lomolino et al. 1995), but its distribution is now known to be more restricted by prey availability and human disturbance than by soil composition (Holloway and Schnell 1997). In the Nebraska Sandhills, habitat modeling identified loamy sand, wetland cover, and higher 30-year average precipitation as variables associated with ABB presence. Variables associated with ABB absence were loam soil, agriculture, woodland, and urban development (Jorgensen et al. 2014; Jurzenski et al. 2014). In Nebraska, ABB can be found throughout the Nebraska Sandhills Ecoregion in mesic areas such as wet meadows and wetlands, semi-arid sandhills, loam grasslands, and tree-lined shelterbelts. Soil composition and moisture play a major role in habitat occupied by ABB; soil moisture has been shown to positively influence beetle presence. Moist soils are a major component of habitat used by ABB during daily periods of inactivity. Research completed on behalf of the Nebraska Department of Roads indicates that ABB largely prefer moist soils during periods of inactivity. This research found that 70% of tested ABB preferred moist loam soils and 20% preferred moist sandy soils (W. Hoback unpublished). Probability of occurrence models created by Jorgensen et al. (2014) and Jurzenski et al. (2014) indicate that one area with a high probability of ABB occurrence is located in Holt County south of the Elkhorn River. This region coincides with the Elkhorn Headwaters Biologically Unique Landscape, which is known for a high water table and a high density of subirrigated meadows and wetlands. Analyses completed by the USFWS for the proposed Keystone XL pipeline indicated that the highest-quality ABB habitat had some form of wetland or wet meadow in the immediate vicinity (USFWS 2013a). One common theme to suitable habitat is the presence of substantial vegetative structure, either trees or grasses. Short grasses, less than eight inches in height, are not favored by the ABB, likely due to desiccation of the soils (USFWS and NGPC 2008).

Like all scavengers, the ABB searches its environment for food sources in the form of deceased animals or carrion. Because carrion is typically a limited resource, ABB must find carcasses quickly. The discovery of a carcass often occurs within two days but may occur as quickly as 35 minutes after death (Ratcliffe 1996). Deceased animals of all size provide a source of food for ABB, but carcasses used for brood rearing must be of the proper size. Small mammals and birds between 50 and 300 grams are typically selected for brood rearing (Ratcliffe 1996; Panella 2013). ABB in Oklahoma were positively correlated with increased populations of small mammals and passerine birds, indicating that more ABB were located where potential prey items were more abundant (Holloway and Schnell 1997). Reliance of available carrion likely accounts for the ABB's avoidance of highly fragmented landscapes. Landscapes fragmented by anthropogenic disturbance may allow easier access for vertebrate scavengers (coyotes, opossum, and raccoon), which consume carcasses before ABB can bury them (Panella 2013).

The lifecycle of the ABB can be divided into three parts, the early-late summer active period (mid/late May to late June; and August to early September), reproductive period when adults are underground actively tending to broods (late June through early August), and the winter inactive period (October to mid/late May). Adult ABB that were hatched the previous year become active after winter dormancy when nighttime temperatures reach approximately 60°F. In Nebraska, this typically occurs in late May or early June (USFWS 2013b). The ABB is fully nocturnal with its peak activity occurring directly after sundown. Adults immediately begin the search for suitable carrion on which to mate and raise broods. Until a suitable carcass is located, ABB will remain active at night and bury themselves during the day. Studies conducted in a laboratory setting indicate that ABB may bury to a depth of 16 centimeters (cm) during daily periods of inactivity (W. Hoback unpublished) in the summer active time. Carrion suitable for brood rearing must be small enough for burial but large enough to sustain the brood until emergence later in the summer. Kozol et al. (1988) found no preference for mammalian or avian carcasses. Upon locating and securing a carcass suitable for brood rearing, a male and female ABB pair will bury the carcass. Burial depths may range from "several inches" (Ratcliffe 1996) to 60 cm underground (Scott 1998).

Once a carcass is buried, the adult ABB will remove all hair or feathers and treat the carcass with oral and anal secretions, which slow decomposition. Eggs are laid in the soil adjacent to the carcass. Upon hatching, the larvae are moved to the carcass by the parent beetles, which also regurgitate meat for the larvae. Larvae continue to feed on the buried carcass for 10 to 14 days until they move a short distance away to pupate. Once the larvae have metamorphosed into adult beetles, approximately one month, the original parent adults (referred to as senescent) and the newly formed adults (referred to as teneral) all emerge from the ground and disperse to other prey items. Teneral and senescent adults typically emerge in early August. Teneral adults return to dormancy for the fall and winter by September or October. Senescent adults typically die shortly after re-emerging in early August (Ratcliffe 1996; Scott 1998). This pattern creates two spikes in American burying beetle activity, one in June and one in August (USFWS and NGPC 2008).

It is hypothesized that overwintering ABB in Nebraska employ a strategy that lowers their body to near freezing temperatures during the coldest parts of the winter (USFWS 2013a). Research indicates that burying beetles in the Sandhills may burrow below the frost line during the winter (Conley 2014).

ABB have been shown to be quite mobile. Bedick et al. (2004) reported average nightly movements of 0.62 mile with 85% of recaptures moving 0.31 mile in a night. The USFWS considers the effective trap radius of a baited pitfall trap to be 0.5 mile, indicating that a single trap baited with carrion will attract ABB from at least 0.5 mile away (USFWS 2013b). While ABB movement may average approximately 0.5 mile, individual ABB are capable of moving much larger distances. Jurzenski (2012) documented one ABB moving 4.5 miles in a single night and another moving an astounding 18 miles in one night. Those individuals were likely aided by strong winds during the night of their dispersal.

The main cause for ABB population declines range-wide is habitat fragmentation (USFWS 1991). In Nebraska, loss of native grassland from conversion to agriculture is the main cause of ABB habitat loss and fragmentation. Increased grain prices and reduction in enrollment in the Conservation Reserve Program have removed suitable habitat for ABB (USFWS 2013a). Habitat fragmentation may also impact the species by reducing prey base and increasing vertebrate scavengers that compete for carrion. For instance, scavenger species such as northern raccoon (*Procyon lotor*) and striped skunk (*Mephitis mephitis*) have undergone large population increases over the last century, and coyote (*Canis latrans*) and Virginia opossum (*Didelphis virginiana*) have undergone range expansions. In addition to potentially competing for carrion resources, Virginia opossum have been observed directly feeding on ABB during surveys (Jurzenski and Hoback 2011). Studies completed on the Block Island population support the idea that the primary mechanism for the species range-wide decline lies in its dependence on carrion of larger size for brood rearing. Carrion of the optimum size for brood rearing has been reduced throughout the species range (USFWS 1991).

Although lacking in scientific evidence, another prevailing theory on the decline of ABB is the increase in artificial light sources throughout the species range. Like all insects, the ABB is attracted to light sources. Attraction to artificial light sources may expose ABB to increased risk of predation, increased energy requirements, and reduced recruitment for future generations (Hoback et al. 2002).

Direct mortality from farm and construction-type equipment was not addressed as a potential threat to ABB (USFWS 1991). To better understand the potential for direct mortality to ABB as a result of compaction from overland travel of vehicles, a graduate student at the University of Nebraska-Kearney completed a thesis examining the effects of soil compaction from vehicles on burying beetles (Willemssens 2015). While the studies completed for this research were designed to better understand how vehicles might impact ABB, all studies were performed using other species of burying beetles as surrogates. Studies included field and laboratory-based experiments where beetles were allowed to bury in a specific space, then subjected to various levels of soil compaction through vehicles driving over or other similar conditions in a controlled laboratory setting. Studies examined compaction controlled in a laboratory setting, compaction created by a full-size pick-up truck when parked and when driving, and compaction created by large utility-scale trucks. The utility-scale trucks were provided by NPPD to assist in this research and included a large line truck that weighed approximately 30,000 kilograms (Willemssens 2015). The line truck was the largest vehicle in NPPD's operation and maintenance vehicle fleet.

Laboratory-controlled compaction tests involved placing *N. carolinus*, *N. marginatus*, and *N. orbicollis* in PVC tubes and allowing the individuals to bury. Once buried, compaction was artificially applied using a wooden board and hammer. Tests were completed in moistened sandy loam and silt loam soils. Results of the laboratory-controlled compaction studies showed that all *N. carolinus* and *N. marginatus* survived compaction of at least 4.5 kilograms per square centimeter (kg/cm^2). One *N. orbicollis* died at a compaction of 3 kg/cm^2. Note that 4.5 kg/cm^2 was the highest reading available on the penetrometer used to measure compaction and burying beetles may have survived higher levels of compaction. *N. orbicollis* is a much smaller burying beetle, and ABB would likely have similar results to *N. carolinus* and *N. marginatus* based on physical traits (Willemssens 2015).

The mean soil compaction after a full-size pick-up truck drove over a soil sample was 1.14 kg/cm^2, and accordingly very low mortality was observed in the buried beetles that were driven over. Mortality did increase when the pick-up truck was parked over the soil sample for an extended period (Willemssens 2015). A penetrometer was not used in the study of the utility line truck. Results were not presented in kg/cm^2, and therefore a direct comparison back to the laboratory compaction studies cannot be made. However, there was no significant difference in compaction measurements before and after driving the truck over a soil sample (Willemssens 2015), which would support the conclusion that the utility line truck, despite its large size and weight, would not impact buried beetles. The author of the thesis concluded that the utility line truck did not cause high compaction levels and was not likely to harm ABB (Willemssens 2015). Similar conclusions were made regarding large farm equipment and the likelihood that they would harm ABB.

<u>Occurrence within Study Area</u>: The USFWS provided ABB trap data from 1996 – 2014, which indicate that ABB have been captured at 539 trap locations throughout the Study Area during this time period. The majority of captures occurred east of Thomas and Cherry counties. It should be noted that the vast

majority of these occurrences are located along existing public highways and county roads. Because of the prevalence of existing trap data along roads, large tracts of open roadless spaces in between State Highway 7, U.S. Highway 283, State Highway 91, and U.S. Highway 281 have not been previously surveyed according to the USFWS data. Given the ABB's ability to travel relatively long distances in a single night, it is impossible to determine exactly from where captured ABB originated. However, survey protocol states a trap's effective radius is approximately 0.5 mile, so it is reasonable to assume that the majority of ABB captured in any one trap originated within 0.5 mile. Mark-recapture studies indicate that, while ABB are capable of traveling long distances, published literature indicates that more often than not they are recaptured at the same trap (Bedick et al. 1999; Peyton 2003).

In June 2014, NPPD conducted a presence/absence survey along two road corridors that run north-south in Thomas, Logan, and McPherson counties adjacent to alternative routes being considered at that time. The survey was done in accordance with the ABB survey protocol (NGPC and USFWS 2008). A total of 76 traps were placed within the road ROWs on two survey routes. Three ABB were captured during the 380 trap nights surveyed. Two ABB were captured from a single trap located on U.S. Highway 83 immediately south of the Dismal River (Figure 3-1). One ABB was captured approximately six miles south of the Dismal River on Seneca Road. All ABB captured were located in Thomas County. ABB has not been documented in Logan and McPherson counties to date.

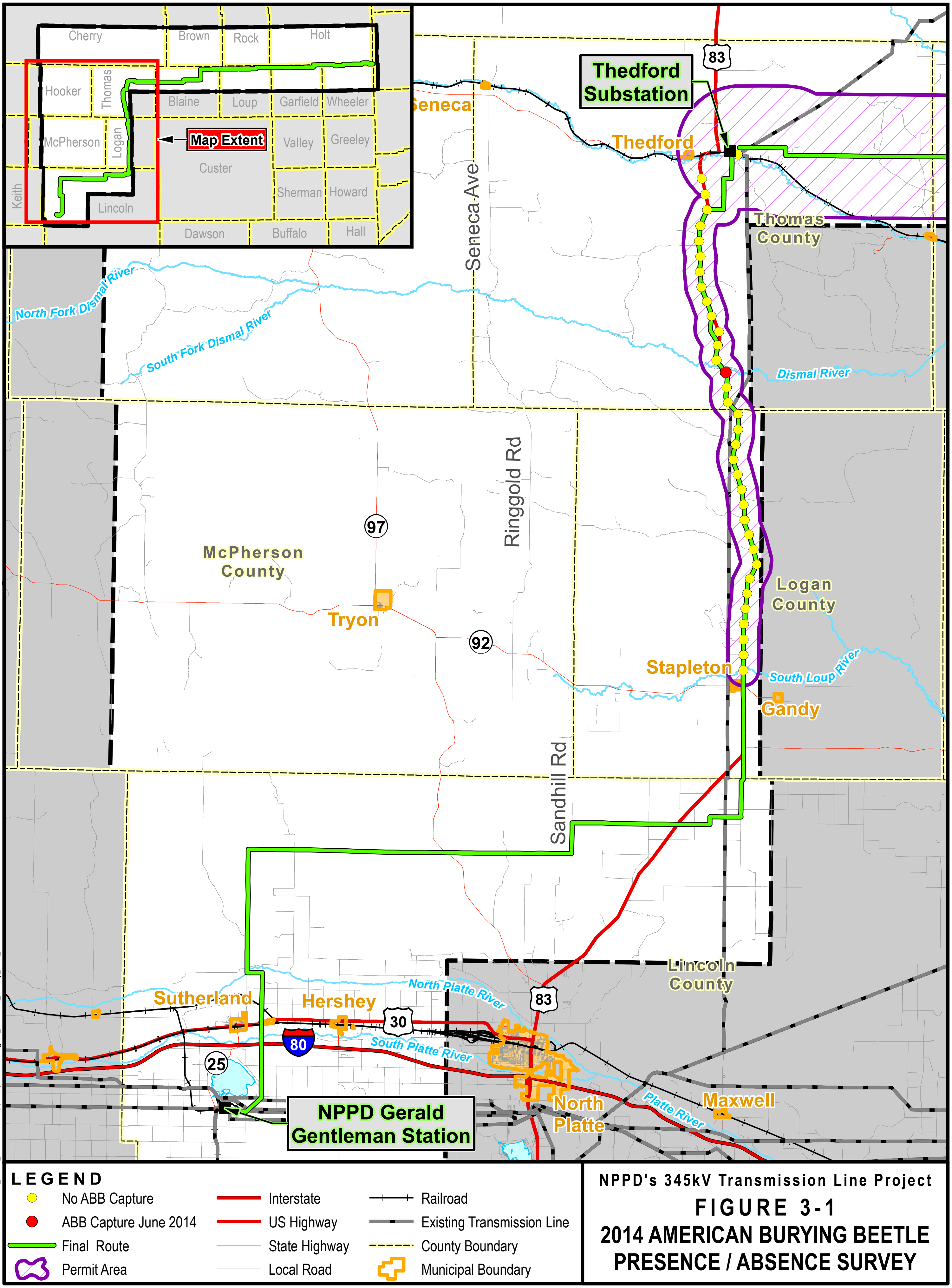
In August 2015, NPPD completed a protocol-level presence/absence survey along the North Loup River and State Highway 7 near Brewster. This survey captured 130 ABB in nine traps over a five-night trap period (45 trap nights surveyed). Three additional traps were placed in dry, sandy habitat along Pleasant Valley Road in an effort to determine if ABB inhabited such habitat. No ABB were captured in the dry, sandy habitat while 130 ABB were captured in adjacent suitable habitat.

In August 2016, NPPD began annual monitoring using a large-scale protocol-level mark/recapture survey that includes 79 traps spread throughout the Permit Area (Figure 3-2). This survey effort has been completed on the same days in early August in 2016, 2017, and 2018. ABB were captured each year throughout the east-west portion of the R-Project. A population estimate calculated using the Schnabel Method is provided. Under the Schnabel Method, biologists collect a species multiple times. Each survey effort notes the number of individuals captured, the number of individuals recaptured (cumulatively), and marks all the new captures. A summary of survey results are provided in Table 3-1.

TABLE 3-1 RESULTS OF AMERICAN BURYING BEETLE MONITORING: 2016, 2017, 2018

Survey Area	Individual ABB Captured		
	2016	2017	2018
Hwy 83	0	0	0
Purdum	2	3	0
Brewster	99	46	77
Hwy 7	118	49	27
Calamus River	63	8	43
Gracie Creek Rd	23	23	33
Hwy 11/846 Rd	122	74	30
846 Rd	64	91	17
TOTAL	**491**	**294**	**227**
Survey Area Population Estimate	**1,281**	**714**	**1,017**

1. Population estimate reflects the estimated ABB population for the area surveyed each year as calculated using the Schnabel Method of mark/recapture surveys.



NPPD's 345kV Transmission Line Project

FIGURE 3-1

2014 AMERICAN BURYING BEETLE PRESENCE / ABSENCE SURVEY

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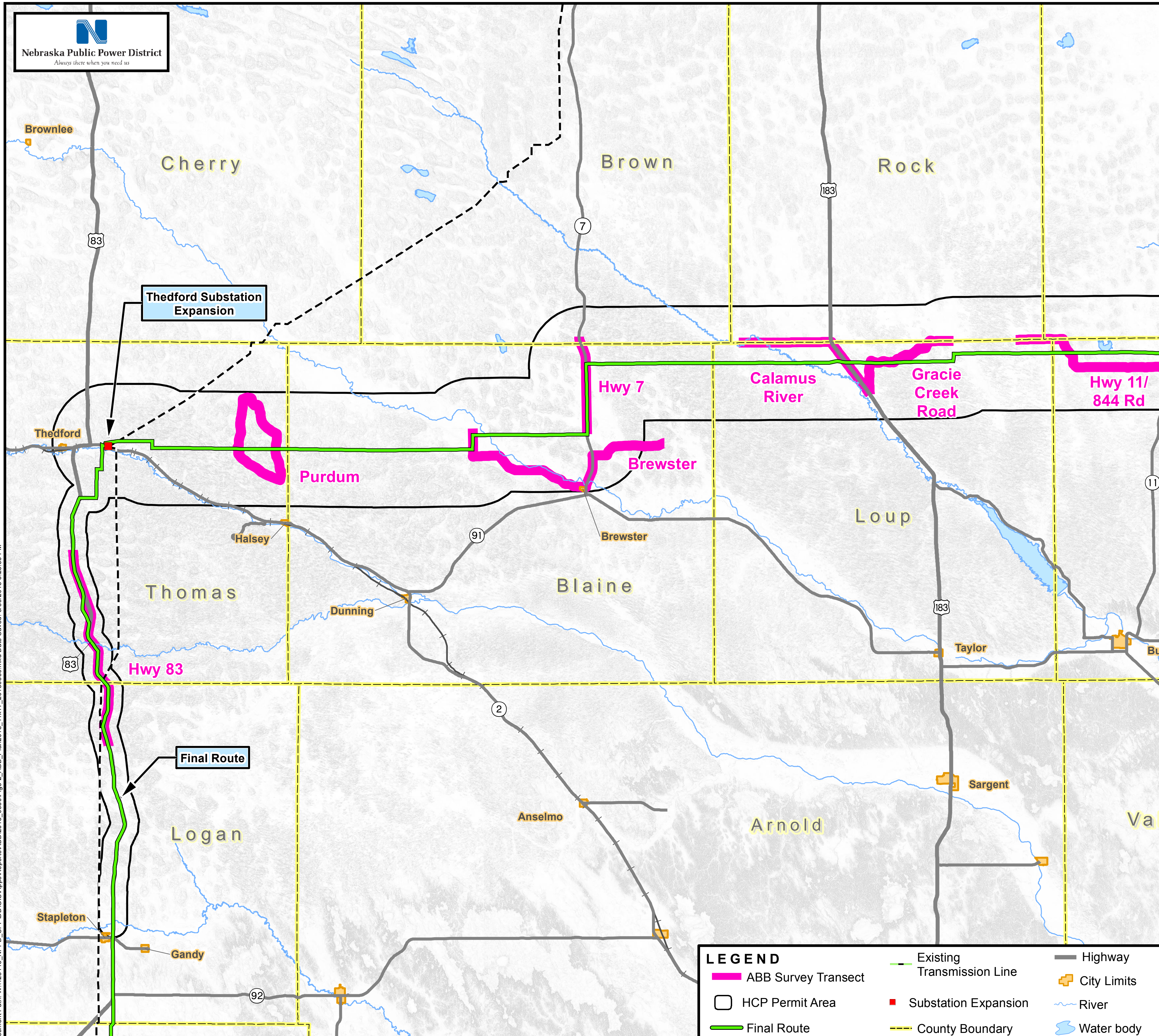

NPPD's 345 kV Transmission Line Project
R - PROJECT
FIGURE 3-2 - AMERICAN BURYING BEETLE MARK/RECAPTURE SURVEYS

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3.3 Evaluated Species

3.3.1 *Whooping Crane* (*Grus americana*)

Status and Distribution: The whooping crane was given legal protection under the Endangered Species Preservation Act (Public Law [P.L.] 89-699) in 1967 (32 FR 4001) and the Endangered Species Conservation Act (P.L. 91-135) in 1970 (35 FR 6069), each of which were incorporated into the current ESA in 1973. NESCA states that a species occurring in the state of Nebraska protected under the ESA will also be listed under NESCA. Therefore, the whooping crane is also protected as a state of Nebraska endangered species under NESCA. Federally designated critical habitat for the whooping crane occurs in Nebraska along the Platte River approximately 80 miles south of the Study Area. The critical habitat includes the Platte River and adjacent habitat within a three-mile-wide strip with the north boundary being Interstate 80 in Dawson, Buffalo, Hall, Phelps, Kearney, and Adams counties. Critical habitat runs from the junction of the U.S. Highway 283 bridge over the Platte River located south of Lexington, Nebraska to Denman, Nebraska. Denman is located southeast of the Interstate 80 interchange for Shelton, Nebraska near the Buffalo-Hall County line (43 FR 20941).

Whooping cranes that may occur in the Study Area are part of the Aransas-Wood Buffalo migratory population. The Aransas-Wood Buffalo population is the last remaining naturally migrating population of whooping cranes. Whooping cranes in this population nest in Wood Buffalo National Park in Northwest Territories, Canada and winter in Aransas National Wildlife Refuge in Texas. Spring migrants leave Aransas National Wildlife Refuge in March and April, arriving on the nesting grounds in April and May (Canadian Wildlife Service [CWS] and USFWS 2007). Fall migrants leave the nesting grounds in Wood Buffalo National Park in September and October and arrive on the wintering grounds in October and November. States and provinces that fall within the identified migration corridor include Texas, Oklahoma, Kansas, Nebraska, South Dakota, North Dakota, Montana, Manitoba, Saskatchewan, Alberta, and Northwest Territories (Stehn and Wassenich 2008).

The Aransas-Wood Buffalo population is the only remaining completely self-sustaining population of whooping cranes. Surveys to count whooping cranes within the Aransas-Wood Buffalo population occur multiple times each winter while the birds are at Aransas National Wildlife Refuge. In 2015 – 2016, population surveys on the wintering grounds estimated whooping crane abundance within the sampled area of 329 whooping cranes (293 to 371, 95% confidence interval) (USFWS 2016a). This was up from an estimate of 257 birds in 2012 – 2013. Surveys completed in the 2016 – 2017 wintering period estimate the whooping crane population at 431 whooping cranes (371 to 493, 95% confidence interval) (USFWS 2017) and 505 whooping cranes in the 2017 – 2018 wintering period (439 to 576, 95% confidence interval (USFWS 2018a). It is not possible to know the exact number of cranes outside of the surveyed area. However, it is unlikely that the entire population of whooping cranes was within the surveyed area during the survey and, in the February 2018 survey period, it is estimated that an additional 21 whooping cranes were beyond the primary survey area (USFWS 2018a).

Three other populations of whooping cranes have been reintroduced in their historic range. One population migrates between Florida and central Wisconsin, the second population is a group of non-migratory birds in central Florida, and the third is a non-migratory flock at White Lake, Louisiana. Each of these populations are established and supplemented by whooping cranes that were raised in captivity and released into these wild populations, until such time as the population becomes self-sustaining or it is determined that natural reproduction will not sustain the reintroduced population.

Habitat Characteristics/Use: Whooping cranes do not breed in Nebraska and only occur within the state while migrating between Aransas National Wildlife Refuge and Wood Buffalo National Park during the spring and fall. The whooping crane migration corridor in the Central Flyway is based on 100- and 200-mile thresholds around a center line, created by using all previously documented whooping crane locations (Stehn and Wassenich 2008). The 100-mile corridor represents 82% of all sightings, and the 200-mile corridor represents 94% of all sightings. This information was then adapted to create a 95%-sighting corridor and a 75%-sighting corridor in a USFWS memo titled *Region 6 Guidance for Minimizing Effects of Power Line Projects within the Whooping Crane Migration Corridor.* The Study Area falls within the 95%-sighting corridor and a portion is within the 75%-sighting corridor (Figure 3-3).

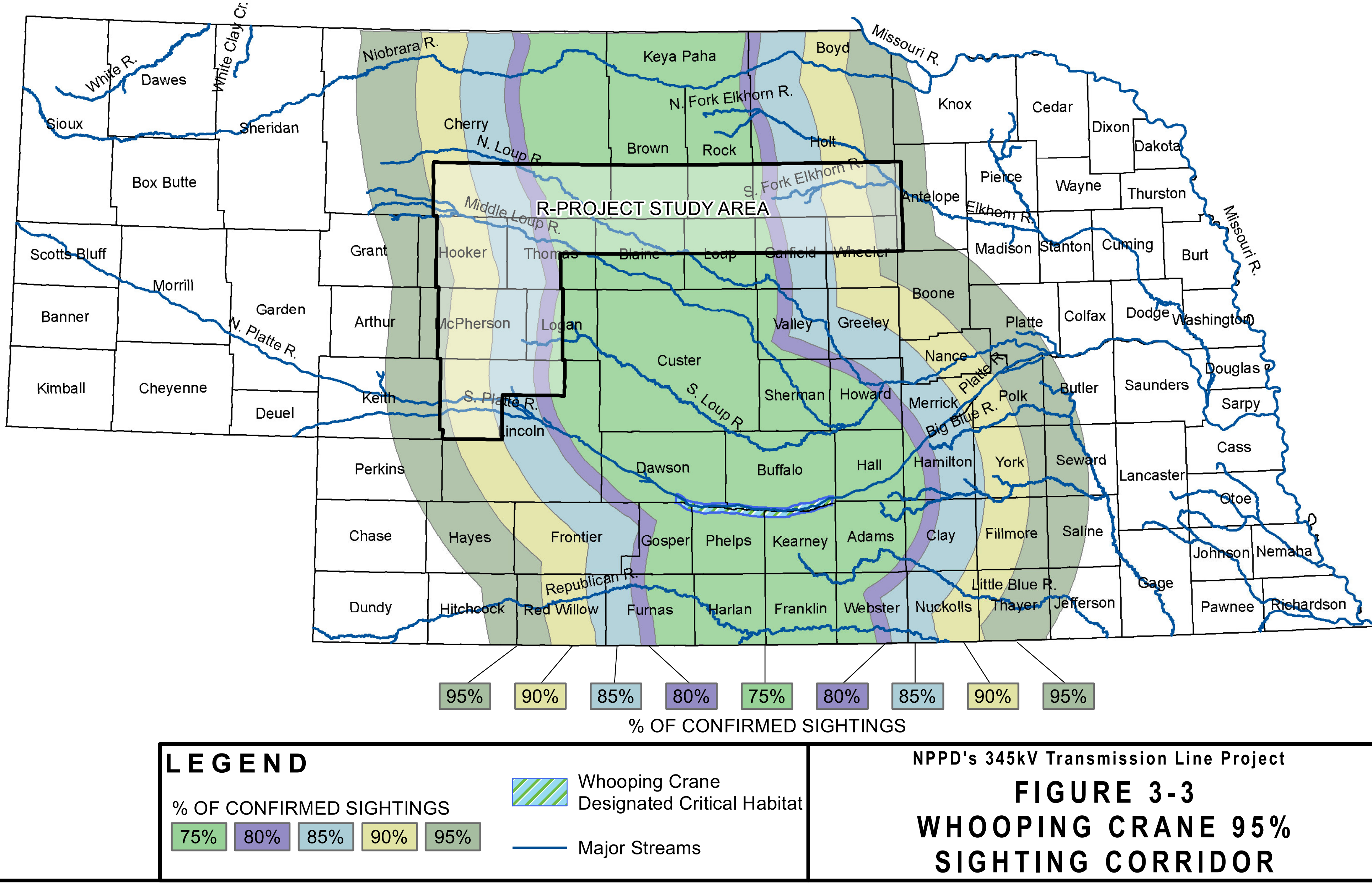
Beginning in 2009, a team of biologists from the U.S. Geological Survey, USFWS, Canadian Wildlife Service, Crane Trust, and Platte River Recovery Implementation Program began placing GPS trackers on whooping cranes to closely monitor locations and habitats used by cranes during all portions of their lifecycle (Headwaters 2018). GPS trackers were placed on whooping cranes of various age classes between 2009 and 2014. A total of 58 whooping cranes were tracked during at least one migration in this study, which represented approximately one-fifth of the population at the time. This study, hereafter referred to as the satellite tracking study, provided valuable information on whooping crane use and habitat selection in central Nebraska.

Whooping crane sightings in Nebraska have primarily been in palustrine wetland (56%) and riverine habitats (40%) (Austin and Richert 2005). During migration, whooping cranes roost in shallow depressional wetlands or large, shallow riverine habitat, typically adjacent to agricultural fields. Most wetlands used for roosting are small (<1 hectare) and less than 28 cm deep (Armbruster 1990). The satellite tracking study found that, of 504 roost sites where site visits were made, 50% were in emergent wetlands, 26% in lacustrine wetlands, 19% in riverine wetlands, and 5% were in dryland areas (Pearse et al 2017). Agricultural fields and grasslands also serve as habitat by providing forage and energy in the form of waste grain following fall harvest for whooping cranes during their migrations. Pearse et al. (2017) found that, of 83 day-use sites, 54% were dry land sites and 45% were wetlands. Whooping cranes may spend several days resting in a given area and make short flights between roosting and foraging areas, generally less than one kilometer (km) apart (Howe 1987).

Wetlands in the Great Plains are spatially and temporally dynamic, and migrant waterbirds that rely on them must be flexible in habitat selection during migration (Albanese et al. 2012). Preliminary analysis of the satellite tracking study, conducted by Pearse et al., indicate that whooping cranes rarely display site fidelity during migration, where they continually return to the same specific wetlands throughout their lifecycle. They instead prefer to find suitable roosting habitat close to their location when conditions are no longer optimal for migrating. Preliminary analysis completed by Pearse et al. of data collected by satellite tracking study showed that only four percent of all stopovers within the Central Flyway could be considered some sort of site fidelity. In this case, site fidelity was defined by a marked whooping crane using stopover habitat within ten miles of a previous stopover (Headwaters 2018). The exceptions to the lack of whooping crane migration site fidelity include several large wetland complexes along the migration corridor, many of which have been designated as critical habitat in other states along the migration path including the stretch of Platte River bottoms in Nebraska. While individual whooping cranes show little site fidelity, broad areas where the landscape supports abundant habitat have resulted in multiple occasions of documented use (Pearse et al. 2015).

The diet of migrating whooping cranes is poorly documented. However, individuals are known to consume frogs, fish, crayfish, insects, plant tubers, and agricultural waste grain during migration (CWS and USFWS 2007). Feeding sites of migrating whooping cranes noted from 1977 through 1999 were largely upland crops. Seasonal or permanent wetlands or upland perennial cover was used less frequently (Austin and Richert 2005).

Data Source: USFWS Cooperative Whooping Crane Tracking Project Database



NPPD's 345kV Transmission Line Project

FIGURE 3-3
WHOOPING CRANE 95% SIGHTING CORRIDOR

Extensive analysis of the satellite tracking study found that predation was the highest cause of whooping crane mortality, and no birds collided with a power line (Pearse et al. 2018). A 2011 publication identified shooting and power line collision as the most commonly identified sources of whooping crane mortality (Stehn and Strobel 2011). However, in over 90% of all mortality cases, a carcass is not found and the cause of mortality is unknown and speculative (Stehn and Strobel 2011). In studies of waterbirds, collisions typically occur when a transmission line bisects roosting habitat from foraging habitat (Brown et al. 1987; Morkill and Anderson 1990). Because whooping cranes will feed in the same wetlands they roost in and move to other adjacent wetlands and agricultural fields, it is not possible to predict where whooping cranes will forage. Kaufield (1981) found that optimal stopover habitat for migrating whooping cranes had adequate roosting and foraging sites 0.62 to 1.24 miles away and that foraging locations more than 6.2 miles from the roost site were not used. Austin and Richert (2005) found that approximately two-thirds of whooping crane foraging locations during migration were within 0.5 mile of their roost site. Howe (1989) observed 27 whooping cranes, seven of which were radio tracked, and found that whooping cranes traveled up to 5.0 miles to upland feeding sites from their roost sites, but 56% traveled less than 0.62 mile. The satellite tracking study supports this assertion. The median distance moved during a migration stopover by whooping cranes tracked in that study was 0.45 mile (Headwaters 2018).

<u>Occurrence within Study Area</u>: The Study Area was identified early in the development of the R-Project as a means to identify and evaluate all parameters associated with selecting potential transmission line routes, including environmental concerns such as whooping crane occurrences. In this section and throughout Chapter 3, the Study Area is used to provide a general overview of known species occurrences; however, the Study Area of 7,039 square miles is not the relevant scale at which potential effects are analyzed in Chapter 4.

Whooping cranes are largely, though not entirely, opportunistic in their use of stopover sites along the Central Flyway and will use sites with available habitat when weather or diurnal conditions require a break in migration. Because much of the Central Flyway is sparsely populated, only a small percent of stopovers are observed by people, those observed may not be identified, those identified may not be reported, and those reported may not be confirmed. Based on the crane population and average flight distances, as little as four percent of crane stopovers are reported. Therefore, absence of documented whooping crane use of a given area in the Central Flyway does not necessarily mean that whooping cranes do not use that area. For this reason, NPPD assumes that any suitable stopover or foraging habitat could be used by whooping cranes over the life of the project. Examining previous stopover locations provides only a general sense of where suitable habitat occurs. The lack of observations during migration highlight the importance of studies like the satellite tracking study to evaluate whooping crane migrations.

Of the 58 whooping cranes tracked by the satellite tracking study during migration, 33 used stopover habitats within the 7,039 square mile Study Area at some point (Figure 3-4; Headwaters 2018). However, very few of these occurrences were within one mile the proposed R-Project. A total of five different whooping cranes used stopover habitat within one mile of the R-Project route during the fall migration:

- One bird on Calamus River in 2012,
- One bird on Rush Lake in 2012,
- Two birds on wet meadow habitat in northern Wheeler County in 2013,
- One bird on wet meadow habitat in northern Garfield County in 2015.

Stopovers ranged from six days on the Calamus River to less than one day on wet meadows in northern Wheeler County and northern Garfield County. The average time spent at these habitats within one mile of the R-Project was approximately two days.

Data received from the Nebraska Natural Heritage Program (NNHP) and USFWS included incidental observations of whooping cranes that have been verified by a qualified biologist. These data are in addition to the satellite tracking study described above and indicate that whooping cranes have been observed in the Study Area 27 times since 1968, the most recent being 2014 (NGPC 2015a). However, like the satellite tracking study, very few of these birds were close to the R-Project. Only three birds from the NNHP and USFWS data were observed within one mile of the R-Project.

Using information from the satellite tracking study, Pearse et al. (2015) divided the whooping crane migration corridor into 400 square kilometer (km^2) cells (20 km by 20 km), which were defined by the amount of whooping crane use within each cell. While the study's authors caution against using their results to provide a fine-scale site evaluation due to the large scale of the cells, the results do provide insight into general whooping crane use of the surrounding landscape. Cells were divided into four categories based on whooping crane use: unoccupied, low intensity, core intensity, and extended-use core intensity. Low-intensity-use cells had at least one stopover site within the cell but typically not a high level of use. Core-intensity cells may have had multiple stopover sites within each cell but a lower number of crane use days, indicating the whooping cranes did not spend multiple days in the cell. Extended-use core-intensity cells had multiple stopover sites within the cell and multiple crane days at those sites, indicating whooping cranes remained at the site for multiple days. The Study Area contains all or a portion of the following cells: 37 unoccupied, 13 low intensity, seven core intensity, and one extended-use core intensity. Pearse et al. have continued to refine their analysis of whooping crane use cells throughout the Central Flyway. The refined analysis, which is still in a draft state, defines hexagonal grid cells with a 10-km radius and classifies them as no use, peripheral use, and core use. This is similar to the 2015 analysis but does not differentiate those cells where whooping cranes remained for extended periods.

Additional examination of the Pearse et al. (2015) analysis and draft refined analysis was not conducted because the scope of analysis for the Pearse et al. documents is much larger than the applicable scope of analysis for the R-Project. As described above, Brown et al. (1987) and Shaw et al. (2010) show birds that originate flight more than one mile from a power line are at little to no risk of collision. The analysis presented in Pearse et al. (2015) and the continued refinement of those data show where whooping cranes had stopover sites somewhere within a 154-square-mile cell. Because of the cell's large size and the use of a centroid to create the cell, as used in the draft analysis with a 10 km radius around a point, a slight shift in the start point of cell mapping could result in changes to a cell's classification. Review of the Pearse et al. (2015) against the draft analysis shows that the whooping crane use cells can and do change annually based on where individual birds elect to stop each year, and as little as one whooping crane occurrence could shift a cell to the core-use designation. For these reasons, additional examination of Pearse et al. (2015) and the draft analysis was not conducted.

The following disclaimer applies to the use of the USFWS Nebraska Ecological Services Field Office whooping crane data, including the occurrences displayed in Figure 3-4:

> *This document or presentation includes Whooping Crane migration use data from the Central Flyway stretching from Canada to Texas, collected, managed and owned by the U.S. Fish and Wildlife Service. Data were provided to the NPPD as a courtesy for their use. The U.S. Fish and Wildlife Service has not directed, reviewed, or endorsed any aspect of the use of these data. Any and all data analyses, interpretations, and conclusions from these data are solely those of NPPD.*

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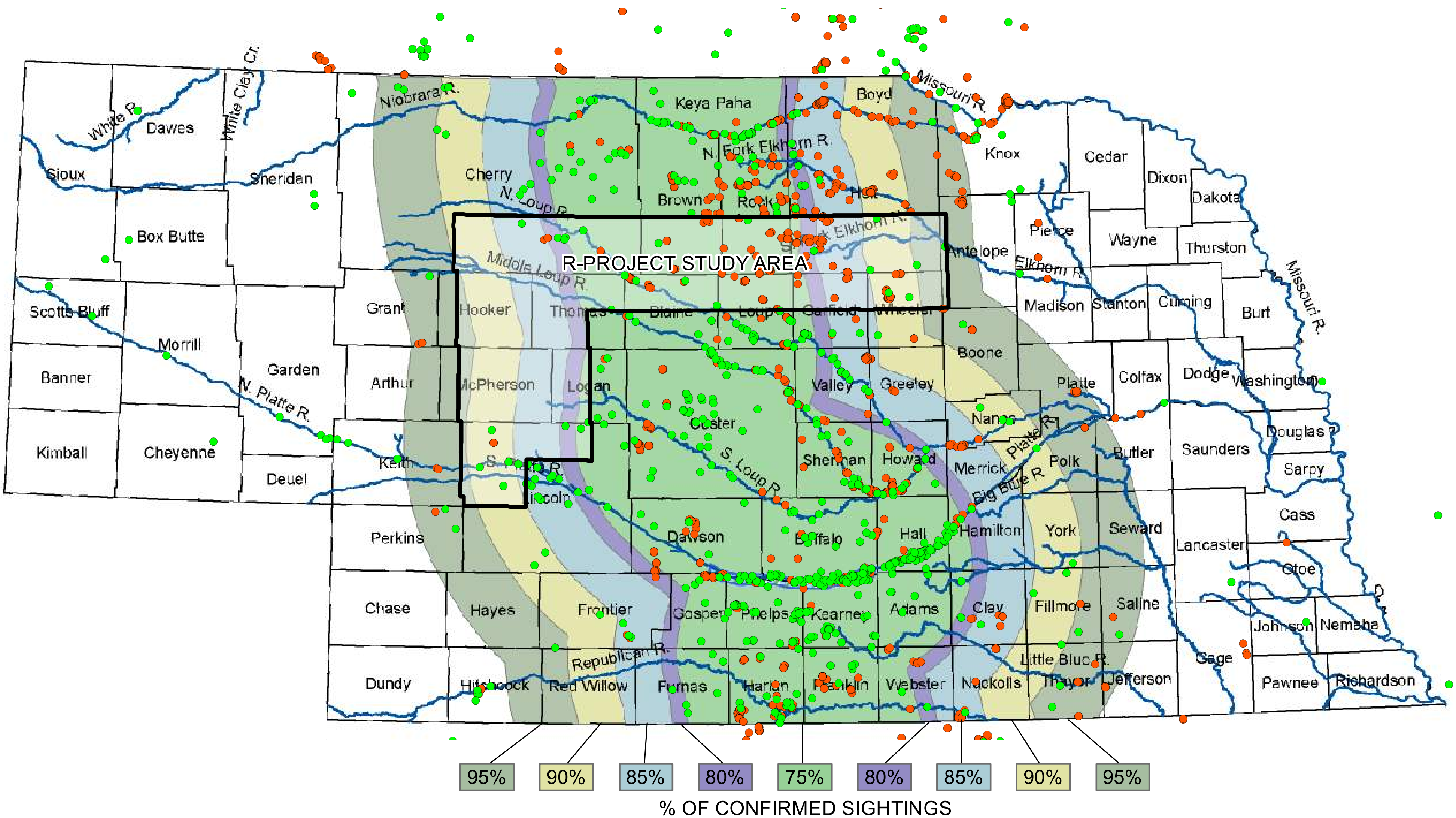
Data Source: U.S. Fish and Wildlife Service Nebraska Ecological Services Field Office



LEGEND

% OF CONFIRMED SIGHTINGS

75% | 80% | 85% | 90% | 95%

- USFWS Whooping Crane Tracking Project Occurrences
- Whooping Crane Satellite Tracking Stopover Location
- Whooping Crane Designated Critical Habitat
- Major Stream

NPPD's 345kV Transmission Line Project

FIGURE 3-4

SATELLITE TRACKING AND HISTORICAL WHOOPING CRANE OBSERVATIONS

3.3.2 Interior Least Tern (*Sterna antillarum*)

Status and Distribution: The interior population of least tern (hereafter referred to as interior least tern) was listed as federally endangered under the ESA in July of 1985 (50 FR 21784). NESCA states that a species occurring in the state of Nebraska protected under the ESA will also be listed under NESCA. Therefore, the interior least tern is also protected as a state of Nebraska endangered species under NESCA. No critical habitat has been designated for the interior least tern.

The interior least tern is a migratory species that breeds along inland river systems in the United States and is believed to winter in Central and South America. Because it does not winter in Nebraska, only the breeding portion of the species' range will be addressed in this HCP. The historical breeding range of the interior least tern ranged from Texas to Montana and from eastern Colorado and New Mexico to Indiana. Breeding has occurred on river systems that support large sandbar habitat, including the Red, Missouri, Arkansas, Platte, Mississippi, Ohio, and Rio Grande river systems (USFWS 1990). Within Nebraska, the species utilizes sandbar habitats on the Platte River, Missouri River, lower reaches of the Loup, Niobrara, and Elkhorn rivers, and large sandy beaches of Lake McConaughy on the North Platte River (Lackey 2013).

Habitat Characteristics/Use: Interior least terns typically arrive at breeding areas from late April to early June before returning to wintering areas from July through August. Little is known about migratory paths taken by interior least terns. Thompson et al. (1997) states that interior least terns likely follow large river basins to their confluence with the Mississippi River before proceeding south to the Gulf of Mexico. However, limited band return data and documented interior least tern nests at non-riverine sites indicate that overland migrations do occur (Koenen 1995; Lott et al. 2013).

Nesting habitat of interior least terns includes sparsely vegetated sand and gravel bars within a wide, unobstructed river channel, salt flats, and along lake shorelines (Thompson et al. 1997). Areas suitable for nesting are more than 250 feet from trees and more than 200 feet from channel banks (Lott and Wiley 2012). Studies conducted in Nebraska found that nesting attempts on the lower Platte River had a minimum channel width of over 1,000 feet (Ziewitz et al. 1992; Jorgensen et al. 2012). Minimum channel width at nest sites on the central Platte River had a minimum channel width of over 600 feet (Ziewitz et al. 1992).

Prior studies have found that sparse vegetation with high contents of sand and gravel substrates are key predictors of suitable interior least tern nesting habitat on natural and constructed sandbars on the Missouri River (Sherfy et al. 2012a). Nests are commonly placed close to debris, such as driftwood, which is thought to add a windbreak shielding the nest from blowing sand (Sherfy et al. 2012a). In Nebraska, the species commonly nests in man-made habitats such as sand and gravel pits next to large river systems and dredge islands (Faanes 1983; USFWS 1990; Kirsch 1996). A 2012 study of 23 radio-tracked interior least terns in the central Platte River Valley identified a total of 98 interior least tern nests, 95 of which were located on sandpit spoil piles (Sherfy et al. 2012b). Other studies located on the lower Platte River identified an equal number of nests on river sandbars and sandpits. Nests located on river sandbars and sandpits had approximately the same level of productivity (Kirsch 1996). The extent of available nesting area depends on water levels and the resulting amount of exposed bar and shoreline habitat.

Interior least terns are considered colonial nesters. Colonies generally consist of up to 20 nests and colonies with up to 75 nests have been recorded on the Mississippi River; however, such large colonies are unlikely to occur in Nebraska. Interior least terns nest on the ground in a simple unlined scrape, typically on sites that are sandy and relatively free of vegetation. Usually two to three eggs are laid by late May or early June (USFWS 2013c). Incubation lasts 20 to 25 days and incubation duties are shared by both male and female parents. Fledging occurs within three weeks after hatching. Departure from colonies varies but is usually complete by early September (USFWS 1990).

The interior least tern is piscivorous and feeds by hovering and diving into shallow waters of rivers, streams, and lakes. The most common fish species taken in Nebraska include several shiner species (*Notropis* sp.) and plains killifish (*Fundulus zebrinus*), but interior least terns will eat almost any fish species of appropriate size (Lackey 2013). In addition to small fish, terns also may feed on crustaceans, insects, mollusks, and annelids. In the Great Plains, fish are the primary diet of interior least terns (Thompson et al. 1997; USFWS 1990). While nesting terns will forage close to nesting colonies, a recent study found that foraging movements of greater than 10 km occurred regularly (Sherfy et al. 2012b).

Occurrence within Study Area: Data received from the NNHP do not indicate any occurrences of interior least terns within the Study Area (NGPC 2015a). However, the species has been documented at Lake McConaughy on the North Platte River and portions of the South Platte River upstream of the Study Area. This indicates that the interior least tern may pass through the Study Area during migration. None of the rivers' segments within the Study Area have documented nesting or suitable nesting habitat. An interior least tern nesting habitat assessment was completed for the R-Project crossing locations on the North Platte River and South Platte River. No nesting habitat was observed at the crossing locations. No known nesting of interior least terns occurs within 10 km of any of the river crossings. The only known annual nesting area upstream of the crossings is small number of nests at Lake McConaughy (Peyton and Wilson 2013).

3.3.3 Piping Plover (*Charadrius melodus*)

Status and Distribution: Piping plover populations within the Great Lakes watershed are listed as endangered under the ESA, and the species is listed as threatened in the remainder of its range, which includes the R-Project Study Area. This listing occurred on December 11, 1985 (50 FR 50726). Populations of piping plover within Nebraska belong to the threatened Northern Great Plains population. The piping plover is also protected as a state of Nebraska threatened species under NESCA. No piping plover critical habitat occurs in Nebraska.

Historically, piping plovers bred on large prairie river sandbars, alkali wetlands, and barren lake shores throughout the U.S. and Canadian Northern Great Plains from Alberta to Manitoba south to Nebraska, on Great Lakes beaches, and on Atlantic coastal beaches from Newfoundland to North Carolina. Wintering areas are not well known, although wintering birds have most often been seen along the Gulf of Mexico, southern U.S. Atlantic coastal beaches from North Carolina to Florida, eastern Mexico, and scattered Caribbean Islands. The piping plover's current breeding range remains similar to historical records; however, an increase in nest predation and a decrease in suitable breeding habitat have led to sharp declines in populations (USFWS 1988; USFWS 2009a). Data included in the USFWS 2009 5-Year Review for Piping Plover indicate the number of nesting piping plovers on the Platte River has been near or over the recovery goal of 140 pairs since 2003 (USFWS 2009a). The plover pairs on the Niobrara have only been about half of the 50 pairs called for in the recovery plan (USFWS 2009a). The Loup River system has not approached the recovery goal of 25 pairs (USFWS 2009a).

Habitat Characteristics/Use: Piping plovers begin arriving on their breeding grounds in mid-April. Most birds arriving in the Northern Great Plains initiate breeding behavior by mid-May (USFWS 1988). Populations that nest on the Missouri, Platte, Niobrara, and other rivers use beaches and dry barren sandbars in wide, open channel beds. Nesting locations of inland populations may also occur on sparsely vegetated shorelines around small alkali lakes, large reservoir beaches, sandpits, and shorelines associated with industrial ponds (Faanes 1983; Sherfy et al. 2012b). Studies conducted in Nebraska found that nesting attempts on the lower Platte River had a minimum channel width of over 1,000 feet (Ziewitz et al.

1992; Jorgensen et al. 2012). Minimum channel width at nest sites on the central Platte River had a minimum channel width of over 600 feet (Ziewitz et al. 1992).

A 2012 study of 19 radio-tracked piping plovers in the central Platte River Valley identified a total of 39 piping plover nests, 31 of which were located on sandpit spoil piles. This study noted that nest success was higher on sandpits (48% success) than on riverine sandbar habitat (25% success) (Sherfy et al. 2012b).

The most common habitat used by migrating Great Plains birds is reservoir shorelines. However, birds will also use natural lakes, rivers, marshes, industrial ponds, and fish farms as stopover sites (Elliott-Smith and Haig 2004). Lake McConaughy is considered an important spring stopover site and nesting area, with more than 100 piping plovers observed at one time (Brown et al. 2011) and 2,440 nests documented since 1992 (Peyton and Wilson 2013). Wintering birds from the Northern Great Plains tend to have a broader range than other populations, although they typically occur along the Gulf Coast. Wintering birds from the Northern Great Plains have been observed from Texas to Florida (Gratto-Trevor et al. 2012).

Vegetative cover at nest sites is sparse and similar to that of the interior least tern (Elliot-Smith and Haig 2004). Nests consist of shallow scrapes in the sand with the nest cup often lined with small pebbles or shell fragments. The nest is typically far from cover. Nesting piping plovers have been found in least tern nesting colonies at a number of sites on Great Plains river sandbars and sand pits (Sherfy et al. 2012b). Egg-laying commences in mid to late April and continues through June. Surveys of managed nesting sites on the central Platte River have observed incubating piping plovers as early as May 5 (Jenniges, Jim. Biologist, NPPD. Personal communication via telephone with Ben Bainbridge, January 28, 2014). The female generally chooses from several nest sites the male has constructed. Complete clutches contain three to four cryptically colored eggs (Brown et al. 2011). Incubation is shared by the male and female. Incubation averages 26 days with all eggs typically hatching on the same day. Brooding duties also are shared by the male and female. Broods remain in nesting territories until they mature unless they are disturbed. Fledging takes approximately 21 to 35 days. If a nest fails or is destroyed, adults may re-nest up to four times (USFWS 1988). Breeding adults begin leaving nesting grounds as early as mid-July with the majority gone by the end of August (Elliott-Smith and Haig 2004).

Dietary components that make up the bulk of piping plover’s diet include invertebrates such as insects from the orders Coleoptera, Diptera, and Hymenoptera, and small crustaceans in or near shallow water (Elliot-Smith and Haig 2004; Le Fer 2006; Le Fer et al. 2007; Sherfy et al. 2012b). This species feeds by alternating running and pausing to search for prey in moist soils while pecking to capture identified prey items (USFWS 2003; Sherfy et al. 2012b).

<u>Occurrence within Study Area</u>: Because the piping plover commonly breeds at the same locations as the interior least tern, the potential for the two species to occur within the Study Area is similar. Like the interior least tern, data received from the NNHP do not indicate any occurrences of piping plover within the Study Area (NGPC 2015a). However, the species has been documented at Lake McConaughy on the North Platte River and portions of the South Platte River upstream of the Study Area. This indicates that the piping plover may pass through the Study Area during migration flights from nesting locations outside of the Study Area. None of the segments of river within the Study Area have documented nesting or suitable nesting habitat. A piping plover nesting habitat assessment was completed for the R-Project crossing locations on the North Platte River and South Platte River. No nesting habitat was observed at the crossing locations. Nesting habitat would not be present on the North Platte River because water releases from the Lake McConaughy Dam for irrigation purposes create high flows throughout the nesting season. While piping plovers have not been documented by the NNHP in the Study Area, migrating individuals may pass through during migration and go undetected.

3.3.4 Bald Eagle (*Haliaeetus leucocephalus*)

Status and Distribution: The bald eagle was listed as an endangered species under the ESA in 1978 (43 FR 6233). Population declines were attributed to habitat loss (both summer and winter ranges), the use of organochlorine pesticides, and mortality from shooting. Since its listing in 1978, the population trend for the bald eagle has been increasing. The bald eagle was down-listed from endangered to threatened in 1995 (60 FR 35999). On August 8, 2007, the bald eagle was removed from the list of threatened and endangered species protected under the ESA (72 FR 37346). The bald eagle was also delisted from NESCA concurrently with its delisting from the ESA. Although the bald eagle is no longer protected under the ESA as described above, bald eagles are still protected by two other major federal laws: BGEPA and the MBTA.

Bald eagles currently occur in nearly every state; however, the largest breeding populations occur in Alaska, Canada, Florida, the Pacific Northwest, the Greater Yellowstone Ecosystem, the Great Lakes states, and the Chesapeake Bay region (USFWS 2007). Because the bald eagle was delisted under the ESA, neither the USFWS nor NGPC maintain the bird on its county distribution list of threatened and endangered species. The first successful nesting attempt recorded in Nebraska in modern history occurred in 1991. Since that time, active bald eagle nests have increased by approximately 29% per year. In 2017, there were 209 active nests in Nebraska (Jorgensen and Dinan 2018). Bald eagles are considered common as migrants and winter residents in Nebraska. The average number of wintering bald eagles in the state from 1996 to 2011 was 990 individuals (NGPC 2013a). It is likely the number of bald eagles currently wintering in Nebraska is higher than the 2011 average provided by NGPC, based on the increase in nesting occurrences in recent years.

Habitat Characteristics/Use: The bald eagle is a large raptor with a body length from 31 to 37 inches and a wingspan ranging from 70 to 90 inches. Sexes are similar in appearance and mature adult birds (over five years of age) have a distinct white head, neck, and tail, with a contrasting black-brown body and yellow bill. Immature birds are entirely brown with whitish wing linings and a dark bill. Females are larger than males (Sibley 2003).

Bald eagles exhibit complex migration patterns that are influenced by age, location of breeding site, severity of climate at the breeding site, and food availability. Adult bald eagles migrate when food becomes unavailable. Usually migrating alone, they may join other migrants at communal feeding and roost sites along their route. While northern bald eagles (breeding north of 40 degrees latitude) generally migrate south in late summer/fall, southern adults may remain near the nest site throughout the year (Buehler 2000).

Nesting or wintering bald eagles are found in close association with water. Rivers, lakes, and reservoirs often support a reliable prey base for bald eagles. During the critical wintering period (December 15 – February 20), eagles are usually forced to concentrate in areas where water remains free of ice and food is available (NGPC 2013a). Bald eagles are known to winter at open-water areas across a wide portion of Nebraska. A key aspect of wintering habitat is open water, which provides access to eagles for fish and waterfowl (Martell 1992). Bald eagles will congregate at winter roost sites near open water throughout the winter.

While most of the bald eagles observed in Nebraska are wintering eagles, some remain to nest in trees in the riparian corridor of Nebraska's rivers. Nesting takes place in the tops of large trees, also near water. Bald eagles nest near rivers, lakes, and reservoirs, selecting sites free from disturbance. Although bald eagles often avoid areas of high human use for nesting, foraging, perching, and roosting, bald eagles have shown a wide range of sensitivity to human disturbance (Stalmaster and Newman 1978; Knight and Knight 1984; Martell 1992; Buehler et al. 1991; McGarigal et al. 1991). In some areas, bald eagles may be becoming increasingly tolerant of human development (Buehler 2000). Nests are very large, constructed of large sticks, and lined with soft materials. The timing of bald eagle egg laying varies depending on latitude. Swenson et al. (1986) observed that egg laying in the Greater Yellowstone ecosystem occurred from mid-March through early April. Nest surveys performed in Nebraska in 2009 by POWER Engineers, Inc. (POWER), for a separate project, observed eagles brooding eggs in late February (POWER 2009a). Eggs typically hatch 35 days after laying and nest activity continues until the chicks fledge in mid-August (Buehler 2000).

Fish (dead or alive) are the bald eagle's primary source of food. Winter die offs of shad (*Alosa* sp.) or alewife (*Alosa pseudoharengus*) at some of Nebraska's lakes and reservoirs provide readily available forage (NGPC 2013a). Waterfowl are another important source of winter food. Bald eagles will occasionally hunt upland areas for birds or small mammals (Buehler 2000).

Occurrence within Study Area: The NNHP maintains a record of bald eagle nests and communal winter roosts identified throughout the state. Table 3-2 presents the water body and last date observed for each recorded bald eagle occurrence in the Study Area. All of the recorded bald eagle occurrences are associated with either a river or lake in the Study Area.

TABLE 3-2 BALD EAGLE NESTS AND WINTER CONCENTRATION AREAS DOCUMENTED OCCURRENCES IN STUDY AREA

OCCURRENCE TYPE	WATER BODY	YEAR LAST OBSERVED
Nest	Sutherland Reservoir	2013
Nest	Swan Lake	2008
Nest	North Loup River	2018*
Nest	Calamus River	2008
Nest	Calamus River	2014
Nest	Calamus River	2014
Nest	Calamus River	2017
Nest	Calamus River	2013
Nest	Calamus River	2017
Nest	Calamus River	2013
Nest	Bloody Creek	2014
Nest	Hagan Lake	2004
Nest	Lake George	2014
Nest	Elkhorn River	2008
Nest	Elkhorn River	2014
Nest	Goose Lake	2012
Nest	Unnamed wetland	1996
Nest	Birdwood Creek	2018*
Nest	Sunfish Lake	2018*
Nest	Chain Lake	2018*
Nest	Middle Loup River	2018*
Winter Concentration Area	Sutherland Reservoir	1992
Winter Concentration Area	Sutherland Reservoir	1992
Winter Concentration Area	North Platte River	1991

*Nests observed in 2018 were included in the R-Project 2018 Bald Eagle Aerial Nest Survey and were verified as active in 2018.

Three bald eagle winter concentration areas occur in the Study Area. Two are located on the western edge of Sutherland Reservoir, and the third is located on the North Platte River in the western portion of the

Study Area. In addition to winter concentration areas identified by NNHP, wintering bald eagles may occur during daily movements from concentration areas located outside the Study Area. Wintering bald eagles would be congregated around areas of open water that provide a suitable food source through the colder months. Bald eagles routinely occur at Sutherland Reservoir during the winter due to warm water discharge from the NPPD power plant, which prevents a portion of the reservoir from freezing. Additionally, the discharge area on the North Platte River below Lake McConaughy and Lake Ogallala provide ideal winter habitat for bald eagles (NGPC 2013a). Birds using the area downstream of these lakes may occur within the Study Area during daily flights. These lakes are located approximately 20 miles west of the Study Area.

NPPD completed aerial surveys for bald eagle nests along major water bodies within potential route corridors during the 2014 nesting season and along the final route in the 2016, 2017, and 2018 nesting seasons. Surveys included the South Platte River, North Platte River, Birdwood Creek, Dismal River, Middle Loup River, North Loup River, and Calamus River. Additional survey areas included cottonwood stands along 846 Rd in Holt County (2018 only), the area around Sunfish Lake and Brush Lake (2017 and 2018), and cottonwood stands along Highway 7 in Blaine County (2018 only).

All surveys were completed from a Piper Warrior or a Cessna 172. These aircraft were capable of flying low and slow enough to allow surveyors ample time to identify nests. Because surveys completed in 2014 were conducted prior to selection of a final route, the 2014 surveys covered a wider area than the 2016, 2017, and 2018 surveys. In an effort to ensure that no potential bald eagle nests were overlooked during the 2014 survey, NPPD surveyed each river within potential route corridors. Surveys completed in 2016, 2017, and 2018 were more focused and were conducted within one mile upstream and downstream of where the R-Project selected route crosses the waterbodies and along the R-Project in the additional areas listed above. All surveys for bald eagle nests were conducted in a clockwise route around the route corridors at an approximate altitude of 200 feet above ground level. Performing surveys in a clockwise route around the route corridors ensured that the survey biologist was always on the side of the plane facing the riparian corridor. Ground speed during the surveys was approximately 70 miles per hour. This is the lowest and slowest the aircraft could legally and safely operate. The results of the eagle surveys are summarized in Table 3-3.

TABLE 3-3 BALD EAGLE NESTS DOCUMENTED IN R-PROJECT EAGLE NEST SURVEYS

NEST LOCATION	YEARS IDENTIFIED[1]	DISTANCE FROM R-PROJECT ROUTE
Calamus River	2014[2]	5.5 miles to the south
Calamus River	2014[2]	8.5 miles to the south
Birdwood Creek	2014, 2016, 2017, 2018	1.4 miles to the west; 0.2 mile from access route
North Loup River	2016, 2017, 2018	0.56 mile to the south
Between Sunfish Lake and Brush Lake	2017 and 2018[3]	0.4 mile to the north
Middle Loup River	2018	0.75 mile to the west
Chain Lake	2018[4]	2.6 miles to the north
Goose Lake Wildlife Management Area	2018	0.9 mile to the north

[1] All nests were occupied in the years identified, with the exception of a secondary nest at Chain Lake (see table note 4).
[2]The two nests on the Calamus River were identified in the 2014 survey, which was completed before NPPD selected the final route and thus included potential route corridors that NPPD considered but did not select. These nests were not re-surveyed in 2016, 2017, and 2018 because of their distance from the R-Project.
[3] This nest was originally located in July 2017 during NPPD's walking surveys for western prairie fringed orchid. This area was not surveyed during previous focused bald eagle nest surveys because it does not occur along a major river drainage. NPPD revisited this nest in 2018.
[4] Two nests were identified at this location in adjacent trees. One nest was active. The other nest was inactive, but was likely a secondary nest built by the same pair of eagles.

3.3.5 Golden Eagle (Aquila chrysaetos)

Status and Distribution: The golden eagle is protected under BGEPA and the MBTA but is not listed as threatened or endangered under the ESA. The USFWS maintains a list of Birds of Conservation Concern designed to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973" (USFWS 2008). The Birds of Conservation Concern divides North America into 37 separate ecological units called Bird Conservation Regions and creates a list of declining bird species in each unit. The Study Area falls within Unit 19 Central Mixed Grass Prairie. The golden eagle is not listed as a species of concern in the Central Mixed Grass Prairie but is listed in the adjacent Unit 18 Shortgrass Prairie.

Golden eagles are relatively common throughout the western United States and Canada and also occur through the world in a Holarctic (throughout the arctic of the Northern Hemisphere) distribution (Kochert et al. 2002). While a small subpopulation of golden eagles winter in the eastern United States, the bulk of the population occurs from the central Great Plains west to the Pacific Coast. Nebraska occurs along the eastern boundary of this western population (Sibley 2003). Golden eagle occurrences are frequent in the Nebraska Panhandle, becoming less frequent in the central and eastern portions of the state. Inclusion of the golden eagle as a Species of Conservation Concern in the Shortgrass Prairie but not the Central Mixed Grass Prairie supports this distribution. Mathisen and Mathisen (1968) documented diurnal raptors in the Nebraska panhandle and golden eagles were the fifth most common raptor noted. Golden eagles are often permanent residents of the Pine Ridge area in the extreme northwest corner of the state. Wintering eagles may occur further east in the state as individuals explore river corridors for forage.

Habitat Characteristics/Use: Golden eagles can be found in a number of habitats throughout their range, including mountainous canyon land, rimrock terrain of open desert and grasslands in the western U.S. In the Great Plains, golden eagles typically inhabit riparian areas and river corridors (Kochert et al. 2002; DeLong 2004). Nesting and foraging habitat in Nebraska is not well documented but is likely similar to other locations in the western great plains. Winter habitat in the Great Plains is comprised of open habitat with native vegetation and little anthropogenic disturbances. Wintering golden eagles may be more common near rivers and reservoirs or wildlife refuges that concentrate wintering waterfowl (Kochert et al. 2002).

In the western Great Plains, golden eagle nests are typically built on cliffs or in trees such as cottonwood or green ash (*Fraxinus pennsylvanica*). Tree nests are built in the top one-third of large trees that are isolated or on the edge of woodlands (DeLong 2004). Golden eagle nests have also been observed on transmission line support structures; however, these nests were commonly lost due to high winds (Steenhof et al. 1993). Nest building begins when migrating pairs return to the nesting grounds, typically in January or early February. Dates for egg laying vary from year to year and with latitude, but it typically occurs from late January through May. Young fledge from the nest between 45 and 80 days after hatching but may remain with the parents for an additional six months to a year (Kochert et al. 2002).

Golden eagles forage on a wide variety of prey, but jackrabbits (*Lepus* spp.), cottontails (*Silvilagus* spp.), and prairie dogs (*Cynomys* spp.) make up the majority of prey (Collopy 1983; DeLong 2004). While mammals make up the majority of prey, birds are also consumed. Greater prairie-chicken, lesser prairie-chicken, sharp-tailed grouse, greater sage-grouse, and numerous species of waterfowl commonly fall prey to golden eagles (Kochert et al. 2002). Watte and Phillips (1994) described golden eagles killing more than 140 domestic lambs on sheep ranches in South Dakota. Foraging occurs by foraging flights or by use of perches.

Current threats to golden eagles include loss of habitat and direct mortality from anthropogenic sources. The USFWS (2016b) review of golden eagle population demographics and estimates of sustainable take identified the major causes of golden eagle mortality as: (1) starvation, (2) illegal poisoning, (3) illegal shooting, (4) intra-specific fighting, (5) collisions with power distribution lines, vehicles, and wind turbines, and (6) electrocutions. New electrical transmission and distribution lines are specifically designed to provide enough space between energized conductor and ground wires; golden eagle wings cannot span that distance (APLIC 2006). However, older transmission and distribution lines may present electrocution hazards because the spacing between energized and ground wires is narrower.

Occurrence within the Study Area: Data received from the NNHP identified three golden eagle occurrences within the Study Area, all of which were located along Birdwood Creek north of the North Platte River (NGPC 2015a). These occurrences were documented in 1972, 1979, and 1982. Data received from the NNHP identify the three golden eagle occurrences but do not identify the occurrence type. It is unknown if these occurrences represent historic golden eagle nests or just individuals.

3.3.6 Rufa Red Knot (Calidris canutus rufa)

Status and Distribution: The decline of the rufa red knot is a recent development. Population estimates of the rufa subspecies of red knot declined from approximately 82,000 in the 1980s to fewer than 30,000 in 2010. Recent efforts have been made in protecting major non-breeding and stopover sites along the east coast of the United States under the umbrella of the Western Hemisphere Shorebird Network (Baker et al. 2013). Because of the precipitous decline in rufa red knot in recent years, the USFWS listed the rufa red knot as threatened under the ESA in December 2014 (79 FR 73706 – 73748).

The red knot is a Holarctic species that breeds in tundra close to the Arctic Circle in Alaska, Canada, Greenland, and Russia. Red knots are extreme long-distance migrants that may travel up to 9,000 miles between breeding and wintering grounds. The rufa subspecies breeds in extreme northern Canada and winters on Tierra del Fuego in Chile and Argentina. A small subset of rufa red knot winters along the Gulf of Mexico in southern Texas. Individuals of this group, which winters in Texas, have occasionally (though rarely) been documented in the states along the Central Flyway, including Nebraska (Jorgensen 2012; Baker et al. 2013).

Habitat Characteristics/Use: The wintering grounds of the rufa red knot differ greatly from nesting grounds. Nesting occurs on dry, slightly elevated tundra in extreme northern Canada. Nests are often placed on barren windswept slopes with little vegetation (78 FR 60024). Wintering grounds for rufa red knot consist of sandy beaches in South America and Mexico, though they also use peat banks in Georgia and salt marshes, brackish lagoons, tidal mudflats, and mangroves in Florida. Rufa red knots wintering in Texas typically use sandy coastal beaches on South Padre Island and Mustang Beach (Baker et al. 2013).

Little is known about the migratory habits of rufa red knots that winter along the Texas coast. Rufa red knots in general are extreme migrants that may fly thousands of miles in a short period to reach wintering or nesting grounds. Rufa red knots leave nesting grounds in northern Canada between August and September. Wintering rufa red knots leave the beaches of southern Texas between April and June. Rufa red knots wintering on the Texas coast typically bypass the southern and central Great Plains before utilizing stopover sites in the northern Great Plains of Canada (Skagen et al. 1999; Central Flyway Council 2013). In spring, the rufa red knots migrate between the Gulf Coast and Hudson Bay during a two- to three-day flight. Some individuals may use lakes in southern Saskatchewan as stopover sites. The majority of the lakes used as stopover sites are saline (Central Flyway Council 2013). The fall migration uses the same pattern, with rufa red knots congregating along southern Hudson Bay before migrating to the Texas Gulf Coast in two to three days.

The main threats to rufa red knots include the loss of wintering habitat to development, loss of nesting habitat to climate change, and increasing frequency and severity of asynchronies in the timing of the birds' annual migratory cycle relative to favorable food and weather conditions. The most well-known food source for migrating rufa red knots is the abundance of horseshoe crab eggs in the Delaware Bay in New Jersey and Delaware. Rufa red knots may lose this key food source if climate change alters the timing of the horseshoe crabs arrival and reproduction. However, this would not impact the population that winters in coastal Texas and migrates over the central Great Plains.

Occurrence within Study Area: Rufa red knots would only potentially occur within the Study Area during migration, and the likelihood of a rufa red knot occurring within the Study Area is very low. There have been only 15 occurrences of rufa red knots within the state of Nebraska over more than 100 years of observation (Central Flyway Council 2013). A recent review of shorebird occurrences in the Rainwater Basin, a unique wetland landscape in south-central Nebraska, identified only three rufa red knot occurrences (Jorgensen 2012). Rufa red knots have been recorded twice at Lake McConaughy (Central Nebraska Public Power and Irrigation District 2013).

3.3.7 Northern Long-eared Bat (*Myotis septentrionalis*)

Status and Distribution: The northern long-eared bat was formally listed as threatened under ESA on April 2, 2015 (80 FR 17974). The listing rule also included an interim 4(d) rule, which exempted certain forms of take provided that specific criteria are met. A Final 4(d) rule was published on January 14, 2016, which also includes specified take exemptions (81 FR 1900). Because all species federally protected under the ESA are also included under NESCA, the northern long-eared bat is listed as threatened by the state of Nebraska.

The northern long-eared bat ranges across much of the eastern and central United States and Canadian provinces west to the southern Northwest Territories (78 FR 61046). The species commonly occurs in northeastern portion of its range, including the states that make up New England, as well as Quebec and Ontario. However, the species is considered uncommon on the western portion of its distribution. Few captures of the northern long-eared bat occur in the treeless prairie regions of the U.S. and Canada (Caceres and Barclay 2000). In Nebraska, the northern long-eared bat regularly occurs in the eastern third of the state and along the Niobrara and Republican rivers.

Habitat Characteristics/Use: Northern long-eared bat habitat in Nebraska is generally associated with forested riparian areas that provide day roosts during the summer months. Winter roosts in Nebraska are limited to natural caves and mines in the eastern and western portions of the state (80 FR 17983). Males from one study in the northern extent of the range were shown to roost alone under loose bark or in cavities of coniferous trees in conifer-dominated stands for summer day roosting. Females from the same study were shown to roost in small maternity groups in shade-tolerant deciduous trees (Broders and Forbes 2004). Another study completed in West Virginia identified male northern long-eared bats roosting in black locust (*Robinia pseudoacacia*) with considerable amounts of loose bark and cavities (Ford et al. 2006). In Nebraska, males roost separately from females in the summer. Males are found in bachelor groups, while females use maternity trees and rear pups elsewhere. Northern long-eared bats may hibernate singularly or in small groups in multispecies hibernacula. Winter hibernacula are typically located in caves or abandoned mines with small cracks or crevices in the ceiling (Caceres and Pybus 1997). Winter roosts in Nebraska also include rocky cliff faces that contain deep fracturing where the species can hibernate. Cool temperatures and high humidity are often associated with winter roosts.

The northern long-eared bat exhibits a delayed fertilization strategy. Mating occurs in the late summer or early fall during a time referred to as swarming, which takes place prior to entering hibernation. Sperm is stored until the female emerges in the spring (Caceres and Pybus 1997). Fertilization takes place once the female emerges from hibernation, and gestation lasts approximately 55 days. Females may form small maternity colonies under loose bark or in tree cavities and snags. Bat houses and shutters of buildings have also been observed as maternity roosts for female northern long-eared bats (Caceres and Barclay

2000). Next-generation females have exhibited strong philopatry to natal sites for maternity colonies (78 FR 61046).

The northern long-eared bat feeds on flying insects but may also glean prey from foliage (Faures et al. 1993; Caceres and Barclay 2000). Gleaning prey off substrates may allow for a wider array of prey to be taken, including species that may otherwise be able to detect the echolocation calls of aerial hawking bats (Faures et al. 1993). Foraging takes place underneath the forest canopy, at small ponds or streams, or at the forest edge, although Yates and Muzika (2006) noted that fragmentation of forest habitat was detrimental to northern long-eared bat habitat. Diet of the northern long-eared bat varies with its geographic location and is not likely a limiting factor for populations. The species is an opportunistic feeder that is only limited by the size of insect it can capture (Caceres and Barclay 2000).

The largest threat to the northern long-eared bat is white-nose syndrome – a fungal infection highly dangerous to bat populations when it becomes established at winter roost sites. Commonly observed symptoms of white-nose syndrome include visible fungus on flight membranes, excessive dead or dying bats near hibernacula, moderate to severe damage to the wing membranes, and abnormal behavior (78 FR 61046). Other threats to the northern long-eared bat that may act cumulatively to white-nose syndrome include habitat fragmentation, destruction, and modification from logging, oil/gas/mineral development, and wind energy development. Such development may result in the creation of forest edges, which has been shown to be inversely related to occupied northern long-eared bat habitat (Yates and Muzika 2006). Other threats include disturbances at maternity roosts and hibernacula by recreational activities within caves and vandalism within closed mines.

Occurrence within Study Area: In Nebraska, the northern long-eared bat has mainly been found in forested habitat in the eastern and northern portions of the state. Two populations have been identified at limestone quarries in east-central Nebraska, and individuals have been recorded in Cass County. It is likely that the individuals recorded in Cass County utilize limestone quarries in the vicinity. These quarries are known hibernacula of other bat species and likely house northern long-eared bats (80 FR 17983). Northern long-eared bats have been observed in Cherry County north of Valentine and Sheridan County during the summer months (80 FR 17983). Cherry County north of Valentine contains suitable northern long-eared bat habitat along the forested riparian corridor of the Niobrara River. Sheridan County contains suitable northern long-eared bat habitat in the Pine Ridge Biologically Unique Landscape (Schneider et al. 2011).

Geographic information system (GIS) data received from the NNHP have no record of the northern long-eared bat occurring within the Study Area (NGPC 2015a); however, preconstruction acoustical surveys at the Grand Prairie Wind Farm in northeastern Holt County identified northern long-eared bat in close proximity to the Study Area (80 FR 17983). Although not documented, northern long-eared bats may migrate through the Study Area.

3.3.8 Blanding's Turtle (Emydoidea blandingii)

Status and Distribution: The Blanding's turtle is not currently listed under the ESA or NESCA. On July 11, 2012, the USFWS received a petition from the Center for Biological Diversity requesting that 53 species of reptiles and amphibians, including Blanding's turtle, be included under the protection of the ESA. On July 1, 2015, the USFWS issued a 90-day finding on 31 petitions for various species, including Blanding's turtle, which concluded that information provided in the petition indicates the species may be warranted for protection under the ESA (80 FR 37568). The status of the Blanding's turtle is currently under review by the USFWS.

The Blanding's turtle has a wide range surrounding the Great Lakes and extends west into the prairies of Minnesota and central Nebraska (Congdon et al. 2008). The distribution in Nebraska includes all reaches of named rivers and streams throughout the state—with the exception of the Republican River drainage—and all of north, central, and eastern Nebraska from the South Dakota border, east to the Missouri River, and south to the Platte River exclusive of the Panhandle region (Panella 2012a). Surveys completed by the Nebraska Department of Roads estimated a single Blanding's turtle population at over 130,000 individuals at the Valentine National Wildlife Refuge (Lang 2004).

Habitat Characteristics and Use: Habitat for Blanding's turtle includes a mixture of aquatic and upland areas. The majority of habitat occupied by the species is aquatic habitat that includes lake shallows, ponds, marshes, and creeks with soft bottoms (Panella 2012a). One consistent factor in aquatic habitat used by Blanding's turtles is the presence of dense aquatic vegetation. Extensive marshes bordering streams provide optimal habitat (MDNR 2008). Bury and Germano (2003) found that 80 percent of the Blanding's turtles captured in their study occupied pond/marsh habitat composed of wetlands one hectare or smaller in size, while the remaining 20 percent occupied the periphery of larger lake habitat (greater than one hectare). In the same study, Bury and Germano (2003) had a 100 percent capture rate for Blanding's turtles in pond/marsh habitats and found that they were the dominant turtle species in these wetlands. Nearly all types of wetlands provide suitable habitat for Blanding's turtles at one point during their active season; however, much of the season is spent in large wetland complexes with permanent water (Congdon and Keinath 2006). Seasonal wetlands provide important sources of food during migratory movements and are also used as mating sites (Congdon and Keinath 2006). Females make long-distance overland travels to nesting areas from late May through mid-July and will use small ephemeral wetlands as refugia during these movements (Congdon et al. 2011). Refsnider and Linck (2012) found that females on nesting forays spent 49 percent of their time using seasonal wetlands. Hatchlings and juveniles also occupy small ephemeral wetlands in the summer and fall (Bury and Germano 2003). However, Blanding's turtles require larger wetlands with deep water for overwintering. Individuals prefer to bury in soft substrate at the bottom of permanent wetlands for the winter where the water is deep enough to prevent them from freezing (MDNR 2008). In some cases, hatchling Blanding's turtles that hatch late in the season will remain in semi-permanent wetlands over the winter months rather than migrating to permanent wetlands, as long as the soil remains somewhat moist (Congdon et al. 2008). Blanding's turtles emerge from overwintering and begin basking in late March or early April on warm, sunny days. Individuals typically bury in wetlands to overwinter in November (Lang 2004; MDNR 2008). Based on this information, the Blanding's turtle's active season in Nebraska is identified as April through October.

The Study Area contains 115,224 acres of wetlands identified from the USFWS's National Wetlands Inventory (NWI). Palustrine emergent wetlands are the dominant type of wetlands in the R-Project Study Area. These wetlands are characterized by herbaceous plants that are seasonally flooded in the spring and early summer when the water table is high. Blanding's turtles are likely to use these wetlands in the spring and early summer when the water table is high. Under unusual circumstances (i.e., years with abundant rainfall, late arrival of hatchlings), seasonal wetlands may provide adequate overwintering habitat for hatchling or young turtles but would likely not provide overwintering habitat for adult turtles. Wetlands that contain water throughout the winter and provide more suitable overwintering habitat are less common throughout the Study Area.

Female Blanding's turtles make extensive forays overland to nesting areas. Refsnider and Linck (2012) noted that in Minnesota the average distance traveled during these forays, which occurred throughout June, was 1,851 meters (6,073 feet). Nesting habitat consists of open, well-drained soils surrounded by a mosaic of vernal pools, wetlands, bogs, and marshes. Nests are constructed in areas exposed to sunlight and with sparse vegetation (Congdon and Keinath 2006). Many nests are placed in areas with disturbed soils such as road and trail sides, gardens, and agricultural fields. While nests are typically placed close to wetlands, they may be over a kilometer (3,281 feet) from the female's home wetland (Congdon et al. 2008; Congdon et al. 2011). Nesting migrations, pre-nesting activity, and nest construction typically occur in the evenings from late May through mid-July. Hatchlings emerge from late August through October and generally migrate to a water source, typically a seasonal wetland. Congdon et al. (2011) found the average distance from a nest to the closest wetland was 127 meters (416 feet) for Blanding's turtles in a Michigan population.

Blanding's turtles are primarily carnivorous but can also be omnivorous. The majority of their diet consists of various crustaceans and insects, but they also feed on amphibians, fish, and fish eggs (Congdon et al. 2008). Seasonal wetlands that support amphibian breeding sites are often used by juvenile and adult Blanding's turtles as seasonal food resources. When on land, Blanding's turtles may eat berries, leaves, grasses, and succulent vegetation as well as terrestrial invertebrates such as insects and earthworms (Congdon and Keinath 2006).

Primary threats to Blanding's turtles in Nebraska include the loss and conversion of wetland and surrounding upland habitat, increased nest predation, and road mortality (Panella 2012a). The loss of wetland habitat is the primary driver of population loss range-wide. Mammalian nest predators in Nebraska include raccoon and red fox. Turtles making overland movements associated with breeding or moving to new habitat are exposed to increased risks from road mortality (Panella 2012a). The study of Blanding's turtles on the Valentine National Wildlife Refuge was funded by the Nebraska Department of Roads to identify populations near U.S. Highway 83 through the refuge (Lang 2004). The study resulted in the construction of culvert underpasses and fences to prevent additional road mortality when turtles are moving between habitats. Additionally, the Nebraska Department of Roads installed turtle crossing signs to warn approaching vehicles.

Occurrence within Study Area: Data received from the NNHP identified three Blanding's turtle occurrences in the Study Area (NGPC 2015a). Occurrences are noted on the South Loup River near Stapleton, the Middle Loup River near Mullen, and a small pond on the Holt/Wheeler County line.

3.3.9 Topeka Shiner (Notropis topeka)

Status and Distribution: The Topeka shiner is a fish listed as endangered under the ESA in 1998 due to habitat destruction, degradation, modification, and fragmentation as a result of siltation, stream impoundments, and dewatering for irrigation and other purposes (63 FR 69008). In July 2004, the USFWS designated critical habitat for the Topeka shiner on various stream reaches in Iowa, Minnesota, and Nebraska (69 FR 44736). Critical habitat in Nebraska was limited to a five-mile-long segment of Taylor Creek located upstream from its confluence with Union Creek in Madison County. In December 2009, the USFWS concluded a five-year review of the status of the Topeka shiner. Recently identified occupied habitats include an unnamed tributary to Union Creek downstream from Madison, Nebraska in Madison County. Additional populations unknown at the time of listing were identified in other states (South Dakota, Minnesota, and Iowa) during that review, and the review recommended that the species be downlisted from endangered to threatened under the ESA (USFWS 2009b). Despite this recommendation, the Topeka shiner remains listed as endangered at this time. Because all species federally protected under the ESA are also included under NESCA, the Topeka shiner is also listed as endangered by the State of Nebraska.

The Topeka shiner is known to occur in portions of stream reaches in Minnesota, South Dakota, Iowa, Nebraska, Kansas, and Missouri. The species has continued to see significant declines in its distribution in the southern portion of its range, including Kansas, Nebraska, and Missouri. However, additional populations in South Dakota, Minnesota, and Iowa were described in the five-year review.

Habitat Characteristics/Use: Habitat of the Topeka shiner is characterized as small, low-order prairie streams with good water quality and cool temperatures. Suitable streams maintain flow year round, although some may be reduced to intermittent flows during the summer. When surface flows drop, Topeka shiners retreat to deeper pools that are sustained through ground water discharge in the form of springs and seeps (63 FR 69008). Habitat modeled in South Dakota indicated that Topeka shiners were more likely to occur in small creeks and low-order rivers rather than those classified as headwaters due to the stabilized flows. However, some of those small creeks and low-order rivers did lose all flow in drier years. Additionally, the occupied streams had more adjacent grass, shrub, and wetlands than unoccupied streams indicating that the surrounding landscape contributes to habitat suitability (Wall et al. 2004). Substrates in occupied habitat typically include gravel, sand, or rubble and may have a thin layer of silt on top. Stream bottoms largely comprised of silt are not preferable habitat (Kerns and Bonneau 2002; Panella 2012b).

Topeka shiners breed within the same pools they occupy; unlike other native prairie fishes, they do not require high flows to scour silt from potential breeding areas. Topeka shiners may rely on the breeding nests of native sunfish, which use their fins to fan off a small disk-shaped nest. Topeka shiners have been observed placing their eggs in these cleared sunfish nests (Kerns and Bonneau 2002; Panella 2012b). However, other reports indicate Topeka shiners are not totally reliant upon sunfish for breeding substrate (63 FR 69008).

Topeka shiners are largely insectivorous, although algae and other detritus have been found in stomach content analyses and may be consumed purposefully (Dahle 2001; Kerns and Bonneau 2002). Chironomid larvae and other members of the order Diptera make up the majority of the Topeka shiner's diet (Dahle 2001). Other prey items may include microcrustaceans and mayfly larvae. Topeka shiners observed in the wild primarily occurred in the lower half of the water column and were attracted to any disturbance in the substrate. Kerns and Bonneau (2002) hypothesize that this attraction is to prey upon any small items that are dislodged from the sediment.

Threats to Topeka shiners include degraded riparian corridors, gravel removal, vegetation clearing, stream channelization, groundwater withdrawals, and reduced flows from changes in climate patterns (USFWS 2009b). Increased sedimentation of occupied streams from increased livestock use and construction projects can reduce the suitability of Topeka shiner habitat. Native grassland conversion to croplands is the most substantial threat to Topeka shiner in Nebraska due to the associated stream impacts. Increased sedimentation, runoff, and increased exposure to chemicals applied to crops all threaten Topeka shiner habitat (Panella 2012b). Wall et al. (2004) identified a positive correlation between occupied streams and native habitats such as grass, shrub, wetlands, and trees within a 30-meter square surrounding the stream bank. Alterations to stream temperature and flow as a result of altered climate variable also threaten Topeka shiner habitat. Topeka shiners may be threatened by reduced soil moisture, decreased availability of water, rising water temperatures, lowered ground water, and reduced surface flows as a result of climate change (USFWS 2009b; Panella 2012b).

Occurrence within Study Area: In its designation of critical habitat, the USFWS indicated that Taylor Creek, a tributary to Union Creek in Madison County, was the only stream in Nebraska with any record of the Topeka shiner since 1989 (69 FR 44736). However, a review of spatial data within the Study Area received from the NNHP indicates there are extant populations of Topeka shiner in Brush Creek and Big Creek (NGPC 2015a). Both Brush Creek and Big Creek are tributaries of the North Loup River to the west of Brownlee, Nebraska in Cherry County.

3.3.10 *Blowout Penstemon (Penstemon haydenii)*

Status and Distribution: Blowout penstemon is a federally and state-endangered plant species that was listed in 1987 (52 FR 32926). This short-lived, perennial member of the figwort family (*Scrophulariaceae*) can live for up to six to eight years. Initially, the single, often decumbent stem roots wherever nodes become buried in the sand; buds at the base of the stem often subsequently develop into multi-stemmed plants (USFWS 2012a). Blowout penstemon produces fragrant blue, lavender, or pink flowers during its second or third year. Seeds are wind-dispersed and are often distributed downwind of blowout edges where sand accumulates (Kaul et al. 2006; USFWS 2012a).

Blowout penstemon is only known from western Nebraska and southeastern Wyoming (Fertig 2000; NatureServe 2013). The total estimated population of blowout penstemon in Nebraska has increased from 2,788 in 1990 to 23,876 plants in 2008 (USFWS 2012a). Most of these gains were from the establishment of human-planted populations as wild populations have been declining (Schneider et al. 2011; USFWS 2012a). Extensive seedling introductions in Nebraska have been successful in establishing new populations, which has improved the distribution of blowout penstemon and made it less vulnerable to extinction. In Wyoming, the total estimated population of blowout penstemon had declined from 19,343 plants in 2005 to between 5,000 and 8,000 plants in 2009.

Primary threats for blowout penstemon are considered to include loss of blowouts from decreased fire frequency, soil-stabilization projects, changes in range-management practices to increase grass cover, and recent climatic conditions (Kaul et al. 2006; Schneider et al. 2011; USFWS 2012a). Historically, removal of soil-stabilizing vegetation by bison, cattle, and fire are presumed to have maintained its blowout habitat (Fertig 2000). The reduced size and number of blowouts has fragmented blowout penstemon, as it makes dispersal to remaining natural blowouts less likely (USFWS 2012a).

Habitat Characteristics/Use: Habitat requirements are "blowouts" or sparsely vegetated depressions in actively moving sand dunes created by wind erosion (USFWS 1992; Kaul et al. 2006). Blowouts are round or conical depressions that form in sand when prevailing northwesterly winds scoop out the sides of the dunes. Blowouts are created when vegetation is removed or disturbed and wind acts to further develop the blowout. Blowout penstemon is a pioneer of blowouts and frequently co-occurs with blowout grass (*Redfieldia flexuosa*). As other grasses begin to invade the blowout, neither of these species persists on the blowout (USFWS 2012a). Blowout penstemon is associated with Sandhills dune prairies in the Central Platte River, Cherry County wetlands, Dismal River headwaters, Elkhorn River headwaters, panhandle prairies, Sandhills alkaline lakes, Upper Niobrara River, and Upper Loup Rivers and tributaries in the Sandhills Ecoregion (Schneider et al. 2011).

Occurrence within Study Area: Based on data provided by the NNHP, there are 27 occurrences of blowout penstemon in the Study Area (NGPC 2015a). Of these, two occurrences are historical, one is possibly extirpated, and the remaining 24 occurrences are presumably extant. These occurrences are located in the counties of Blaine, Brown, Cherry, Hooker, Loup, Rock, and Thomas. Additional counties having potential for blowout penstemon include Hooker, Lincoln, Logan, and McPherson (USFWS 2012a, USFWS 2012b; NGPC 2013b).

Blowouts providing potential blowout penstemon habitat were identified and mapped using 2013 aerial imagery in potential disturbance areas along the R-Project ROW. Field surveys of the mapped potential habitat were conducted via helicopter June 17-18, 2015, and June 22-23, 2016, during the blowout penstemon flowering period. The helicopter-based survey method was discussed and approved by the USFWS prior to the initiation of surveys. Surveys were completed by local expert Dr. James Stubbendieck and Beth Colket, a botanist with POWER. A known blowout penstemon population was visited prior to the onset of each survey to document whether blowout penstemon individual plants were in flower and identifiable from the helicopter. No blowout penstemon plants were identified during the 2015 or 2016 surveys (POWER 2015a and 2016a).

3.3.11 Western Prairie Fringed Orchid (Platanthera praeclara)

Status and Distribution: Western prairie fringed orchid is a federally and state-threatened plant species that was listed in 1989 (54 FR 39857). This member of the orchid family (*Orchidaceae*) has a showy, creamy-white flower with deeply dissected lobes extruding from the lip (Kaul et al. 2006). Flowers become delicately scented after sundown when pollination by a few species of moths occurs (Kaul et al. 2006; USFWS 2009c). Western prairie fringed orchid is known in scattered counties in the eastern third of Nebraska and also in a few north-central counties (Kaul et al. 2006). Range wide, it is known from tallgrass prairies in Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, and one Canadian province and presumed extirpated in South Dakota (NatureServe 2013).

There are an estimated 2,000 to 5,000 plants in Nebraska, which have been in overall decline, although the population appears to be increasing since 2005 (Schneider et al. 2011). There are conservation concerns from its population decline and associated habitat loss and other issues related to it being an orchid species (NGPC 2005). Most orchids tolerate little environmental disturbance and rarely survive transplanting (Kaul et al. 2006). In Nebraska, its primary threats are considered to be conversion of prairie to cropland and development, inter-seeding of non-native species such as Garrison creeping foxtail (*Alopecurus arundinaceus*) in wet prairie habitats to increase livestock forage, invasive species and control methods (particularly herbicide spraying), annual mid-summer haying, overgrazing, actions that lower water levels in the rooting zone (e.g., off-site drainage), woody plant invasion, and collection of plants from small populations (USFWS 2009c; Schneider et al. 2011).

<u>Habitat Characteristics/Use</u>: Habitat requirements are moist to somewhat dry prairies; unplowed, calcareous tallgrass prairies; sedge meadows; old fields; and roadside ditches (USFWS 1996; Kaul et al. 2006). Moist soils near the ground surface are essential to maintaining western prairie fringed orchid populations, although standing water may have an adverse effect depending on depth and duration (USFWS 2009c). The western prairie fringed orchid is associated with eastern cordgrass wet prairie, northern cordgrass wet prairie, wet-mesic tallgrass prairie, and tallgrass prairie of the central Platte River, Cherry County Wetlands, Elkhorn River Headwaters, lower Platte River, South Loup River, Middle Loup River, and North Loup River and tributaries, and Willow Creek Prairies in the tallgrass prairie and Sandhills Ecoregions (Schneider et al. 2011).

<u>Occurrence within Study Area</u>: Based on data provided by the NNHP, there are 62 occurrences of western prairie fringed orchids in the Study Area (NGPC 2015a). Of these, one is possibly extirpated, and the remaining occurrences are presumably extant. These occurrences are located in the counties of Cherry, Garfield, Holt, Loup, and Wheeler. Additional counties having potential for western prairie fringed orchid include Blaine, Brown, Hooker, Lincoln, Logan, McPherson, Rock, and Thomas (USFWS 2012b; NGPC 2013b).

Western prairie fringed orchid surveys were conducted by NPPD in late-June in 2015, 2016, 2017, and 2018 during the optimal flowering period. Orchid experts identified 2016 as having favorable conditions for western prairie fringed orchid to flower given the precipitation levels in 2015. Western prairie fringed orchids were found at two locations in 2015 near a known occurrence at Carson Lake and at one location near a known occurrence close to Big Cedar Creek (POWER 2015b). In 2016, western prairie fringed orchids were found at multiple locations between State Highway 11 and County Road 465 Avenue (POWER 2016b), including one substantial population. Additional populations were not found in 2017 or 2018; however, those locations identified in previous years were re-visited and confirmed to have western prairie fringed orchids each year.

Flowering within a western prairie fringed orchid population is highly variable from year to year depending on environmental factors, such as precipitation the previous year, landowner haying regimes, and grazing practices. As such, it is possible that individual plants may be present but are not recorded because they are not in flower or visible. Due to this inherent variability in flower production, preconstruction surveys will be conducted during the flowering period each year prior to start of construction in potentially suitable orchid habitat. Preconstruction surveys will cover all potentially suitable habitat as landowner restrictions will be resolved prior to construction.

4.0 POTENTIAL EFFECTS TO EVALUATED SPECIES

This section addresses potential effects, both direct and indirect, of the R-Project on the 11 Evaluated Species identified in Section 3.0. These species, which occur in the Study Area (Section 1.0, Figure 1-1), may have potential to be affected by construction, operation, and maintenance of the R-Project. Table 4-1 provides estimated temporary and permanent ground disturbance from all R-Project activities described in Section 2.0. These estimates were used to evaluate potential effects from construction and operation and maintenance of the R-Project. Because Evaluated Species occur throughout the Study Area, Table 4-1 incorporates all activities associated with the R-Project, not just Covered Activities applicable only to ABB. Temporary and permanent disturbance to an Evaluated Species' specific habitat requirements was compared to available habitat surrounding the R-Project where this information was available. These comparisons are provided in the individual species potential effects analysis sections below. Potential effects to Evaluated Species include temporary disturbance and displacement of individuals, direct mortality of individuals, and loss and/or fragmentation of habitat for breeding, feeding, and sheltering. However, R-Project avoidance and minimization measures reduce the level of effects to any Evaluated Species to below a level that would result in incidental take.

The R-Project may potentially affect species protected under the MBTA. A discussion of impacts to MBTA-listed species that are not also ESA-listed species is outside the scope of this HCP. NPPD has prepared a Migratory Bird Conservation Plan, which will avoid and minimize potential effects to migratory birds throughout the 50-year life of the R-Project. The Migratory Bird Conservation Plan has been provided to USFWS.

TABLE 4-1 TEMPORARY AND PERMANENT DISTURBANCE ESTIMATES FOR R-PROJECT ACTIVITIES

PROJECT ACTIVITY	ESTIMATED TEMPORARY DISTURBANCE (ACRES)	ESTIMATED PERMANENT DISTURBANCE (ACRES)
CONSTRUCTION		
Access		
Scenario 2 – Temporary Access Routes	258	--
Scenario 3 – Permanent Access Roads	--	26[1]
ROW Preparation		
ROW Tree Clearing	49[2]	
Temporary Work Areas		
Fly Yards/Assembly Areas	193	--
Construction Yards/Staging Areas	203	--
Pulling and Tensioning Sites	275	--
Temporary Structure Work Areas		
Lattice Tower	175	--
Steel Monopole	311	--
Structure Foundation Excavation/Installation		
Helical piers – lattice tower	--	0.82
Standard foundation – steel monopole	--	0.35
Distribution Power Line Relocation		
Distribution power line relocation	43	0.09
Well Relocation		
Well relocation	0.4	--
Substations		

PROJECT ACTIVITY	ESTIMATED TEMPORARY DISTURBANCE (ACRES)	ESTIMATED PERMANENT DISTURBANCE (ACRES)
Thedford	--	12
Holt County	--	13
Construction Subtotal	**1,507.4**	**52.26**
Operation and Maintenance[3]		
Emergency Repairs[3]	**301**	**--**
TOTAL	**1,808.4**	**52.26**

[1]Temporary access routes under Access Scenario 2 may be left in place following completion of construction depending on landowner requests and requirements for operation and maintenance of the line. These routes would then be classified as Access Scenario 3 and represent a permanent impact. No more than 10% (26 acres) of Access Scenario 2 will be left in place following construction.
[2]Trees will not be allowed to re-grow within ROW. ROW will be converted to grassland.
[3]Disturbance from emergency repairs is estimated at 20% of the total temporary disturbance from construction. Disturbed areas would be restored if conditions require restoration efforts.

4.1 Whooping Crane

4.1.1 Potential Effects from Construction

A desktop whooping crane habitat assessment (Appendix A) based on parameters developed by the Watershed Institute (2013) was completed to identify where potentially suitable habitat exists within one mile of the R-Project to support line marking requirements under the USFWS memorandum *Region 6 Guidance for Minimizing Effects of Power Line Projects within the Whooping Crane Migration Corridor* (hereafter referred to as Region 6 Guidance). The potentially suitable whooping crane habitat analysis developed by the Watershed Institute was specifically designed for use on power line projects. Note that the primary function of the habitat assessment is to identify portions of the transmission line that will be marked with bird flight diverters and is not intended to represent every conceivable potential use location, no matter how unlikely, within one mile of the R-Project. Data from NWI, the National Hydrologic Dataset (NHD), and NRCS hydric soils were used in the habitat assessment. The habitat assessment consists of two main steps: the Initial Analysis and the Secondary Analysis. The Initial Analysis eliminates habitat from consideration as potentially suitable whooping crane habitat based on size, visibility obstructions, and distance to disturbances. The Secondary Analysis assigns relative values to the remaining habitats based on wetland water regimes, size, proximity to food sources, natural versus man-made, and habitat density.

Whooping cranes will utilize a wide range of land cover types to meet their habitat needs. This is true of migrating waterbirds in general throughout the Great Plains due to the highly dynamic nature of wetlands in the Great Plains (Albanese et al. 2012). The satellite tracking study examined 504 roost sites associated with satellite-tracked birds and supports this concept. That analysis looked at the frequency distribution of certain characteristics of roost habitat. While there was a wide range, it found that 90% of all wetlands used were greater than 0.25 acre (Pearse et al. 2017). While NPPD recognizes that whooping cranes may utilize a wide range of conditions, use is much more likely if a certain set of conditions are present and believes that the Watershed Institute approach represents a viable means to identify where whooping cranes and the R-Project have a reasonable expectation of interacting in the next 50 years.

Based on the results of the desktop habitat assessment, out of the 288,000 acres within one mile of the R-Project, there are approximately 8,969 acres of potentially suitable whooping crane stopover habitat as determined by NPPD's analysis and consistent with Pearse et al. (2017) as described above. All sections of the R-Project transmission line that fall within one mile of potentially suitable whooping crane habitat as assessed through the parameters established by the Watershed Institute will be marked with avian flight diverters to reduce the likelihood of avian collision. See Section 4.1.2 for a complete analysis of the effects of potential whooping crane collision. Table 4-2 provides an estimate of temporary and permanent disturbance to potentially suitable stopover whooping crane habitat.

TABLE 4-2 ESTIMATED TEMPORARY AND PERMANENT DISTURBANCE OF POTENTIALLY SUITABLE WHOOPING CRANE HABITAT

PROJECT ACTIVITY	POTENTIALLY SUITABLE WHOOPING CRANE HABITAT TEMPORARY DISTURBANCE (ACRES)	POTENTIALLY SUITABLE WHOOPING CRANE HABITAT PERMANENT DISTURBANCE (ACRES)
Access Scenario 2	1.2	--
Fly Yards/Assembly Areas	0.5	--
Construction Yards/Staging Areas	0	--
Temporary Structure Work Areas	6.1	--
Pulling and Tensioning Sites	4.4	--
Distribution Relocation	0.5	--
Well Relocation	0	--
Helical piers – lattice tower	--	0.007
Standard foundation – steel monopole	--	0.006
TOTAL	**12.7**	**0.013**

Construction activities associated with the R-Project will result in the total temporary disturbance of 12.7 acres of potentially suitable whooping crane habitat (Table 4-2). Structure foundations located within potentially suitable whooping crane habitat will result in the permanent loss of 0.013 acre of habitat. Temporary and permanent disturbance areas, such as construction yards/staging areas, fly yards/assembly areas, structure work areas, temporary access, and structure locations were sited to avoid potentially suitable whooping crane habitat to the maximum extent practicable. Further refinement of the siting of these work areas will be conducted in the field during final design. NPPD will coordinate work areas with USFWS and NGPC; however, final design must account for engineering, technical, legal, and economic considerations. The existing road network and two-tracks will be used to the maximum extent practicable during construction to reduce the need for new access. Access Scenario 1 (described in Section 2.0) will not result in the temporary disturbance of potentially suitable whooping crane habitat. Rivers, streams, and wetlands were avoided by Access Scenario 2 during the preliminary design phase; however, an estimated 1.2 acres of potentially suitable whooping crane habitat could not be avoided in order to provide access to all work areas. Disturbance of potentially suitable whooping crane habitat will be temporary, and disturbed areas will be restored following completion of construction activities. The need for permanent access roads under Access Scenario 3 is dependent on landowner requests and requirements for operation and maintenance of the line but would not exceed 10% of the Access Scenario 2 acres. Permanent access roads under Access Scenario 3 will not create any additional disturbance beyond that incorporated under Access Scenario 2. Access Scenario 3 will avoid potentially suitable whooping crane habitat to the maximum extent practicable.

Stahlecker (1997) completed an assessment of wetlands mapped under the NWI program in Nebraska in an effort to assess the availability of suitable stopover habitat throughout the state. His results suggested that whooping cranes migrating through Nebraska have multiple options for roost sites during migration due to the “large number and wide distribution of wetlands within the whooping crane migration corridor in Nebraska.” Potentially suitable whooping crane habitat prevalent in the Sandhills included large wetlands in the higher elevation areas of the western Sandhills, the headwaters of major rivers and streams, and major rivers flowing eastward through the region (Stahlecker 1997). As described in Section 3.3.1, Pearse et al. (2015) also quantified whooping crane use throughout the Central Flyway, including central Nebraska, using data from the satellite tracking study. Pearse et al. (2015) identified low-intensity-use, core-intensity-use, and core-intensity-extended-use cells throughout central Nebraska, indicating that suitable habitat is abundant throughout the state. The temporary and permanent disturbance of 12.7 and 0.013 acres, respectively, of potentially suitable whooping crane habitat from the R-Project will have no effect on migrating whooping cranes when considering the availability of habitat throughout the state and

Sandhills region, as reported by Stahlecker (1997) and Pearse et al. (2015) and as identified by the desktop habitat assessment.

No permanent structures or temporary disturbance areas will occur within rivers and streams. All named perennial rivers and streams along the project route will be spanned by the transmission line conductors, and construction equipment will utilize existing crossings for access during construction. Temporary crossings for construction equipment will not be required on named perennial rivers and streams (Table 4-3). Riverine habitat is commonly used by whooping cranes in Nebraska and makes up 59% of all roost sites examined in Austin and Richert (2005). Riverine habitat used by whooping cranes may vary throughout the state. The average river width used by whooping cranes is between 179 and 227 meters, but the narrowest river corridor used was only 36 meters (Austin and Richert 2005; Pearse 2016). The widths of all rivers and streams spanned by the R-Project are provided in Table 4-3. River and stream widths were interpreted using detailed aerial imagery.

TABLE 4-3 POTENTIAL HABITAT WIDTHS AT RIVER AND STREAM TRANSMISSION LINE SPAN LOCATIONS

WATER BODY	WIDTH (METERS)	EXISTING INFRASTRUCTURE AT SPANS
South Platte River	114	Adjacent to Interstate 80
North Platte River	72	Bridge on N. Prairie Trace Road
South Loup River	2	Bridge on U.S. Highway 83
Dismal River	10	Bridge on U.S. Highway 83
Middle Loup River	21	Adjacent to State Highway 2
North Loup River	61	None
Calamus River	23	None
Birdwood Creek	8	None

Data provided by USFWS and NGPC indicate that whooping cranes have previously been observed on most of the water bodies and adjacent habitat described in Table 4-3 except for the South Loup River and the Dismal River (Figure 3-4). The R-Project spans the South Loup River close to the town of Stapleton, which may reduce the potential for whooping crane use. The Dismal River is located in a steep canyon with cottonwood and eastern red cedar, which makes this river less optimal for potential stopover habitat. Where opportunities are available, the spans of all water bodies are located adjacent to existing infrastructure including highways and bridges that are typically avoided by whooping cranes. While the R-Project will not span the South Platte River at an existing bridge, it will span the South Platte River immediately north of I-80. I-80 runs parallel to the South Platte River at this location and is located less than 305 meters (1,000 feet) from the river channel. Armbruster and Farmer (1981) found that sandhill cranes avoided paved roads and bridges by 400 meters, and Armbruster (1990) recommends a similar avoidance be interpreted to apply to whooping cranes. The North Loup River, Calamus River, and Birdwood Creek are spanned at locations where there is no existing infrastructure. These rivers and their adjacent wetland habitat may be suitable for whooping crane use. Potential effects to whooping cranes from fragmentation of riverine habitat are minimized or avoided by utilizing opportunities to span rivers and streams adjacent to existing infrastructure, where available.

Whooping cranes are known to avoid human-related disturbances on their nesting and wintering grounds (CWS and USFWS 2007); however, less is known about their avoidance of human-related disturbance during migration. Armbruster (1990) and Armbruster and Farmer (1981) indicate that migrating whooping cranes may avoid areas of repeated human use, such as urban and commercial areas, at distances up to 800 meters (0.5 mile). Pearse et al. (2017) found that distance to nearest disturbance at 504 roost sites had a median value of 572.5 meters.

The R-Project will utilize existing roads for construction access to reduce the environmental impact from new access. Existing roads that will be used to provide access include, but are not limited to, U.S.

Highway 83, State Highway 7, State Highway 2, North Prairie Trace Road, Gracie Creek Road, and county roads in southern Holt County. In some areas where the R-Project line was located along existing roads, it is also in the vicinity of potentially suitable whooping crane habitat, particularly in the Platte River Valley and wet meadows in the east-west portion of the R-Project. Evidence suggests that migrating whooping cranes may select stopover habitat away from existing roads. Johns et al. (1997) found migrating whooping cranes avoided paved roads by 635 meters. Armbruster and Farmer (1981) found migrating sandhill cranes, a species similar to whooping cranes in habitat selection, avoided paved roads by 400 meters, gravel roads by 200 meters, and homes by 200 meters. Pearse (2016) saw that GPS-tracked whooping cranes avoided disturbances classified as roads, dwellings, machinery, hunting blinds, and other, by an average of 600 meters, but the 10 percent of these instances were approximately 150 meters. By placing the R-Project along existing roads to the maximum extent practicable, the R-Project utilizes areas that may already be avoided by whooping cranes.

Construction activities will occur year-round, including the whooping crane migration season. However, during the whooping crane migration season, all construction-related activities including helicopter use will be preceded by a daily whooping crane presence/absence survey developed for the R-Project that will meet or exceed the NGPC standard protocol (Appendix B; NGPC 2015b). Such surveys will be conducted immediately prior to construction during the spring (March 23 to May 10) and fall (September 16 to November 16) whooping crane migration periods. Surveys will occur in the morning prior to the initiation of construction activities that day. If no whooping cranes are observed within 0.5 mile, work will commence at that location. If a whooping crane is observed within 0.5 mile of any location where construction-related activity is planned to occur, such as structure erection sites, fly yard/assembly areas, pulling and tensioning sites, construction access, and helicopter flight paths, work would not be allowed to begin until the whooping crane vacates the area of its own accord. If, during the day, a whooping crane lands within 0.5 mile, all work will cease and will not resume until the whooping crane(s) has left the area or relocated at least 0.5 mile away from the construction area of its own accord.

The presence of construction personnel and equipment in and adjacent to potentially suitable habitat along the R-Project over the period of project construction (approximately 21 to 24 months) may cause migrating whooping cranes arriving in the area to avoid potentially suitable whooping crane habitat where the construction activity is occurring. Such potential effects would be limited to habitat within 0.5 mile of construction crews during whooping crane migration. The 0.5-mile estimate is based on the search radius described in the NGPC whooping crane preconstruction survey protocol. Therefore, the potential for migrating whooping cranes to encounter construction crews working near suitable habitat the birds may use upon descent from migration flights is small. Migrating whooping cranes may travel 200 to 400 miles in one day (USFWS 2009d), and wetlands suitable for stopover habitat for migrating whooping cranes are available throughout Nebraska and the Sandhills region (Stahlecker 1997). Pearse and Selbo (2012) completed an energetics model for whooping crane flights and found that whooping cranes that fly an additional 10 km in a wetland-dominated ecosystem would require one extra day of foraging to recoup the energy lost from the additional flight distance. The USFWS-mapped NWI indicates there are over 50,000 acres of wetlands within 10 km of the R-Project. Given the availability of potentially suitable whooping crane habitat, any additional flights to locate suitable roosting habitat away from construction crews are expected to be short in distance and duration. At no point would a whooping crane be forced to fly more than 10 km to find suitable roosting and foraging habitat. This would have minimal to no effect on migrating whooping cranes.

4.1.2 Potential Effects from Operations and Maintenance

Once constructed, a power line—distribution or transmission—may present a potential collision hazard for whooping cranes. Stehn and Wassenich (2008) and USFWS (2009d) each document whooping crane power line collisions (distribution and transmission). Between 1959 and 2010, 49 whooping cranes have been documented as having been killed by colliding with power lines; however, this may be a small representation of the actual mortality as described below. The risk the R-Project presents to whooping cranes is discussed in detail below, and the likelihood a whooping crane will collide with the R-Project is extremely low. However, power lines placed in close proximity to suitable whooping crane habitat likely present a higher risk of collision than those located farther away from suitable habitat. Because the risk of collision between the R-Project and a whooping crane is not zero, the R-Project will implement measures described in the Region 6 Guidance (Appendix D) to further protect whooping cranes. The Region 6 Guidance recommends placing line marking devices on all new power lines within one mile of potentially suitable whooping crane habitat, as well as marking an equal amount of existing power lines in the migration corridor. The Region 6 Guidance states implementation of the measures described in the guidance "if implemented and maintained, could reduce the potential effects to the whooping crane to an insignificant and/or discountable level" by not increasing the potential risk above the current level.

NPPD presumes that this one-mile distance in the Region 6 Guidance is based on Brown et al. (1987), which supports the conclusion that the threat to cranes posed by collision decreased to zero when the power line was located a mile (1600 meters) or more from where the bird took flight. Brown et al. (1987) does not indicate a relationship between distance from flight origin and potential for collision, only that at one mile the risk drops to zero. Additionally, Shaw et al. (2010) states that power lines greater than 1,500 meters (0.93 mile) from blue crane (*Anthropoides paradiseus*) habitat present no risk to those birds and should not require line marking.

While birds occurring beyond one mile from a power line may not be susceptible to power line collision (Brown et al. 1987; Shaw et al. 2010), just because a whooping crane selects stopover habitat less than one mile from a power line of any voltage does not automatically mean that bird will suffer a power line collision. Transmission line data are available in a GIS format, making it possible to evaluate the tracked whooping crane occurrences in relation to transmission lines. Data from the satellite tracking study show that 53 of the 58 satellite-tracked birds used stopover habitat less than one mile from a transmission line during migration at least once. Distribution line data are not available in a GIS format for a similar analysis. However, researchers completing the satellite tracking study completed site visits to stopover locations and noted distribution lines in the area. Of those occurrence points where site visits were made, two-thirds (66%) were within one mile of a transmission or distribution line. Despite these numerous uses of habitat within one mile of a transmission or distribution line, not one whooping crane in the satellite tracking study collided with a power line (Headwaters 2018; Pearse et al. 2018).

Over the previous decades, whooping crane populations have increased from 18 birds in 1938 (Gil de Weir 2006) to 505 birds in 2018 (USFWS 2018a). At the same time, the miles of power line throughout the Central Flyway have also increased dramatically. However, while both individual whooping cranes and miles of power lines have increased, there has been no corresponding increase in power line collisions. The majority of known power line collision mortalities have occurred in the experimental introduced flocks: 10 occurred in the Aransas-Wood Buffalo population between 1956 and 2014 (Stehn and Haralson-Strobel 2014) (note that this conflicts with the nine reported in Stehn and Wassenich 2008), 21 occurred in the Florida Non-Migratory Flock between 1997 and 2010, 13 occurred in the non-extant Rocky Mountain Flock between 1977 and 2000, and six occurred in the Wisconsin-Florida Migratory Flock between 2001 and 2009 (Stehn and Wassenich 2008; USFWS 2009d). Of the ten documented collisions in the Aransas-Wood Buffalo population, nine involved distribution lines and one involved a transmission line.

In order to evaluate the likelihood of a whooping crane take from collision with the R-Project, NPPD examined previously documented power line collisions in the Aransas-Wood Buffalo population and the existing transmission lines currently in the migration corridor. To perform this analysis, NPPD first considered the ten whooping crane power line mortalities within the Aransas-Wood Buffalo population in the last 60 years, proportionally expanded to account for unknown mortalities as described in the next section below. In light of the physical differences between transmission and distribution lines and the differences in their respective prevalence on the landscape, NPPD used only transmission line data to estimate the risk for the R-Project. However, the inclusion of distribution lines in the evaluation would not materially change the outcome because the proportion of collision mortalities to miles of distribution line is roughly the same as collision mortalities to miles of transmission line.

It is estimated that there are approximately 326,000 miles of power lines (transmission and distribution) within the migration corridor in the United States (Appendix C). Out of these 326,000 miles, approximately 34,000 miles are transmission lines and 292,000 are distribution lines. In this instance, transmission lines are defined as those power lines with a voltage greater than or equal to 115 kV, which is the typical industry standard.

According to Stehn and Haralson-Strobel (2014), the total mortality in the Aransas-Wood Buffalo population between 1950 and 2010 is 546 (taken from the text; note that Table 1, in Stehn and Haralson Strobel indicates 541 total mortalities). Only 50 of these 546 deaths, or 9.2%, identified cause of mortality, as the majority of birds that disappear from the Aransas-Wood Buffalo population are completely unaccounted for (Stehn and Haralson-Strobel 2014). It has been reported that 80% of mortality occurs off the wintering grounds and likely occurs during migration (Lewis et al. 1992, Stehn and Haralson-Strobel 2014). However, the satellite tracking study indicates that this past assumption is incorrect and that mortality is proportional to the whooping crane's life cycle (Pearse et al. 2018).

The whooping crane is in migration approximately 17% of the year (USFWS 2009d). Thus, the number of mortalities that occurred during migration is estimated at 93 (17% of 546). The analysis of mortality in Pearse et al. (2018) indicates that approximately 15% of mortality occurs during migration, confirming this assumption.[4] Out of the 50 recovered carcasses, 28 occurred during migration (Stehn and Haralson-Strobel 2014). Out of those 28, one was reported to be caused by collision with a transmission line (Stehn and Haralson-Strobel 2014). In other words, approximately 3.6% of identified mortalities during migration can be attributed to transmission lines. Applying this ratio to the 93 estimated mortalities during migration, approximately four whooping cranes (rounded up from 3.3) have collided with transmission lines in the migratory corridor in the U.S. and Canada since 1956. Although only 80% of the known power line collisions occurred in the U.S. (8 out of the 10), NPPD assumed all four collisions with transmission lines occurred in the United States. This equates to 0.067 crane collisions with transmission lines per year (estimated four collisions over the 60-year period from 1956 to 2016).

NPPD evaluated the number of collisions compared to the number of miles of transmission line. As noted above, there are approximately 34,000 miles of transmission line within the U.S. portion of the Aransas-Wood Buffalo population migratory corridor (Appendix C). If it is assumed that all of these transmission lines have an equal probability of collision, the per-mile risk of mortality would be 0.00000197 cranes per mile per year (0.067 crane per year divided by 34,000).

NPPD recognizes it is unlikely that all of the 34,000 estimated miles of power line pose a similar level of threat to the crane. NPPD is aware of several different efforts to model whooping crane habitat in the flyway relative to the probability of use. However, due to the very limited number of documented mortalities on any overhead lines and the fact they are widespread, both temporally and spatially, and do not appear to be related to areas with frequent use (Stehn and Wassenich 2008), it is difficult to envision how even a model that accurately predicts probability of use could predict probability of collision. Therefore, NPPD did not attempt to create a habitat model that would predict probability of use due to the apparent lack of correlation between whooping crane habitat use and collisions. For this reason, NPPD

[4] Note that the use of 17% mortality during migration is conservative, as the use of 15%, as indicated in tracking study, would have resulted in 82 estimated mortalities during migration, three whooping cranes colliding with transmission lines in the migratory corridor in the U.S. and Canada since 1956, 0.05 crane collisions with transmission lines per year, a per-mile risk of 0.00000147 cranes per mile per year, a risk 0.00033 cranes per year for the R-Project, and 0.017 cranes per the 50-year project life.

used the entire 34,000 miles of transmission line. To justify the use of all transmission lines in its analysis, NPPD completed a high-level analysis of miles of transmission line within one mile of an NWI wetland. Nearly all miles of transmission line within the Central Flyway corridor are within one mile of an NWI wetland. Wetlands were not screened for habitat suitability during this high-level analysis.

For the proposed R-Project, 225 miles of new transmission line will be constructed in the Aransas-Wood Buffalo population migratory corridor. Applying methodology from above (using all 34,000 miles of transmission line) to the 225-mile R-Project would equate to a risk of 0.00044 cranes per year (225 x 0.00000197) or 0.022 cranes per the 50-year project life (0.00044 x 50). This does not take into account the risk reduction achieved through line marking, which is identified as 50% to 80% in the Region 6 Guidance and APLIC (2014).

Because NPPD recognizes that not all transmission lines present a collision hazard to whooping cranes, the analysis was also run assuming that only 50% and 10% of the transmission lines in the Central Flyway present a collision hazard to whooping cranes.[5] Note that in these additional analyses, the estimated crane collisions per year remains constant, but the miles of transmission line that present a risk is reduced. This analysis shows that even if only a small portion of all transmission lines present a collision risk, and all reaches of the R-Project are within that group, the estimated collisions with the R-Project over a 50-year period is still very small. This additional analysis is summarized below:

- 50% analysis (50% of transmission lines present a collision risk);
  - 0.067/17,000 = 0.0000039 collision/mile/year;
  - 0.0000039*225*50 = 0.044 estimated collisions with the R-Project in 50-year period

- 10% analysis (10% of transmission lines present a collision risk);
  - 0.067/3400=0.0000197 collision/mile/year;
  - 0.0000197*225*50 = 0.22 estimated collisions with the R-Project in 50-year period

Any method used to assess the likelihood that a whooping crane will collide with the R-Project is confined by the limited documented mortality due to transmission lines and will inherently have a high degree of uncertainty. However, given that the R-Project will increase the miles of transmission line in the whooping crane migration corridor by only 0.06%, the likelihood of mortality by collision is extremely low. When the low likelihood of collision is considered along with implementation of line marking under the Region 6 Guidance, the R-Project is not reasonably certain to incidentally take a whooping crane, which is the USFWS's standard for recommending that an applicant seek coverage in an ITP (USFWS and NMFS 2016).

According to results of the habitat assessment and field-based knowledge of the R-Project selected route, 123 miles of the R-Project fall within one mile of potentially suitable whooping crane habitat (Figure 4-1). Therefore, 123 miles of the R-Project will be marked and maintained according to the APLIC Guidelines (APLIC 2012) and NPPD construction standards to satisfy the Region 6 Guidance. As per the Region 6 Guidance, NPPD will also mark at least 123 miles of existing line. Existing lines that have the potential for marking include the 115 kV transmission line between Thedford Substation and the Ainsworth Substation, lines within the federally designated Whooping Crane Critical Habitat along the Platte River, and lines in Pearse et al. (2015) extended-use core intensity areas. Figure 4-1 shows areas of the R-Project that will be marked with bird flight diverters and areas of existing transmission line that will be marked by bird flight diverters. NPPD construction standards call for the placement of spiral bird flight diverters at 50-foot intervals alternating on opposite shield wires. This application is within the recommended spacing per APLIC (2012) and will increase protection against collision. The NPPD

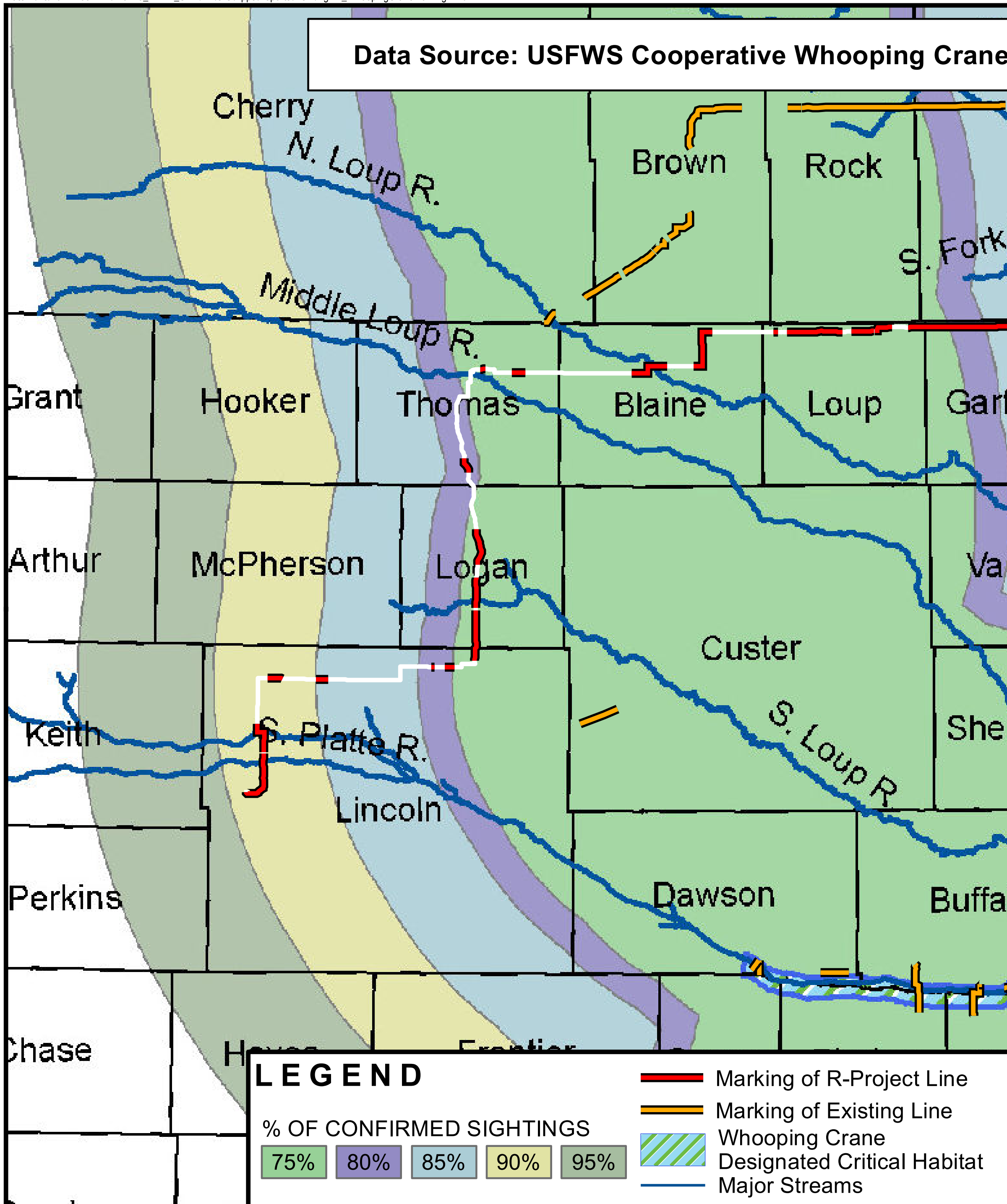
[5] Considering the amount of suitable habitat in the flyway, it is highly unlikely that 90% of existing transmission lines pose no collision risk.

construction standard is based upon available information on the effectiveness of marker types, durability of markers, and the engineering constraints of the line.

Spiral bird-flight diverters are compatible with the OPGW that NPPD uses in most transmission lines. The spiral bird-flight diverters are maintenance free and will remain in place for the life of the line as opposed to other marker types that need to be replaced frequently (Sporer et al. 2013). The Region 6 Guidance recognizes that marking lines is only 50-80% effective at reducing collisions and offsets this by requiring the marking of currently existing but unmarked power lines. The effectiveness of marking is the subject of many studies, with most relevant studies referenced in APLIC (2012). Recent papers have hypothesized that the use of markers with high contrast and or that glow in the dark may be more appropriate over water areas with large concentrations of water birds (Sporer et al. 2013; Murphy et al. 2009; Wright et al. 2009). However, both Sporer et al. (2013) and Murphey et al. (2009) acknowledge that direct comparison of the effectiveness of different marker types has not been done and results from their respective studies did not have the statistical power to provide for direct comparisons. One study in South Africa compared different marker devices; however, the natural variation in bird populations and habitat use made drawing conclusions about the effectiveness of different marker types impossible (Jenkin et al. 2010). These same sort of exterior environmental influences are noted in Sporer et al. (2013) and especially so in Murphy et al. (2009), where a line marked with flapping glow in the dark markers had numerous collisions while a line one mile upstream marked with the same devices had few collisions and a line 6.5 miles upstream had no marking devices and no documented collisions.

Regardless of the ambiguity in line-marking publications, NPPD has agreed to apply avian flight diverters with reflective and glow-in-the-dark surfaces to reduce avian collision in low-light conditions. Portions of the R-Project that will be marked with the reflective and glow-in-the-dark avian flight diverters include river crossings and areas identified as areas of bird use during low light conditions. Consultation with USFWS has determined approximately 10 to 15% of the R-Project proposed line marking will require reflective avian flight diverters. The remainder of the R-Project proposed line marking will use spiral bird flight diverters. NPPD will continue to evaluate available studies, local information, and available marker types to determine if identified marking should be modified.

Date: 2/15/2017 Path: W:\128143_NPPD_SPP\DD\GIS\Apps\Reports\HCP\Fig4-1_WhoopingCraneMarking.mxd



NPPD's 345kV Transmission Line Project

FIGURE 4-1
WHOOPING CRANE REGION 6
GUIDANCE LINE MARKING

In addition to the line marking discussed above, the Region 6 Guidance also calls for the avoidance of designated critical habitat and known high-use areas by five miles and the burial of power lines within one mile of suitable habitat. The R-Project is approximately 70 miles north of designated critical habitat on the Platte River. No other high-use areas were identified at the time of route selection. Burial of the R-Project was dismissed from consideration because temporary and permanent disturbance associated with Project construction, operation, and maintenance would significantly increase, causing an increase in the take of American burying beetle as described in Chapter 5. NPPD was not willing to increase the take of one federally endangered species to potentially decrease the already low likelihood of take of a whooping crane.

Relocation of distribution power lines in the ROW will reduce the likelihood of whooping crane collision by placing eight of the 28 miles underground. The remaining 20 miles that will be relocated as overhead power lines will not present an increase in the likelihood of whooping crane collision because these lines currently occur on the landscape and will only be relocated a short distance to avoid the R-Project.

Routine inspection of the transmission line will be completed by helicopter, fixed-wing aircraft, or ground patrol twice per year, in the spring and fall following completion of construction. Ground patrols are typically conducted using light ATVs or foot patrol. Patrols will note the general condition of the line and any infrastructure, including line marking devices that may require repair or replacement. Spiral bird flight diverters are static marking devices that are not prone to wear or breaking. Inspections will be conducted along the transmission line ROW. Given the infrequent nature of routine inspection, and the methods that only require crews to pass down the line with minimal stopping, the likelihood that these crews would encounter a whooping crane is very low and is not likely to have an effect.

Routine maintenance and repairs will not begin until 30 years after the in-service date and will occur once every 10 years for the remainder of the life of the transmission line. Routine maintenance and repair activities will be scheduled outside the whooping crane migration season to the maximum extent practicable.

Emergency repairs may temporarily disturb an estimated 301 acres during the life of the R-Project; however, the timing and location of emergency repair activities cannot be predicted (Table 4-1). It is unlikely that potentially suitable whooping crane habitat will be directly impacted by emergency repair activities because the disturbance will largely be a result of required access to structures for equipment completing the repairs. Access for emergency repairs will likely avoid potentially suitable whooping crane habitat because those areas are not conducive for vehicle travel. Additionally, emergency repairs are typically required during the winter when ice storms can damage large stretches of power lines. Emergency repairs would largely be required outside the whooping crane migration season.

Vegetation management will only be required in areas where trees may encroach on the transmission line. Vegetation management is unlikely to disturb migrating whooping cranes because the species typically selects stopover habitat devoid of trees that could interfere with operation of the transmission line. Vegetation management for the R-Project will be scheduled outside of the whooping crane migration season.

4.1.3 Avoidance and Minimization Measures Proposed for Whooping Crane

The avoidance and minimization measures proposed for whooping cranes are:

- Daily whooping crane surveys will be completed according to protocol (Appendix B) prior to the initiation of all construction activities for habitat within 0.5 mile of construction activities conducted during the spring (March 23 – May 10) and fall (September 16 – November 16) whooping crane migration periods. Surveys will occur in the morning prior to the initiation of construction activities that day. If a whooping crane is observed within 0.5 mile of any construction-related activity, work would not be allowed to begin until the whooping crane vacates the area of its own accord and NGPC and USFWS will be contacted immediately. If no whooping crane is observed within 0.5 mile, work will commence at that location. If, during the day, a whooping crane lands within 0.5 mile, all work will cease and will not resume until the whooping crane(s) has left the area or relocated at least 0.5 mile away from the construction area on its own accord. If a whooping crane is observed in the vicinity of but more than 0.5 mile away from the construction area, that bird will be observed for signs of agitation. If signs of agitation are observed, all construction activities will cease until the individual has relocated on its own accord. Environmental monitors will be required to maintain documentation of daily whooping crane surveys and occurrence of whooping cranes within 0.5 mile. Checklists will be completed by the environmental monitors and submitted to NPPD. NPPD will submit all checklists to the USFWS at the completion of each whooping crane migration season.

- All personnel including contractors will be required to complete the Worker Educational Awareness Program regarding ESA-protected species as described in Section 6.2.1.
- Temporary and permanent disturbance areas, such as construction yards/staging areas, fly yards/assembly areas, structure work areas, temporary access, and structure locations were sited to avoid potentially suitable whooping crane habitat to the maximum extent practicable. Further refinement of the siting of these work areas will be conducted in the field during final design.
- Wetland habitat will be crossed using low-ground-pressure equipment and temporary matting or other best management practices (BMPs).
- Temporary disturbance to potentially suitable whooping crane stopover habitat would be restored as per the Restoration Management Plan.
- The R-Project transmission line will span rivers and streams at locations with existing bridge crossings where such infrastructure is available.
- Line marking devices will be installed on the overhead shield wire along portions of the line within one mile of potentially suitable whooping crane habitat, including river channels and wetlands, as identified in the desktop habitat assessment. Marking will be done in accordance with NPPD construction standards and APLIC Guidelines.
    - Areas with known high avian densities, such as river crossings and known roost sites, will be marked with avian flight diverters with reflective and glow-in-the-dark surfaces.
    - Line marking devices will be installed on an equal amount of NPPD-owned power lines within the 95% sighting corridor to comply with the Region 6 Guidance. Selection of existing lines to be marked is described above and will be completed in cooperation with the USFWS and NGPC.
- NPPD has prepared a Migratory Bird Conservation Plan, which will avoid and minimize potential effects to migratory birds throughout the life of the R-Project.

4.2 Interior Least Tern

4.2.1 Potential Effects from Construction

The North and South Platte rivers are the only rivers spanned by the R-Project that occur in the NGPC's estimated breeding range of the interior least tern (NGPC 2014). Nesting interior least terns occur on the Loup River but are much farther downstream than the R-Project location. The North and South Platte rivers channel widths were measured using detailed aerial imagery. The North Platte channel is 205 feet (62 meters) wide and the South Platte channel is 225 feet (68 meters) wide at the location of the R-Project spans. This is much narrower than the 600 feet identified by Ziewitz et al. (1992) and 1,000 feet identified by Jorgensen et al. (2012) as suitable nesting habitat. The North Platte River span is also adjacent to an existing bridge on N. Prairie Trace Road. No anthropogenic nesting habitat, such as sandpit lakes or expansive rooftops, occurs within 0.25 mile of the R-Project. A field survey of interior least tern nesting habitat was conducted in June 2014 within a 0.25-mile buffer of the R-Project's river crossing locations on the North and South Platte rivers. No suitable nesting habitat was identified. The 0.25-mile distance is based on USFWS's recommended buffer distance.[6] Project activities will not be located within potential interior least tern nesting habitat. Therefore, construction of the R-Project will not result in permanent or temporary disturbance of interior least tern nesting habitat.

Interior least terns foraging at crossing locations on the North or South Platte rivers may be temporarily disturbed as a result of construction-related activities. Within the Missouri River Basin, interior least terns have been observed foraging more than seven miles from nesting colonies (Stucker 2012). Radio-marked interior least terns on the Platte River typically forage at preferred foraging locations close to the nesting colony (Sherfy et al. 2012a). Radio-marked individuals from one particular nesting colony frequented feeding sites within four miles, while individuals from another nesting colony frequented foraging sites within two miles (Sherfy et al. 2012b). Interior least terns frequently nest along the shores of Lake McConaughy, approximately 30 miles upstream of the North Platte River crossing. Given the distance between the crossing locations and nesting habitat at Lake McConaughy, it is unlikely that birds from those nesting colonies will forage at the crossing locations.

During the fall, interior least terns are believed to migrate along major river corridors to their confluence with the Mississippi River and then fly south to the Gulf of Mexico (USFWS 2013c). Avoidance of construction crews and activities at the North Platte and South Platte river crossings may temporarily disturb interior least terns traveling along these river corridors during construction. This disturbance will be temporary and limited to when construction crews are constructing the North and South Platte river crossings. Thompson et al. (1997) noted observations of interior least terns over 90 miles from major river corridors, indicating that some birds may migrate cross-country. In the unlikely event interior least terns migrating cross-country encounter construction activities, they likely will avoid the area and instead use other abundantly available areas to migrate.

The installation of transmission structures in grassland habitat will provide additional hunting and loafing perches for raptors, which can potentially prey on nesting interior least tern. However, because of the lack of suitable nesting habitat near the R-Project, potential effects on interior least tern from increased raptor use are not anticipated.

4.2.2 Potential Effects from Operations and Maintenance

The transmission line span over the North and South Platte rivers presents a potential collision hazard for interior least terns. A single interior least tern was killed after a collision with a transmission line over a broad stretch of the lower Platte River in Saunders County, Nebraska (Dinan et al. 2012). However, interior least tern collisions with power lines are extremely rare; Dinan et al. (2012) is the only documented occurrence. One study of a similar species, the common tern (*Sterna hirundo*), found only two collisions while studying a colony located beneath an existing power line despite over 10,000 observations of individuals passing the line (APLIC 2012). Interior least terns are small, agile flyers and are able to avoid transmission lines. The USFWS Interior Least Tern Recovery Plan does not identify power line collision as a potential threat to species recovery (USFWS 1990). Strategic placement of river crossing locations can reduce the likelihood of any avian species colliding with a transmission line (APLIC 2012). The R-Project crosses the North Platte and South Platte rivers where the channels are narrow and lack interior least tern nesting habitat, reducing the likelihood of collision by congregating

[6] See, e.g., USFWS South Dakota Field Office, Interior Least Tern, *Sterna antillarum athallasos*, https://www.fws.gov/southdakotafieldoffice/TERN.HTM.

interior least terns. Marking the transmission line at these river crossings will further minimize the already low risk of collision for interior least tern. Relocation of existing distribution power lines will not have an effect on interior least tern because none of the lines occur in the species' habitat.

Routine inspection of the transmission line will be completed by helicopter, fixed-wing aircraft, or ground patrol twice per year. Ground patrols typically are conducted using light ATVs or foot patrol. Inspections will be conducted along the transmission line ROW. Routine inspections will pass directly down the transmission line and will note areas requiring maintenance. Inspections will not disturb nesting interior least terns due to the lack of suitable nesting habitat at the line crossing locations on the North Platte and South Platte rivers.

Routine maintenance and repair activities could potentially disturb migrating or foraging interior least terns if individuals occur at the crossing locations at the same time as inspection or maintenance crews. Routine maintenance and repairs will not begin until 30 years after the in-service date and will occur once every 10 years for the remainder of the life of the transmission line. Thus, there is a very low likelihood of migrating or foraging interior least terns being present at the crossing locations at the same time as inspection or maintenance crews.

Emergency repairs may temporarily disturb an estimated 301 acres during the life of the R-Project (Table 4-1); however, the timing and location of emergency repair activities cannot be predicted. No structures or access routes will be sited in interior least tern nesting habitat. Therefore, none of the 301 acres of temporary disturbance for emergency repairs will occur in interior least tern nesting habitat. Emergency repair activities are not likely to disturb foraging interior least terns because no nesting habitat occurs at the river crossing locations and individuals typically forage near nesting colonies. Avoidance of crews conducting emergency repair activities at the North Platte and South Platte river crossings may temporarily disturb interior least terns traveling along these river corridors if emergency repairs are required during migration. This disturbance will be temporary and limited to if and when emergency repair crews are working at the North Platte and South Platte river crossings.

Riparian areas along the North Platte and South Platte river crossings may require vegetation management during which trees adjacent to the ROW that could interfere with the energized transmission line are removed. Vegetation management crews may disturb migrating or foraging interior least terns, if individuals occur at the crossing location during maintenance activities. This potential effect is unlikely because the likelihood of migrating or foraging interior least terns occurring in the vicinity of the crossing locations at the time of vegetation management is very low.

4.2.3 Avoidance and Minimization Measures Proposed for Interior Least Tern

The avoidance and minimization measures proposed for the interior least tern are:

- The R-Project will span the North Platte and South Platte rivers at locations that do not provide suitable interior least tern nesting habitat, and the remaining project activities will not be located within potential interior least tern nesting habitat.
- Line marking devices will be installed on the overhead shield wire at the North Platte and South Platte rivers spans according to APLIC Guidelines (2012) and NPPD construction standards.
- NPPD has prepared a Migratory Bird Conservation Plan, which will avoid and minimize potential effects to migratory birds throughout the life of the R-Project.

4.3 Piping Plover

4.3.1 Potential Effects from Construction

Potential effects to piping plovers are similar to interior least terns, given the species preference for similar habitat. The North Platte and South Platte rivers are the only rivers crossed by the R-Project that occur in the NGPC's estimated breeding range of the piping plover (NGPC 2014). Natural Heritage Program data do not contain any occurrences of piping plover at Sandhill lakes within the Study Area (NGPC 2015a). A field assessment of piping plover nesting habitat was completed in June 2014 within 0.25 mile of the R-Project's river crossing locations on the North Platte and South Platte rivers. No suitable nesting habitat was identified. No other types of nesting habitat, including alkali lakes, large reservoir or lake shorelines, sandpit lakes, or industrial dredge areas, occur within 0.25 mile of the R-Project. The 0.25-mile buffer is based on survey protocols used by NPPD on previous transmission related projects (POWER 2009b) and the standard best management practice employed by various state and federal agencies. Measurements of detailed aerial imagery showed that the North Platte River channel is 205 feet (62 meters) wide at the crossing location, and the South Platte River channel is 225 feet (68 meters) wide at the crossing location. This is much narrower than the 600 feet identified by Ziewitz et al. (1992) and 1,000 feet identified by Jorgensen et al. (2012) as suitable nesting habitat. Removal of riparian areas within the R-Project ROW or presence of construction equipment at the North and South Platte river crossings will not create a temporary disturbance to nesting piping plovers because nesting is unlikely to occur due to lack of habitat. Project activities will not be located within potential piping plover nesting habitat. Therefore, construction of the R-Project will not result in permanent or temporary disturbance of piping plover nesting habitat.

The R-Project will not result in the fragmentation of suitable piping plover nesting habitat. The R-Project will span the North Platte and South Platte rivers where the rivers are narrow and do not provide suitable nesting habitat. The R-Project will not present a barrier to migrating or nesting individuals. The R-Project will cross the North Platte River adjacent to an existing bridge on N. Prairie Trace Road. By crossing the North Platte and South Platte rivers in areas without suitable nesting habitat, and adjacent to existing anthropogenic disturbance such as the bridge over the North Platte River, the R-Project will not fragment suitable piping plover nesting habitat.

Construction activities will not disturb foraging piping plovers with nests further than 0.25 mile from the R-Project. Piping plovers rarely leave the nesting colony to forage. Sherfy et al. (2012) found that 98% of all piping plover foraging activity occurred within the nesting colony. Therefore, construction activities associated with the R-Project will not affect foraging piping plovers.

Little is known about the migration paths of piping plovers. However, they are known to use the shores of large reservoirs, rivers, wetlands, and sandpits as stopover habitat (Elliott-Smith and Haig 2004). Lake McConaughy is a known piping plover nesting and migration stopover site and individual migrants may use large wetland complexes and natural lakes throughout the Sandhills. Migrating piping plovers were also documented at Carson Lake in 1992 (Ducey 2014). However, migrating piping plovers are not commonly observed at Carson Lake, as is the case for Lake McConaughy. Ducey (2014) completed migratory bird point counts at Carson Lake from 1990 through 1995, 2003, and 2004. Piping plover were only observed during the 1992 migration. While Carson Lake may have supported suitable migration habitat for piping plover in 1992, the lake does not currently provide the open sand bar-type habitat typically associated with piping plover. Construction activities may temporarily disturb migrating piping plovers if individuals are passing the North Platte and South Platte river crossing locations or using other migration stopover habitat, such as large wetland complexes or Sandhills lakes, during construction. This disturbance will be temporary and limited to instances when construction crews are present. No construction activities will take place within the North Platte and South Platte river channels and migrating piping plovers will not be forced to move upstream or downstream. In the unlikely event piping plovers migrating cross-country encounter construction activities, they likely will avoid construction activities and instead use abundant adjacent habitats, including wetlands and Sandhills lakes throughout the Study Area.

The installation of transmission structures in grassland habitat will provide additional hunting and loafing perches for raptors, which can potentially prey on nesting piping plovers. However, because of the lack of suitable nesting habitat near the R-Project, potential effects to piping plover from increased raptor use are not anticipated.

4.3.2 Potential Effects from Operation and Maintenance

Potential effects to the piping plover from operations and maintenance activities are similar to those for the interior least tern. The transmission line span over the North Platte and South Platte rivers presents a potential collision hazard for piping plovers. A recent study on transmission line marking identified one piping plover mortality from a power line collision on Lake Sakakawea and Lake Audubon in North Dakota (Sporer et al. 2013). However, collision with transmission lines is not considered a major threat to the species and is not addressed in the USFWS Piping Plover Recovery Plan or 5-Year Review (USFWS 1988; USFWS 2009a). Marking of the transmission line specifically designed to minimize the collision hazard for whooping cranes will also minimize the risk of collision for piping plovers. Crossing the North Platte and South Platte rivers where the channels are narrow and lack piping plover nesting habitat minimizes the risk of collision for piping plovers. Relocation of existing distribution power lines will not have an effect on piping plover because none of the lines occur in the species' habitat.

Routine inspection of the transmission line will be completed by helicopter, fixed-wing aircraft, or ground patrol twice per year. Ground patrols typically are conducted using light ATVs or foot patrol. Routine inspections will pass directly down the transmission line and will note areas requiring maintenance. Routine inspections will not disturb nesting piping plovers due to the lack of suitable nesting habitat at the line crossing locations on the North Platte and South Platte rivers.

Routine maintenance and repair activities could potentially disturb migrating or foraging piping plovers if individuals occur at the crossing locations at the same time as inspection or maintenance crews. Routine maintenance and repairs will not begin until 30 years after the in-service date and will occur once every 10 years for the remainder of the life of the transmission line. This potential effect is unlikely given the limited number of times routine maintenance activities are likely to occur and the low probability that those activities would occur at the same time migrating and foraging piping plovers are present.

Emergency repairs may temporarily disturb an estimated 301 acres during the life of the R-Project (Table 4-1); however, the timing and location of emergency repair activities cannot be predicted. No structures or access routes will be sited in piping plover nesting habitat. Therefore, none of the 301 acres of temporary disturbance for emergency repairs will occur in piping plover nesting habitat. Emergency repair activities are not likely to disturb foraging piping plovers because no nesting habitat occurs at the river crossing locations and individuals typically forage near nesting colonies. Avoidance of crews completing emergency repair activities at the North Platte and South Platte river crossings may temporarily disturb piping plovers traveling along these river corridors if emergency repairs are required during migration. This disturbance will be temporary and limited to if and when emergency repair crews are working at the North Platte and South Platte river crossings.

Riparian areas along the North Platte and South Platte river crossings may require vegetation management during which trees adjacent to the ROW that could interfere with the energized transmission line are removed. Vegetation management crews may disturb migrating or foraging piping plovers, if individuals occur at the crossing location during maintenance activities. This potential effect is unlikely given the lack of suitable nesting habitat and low likelihood of migrating piping plovers being in the vicinity during maintenance activities.

4.3.3 Avoidance and Minimization Measures Proposed for Piping Plover

The avoidance and minimization measures proposed for the piping plover are:

- The R-Project will span the North Platte and South Platte rivers at locations that do not provide suitable piping plover nesting habitat, and the remaining project activities will not be located within potential piping plover nesting habitat.
- Line marking devices will be installed on the overhead shield wire at the North Platte and South Platte river spans according to APLIC Guidelines (2012) and NPPD construction standards.
- NPPD has prepared a Migratory Bird Conservation Plan, which will avoid and minimize potential effects to migratory birds throughout the life of the R-Project.

4.4 Bald Eagle

4.4.1 Potential Effects from Construction

Forested riparian areas that provide potential bald eagle nesting, foraging, and roosting habitat are found within the R-Project area. While NPPD attempted to avoid all riparian habitat that may provide bald eagle nesting, roosting, and foraging habitat during design of the R-Project, complete avoidance was not possible, particularly in forested riparian areas that must be crossed. Permanent habitat loss will result from clearing of 18 acres of forested riparian habitat within the ROW to satisfy utility safety requirements.

Bald eagle nest surveys were conducted in 2014, 2016, 2017, and 2018 at each major river crossed by the R-Project. Bald eagle nests were surveyed by NPPD in an area within one mile of the R-Project. One bald eagle nest was identified within 0.5 mile of the R-Project centerline near Sunfish Lake in northern Garfield County. One occupied bald eagle nest was identified on the North Loup River 0.56 mile south of the R-Project selected route and 0.4 mile west of a potential access path. One occupied bald eagle nest was identified on Birdwood Creek approximately 1.4 miles downstream of the R-Project centerline. One public road that may be used for access is located approximately 0.2 mile from this nest. All other nests identified during R-Project bald eagle nest surveys were more than 0.5 mile from the R-Project centerline and associated disturbance areas. A preconstruction bald eagle nest survey will be completed prior to leaf-out the spring (February to March) before construction to identify any nests that may have been established since the 2018 survey, unless construction begins before the next nesting season. If an occupied bald eagle nest is identified during the preconstruction survey, construction activities would comply with seasonal nest restrictions identified in Section 4.4.3. This will avoid potential effects to nesting bald eagles should additional nests be established prior to construction.

Numerous foraging bald eagles were observed along the North Platte, Middle Loup, North Loup, and Calamus rivers during the 2014, 2016, 2017, and 2018 surveys. Most individuals were observed perching in trees along river edges. Construction activities at river crossings may temporarily cause foraging bald eagles to relocate to another perch; however, the effect will be temporary and bald eagles likely will continue foraging in adjacent suitable habitat. Bald eagles will not be restricted from foraging adjacent to construction crews or along other stretches of these rivers.

Existing spatial data identified three bald eagle communal winter roosts in the Study Area. Two of these roosts are located at Sutherland Reservoir. Both of the Sutherland Reservoir winter roosts are located on the western side of the reservoir approximately 2.5 miles west of the R-Project selected route. Birds using the winter roosts located on Sutherland Reservoir are acclimated to human activity associated with operation of the power plant, recreational fishing, and hunting. Construction activities will not likely disturb birds using these winter roosts. The third winter roost is located on the North Platte River approximately three miles upriver of the R-Project. Construction activities will not likely affect birds using this winter roost due to the distance between construction and the roost. NPPD will complete winter roost surveys according to Nebraska Bald Eagle Survey Protocol if active construction is to take place in areas of suitable roosting habitat during the winter roost season (October 1 – January 31; NGPC 2007). If active roosts are located within 0.25 mile of construction, construction activities will be delayed until the eagles leave roosts for the day.

Bald eagles are known scavengers and will prey on fish carcasses, roadkill, and human refuse. Construction personnel will remove all trash to avoid attracting scavenging bald eagles to the construction areas.

Migrating bald eagles are common in Nebraska where major river corridors provide migratory stopover habitat and winter habitat. The presence of construction crews may temporarily cause migrating bald eagles to move to other adjacent habitat. This displacement will be temporary and limited within the R-Project ROW.

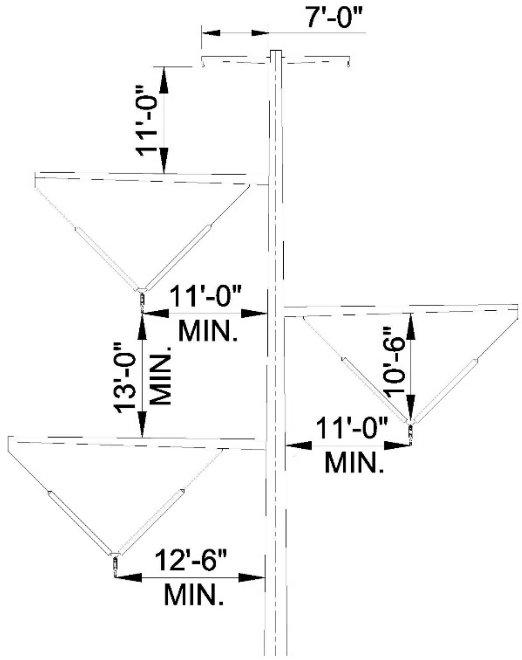
Bald eagles successfully navigate over large transmission lines daily throughout their range and will use transmission support structures for perching. The R-Project will not present a barrier to migrating or foraging individuals. Potential effects of habitat fragmentation of nesting and foraging habitat from the removal of riparian habitat within the ROW will be negligible, given the availability of suitable habitat both upstream and downstream of each river crossing location.

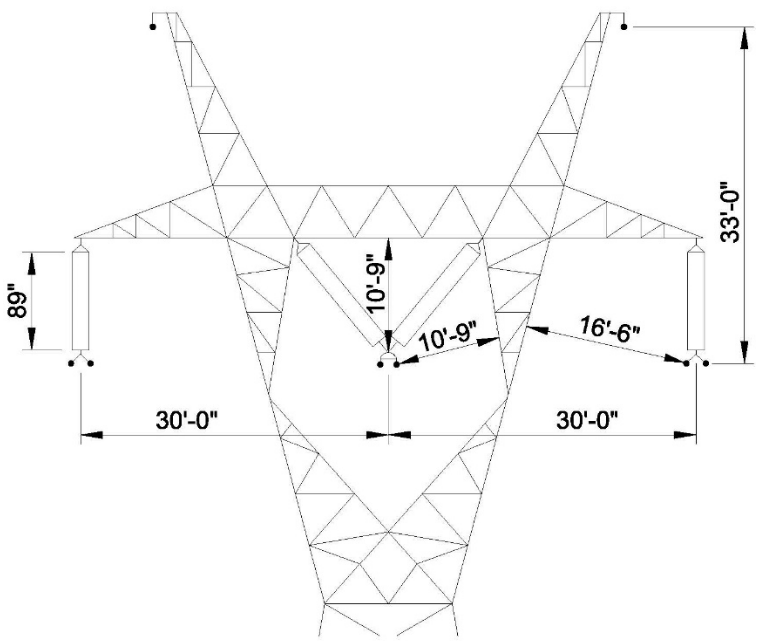
4.4.2 Potential Effects from Operations and Maintenance

A common concern regarding transmission lines is the possibility of raptor electrocution. Transmission lines require large spacing between conductors to prevent flashover between phases and to prevent contact during galloping events, both of which cause line outages. Also, sufficient clearance is needed to provide safe working distances for lineman to perform hot line maintenance work, which also reduces the outage events required to maintain the line. The spacing is utility-specific, based on each utility’s design and maintenance practices. Suggested transmission line conductor spacing and configurations are described in APLIC’s 2006 electrocution document *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006). The R-Project will be designed to NPPD and APLIC standards that will eliminate the potential for raptor electrocution. The bald eagle and golden eagle are the largest birds with potential to perch on R-Project structures. APLIC (2006) recommends 60 inches of spacing between energized portions of transmission lines or grounds.

Electrocution of bald eagles is unlikely given the spacing between energized conductors and between energized conductors and grounded portions of the structure (Figure 4-2). For the steel monopoles, the vertical separation between energized conductors and the supporting arm of the conductor below is 13 feet. The separation between energized conductors and grounded portions of the structure is 11 feet. The horizontal spacing between energized conductors on steel monopoles is 23 feet. The horizontal spacing between energized conductors on lattice towers is 30 feet. The shortest separation between energized conductors and grounded portions of the structure on lattice towers is 10 feet 9 inches. These spacing distances are substantially greater than the 60 inches (five feet) recommended by APLIC (2006). Figure 4-2 also shows the separation of shield wire and the structure as seven feet on steel monopole structures. The shield wire is not energized and does not create an electrocution hazard.

FIGURE 4-2 TRANSMISSION CONDUCTOR SPACING





Bald eagles occasionally will hunt in upland habitat. The placement of transmission structures in upland habitat will provide hunting and loafing perches that may be used by bald eagles. Because conductor spacing makes electrocution unlikely, the presence of transmission structures may be beneficial to bald eagles utilizing upland habitat by increasing available hunting and loafing perches.

While unlikely, the R-Project may present a potential collision risk for bald eagles. As previously described, line marking devices will be installed on overhead shield wires spanning rivers, streams, and some wetlands (see Section 4.1 on whooping cranes) to reduce the risk of potential collisions to negligible levels. Line marking will be completed according to APLIC Guidelines (2012) and NPPD construction standards (see Section 4.1.2). Relocation of existing distribution power lines will not have an effect on bald eagles because none of the lines occur in the species' habitat.

The R-Project is not expected to result in the take of a bald eagle through electrocution or collision. Correspondence with USFWS states that the expected risk to bald eagles is low; so long as the R-Project follows the guidance described in APLIC (2006) and APLIC (2012), take of a bald eagle is not anticipated (Kritz, Kevin. Biologist, USFWS Region 6 Migratory Bird Management Office. Personal communication via email with Jim Jenniges, May 27, 2016).

Routine inspection of the transmission line will be completed by helicopter, fixed-wing aircraft, or ground patrol twice per year. Ground patrols typically are conducted using light ATVs or foot patrol. Routine inspections will pass directly down the transmission line and will note areas requiring maintenance. Routine inspections are not likely to disturb nesting, roosting, or foraging bald eagles. Bald eagles typically experience numerous anthropogenic disturbances during foraging activities and will not likely be disturbed by biannual surveys. Bald eagles observed nesting, roosting, and foraging during aerial surveys did not react to the aircraft.

Currently, one known nest occurs within 0.5 mile of the R-Project centerline, and two nests within 0.5 mile of proposed access routes. Potential effects to nesting bald eagles will be minimal because routine maintenance and repairs will not begin until 30 years after the in-service date and will occur once every 10 years for the remainder of the life of the transmission line.

Emergency repairs may cause temporary surface disturbance of an estimated 301 acres during the life of the R-Project (Table 4-1); however, the timing and location of emergency repair activities cannot be predicted. Emergency repair activities cause bald eagles to temporarily vacate an area. Bald eagles would be able to return to the area upon completion of emergency repair activities. If an occupied bald eagle nest occurs within 0.5 mile of the R-Project, emergency repair activities would comply with the National Bald Eagle Management Guidelines. This will avoid potential effects to nesting bald eagles. Emergency repair activities may cause foraging bald eagles to move to other locations if repairs are necessary adjacent to foraging habitat. Effects from emergency repair activities would be temporary and limited to the specific location requiring repairs. Emergency repairs will not require the removal of any bald eagle nesting, foraging, or roosting habitat.

Vegetation management within the ROW could cause nesting, roosting, and foraging bald eagles to temporarily vacate an area if individuals occur at the location requiring management. Bald eagles would be able to return to the area upon completion of activities. Vegetation management also could remove potential future bald eagle nest trees, night roosts, foraging perches, or winter roost trees, if trees adjacent to the ROW present a risk to the energized transmission line. However, these potential effects will be minimal considering the infrequent nature of vegetation management and the availability of suitable adjacent habitat for bald eagles.

In the unlikely event that a bald eagle nest threatens the energized transmission line and needs to be removed to ensure safe operation of the line or alleviate a threat of harm to eagles, NPPD would pursue an Eagle Take Permit (see Section 1.6.5).

4.4.3 Avoidance and Minimization Measures Proposed for the Bald Eagle

The avoidance and minimization measures proposed for the bald eagle are:

- A bald eagle nest survey will be conducted during the spring prior to construction to ensure no new bald eagle nests have been constructed within 0.5 mile of the R-Project. If a new occupied bald eagle nest is identified during the preconstruction survey, construction will not be allowed within 0.5 mile of the occupied nest during the bald eagle nesting season. The nesting season is February 1 through August 31 as discussed in the NGPC Bald Eagle Survey Protocol (NGPC 2007).
    - NPPD will consult with the USFWS and NGPC regarding the need for a second follow-up preconstruction survey.
- Winter roost surveys will be conducted according to Nebraska Bald Eagle Survey Protocol if construction is to take place in areas of suitable roosting habitat during the bald eagle winter roost season (October 1 – January 31; NGPC 2007). If active roosts are located within 0.25 mile of construction, construction activities will be delayed until the eagles leave roosts for the day.
- The R-Project will be designed to NPPD standards and APLIC Guidelines (2006) to eliminate the risk of bald eagle electrocution.
- Line marking devices will be installed on the overhead shield wire at river spans and near wetlands according to APLIC Guidelines (2012) and NPPD construction standards.
- Construction personnel will be required to remove all trash, which may attract scavenging bald eagles to construction areas.
- If an occupied bald eagle nest occurs within 0.5 mile of the R-Project, emergency repair activities would comply with the National Bald Eagle Management Guidelines.
- NPPD has prepared a Migratory Bird Conservation Plan, which will avoid and minimize potential effects to migratory birds throughout the life of the R-Project.

4.5 Golden Eagle

4.5.1 Potential Effects from Construction

The R-Project occurs on the extreme eastern edge of the golden eagle's western population. Little information is available that documents golden eagles along the R-Project because their occurrence along the extreme eastern edge of the range is rare. Nesting golden eagles in Nebraska typically occur farther west than the R-Project. The range map presented in DeLong (2004) shows golden eagle nesting territory in the extreme western portion of the Nebraska panhandle and non-breeding individuals extending farther east into the state. Occurrence of nesting golden eagles along the R-Project is unlikely given the species nesting distribution within the state. Golden eagle nests in Nebraska typically occur on cliff sides but may also be in trees. Construction activities will not be located within potential golden eagle nesting habitat to the maximum extent practicable. Transmission line ROW clearing will result in the removal of 23 acres of habitat between GGS Substation and the Thedford Substation that has the potential to support nesting golden eagles. Nesting golden eagles are not anticipated as the R-Project moves east to the Western line from the Thedford Substation. No previously documented golden eagle nests occur within 0.5 mile of the R-Project (NGPC 2015a), and no golden eagle nests were anecdotally observed during the aerial bald eagle nest surveys. Construction of the R-Project is not likely to affect nesting golden eagles, considering the species' typical range in Nebraska and lack of any identified nests along the R-Project.

Potential effects of fragmentation of nesting habitat from the removal of trees within the ROW will be negligible, given the availability of suitable habitat. The R-Project will not present a barrier to dispersing or foraging individuals. By not altering native grassland habitat within the ROW and restoring temporarily disturbed areas, the R-Project will not result in additional habitat fragmentation to golden eagles.

Golden eagles are habitat generalists that may forage in several habitat types, including grassland habitat that is prevalent along the R-Project. Hares, rabbits, and prairie dogs make up the bulk of golden eagle diets (Kochert et al. 2002). No prairie dog towns or concentrations of mammalian prey species occur along the R-Project. Golden eagles may forage at wetlands, rivers, and streams, which may attract prey, such as waterfowl and other shorebirds. Permanent loss of grassland habitat that may support foraging golden eagles will include approximately 13 acres at the Thedford Substation site and approximately one acre of permanent structure foundations. The extent of permanent access roads under Access Scenario 3 is not known at this time, but is anticipated to be minimal and will be no more than 10% of Access Scenario 2 (26 acres). The Holt County Substation will be located in a cultivated agricultural field that does not provide suitable foraging habitat for golden eagles. Permanent loss of wetland habitat is expected to be minimal.

Wetlands and riverine foraging habitat have been avoided by construction-related activities to the maximum extent practicable. River and stream crossings occur in close proximity to existing disturbances where possible (see Section 4.1.1). Temporary disturbance to golden eagle foraging habitat during construction will be restored with native vegetation following completion of construction activities. Given the availability of suitable foraging habitat surrounding the R-Project, this temporary disturbance of grassland, wetland, and riverine foraging habitat will not affect potential foraging of the golden eagle in the area.

Foraging golden eagles may avoid areas occupied by construction crews and equipment during construction. This will be temporary effect, and golden eagles will not be restricted from foraging in adjacent or other grassland habitats further from the R-Project construction activities. Effects to foraging golden eagles will be minimal given the availability of suitable grassland foraging habitat surrounding the R-Project. Individual golden eagles attempting to expand their range by traveling along river corridors may also avoid construction crews and equipment. These golden eagles will not be precluded from continuing travel along the river corridor or using portions of the river corridor adjacent to construction.

Like bald eagles, golden eagles are known scavengers and will prey on roadkill and human refuse. Construction crews will be required to remove all trash to avoid attracting scavenging golden eagles in construction areas.

4.5.2 Potential Effects from Operations and Maintenance

As stated above for bald eagles, the R-Project will far exceed NPPD conductor spacing requirements and APLIC Guidelines (2006) (Figure 4-2). Electrocution of golden eagles is unlikely given NPPD and APLIC design standards requirements and conductor spacing that will be applied on the R-Project.

Golden eagles are strong fliers that are not typically prone to collision with transmission lines (APLIC 2012). However, Bevanger (1994) hypothesizes that some raptor species, including golden eagles, may be at an increased risk of power line collision when flying at high speeds chasing prey. While the R-Project lacks areas of elevated mammal prey densities preferred by golden eagles, wetlands, rivers, and streams may concentrate waterfowl and attract foraging individuals. Marking the transmission line at river crossings and wetlands crossings (see Section 4.1) that attract waterfowl will reduce the risk of collision for golden eagle. If areas of elevated mammal prey densities are observed during construction, the transmission line spanning those areas will also be marked to reduce the risk of collision. Marking according to APLIC Guidelines (2012) and NPPD construction standards will minimize the likelihood of a golden eagle colliding with the R-Project (see Section 4.1.2). Due to the rarity of golden eagles in the project vicinity (DeLong 2004; NGPC 2015a) and the project's use of line markers, the potential to take golden eagles is negligible. Relocation of existing distribution power lines will not have an effect on golden eagles because none of the lines occur in the species' habitat.

Golden eagles successfully navigate transmission lines throughout their range and will use transmission structures for perching and hunting (APLIC 2006). The installation of transmission structures in grassland habitat will provide additional raptor hunting and loafing perches that may potentially benefit golden eagles.

The R-Project is not expected to result in the take of a golden eagle through electrocution or collision. Correspondence with USFWS states that the expected risk to golden eagles is low; so long as the R-Project follows the guidance described in APLIC (2006) and APLIC (2012), take of a golden eagle is not anticipated (Kritz, Kevin. Biologist, USFWS Region 6 Migratory Bird Management Office, personal communication via email with Jim Jenniges, May 27, 2016).

Routine inspection of the transmission line will be completed by helicopter, fixed-wing aircraft, or ground patrol twice per year. Ground patrols are typically conducted using light ATVs or foot patrol. Inspections will be conducted along the ROW and will identify areas requiring maintenance. Golden eagles may avoid inspection personnel and equipment but will be able to reoccupy all areas once the inspection has concluded.

Routine maintenance and repair activities may cause golden eagles to temporarily vacate an area. Golden eagles would be able to return to the site upon completion of activities. No golden eagle nests are known to occur within 0.5 mile of the R-Project. Potential effects to nesting golden eagles will be minimal because the R-Project is located on the far eastern edge of the species nesting range where nesting is uncommon. Routine maintenance and repairs will not begin until 30 years after the in-service date and will occur once every 10 years for the remainder of the life of the transmission line.

Emergency repairs may cause temporary surface disturbance of an estimated 301 acres during the life of the R-Project (Table 4-1); however, the timing and location of emergency repair activities cannot be predicted. Currently, no known golden eagle nests occur within 0.5 mile of the R-Project. However, emergency repair activities may cause golden eagles to temporarily vacate an area. Golden eagles would be able to return to the site upon completion of activities. Because golden eagles forage in a wide variety of habitats, it is likely that the 301 acres of temporary surface disturbance associated with emergency repairs will occur in golden eagle foraging habitat. All activities will be temporary and limited to the specific location requiring repairs.

Vegetation management within the ROW could cause golden eagles to temporarily vacate an area if individuals occur at the location requiring management. Golden eagles would be able to return to the location upon completion of activities. Vegetation management could also remove potential future golden eagle nest trees and foraging perches; however, these effects will be minimal considering the infrequent nature of vegetation management and the availability of suitable adjacent habitat.

4.5.3 Avoidance and Minimization Measures Proposed for Golden Eagle

The avoidance and minimization measures proposed for the golden eagle are:

- The R-Project will be designed to NPPD standards and APLIC Guidelines (2006) to eliminate the risk of golden eagle electrocution.
- Line marking devices will be installed on the overhead shield wire at river and wetland spans, as well as any upland prey concentrations identified during construction, according to APLIC Guidelines (2012) and NPPD construction standards.
- Construction personnel will be required to remove all trash, which may attract scavenging golden eagles to the construction areas.
- NPPD has prepared a Migratory Bird Conservation Plan, which will avoid and minimize potential effects to migratory birds throughout the life of the R-Project.

4.6 Rufa Red Knot

4.6.1 Potential Effects from Construction

It is unlikely that rufa red knot will be affected by construction of the R-Project because the species rarely occurs in Nebraska. The Central Flyway Council, a group of biologists from the United States and Canada, describes the species as a casual or irregular migrant in the central Great Plains (Central Flyway Council 2013). The Central Flyway Council states that rufa red knot occurs in the central Great Plains in very limited numbers and that the states of the Central Flyway have “near-zero occupancy potential.” Rufa red knot has only been observed in Nebraska 15 times over the last 100 years.

The R-Project does not occur within the breeding range of rufa red knot and will not result in the loss of nesting habitat. Spring migration occurs between April and June; fall migration occurs between August and September. Rufa red knots do not have any traditional stopover sites in Nebraska and typically complete their migrations in a matter of days. While the likelihood of migrating rufa red knots occurring in wetland habitat during construction activities is extremely low, the R-Project may result in the temporary disturbance of wetland habitat that may be used by migrating individuals. Both permanent and temporary disturbance in wetlands will be avoided to the maximum extent practicable by siting activities outside wetlands and using matting and other protective construction methods. Wetland matting may be applied in site-specific locations to protect the substrate and vegetation in identified wetlands. Wetland matting supports construction equipment and distributes the weight across the entire mat, thereby reducing potential impacts to the wetland. Wetlands temporarily disturbed by construction activities will be restored following the completion of construction. Potential effects to rufa red knots from habitat disturbance, loss, and fragmentation will be minimal.

Construction activities may temporarily disturb migrating rufa red knots by causing them to avoid construction crews and equipment in suitable wetland habitat near construction sites. Disturbance will be temporary and limited to work areas and access paths. Rufa red knots will not be restricted from foraging in areas adjacent to construction activities or other habitats further from the R-Project.

The installation of transmission structures adjacent to wetland habitat will provide additional hunting and loafing perches for raptors, which may prey on rufa red knot. Individual rufa red knots rarely occur in Nebraska, will only be present while migrating through the region, and will not occupy habitat surrounding the completed project for long periods of time. Avoidance of wetlands will continue to provide wetland vegetation cover for migrating individuals, thus minimizing the potential effects from raptor predation.

4.6.2 Potential Effects from Operations and Maintenance

Shorebirds such as the rufa red knot are typically less agile fliers with a larger body size in relation to wing size. This makes the rufa red knot more susceptible to collision with power lines (APLIC 2012). The lack of rufa red knot occurrences in Nebraska makes the likelihood of an individual striking the R-Project extremely low. While the potential for rufa red knot collision is highly unlikely, marking the transmission line at river and wetland crossings (see Section 4.1) will further reduce the risk of collision. Relocation of existing distribution power lines will not have an effect on rufa red knot because none of the lines occur in the species' habitat.

Routine inspection of the transmission line will be completed by helicopter, fixed-wing aircraft, or ground patrol twice per year. Ground patrols are typically conducted using light ATVs or foot patrol. Inspections are conducted along the ROW. If rufa red knots are present in wetland habitat, individuals will not likely react to survey aircraft, and ground patrols will avoid wetland habitat.

Routine maintenance and repair activities are not likely to disturb rufa red knots since structures will be in upland habitat and routine maintenance and repairs will not begin until 30 years after the in-service date and will occur once every 10 years for the remainder of the life of the transmission line.

Emergency repairs may temporarily disturb an estimated 301 acres during the life of the R-Project (Table 4-1); however, the timing and location of emergency repair activities cannot be predicted. It is unlikely that suitable rufa red knot habitat will be directly impacted by emergency repair activities because disturbance will largely be a result of required access to structures for equipment completing the repairs. Access for emergency repairs will likely avoid rufa red knot habitat because those areas are not conducive for vehicle travel. Emergency repair activities may temporarily disturb migrating rufa red knots by causing them to avoid crews and equipment in suitable wetland habitat near emergency repair sites. Disturbance will be temporary and limited to work areas and access routes.

Vegetation management will not be required in wetlands preferred by rufa red knot, so no effects are anticipated.

4.6.3 Avoidance and Minimization Measures Proposed for Rufa Red Knot

The avoidance and minimization measures proposed for the rufa red knot are:

- Wetland habitat will be avoided to the maximum extent practicable.
- Temporary disturbance of wetlands from construction will be restored upon project completion.
- Wetland habitat will be crossed using low-ground-pressure equipment and temporary matting or other best management practices (BMPs).
- Line marking devices will be installed on the overhead shield wires at river and wetland spans according to APLIC Guidelines (2012) and NPPD construction standards.
- NPPD has prepared a Migratory Bird Conservation Plan, which will avoid and minimize potential effects to migratory birds throughout the life of the R-Project.

4.7 Northern Long-eared Bat

4.7.1 Potential Effects from Construction

The northern long-eared bat occurs in forested habitats in eastern, central, southern, and northwestern Nebraska and in conifer forests of northern Cherry and Sheridan counties. The R-Project area lacks large continuous forested habitats but does include forested riparian areas that may be used as potential dispersal areas for northern long-eared bat. Limited tree removal, including planted shelter belts and riparian areas, within the white-nose syndrome zone will result in the removal of 19 acres of trees. Currently, all counties crossed by the R-Project, with the exception of Lincoln County, fall within the white-nose syndrome zone (USFWS 2018b). Trees to be removed may provide habitat for dispersing individuals. Given the small amount of suitable riparian habitat in the R-Project area, it is unlikely that the project will have an effect on the species.

The USFWS's decision to list the northern long-eared bat as threatened (80 FR 17974) identified fragmentation of forested habitats as a threat to the species' continued viability. The R-Project will not result in the removal of large, intact, unfragmented forests that were identified in the USFWS listing decision as at risk of habitat fragmentation.

The USFWS published a final 4(d) rule that accompanied the final listing for the northern long-eared bat on January 14, 2016 (81 FR 1900). The prohibitions of the final 4(d) rule apply to areas within an identified "white-nose syndrome zone," which represents all counties that contain or are within 150 miles of documented cases of white-nose syndrome or documented presence of the fungus that causes white-nose syndrome. White-nose syndrome is largely responsible for the decline of northern long-eared bat. For all areas of the country outside the white-nose syndrome zone, there are no prohibitions on incidental take as per the final 4(d) rule. Within the white-nose syndrome zone, the final 4(d) rule prohibits incidental take of northern long-eared bats (1) in known hibernacula, (2) that occurs as a result of removing a known occupied maternity roost tree or removing trees within 150 feet of a known occupied maternity roost tree during the pup season from June 1 through July 31; or (3) that occurs as a result of removing trees from within 0.25 mile of a hibernaculum at any time of year.

The fungus that causes white-nose syndrome was identified in southeastern Nebraska in November 2015. Portions of the R-Project within Holt, Wheeler, Garfield, and Loup counties fall within the white-nose syndrome zone. These counties fall on the periphery of the northern long-eared bat range, and the presence of maternity roost trees is unlikely. No underground caves or mines that may support hibernacula occur within the Permit Area. NPPD will avoid tree clearing within the transmission line ROW in Holt, Wheeler, Garfield, and Loup counties during the pup season (June 1 – July 31) to ensure compliance with the final 4(d) rule.

4.7.2 Potential Effects from Operations and Maintenance

Vegetation management of trees in the ROW and the removal of danger trees that encroach on the ROW could remove potential northern long-eared bat roost habitat. Removal of trees within the white-nose syndrome zone will not occur during the pup season (June 1 – July 31) to ensure compliance with the final 4(d) rule. This will include any future expansions in the white-nose syndrome zone as the fungus continues to spread.

Emergency repairs may temporarily disturb an estimated 301 acres during the life of the R-Project (Table 4-1); however, the timing and location of emergency repair activities cannot be predicted. Emergency repairs will not be required in northern long-eared bat habitat because trees are cleared from the ROW during construction and remain cleared throughout the life of the transmission line.

4.7.3 Avoidance and Minimization Measures Proposed for Northern Long-eared Bat

The avoidance and minimization measures proposed for the northern long-eared bat are:

- No tree clearing in the USFWS-identified white-nose syndrome zone (USFWS 2018b) during the pup season (June 1 – July 31).

4.8 Blanding's Turtle

4.8.1 Potential Effects from Construction

Table 4-1 provides a summary of estimated temporary and permanent disturbance from construction of the R-Project. Both permanent and temporary disturbance may occur in suitable Blanding's turtle upland habitat. Blanding's turtles may be found in upland habitat during their active season (April 1 – October 31) when moving to and from nesting habitat and moving between wetland habitats.

Blanding's turtles use various types of wetlands throughout the year. They rely heavily on wetlands for feeding and as refugia during travel throughout their active season and require wetlands with permanent water that is deep enough or warm enough to not freeze solid for overwintering habitat. Construction of the R-Project will temporarily disturb approximately 16 acres of wetlands. Blanding's turtles may use the seasonally flooded wetlands during the spring and early summer when they contain water and permanent wetlands year-round and possibly for overwintering. Temporary disturbance to wetlands represents 0.02% of the total wetlands available in the Study Area identified by NWI.

Blanding's turtles and their nests may potentially be crushed by construction equipment in work areas and along travel paths to and from construction sites. NPPD will employ construction monitors to survey for Blanding's turtles and their nests within these areas. Blanding's turtles prefer to nest in recently disturbed areas. Should a Blanding's turtle nest be established in a construction work area, that nest would be flagged and avoided by a one-meter radius until the nest fails due to natural causes or the hatchlings emerge and disperse. Individual Blanding's turtles would be identified and removed from disturbance areas immediately prior to their use. All relocated turtles will be placed in suitable adjacent habitat (e.g., wetland) within 100 yards. By removing Blanding's turtles from disturbed areas prior to construction activities and by avoiding nests by one meter, the R-Project will avoid take of a Blanding's turtle or nest from construction equipment. If a Blanding's turtle travels into an active construction site, construction monitors will remove the turtle from the area to suitable adjacent habitat within 100 yards. Nebraska Wildlife Statute Title 163, Chapter 4, Section 010.04 stipulates that it is unlawful to release fish or wildlife that has been transported from one location to another over a distance of 100 yards. NPPD will consult with USFWS and NGPC biologists for further guidance if suitable adjacent habitat is not available within 100 yards of the disturbed area.

Blanding's turtles may be temporarily handled by construction monitors when relocated from disturbance areas. However, temporary handling and relocation of turtles will not have a detrimental effect on Blanding's turtle and will not result in take of the species. Some turtle and tortoise species may suffer negative impacts as a result of dehydration from urinating during temporary handling coupled with a lack of water when released. This will not be the case for Blanding's turtle since water sources (rivers and wetlands) are abundant in the R-Project Area.

Blanding's turtles may become trapped in excavations dug as part of construction activities. Excavations will be checked for Blanding's turtles prior to backfilling. In instances such as structure foundations where the hole is extremely deep, the hole will be surrounded by turtle-proof fencing (e.g., silt fence) or covered to prevent turtles from falling in, in addition to checking for turtles prior to backfilling.

The R-Project will implement BMPs described in the project's Stormwater Pollution Prevention Plan (SWPPP) to control erosion and sediment runoff from construction areas before it reaches receiving water bodies. Proper implementation of BMPs will avoid sedimentation and therefore minimize potential indirect effects on wetland habitat for Blanding's turtles. The SWPPP will be prepared in support of the Clean Water Act National Pollutant Discharge Elimination System permit at a later date when project design is final and before the project goes to construction. Potential BMPs incorporated in the SWPPP may include, but are not limited to, conservation of riparian areas, installation of silt fences, straw wattles, straw bales, temporary bridges, vegetation restoration, jute netting, and sediment traps.

4.8.2 Potential Effects from Operation and Maintenance

Routine operation and maintenance activities on the R-Project will not begin until 30 years after the transmission line is energized. Routine operation and maintenance activities will occur at each structure beginning at year 30 and every ten years following for the life of the transmission line (50 years). Routine operation and maintenance activities will avoid permanent standing water where wintering Blanding's turtles may occur. In an effort to reduce potential effects on ABB, all routine operation and maintenance activities will take place during the ABB non-active season (October – April) when ABB are dormant. Restricting routine operation and maintenance activities within this time period will also reduce potential effects to Blanding's turtle by overlapping the turtle's non-active season. Routine operation and maintenance activities will have little to no effect on Blanding's turtles because they will take place during the turtles' non-active season when they are buried.

Emergency repairs may temporarily disturb an estimated 301 acres during the life of the R-Project; however, the timing and location of emergency repair activities cannot be predicted. Equipment may encounter Blanding's turtles when traveling to complete the necessary emergency repairs. However, the likelihood of equipment used for emergency repairs encountering a Blanding's turtle is low because emergency repairs are anticipated to be infrequent and would be spread out over the 50-year life of the project. BMPs may be employed to reduce the potential for sediment to reach receiving waters in suitable Blanding's turtle habitat if the required emergency repair allows enough time for BMP application.

4.8.3 Avoidance and Minimization Measures Proposed for Blanding's Turtle

The avoidance and minimization measures proposed for Blanding's turtle are:

- Wetland habitat will be avoided to the maximum extent practicable.
- Construction monitors will remove Blanding's turtles from disturbance areas or access paths immediately prior to construction activities and relocate them to adjacent suitable habitat within 100 yards in accordance with Nebraska Wildlife Statute Title 163, Chapter 4, Section 010.04.
- Construction monitors clearing ahead of equipment will use a UTV or ATV with ground visibility. The construction monitor will control speeds to ensure adequate inspection for Blanding's turtles.
- All personnel entering R-Project work areas, including contractors, will receive environmental training regarding avoidance and minimization measures identified in this HCP. The environmental training will include Blanding's turtle identification and avoidance and minimization measures.
- Fly yards/assembly areas and construction yards/staging areas will be surrounded by turtle-proof fencing (e.g., silt fence) to prevent Blanding's turtles from entering the work area.
- During the Blanding's turtle's active period, pipes, culverts, or similar structures with a diameter greater than three inches left above ground on site for one or more nights will be inspected for Blanding's turtle before the material is moved, buried, or capped.
- All open trenches and excavations left open overnight will be covered and/or fenced with temporary turtle-proof fencing (e.g., silt fencing) to prevent Blanding's turtles from falling in the open trench or excavation.

4.9 Topeka Shiner

4.9.1 Potential Effects from Construction

None of the rivers or streams spanned by the R-Project support Topeka shiner populations. Because there are no known populations of Topeka shiner occupying the rivers or streams spanned by the R-Project and no construction activities are required within these water bodies, individuals of the species will not be affected by construction activities.

Although there are no known populations of Topeka shiner in the rivers and streams crossed by the R-Project, small streams that are crossed may provide potential, although currently unoccupied, habitat. No in-water work will be required for construction of the R-Project. Existing stream crossing locations will be utilized for access to the maximum extent practicable. If small streams need to be crossed by construction equipment and an existing crossing is not available, a temporary crossing (i.e., bridge or culvert) will be installed temporarily, which will not alter the stream's flow or channel.

The R-Project will implement BMPs described in the project's SWPPP to control erosion and sediment runoff from construction areas before it reaches receiving water bodies. Proper implementation of BMPs will avoid sedimentation and therefore minimize potential effects on Topeka shiner potential habitat. The SWPPP will be prepared in support of the Clean Water Act National Pollutant Discharge Elimination System permit at a later date when project design is final and before the project goes to construction. Potential BMPs incorporated in the SWPPP may include, but are not limited to, conservation of riparian areas, installation of silt fences, straw wattles, straw bales, temporary bridges, vegetation restoration, jute netting, and sediment traps.

4.9.2 Potential Effects from Operations and Maintenance

Operations and maintenance activities will not affect Topeka shiner individuals. Routine inspections utilizing light vehicles or ATVs will use existing stream crossings and will not affect potentially suitable, albeit unoccupied, habitat. Routine maintenance and repair activities and vegetation management will not occur in potentially suitable Topeka shiner habitat.

Emergency repairs may temporarily disturb an estimated 301 acres during the life of the R-Project (Table 4-1); however, the timing and location of emergency repair activities cannot be predicted. Temporary bridges may be required for emergency repair vehicles to cross suitable Topeka shiner habitat but will be removed following completion of the repair. BMPs may be employed to reduce the potential for sediment to reach suitable but currently unoccupied Topeka shiner habitat if the required repair allows enough time for their placement prior to completing the repair.

4.9.3 Avoidance and Minimization Measures Proposed for Topeka Shiner

The avoidance and minimization measures proposed for the Topeka shiner are:

- No in-water work will be conducted in small streams providing potentially suitable habitat.
- Existing stream crossings will be used to the maximum extent practicable. If small streams need to be crossed by construction equipment and an existing crossing is not available, a temporary crossing (i.e., bridge or culvert) will be installed temporarily, which will not alter the streams flow or channel.
- BMPs described in the project SWPPP will be implemented to control erosion and sediment runoff from construction areas before it reaches receiving water bodies.

4.10 Blowout Penstemon

4.10.1 Potential Effects from Construction

Potentially suitable blowout penstemon habitat was identified by a desktop habitat assessment to analyze the potential effects of the R-Project. Potentially suitable habitat is characterized by "blowouts" or sparsely vegetated depressions in actively moving sand dunes created by wind erosion (USFWS 1992; Kaul et al. 2006). Blowouts within the R-Project transmission line ROW and potential disturbance areas outside the ROW were mapped based on the review of detailed 2013 aerial imagery (approximately one-foot pixel resolution) by a local species expert to define potentially suitable habitat (Stubbendieck, James. Botanist, retired from University of Nebraska. Personal communication via meeting with Kirsten Severud. October 2014).

In addition, there are two areas crossed representing buffered occupied blowout penstemon habitat based on NNHP data (NGPC 2013b). Examination of detailed aerial imagery did not identify any blowouts in one of these buffers. Examination of detailed aerial imagery identified a 1.1-acre blowout located 40 feet from the edge of the ROW in the other buffer. A total of 76 blowouts were identified based on the desktop habitat assessment and the NNHP data.

Blowouts will be avoided to the maximum extent practicable. However, construction activities for the R-Project may result in potential disturbance of blowouts so those identified in the desktop assessment were surveyed via helicopter in June 2015 and 2016 during the blowout penstemon flowering period. No blowout penstemon plants were observed in the blowouts surveyed. In addition, Dr. Stubbendieck assessed the habitat of each blowout surveyed in 2015 and 2016 and found that only nine of the 74 blowouts provide good habitat quality for blowout penstemon (POWER 2016a).

Prior to construction, an additional survey will be conducted to confirm the 2015 and 2016 surveys. Preconstruction surveys will be conducted in blowouts previously assessed as having good habitat quality, the nearby blowout within NNHP buffered occupied habitat, and any disturbance areas based on final design that support blowouts. If occupied habitat is identified during the preconstruction survey, the R-Project design will be adjusted to avoid impacts.

NPPD will only revegetate disturbance caused by construction of the R-Project. Because disturbance areas will avoid blowouts, few, if any, blowouts will require restoration efforts. Therefore, no direct mortality of individual plants or loss or degradation of occupied habitat will occur during construction or restoration of temporary disturbance areas.

4.10.2 Potential Effects from Operations and Maintenance

Routine inspection of the transmission line will be completed by helicopter, fixed-wing aircraft, and ground patrols twice per year. Ground patrols are typically conducted using light ATVs or foot patrol. Ground patrols would avoid blowout penstemon habitat.

Routine maintenance and repair activities are not expected to affect blowout penstemon since the transmission structures are not sited in blowouts. Access for routine maintenance and repairs would avoid blowout penstemon habitat because blowouts are not conducive to equipment and vehicle travel. If future blowouts originate at a structure or migrate toward a structure, NPPD would secure (revegetate or otherwise stop the aeolian erosion) these blowouts before they reached a size and vegetated state suitable to support blowout penstemon.

Emergency repairs may temporarily disturb an estimated 301 acres during the life of the R-Project (Table 4-1); however, the timing and location of emergency repair activities cannot be predicted. Emergency repairs are not anticipated to affect blowout penstemon because structures and construction access will not be located in blowout habitat. Therefore, emergency repair activities will avoid blowouts.

4.10.3 Avoidance and Minimization Measures Proposed for Blowout Penstemon

The avoidance and minimization measures proposed for the blowout penstemon are:

- Blowout habitat will be avoided to the maximum extent practicable.
- All identified blowout penstemon occurrences will be avoided.
- A preconstruction blowout penstemon survey will be conducted prior to the onset of construction activities to confirm that occupied habitat has been avoided. Surveys will take place between June and July, the recognized flowering period for blowout penstemon or during other times of the growing season as determined by a local species expert.

4.11 Western Prairie Fringed Orchid

4.11.1 Potential Effects from Construction

Potentially suitable western prairie fringed orchid habitat was identified by a desktop habitat assessment and field verified to analyze potential effects of the R-Project. The results of the desktop habitat assessment were reviewed by a recognized and published orchid expert, Bob Steinauer. Potentially suitable habitat is characterized by moist to somewhat dry prairies and unplowed, calcareous tallgrass prairies, sedge meadows, old fields, and roadside ditches (USFWS 1996; Kaul et al. 2006). Potentially suitable habitat for western prairie fringed orchid was identified using NWI, NHD, and/or NRCS soils data defined as hydric and/or soils having any of the following wetland soil components: Elsmere, Ipage, Tryon, Hoffland, or Marlake (NRCS 2012); NNHP community type element occurrences associated with wetland habitat (NGPC 2013b); or Tier I and II plant species locations that are associated with wetland habitats (NGPC 2013b).

Western prairie fringed orchid surveys were conducted in late June 2015, 2016, 2017, and 2018 (optimal flowering period). Surveys were conducted on foot or UTV in potentially suitable orchid habitat along the R-Project ROW and off-ROW disturbance areas. Western prairie fringed orchids were found at two locations in 2015 near a known occurrence at Carson Lake and at one location near a known occurrence close to Big Cedar Creek (POWER 2015b). In 2016, western prairie fringed orchids were surveyed within potential orchid habitat and were found at multiple locations between State Highway 11 and County Road 465 Avenue (POWER 2016b), including one substantial population. No additional western prairie fringed orchid populations were found in 2017 or 2018, but known populations were re-visited and verified to be extant.

Flowering within a western prairie fringed orchid population is highly variable from year to year depending on environmental factors, such as precipitation the previous year, landowner haying regimes, and grazing practices. As such, it is possible that individual plants may be present but are not recorded because they are not in flower or visible. According to Bob Steinauer, the precipitation received in 2015 made 2016 a good year for orchid flowering. Due to the inherent variability in flower production, preconstruction surveys will be conducted during the flowering period each year prior to start of construction in potentially suitable orchid habitat. If occupied habitat in addition to what was identified in field surveys is identified during the preconstruction survey, the R-Project design would be adjusted to avoid impacts. Preconstruction surveys will cover all potentially suitable habitat as landowner restrictions will be resolved prior to construction. Therefore, no direct mortality of individual plants or loss or degradation of occupied habitat will occur during construction.

Construction activities for the R-Project may result in potential disturbance of 276 acres of western prairie fringed orchid habitat that was field-verified during the surveys. An additional 44 acres of habitat may be suitable for western prairie fringe orchid; however, surveyors were unable to confirm these areas because right-of-entry was not granted by the landowners of those areas. Disturbances in field-verified suitable habitat will be temporary and may include access paths, fly-yards, construction yards, pulling and tensioning sites, and structure work areas. Temporary disturbance areas will be sited to avoid field-verified suitable habitat to the maximum extent practicable. Existing stream crossings will be used and any new temporary crossings of wetlands and streams required for access will utilize temporary bridges, culverts, and matting, which will not alter hydrology. BMPs in the project-specific SWPPP will be implemented to prevent and minimize sediment runoff from construction areas from entering receiving wetlands and streams that may provide suitable western prairie fringed orchid habitat. All temporarily disturbed areas in field-verified western prairie fringed orchid habitat will be restored following the completion of construction activities. See Section 6.3.2 for further discussion of restoration activities.

4.11.2 Potential Effects from Operations and Maintenance

Routine inspection of the transmission line will be completed by helicopter, fixed-wing aircraft, and ground patrols twice per year. Ground patrols are typically conducted using light ATVs or foot patrol. Ground patrols would avoid wetlands including western prairie fringed orchid habitat to the maximum extent practicable.

Routine maintenance and repairs will not begin until 30 years after the in-service date and will occur once every 10 years for the remainder of the life of the transmission line. Since structures are sited in upland areas, maintenance and repair activities at these structures are not anticipated to affect western prairie fringed orchid habitat. Access to these structures will be evaluated for potential habitat and avoided to the maximum extent practicable.

Construction-related impacts currently avoid all known western prairie fringed orchid occurrences based on project-specific surveys. However, it is likely that western prairie fringed orchid occurrences will change over the next 30 years before routine maintenance and repairs begin. As stated in Table 2.1, routine maintenance activities would only occur from October to April when the species is not actively growing or flowering, and there is no information available to suggest that driving over dormant plants has a negative effect. Adverse effects to western prairie fringed orchids would not occur from routine maintenance and repairs due to activities occurring when the plants are dormant and would not result in loss of individuals or habitat.

Emergency repairs may temporarily disturb an estimated 301 acres during the life of the R-Project (Table 4-1); however, the timing and location of emergency repair activities cannot be predicted. Field-verified suitable orchid habitat will be avoided by emergency repair activities to the maximum extent practicable. However, habitat suitability for western prairie fringed orchid changes from year to year depending on the current grazing or haying regime, precipitation, and ground water levels. Areas of field-verified suitable habitat may not remain suitable throughout the duration of the ITP and areas that are currently not suitable may become so. All disturbance associated with emergency repairs will be temporary and restoration activities will be employed if necessary.

4.11.3 Avoidance and Minimization Measures Proposed for Western Prairie Fringed Orchid

The avoidance and minimization measures proposed for the western prairie fringed orchid are:

- Field-verified orchid habitat will be avoided to the greatest extent possible.
- Identified western prairie fringed orchid occurrences will be avoided.

- A preconstruction survey will be conducted in the appropriate survey window immediately prior to the onset of construction activities to confirm that occupied habitat has been avoided. Surveys will take place between mid-June and July, the recognized flowering period for western prairie fringed orchid.
- BMPs described in the project SWPPP will be implemented to control erosion and sediment runoff from construction areas before it reaches receiving waters and wetlands.

5.0 POTENTIAL EFFECTS ANALYSIS AND TAKE ASSESSMENT

5.1 American Burying Beetle

This section addresses potential effects, both direct and indirect, of the R-Project on the Covered Species identified in Section 1.0. The only species categorized as a Covered Species in this HCP is the ABB. Potential effects from Covered Activities associated with construction, operation, and maintenance of the R-Project have potential to cause take of ABB. Potential effects to ABB analyzed in this chapter include direct mortality due to operation of construction equipment, temporary and permanent loss of habitat, fragmentation of habitat, degradation of habitat through lighting, and temporary disruption of behavior. Avoidance and minimization measures that will be implemented to reduce potential effects to ABB are described in Section 6.0.

The ABB is a habitat generalist that may occur in multiple land cover types and is therefore assumed to be present in all habitats within the Permit Area (Section 1.4, Figure 1-2). While disturbance areas will be located on previously disturbed lands to the maximum extent practicable, this analysis assumes that all Covered Activities within the Permit Area will occur within ABB habitat. Covered Activities that occur in areas that are not likely to support ABB will be identified prior to the onset of construction and will be reported to the USFWS through Compliance Monitoring. See Section 6.2.1 for definitions of what constitutes areas unsuitable for ABB use and Section 6.3.1 for additional details on Compliance Monitoring. Table 5-1 provides estimates of temporary and permanent ground disturbance that will occur as a result of Covered Activities within the Permit Area. Acres presented in Table 5-1 are derived from disturbances associated with the R-Project preliminary design. These disturbance values were used to estimate potential effects and approximate take of ABB.

TABLE 5-1 TEMPORARY AND PERMANENT DISTURBANCE ESTIMATES FOR COVERED ACTIVITIES WITHIN THE PERMIT AREA

COVERED ACTIVITY	ESTIMATED TEMPORARY DISTURBANCE (ACRES)	ESTIMATED PERMANENT DISTURBANCE (ACRES)
CONSTRUCTION		
Access		
Temporary Access Scenario 2	192	--
Permanent Access Scenario 3[1]	--	19
ROW Preparation		
ROW Tree Clearing[2]	29	--
Temporary Work Areas		
Fly Yards/Assembly Areas	156	--
Construction Yards/Staging Areas	82	--
Pulling and Tensioning Sites	192	--
Temporary Structure Work Areas		
Lattice Tower	129	--
Steel Monopole	219	--
Structure Foundation Excavation/Installation		
Helical piers – lattice tower	--	0.61
Standard foundation – steel monopole	--	0.25
Distribution Power Line Relocation		
Distribution power line relocation	43	0.09
Well Relocation		
Well relocation	0.4	--
Substation		
Thedford Substation	--	13
Construction Subtotal	**1,042**	**33**
OPERATION AND MAINTENANCE		
Emergency Repairs[3]	208	--
TOTAL	**1,250**	**33**

[1]Temporary access routes under Access Scenario 2 may be left in place following completion of construction depending on landowner requests and requirements for operation and maintenance of the line. These routes would then be classified as Access Scenario 3 and represent a permanent impact. No more than 10% (19 acres) of Access Scenario 2 will be left in place following construction.
[2]Trees will not be allowed to re-grow within ROW. ROW will be converted to grassland.
[3]Disturbance from emergency repairs is estimated at 20% of the temporary disturbance from construction in the Permit Area. Disturbed areas would be restored if conditions require restoration efforts.

5.1.1 Potential Effects from Construction

Construction related to Covered Activities has the potential to affect ABB in the following ways:

- Crushing and desiccation of individuals.
- Direct habitat disturbance.
- Fragmentation of habitat.
- Degradation of habitat from lighting.
- Temporary disruption of behavior.

Crushing and Desiccation of Individuals

A potential effect to ABB is the loss of individuals, including eggs and larvae in brood-rearing chambers, due to mortality caused by crushing from construction equipment. Removal and physical alteration of soil during excavation and grading may crush ABB resulting in injury or mortality. Covered Activities that do not require physical alteration of soils but include the repeated use of heavy equipment, or areas where any equipment will be parked, may still cause mortality and injury by crushing or preventing the escape of buried ABB.

In addition to mortality as a result of crushing, Covered Activities involving physical alteration of soil may uncover ABB adults, larvae, and eggs. The resulting exposure may result in desiccation, leading to injury or mortality. For the purposes of this analysis, it is assumed that any ABB occupying an area physically disturbed by Covered Activities will suffer mortality via crushing from construction equipment or desiccation as a result of exposure. It is unlikely that ABB would use any temporarily disturbed areas after the initial disturbance. Therefore, ABB would not be at an elevated risk of crushing or desiccation from the repeated use of a temporarily disturbed area by construction equipment.

Covered Activities completed in the winter that do not involve the physical alteration of soil likely will not result in mortality or injury to ABB. Studies indicate that ABB in Nebraska bury to much greater depths to survive cold winters than they do during the day in the active season. Overwintering ABB in Nebraska bury to just beneath the frost line and move deeper during colder weather if the frost line moves deeper. Conley (2014) used *N. orbicollis* as a surrogate for ABB and showed this species can bury up to 80 centimeters (2.6 feet) over the winter. Average winter burial depth ranged from 26 centimeters (10 inches) during the 2011-2012 winter to 51 centimeters (20 inches) during the 2013-2014 winter. The frost line during Conley's studies occurred between 20 centimeters (7.8 inches) and 30 centimeters (12 inches), depending on the severity of the winter. Covered Activities that do not require the physical alteration of soils are not likely to crush overwintering ABB due to the increased depth at which individuals are buried. The layer of frozen soil above overwintering ABB will also act as a solid surface to disperse the weight of construction equipment, thus protecting the buried individual. A construction timeline identifying when and where each Covered Activity will occur has not been developed at this time. For this reason, it is assumed that all Covered Activities have potential to result in the mortality or injury to ABB occupying areas of disturbance, regardless of the season. This assumption likely results in an over-estimation of effects to ABB.

Avoidance and minimization measures will reduce potential mortality and injury of ABB individuals, including eggs and larvae in brood-rearing chambers, by minimizing the acres of habitat disturbed by Covered Activities. Because all ABB habitats in the Permit Area are assumed to be occupied by ABB, reducing the acres of habitat disturbed will reduce the number of ABB encountered. Avoidance and minimization measures are further described in Section 6.2.1 and include: (1) avoidance of preferred habitat where practicable (i.e., sub-irrigated wet meadows and mesic grasslands); (2) the use of existing access roads, helical pier foundations for lattice structures, and low-ground-pressure equipment; (3) minimizing structure work areas for lattice structures; (4) helicopter construction of lattice structures; and

(5) siting disturbance areas on areas unsuitable for ABB use to the maximum extent practicable. By using, to the maximum extent practicable, a combination of existing access roads and low-ground-pressure equipment where no current access road exists, the R-Project will reduce the acres of ABB habitat affected by access. Helical pier foundations for lattice structures require fewer and smaller pieces of construction equipment, a smaller temporary structure work area, and less developed access to each structure than traditional foundations on steel monopole structures. Helicopter construction of lattice structures eliminates the need for larger equipment such as cranes and materials delivery trucks to access individual lattice tower temporary structure work areas. Implementation of these avoidance and minimization measures reduces mortality resulting from Covered Activities by reducing the acres of habitat disturbed.

Direct Habitat Disturbance

The majority of ABB habitat within the R-Project ROW will be spanned and undisturbed. Some areas of ABB habitat cannot be avoided. Covered Activities will result in the temporary disturbance of 1,042 acres (Table 5-1). For purposes of this analysis, all areas disturbed by Covered Activities within the Permit Area were considered ABB habitat. The impact of temporary disturbance is minor when compared to the acres of available ABB habitat in the Sandhills (Table 5-2).

TABLE 5-2 TEMPORARY DISTURBANCE COMPARED TO AVAILABLE ABB HABITAT

GEOGRAPHIC AREA	ACRES TEMPORARY DISTURBANCE	ACRES OF AVAILABLE ABB HABITAT	% DISTURBED
Permit Area	1,042	503,963	0.20%
Sandhills Estimated Occupied Range	1,042	5,574,357	0.018%

All acres of temporary disturbance that are ABB habitat prior to construction will be restored with native grassland seed mix following completion of construction activities. Restoration will be based on R-Project specific restoration and revegetation requirements, including the use of specific seed mixes to prevent the establishment of non-native vegetation. Following completion of restoration activities, these areas again will be available as ABB habitat. Acres of temporary disturbance will not be available as ABB habitat in the duration between the completion of construction activities and successful restoration of vegetation, which can be three to five years. However, this short-term impact will be minor as shown in Table 5.2.

Portions of the Permit Area containing trees are mostly forested riparian areas and planted windrows and shelterbelts. These habitats may support ABB. Based on the preliminary design, ROW clearing within the Permit Area will result in the removal of approximately 29 acres of trees; however, shelterbelts are an important landscape feature to landowners because they provide shelter and a windbreak for calving. The number of acres removed will be reduced if possible. Tree-cleared areas will be converted to grassland habitat following the completion of construction activities. Areas that have been cleared of trees will not provide habitat until restoration has been completed. Because ABB is a habitat generalist, these areas will continue to provide ABB habitat following restoration. Therefore, tree clearing will result in a temporary loss of habitat, similar to other disturbance areas, until restoration is complete.

Areas temporarily disturbed by construction activities may be used more than one time throughout the construction process, but that habitat will only be removed once during the initial construction activity. Once disturbed, the area will no longer support suitable habitat for ABB and any additional use would not result in further take of ABB until the area is restored. For instance, a single structure work area may be used over the course of two ABB generations for site preparation, foundation installation, structure erection, and potentially pulling and tensioning (in that order), all at the same location. However, habitat removed during site preparation would not be returned to ABB habitat until all construction activities are completed at that location. For the purposes of the ABB take calculation in Section 5.2, those acres are only removed as habitat one time and only have the potential to take ABB within that habitat one time. Therefore, those disturbed acres are only accounted for in the take calculation once, even if activities may occur on that disturbed area over multiple active seasons at that location.

Permanent disturbance of ABB habitat will occur at structure foundations and at permanent access roads under Access Scenario 3. The need for permanent access roads under Access Scenario 3 is dependent on landowner requests and requirements for operation and maintenance of the line, but the total acreage will not exceed 10% of the Access Scenario 2 acres. Permanent access roads under Access Scenario 3 will not create any additional disturbance beyond that incorporated under Access Scenario 2. Tubular steel monopole structures require a permanent foundation that occupies approximately 38 square feet. Lattice structures require a permanent foundation at each of the four legs that occupies 16 square feet (64 square feet for all four legs). Permanent loss of ABB habitat from structure foundations will be less than one acre (Table 5-1).

Fragmentation of Habitat

Fragmentation of habitat is considered a major cause of ABB population decline throughout the species range (USFWS 1991 and 2008). The USFWS 5-year review for ABB ties fragmentation to the conversion from habitat to developed and agricultural lands (USFWS 2008). The ABB Recovery Plan relates habitat fragmentation to an increase in edges between two habitat types: one being suitable habitat and the other being unsuitable (i.e., grassland and agricultural uses) (USFWS 1991). See Section 3.2.1 for additional information regarding ABB and habitat fragmentation.

The majority of access routes will be temporary and will be restored upon completion of construction to their previous habitat condition. Restoration may take up to five years following completion of construction activities. Temporary access routes may result in the short-term fragmentation of ABB habitat. Vertebrate scavengers that compete for prey sources may use these temporary access routes as travel corridors into unfragmented grassland habitat, thus increasing competition for ABB until the disturbance is restored. Once revegetated, temporary access routes will not present a permanent travel corridor for vertebrate scavengers into grassland habitats.

The R-Project will result in the permanent loss of less than one acre of ABB habitat within the Permit Area at structure locations and a maximum of 19 acres as a result of permanent access roads. The R-Project also will not result in the creation of permanent edges between two habitat types once disturbance areas are revegetated, with the exception of a minimal amount under Access Scenario 3. The R-Project will not present a travel barrier to ABB. Tree removal will result in the permanent alteration of habitat, but those areas will continue to provide ABB habitat once revegetated. Trees located in narrow riparian areas and planted windrows and shelterbelts do not provide large contiguous blocks of forested habitat used by ABB in other parts of their range. Therefore, removal of riparian area trees and planted windrows and shelterbelts within the ROW will not fragment forested habitat.

Presence of the transmission line itself will not fragment ABB habitat. ABB are routinely captured along road sides with adjacent power lines of varying voltage. If power lines triggered ABB avoidance of otherwise suitable habitat, ABB would not be captured under these lines as frequently as they are. By eliminating the permanent alteration of large expanses of ABB habitat and the creation of permanent edges, habitat fragmentation will be avoided.

Temporary Disruption of Behavior

Increases in human activity, vehicle traffic, and noise as a result of Covered Activities may cause ABB outside the project area to avoid areas occupied by construction personnel and equipment that may otherwise present suitable habitat. ABB avoidance of construction personnel and equipment is expected to be temporary. Further, it is expected that ABB would continue to utilize adjacent habitats during the temporary disturbance. Temporary avoidance of limited areas of habitat is expected to have no effect on ABB given the abundance and availability of habitat throughout the Sandhills region.

Degradation of Habitat from Lighting

ABB, like many insects, are attracted to artificial lighting (USFWS 1991). This attraction may disrupt normal ABB feeding behavior or increase the risk of predation by attracting individuals to areas unsuitable for ABB use. Covered Activities may occur in limited instances at night. Covered Activities occurring at night will require some form of artificial lighting, which may attract foraging ABB to construction areas. Potential occurrence of effects from artificial lighting would be limited to the ABB active season of June through August (USFWS and NGPC 2008), during which construction activities will be completed during the daytime to the maximum extent possible. In rare instances when nighttime work may be required during the active season, potential effects resulting from such use of artificial lighting would be temporary and short in duration. Permanent lighting of structures within the Permit Area is not anticipated. While the FAA may require lighting of structures taller than 200 feet, at this time, no structures for the R-Project are anticipated to be taller than 200 feet.

5.1.2 Potential Effects from Operation and Maintenance

Routine operation and maintenance activities on the R-Project will not begin until 30 years after the transmission line is energized. Routine operation and maintenance activities will visit each structure beginning at year 30 and every ten years following for the life of the transmission line. Refurbishment of the line is not expected to occur until year 50. Equipment used to access each structure and complete routine operation and maintenance activities will be low-ground-pressure equipment when possible. All routine operation and maintenance activities will take place during the ABB non-active season (October – April) when ABB are dormant. Access to the structures will be by overland travel or two-tracks and will not require any temporary improvements that may remove potential ABB habitat for equipment to access structures. Studies completed by Willemssens (2015), described in Section 3.2.1, support the assertion that access by NPPD operation and maintenance equipment would have no effect on buried ABB. Compaction and mortality studies conducted by Willemssens (2015) included the largest vehicle in NPPD's operation and maintenance fleet. When the results of Willemssens (2015) are considered in conjunction with the use of low-ground-pressure equipment when possible, completing scheduled activities during the ABB non-active season, and not requiring temporary improvements and removal of ABB habitat for structure access, routine operation and maintenance activities will not result in the take of ABB.

It is possible that emergency repairs will be required at some time during the 50-year permit duration. However, the timing and location of emergency repairs to the R-Project transmission line is not known at this time. The extent of emergency repairs that may impact ABB is estimated at 20% of the total temporary disturbance from construction within the Permit Area. The result is 208 acres (1042 x 0.2) of temporary disturbance associated with emergency repairs within the Permit Area over the duration of the permit. Emergency repairs may include repairs to isolated damage, such as single insulators or weak points on conductors, as well as large-scale repairs following severe weather events.

Emergency repairs may be completed at any time of the year, including the ABB active season, and may include the use of any equipment necessary to complete the repair. The majority of potential effects to ABB habitat from emergency repairs would be caused by necessary access to structures. NPPD would apply the final Access Plan created for construction purposes when determining how and where to access the necessary repair, to the extent practicable. NPPD would use low-ground-pressure equipment to complete these repairs when possible. However, some repairs may require heavy equipment that would disturb ABB habitat.

Potential effects from 208 acres of temporary disturbance associated with emergency repairs within the Permit Area would be similar to those described for construction in Section 5.1 under Crushing and Desiccation of Individuals and Direct Habitat Disturbance. Emergency repairs will not likely require the physical alteration of soils but may require the use of equipment that could potentially crush buried ABB. Emergency repairs would employ avoidance and minimization measures described in Section 6.2.1 when the situation allows. However, some situations, such as storm-related line failure, may require NPPD to act quickly to restore power. In these instances implementation of avoidance and minimization measures may not be feasible.

Any potential disturbance to ABB habitat under emergency repairs will be temporary. If necessary, NPPD will restore ABB habitat disturbed during emergency repairs per the requirements of the Restoration Management Plan. USFWS and NGPC will be notified of actions undertaken during emergency repairs and will coordinate land cover restoration activities.

5.2 Estimated Take of Covered Species

5.2.1 ABB Density Estimate

For circumstances where take of ABB is relatively likely to occur, take is difficult to precisely quantify as numbers of ABB individuals because:

- ABB surveys cannot be completed along the R-Project route because NPPD has not gained right of entry for all properties.
- The ABB is a relatively small organism, making it unlikely to observe dead or injured individuals.
- Loss of individual ABB may be masked by annual fluctuations in numbers.
- ABB individuals spend a substantial portion of their lifespan underground.
- ABB are primarily active at night (USFWS 2014a).
- ABB are mobile.
- ABB activity is influenced by daily climatic conditions.

For these reasons, take of ABB often is expressed in numbers of acres of habitat expected to be rendered either degraded where ABBs are still present but with reduced success or unsuitable for further use by ABB as a result of Covered Activities. Several conservation plans use acres of habitat as a proxy for individuals when estimating take of ABB (USFWS 2005; Atkins 2011; Enercon Services, Inc. 2012; USFWS 2014b). However, courts have recognized that "Congress wanted incidental take to be stated in number of animals where practical, not in terms of habitat markers" (*Miccosukee Tribe of Indians of Florida vs. United States*, 566 F.3d 1257, 1274 [11th Cir. 2009]). The Permit Area (Section 1.4) is within an area with extensive existing trap data. These data are typically collected for proposed development projects, including roads, urban development, and energy infrastructure, and are not uniformly distributed across the counties included here. Because development projects typically occur along existing access, and for ease of completing large survey transects, the majority of traps were placed along existing roads. The decision to include portions of Logan County in the Permit Area was based on potential ABB habitat. Existing trap data analyzed to estimate take included data collected from 1996 through 2016, including data collected in support of the R-Project in 2014, 2015, and 2016. The take estimation method described below was developed in coordination with NPPD and USFWS and agreed upon in December 2016.

Take estimation derived from existing trap data is based on an operational assumption that the entire disturbance area of the R-Project is considered high-quality habitat for ABB. This allows the analysis to include historic sampling data (1996-2016) collected from outside the Permit Area where there is reason to believe that ABB surveys sampled mostly high-quality habitats. ABB populations fluctuate annually based on climate factors including precipitation and temperature (USFWS and NGPC 2008). Incorporating numerous years of historic data from a large spatial area allows the take estimation to increase the sample size and increase the reliability of conclusions about temporal variability in ABB abundance without having to wait until sampling within the R-Project area has been repeated over many years.

To ensure that the data used to calculate the take estimate only represents high-quality habitat, the historic database was screened to include only those traps with at least six unmarked beetles captured across a standardized 5-night sampling effort. All survey points with less than a 5-night sampling period were removed, surveys with a 5-night survey period were included, and surveys with more than five nights were standardized by multiplying the average ABB per trap night by five. The habitat assumption and database screening criteria yielded a set of data for analysis consisting of 299 ABB survey points. This data set is likely composed almost exclusively of ABB surveys conducted within good to prime habitats in the Sandhills. See Section 6.3.1 for full definitions of ABB habitat categories.

Individual densities for each trap were calculated by dividing the number of ABB captured in each trap by the effective trap area (500 acres) and then adjusting for a capture efficiency of 90% (rounded up from 89.4; Butler 2011). ABB populations fluctuate annually based on climate factors including precipitation and temperature (USFWS and NGPC 2008). Because of the annual population fluctuation, the take estimate will apply a precautionary approach to protect against underestimation of the R-Project's potential incidental take by applying a density based on the 99th percentile of the dataset described above. The 99th percentile means that 99% of all data points are less than the 99th percentile data point. The 99th percentile density is 0.13 ABB/acre.

An additional screening criterion was also included that only considered surveys completed in August. This reduced the sample size from 299 survey points to 167. However, the 99th percentile density did not change after this criterion was added and remained 0.13 ABB/acre.

5.2.2 ABB Take Calculation

Covered Activities associated with construction will temporarily disturb an estimated 1,042 acres and permanently disturb 33 acres within the Permit Area. Covered Activities associated with emergency repairs will temporarily disturb an estimated 208 acres within the Permit Area (Table 5.3). All of the acres within the Permit Area are assumed to be ABB habitat. When multiplied by 0.13 ABB/acre, Covered Activities associated with construction will account for an estimated take of 140 ABB during construction of the R-Project. Covered activities associated with emergency repairs will account for an estimated take of 27 ABB during operation and maintenance of the R-Project. Total ABB take is 167 for construction and emergency repair of the R-Project over the 50-year permit duration.

Temporary access routes under Access Scenario 2 may be left in place following completion of construction depending on landowner requests and requirements for operation and maintenance of the line. These routes will then be classified as Access Scenario 3 and represent a permanent impact. No more than 10% (19 acres) of Access Scenario 2 would be left in place following the completion of construction. Permanent access roads under Access Scenario 3 would not create any additional disturbance beyond that incorporated under Access Scenario 2. Permanent access roads under Access Scenario 3 would be used during emergency repair situations to the greatest extent feasible given the site-specific situation.

ABB larvae and eggs may be present in disturbance areas during the ABB breeding season (June through August). Brood chambers typically contain 12 to 18 larvae and two adult ABB (USFWS 2013a). Eggs and larvae may be at risk of take for approximately six weeks each year during the construction timeframe. Specific areas of disturbance that may occur from June through August when eggs or larvae may be present have not been identified at this time. The density estimate of 0.13 ABB per acre was derived from survey efforts that occurred after the ABB breeding season and includes all ABB larvae that successfully emerged.

TABLE 5-3 ANTICIPATED TAKE FROM COVERED ACTIVITIES ASSOCIATED WITH CONSTRUCTION, OPERATION, AND MAINTENANCE

COVERED ACTIVITY	ESTIMATED DISTURBANCE (ACRES)	ESTIMATED ABB DENSITY PER ACRE	ABB TAKE
CONSTRUCTION			
Access			
Temporary Access Scenario 2	192	0.13	25
Permanent Access Scenario 3[1]	19	0.13	2
ROW Preparation			
ROW Tree Clearing[2]	29	0.13	4
Temporary Work Areas			
Fly Yards/Assembly Areas	156	0.13	20
Construction Yards/Staging Areas	82	0.13	11
Pulling and Tensioning Sites	192	0.13	25
Temporary Structure Work Areas			
Lattice Tower	129	0.13	17
Steel Monopole	219	0.13	28
Permanent Structure Foundations			
Lattice Tower	0.61	0.13	0.079
Steel Monopole	0.25	0.13	0.032
Distribution Power Line Relocation			
Distribution Power Line Relocation	43	0.13	6
Well Relocation			
Well Relocation	0.4	0.13	0.052
Substation			
Thedford Substation	13	0.13	2
Construction Subtotal	**1,075**	**--**	**140**
OPERATION AND MAINTENANCE			
Emergency Repairs[3]	208	0.13	27
TOTAL	**1,283**	**--**	**167**

[1]Temporary access routes under Access Scenario 2 may be left in place following completion of construction depending on landowner requests and requirements for operation and maintenance of the line. These routes would then be classified as Access Scenario 3 and represent a permanent impact. No more than 10% (19 acres) of Access Scenario 2 will be left in place following construction.
[2]Trees will not be allowed to re-grow within ROW. ROW would be converted to grassland.
[3]Disturbance from emergency repairs is estimated at 20% of the total estimated temporary disturbance from construction within the Permit Area. Disturbed acres would be restored if conditions require restoration efforts.

5.3 Anticipated Impacts of the Taking

A published, recognized population estimate for the entire Sandhills ABB population is not available. Therefore, the same method and assumptions used to determine take of ABB for the R-Project were applied to estimate a population when analyzing the impacts of the taking.

The median ABB density in the Sandhills is 0.01 ABB per acre. While NPPD used a density based on the 99th percentile value to calculate take, applying that upper limit to the entire ABB Sandhills population would provide an artificially inflated population estimate. Therefore, this analysis compares a take estimated from the 99th percentile value of available data (0.13 ABB per acre) to a population size estimated from the median density (0.01 ABB per acre). Note that to incorporate the likelihood of high suitability habitat across the R-Project, the take estimate applies the 99th percentile value of a data set that only includes traps that captured at least one ABB for each trap night. The median density of 0.01 ABB per acre is the same as the 50th percentile value of this data set, meaning that half of all traps were above this density and half were below. Using this approach provides a means to determine the maximum potential impact from the take to the entire ABB population using the accepted confines of statistical analysis.

Jorgensen et al. (2014) completed a model to predict the probability of occurrence for ABB throughout the Sandhills. The USFWS considers ABB to be present in all areas with a greater than 1.0% probability of occurrence to reduce the likelihood that an area is classified as unoccupied based on the model when ABB are actually present. However, the report that accompanied the completed model suggested alternative ways to interpret the results. Jorgensen et al. (2014) suggests a more accurate way to interpret the results is to consider areas with a probability of occurrence greater than or equal to 60% as locations where ABB "does occur," areas with a probability of occurrence between 15% and 60% are locations where ABB may "potentially occur," and areas with a probability of occurrence lower than 15% are locations where ABB are absent. For purposes of determining the impact of the taking and avoiding an artificial over-inflation of the ABB population in the Sandhills, this HCP will only apply that density to areas with a probability of occurrence of greater than or equal to 60%.

Because the ABB is a habitat generalist, and the majority of the Permit Area is rangeland, it is possible that 100% of the Permit Area provides habitat for the species, supporting the assumption that all areas disturbed by the R-Project are occupied. However, to be conservative in the impacts of the take analysis, this HCP compares potential impacts to those areas with a probability of occurrence greater than or equal to 60% or areas where ABB are most likely present. The Permit Area contains 503,963 acres of ABB habitat with a probability of occurrence greater than or equal to 60% as identified in Jorgensen et al. (2014). Using a density of 0.01 ABB per acre, it is estimated that 5,039 ABB may be present within the Permit Area in a year with a median ABB population.

The estimated take of 167 beetles represents 3.3% of the estimated median ABB population within the Permit Area. Comments from the USFWS indicate that ABB may be attracted to traps from unknown distances and that ABB populations are highly variable from year to year and area to area. Such fluctuations are evident in the variation that exists in densities determined from both the trap-based data set provided by USFWS and in Jurzenski (2012).

Construction of the R-Project will occur over approximately 21 to 24 months or at least two generations of beetles. However, because it is unknown at this time how to proportionally divide the take during construction, the 140 ABB estimated to be incidentally taken during construction only will be compared to a single generation as a worst-case scenario. While the take will occur over two generations, there will not be two generations of ABB taken from the same area. Once habitat is impacted, it would no longer be considered suitable for ABB until it is restored; therefore, the take can only occur once. The additional 27 ABB that would be taken by emergency repairs would be spread over the remaining life of the permit.

ABB probability of occurrence modeling estimates indicates that the Sandhills ABB population occurs in approximately 10 million acres of habitat (Jorgensen et al. 2014). Areas with a modeled probability of occurrence greater than or equal to 60% represent 5,574,357 acres within the Sandhills. Using the median density of 0.01 ABB per acre, an estimated 55,743 ABB may be present within these lands. The take of 167 ABB represents 0.29% of the entire Sandhills ABB population. Given the natural variation in trap efficiency and population fluctuation of ABB noted within the USFWS dataset, impacts to the ABB population as calculated within this analysis would not be detectable on the local scale (Permit Area) and would be even further diluted and impossible to measure on the Sandhills-population scale.

Another approach to analyzing impacts to the ABB population described above is to examine how removing individuals may affect the local population in the year it is impacted. NPPD completed annual ABB surveys in the Permit Area that included the collection of data to estimate ABB populations using mark/recapture analysis. These surveys were completed over the same dates and same trap locations in August 2016, 2017, and 2018 as described in Section 3.2.1. Results of these surveys used in conjunction with the population viability analysis from Amaral et al. (2005) allow NPPD to evaluate the long-term persistence of the local population following the estimated take of ABB. Impacts that may cause the local population to collapse could produce an area that is a population sink and have an effect on the larger ABB population as a whole.

Using a mark/recapture population estimate derived from the 2016, 2017, and 2018 survey results, NPPD estimated ABB populations within the 39,500 acres surveyed each year (Table 5-4). NPPD also estimated the ABB population within the Permit Area for each year surveyed (Table 5-4). Amaral et al.'s (2005) population viability analysis concluded that ABB populations of 1,000 or more individuals are viable long-term in the absence of severe catastrophic events or reduction in carrying capacity through a reduction in carcass availability, habitat loss, or fragmentation. Amaral et al. (2005) indicates that populations of greater than 10,000 ABB can persist even through catastrophic events. The take of 140 ABB during construction from an estimated population within the area surveyed would not be expected to affect the long-term viability of that population. Moreover, the take of 140 ABB during construction will be distributed over the much larger Permit Area, not just the acres surveyed annually.

TABLE 5-4 ANNUAL ABB MARK/RECAPTURE POPULATION ESTIMATES

Survey Year	Estimated ABB Population – Survey Area	Estimated ABB Population – Permit Area
2016	1,281	16,125
2017	714	9,071
2018	1,017	13,103

Comparison of individuals taken to the estimated annual populations indicate that NPPD's take will have little impact on the population as a whole and no impact on its long-term persistence. With little to no impact on the local ABB population, it is not expected there would be any effect on the Sandhills population as a whole. This comparative analysis supports the conclusions drawn from the more temporally and spatially robust trap dataset, as described above, that the take from the R-Project will not negatively impact the Sandhills population of ABB.

6.0 CONSERVATION PLAN

6.1 Biological Goals and Objectives

As described in the USFWS's HCP Handbook (USFWS and NMFS 2016), HCPs must establish biological goals and objectives relative to Covered Species. Biological goals are the broad guiding principles for the operating conservation program and provide the rationale behind the minimization and mitigation strategies. Specific biological objectives are the measurable targets for achieving the biological goals. These goals have been developed based on ABB biology, threats to ABB, and the potential effects of the Covered Activities on ABB.

- Goal 1: Maintain or restore ABB habitat within the Permit Area to support a sustainable ABB population.
  - Objective 1a: During Project construction, ensure permanent disturbance of ABB habitat does not exceed 33 acres and temporary disturbance of ABB habitat does not exceed 1,042 acres from R-Project Covered Activities (Table 5-1).
  - Objective 1b: Within five years post-construction, establish vegetation on disturbed sites with basal ground cover at least 80% of adjacent reference plots, thus restoring ABB habitat. Thirty paired disturbance and reference plots (total of 60 plots) will be established so that there is approximately one plot pair for every four miles of transmission line within the Permit Area.
- Goal 2: Protect habitat that supports individuals of the Sandhills ABB population.
  - Objective 2a: Protect, in perpetuity, an amount of occupied ABB habitat based on mitigation ratios described in Section 6.2.2.

Avoidance, minimization, and mitigation measures described below are intended to achieve these biological goals and objectives.

6.2 Avoidance, Minimization, and Mitigation Measures

6.2.1 Avoidance and Minimization Measures

Avoidance and minimization measures were developed in coordination with the USFWS and the NGPC during technical HCP meetings and are intended to reduce potential for effects to ABB. These measures were implemented in the preliminary project design and will be further refined and applied in the final design. Avoidance and minimization measures are listed here and described in greater detail below.

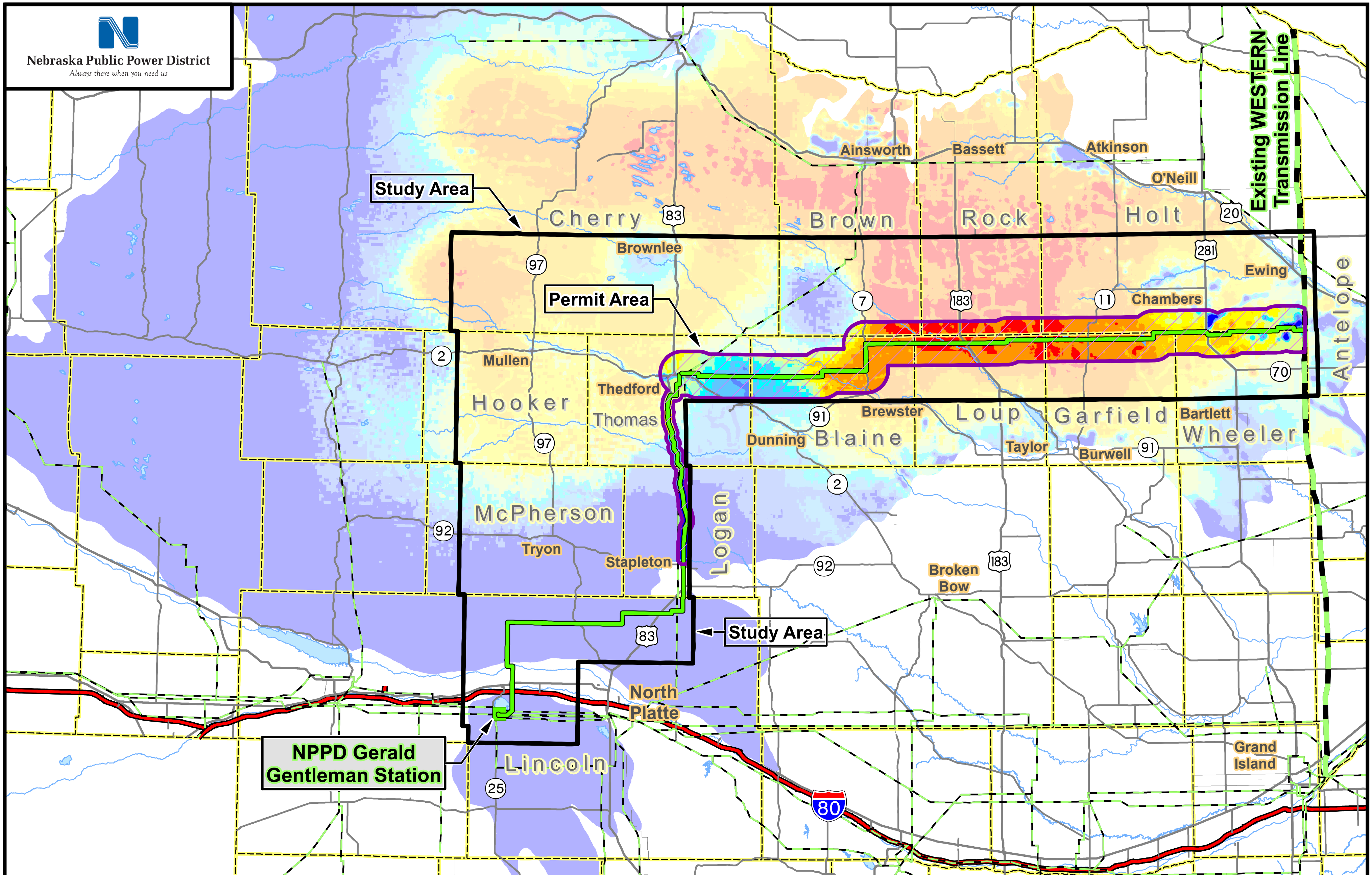
- Avoidance of ABB high-density areas.
- Avoidance of sub-irrigated wet meadows and mesic grasslands.
- Use of existing roads and two-tracks for access.
- Use of temporary improvements for access.
- Overland access with low-ground-pressure equipment.
- Siting temporary work areas in areas unsuitable for ABB use.
- Use of helical pier foundations in Sandhills.
- Helicopter construction.
- Winter construction.
- Limited nighttime construction during periods when ABB are active.
- Sodium vapor lighting and downshield lighting.

- Limited mowing and windrow vegetation in specified areas.
- Limited removal of carrion at structure locations along existing roads in specified areas.
- Restoration of ABB habitat.
- Worker Educational Awareness Program.

Avoidance of ABB High-Density Areas

NPPD's initial Study Area was developed in the shape of a large "L" to connect the SPP-defined termination points identified to meet the needs and benefits to network upgrades (Section 1.2, Figure 1-1). The Study Area extended north from the GGS Substation to the Cherry County area, and then east to connect to the Fort Thompson to Grand Island 345 kV transmission line. As recommended by the USFWS and NGPC, NPPD considered the NGPC's 2014 ABB predicted probability of occurrence in Nebraska's Sandhills when developing potential corridors within the Study Area. The highest ABB predicted occurrence is identified in Brown, Rock, and Holt counties in the Study Area. Therefore, corridors were sited along the southern borders of these counties and adjacent to Blaine, Loup, Garfield, and Wheeler counties, where predicted occurrence of ABB is comparatively less (Figure 6-1).

Date: 1/22/2016 Path: W:\128143_NPPD_SPP\DD\GIS\Apps\Reports\HCP\Fig6-1ABB_PredictedOccurence_RasterModel_20160122.mxd



LEGEND

American Burying Beetle Predicted Occurrence

0.0 - 0.1, 0.1 - 0.2, 0.2 - 0.3, 0.3 - 0.4, 0.4 - 0.5, 0.5 - 0.6, 0.6 - 0.7, 0.7 - 0.8, 0.8 - 0.9, 0.9 - 1.0

Final Route

Permit Area

Existing Transmission Line

River

Water body

County Boundary

NPPD's 345kV Transmission Line Project

FIGURE 6-1 AMERICAN BURYING BEETLE PREDICTED PROBABILITY OF OCCURRENCE IN NEBRASKA SANDHILLS

FIGURE 6-1 AMERICAN BURYING BEETLE PREDICTED PROBABILITY OF OCCURRENCE IN NEBRASKA SANDHILLS

Avoidance of Wet Meadows and Mesic Grasslands

ABB is a habitat generalist when foraging; however, the species requires areas with some element of moist soils (i.e., wet meadows and edges of wetlands) during periods of inactivity (Panella 2013). Wet meadows and edges of wetlands are considered some of the most likely ABB habitat (USFWS 2014). Early in the project development, USFWS biologists stated that avoiding wetlands would also result in the avoidance of potentially occupied ABB habitat (Carlisle, Martha. Biologist, USFWS. Personal communication via meeting with Ben Bainbridge. September 12, 2013). This guidance was considered by project engineers while designing the R-Project. While ABB do not live in permanently inundated wetlands, they do live in some types of wetlands including wet meadows and mesic grasslands that maintain high levels of soil moisture. Dr. Wyatt Hoback's definition of prime ABB habitat confirms this: "Undeveloped wet meadows with some trees (especially cottonwoods [*Populus deltoides*]) or forest areas visible. Water sources are available including the presence of a river, stream or sub-irrigated soils (water is close to the surface as a result of shallow aquifer). Cropland is not visible or is at a distance greater than 2.0 miles" (Hoback 2015). This definition of prime habitat closely aligns with the Cowardin definition of wetlands. The Cowardin et al. (1979) definition of wetlands, which has been adopted by the USFWS, is "wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year."

A GIS-based desktop wetland layer was developed utilizing aerial photographs, USFWS NWI polygons, NRCS hydric soil polygons, open water/surface water data from United States Geological Survey (USGS) NHD, and rivers/streams digitized from detailed aerial imagery. The desktop wetland inventory identified approximately 355 acres of potential wetlands meeting the Cowardin definition of wetlands described above. The desktop inventory was field verified in early July 2015 and 2016, which confirmed that the desktop inventory was accurate. The field-verified and desktop wetland inventory was used for the preliminary siting of substations, transmission line structures, temporary work areas, and construction access. To the extent feasible, sites were located to avoid impacts to verified and potential wetlands. Final design of the R-Project will be further refined to avoid additional field-verified wetlands where possible.

Use of Existing Roads and Two-Tracks for Access

To minimize ground disturbance, the R-Project will use existing roads, two-tracks, and existing stream and wetland crossings wherever feasible for accessing transmission line structure locations during construction. The preliminary access plan includes approximately 200 miles of existing public roads that may be used by construction vehicles and equipment to access structure locations. Existing roads that will be used to provide access include, but are not limited to, U.S. Highway 83, State Highway 7, State Highway 2, North Prairie Trace Road, Gracie Creek Road, and various county roads in southern Holt County. Approximately 119 miles of existing two-tracks were included in the preliminary access plan. Approximately 49 miles of the existing two-tracks may require improvements for access of large equipment.

Use of Temporary Improvements for Access

Temporary access for higher-ground-pressure equipment may require improvements such as blading and, where required, placement of fill material on geofabric. Any fill material used will be removed upon completion of construction. Some side-slopes may require leveling so equipment can safely pass without rolling over. Land contour improvements made to facilitate access may be left in place to allow future access. However, these areas will be revegetated upon completion of construction and, upon revegetation to the 80% minimum, will provide ABB habitat and meet Biological Objective 1b as described above. Restoring temporary improvements to access will reduce permanent impacts to ABB habitat by approximately 192 acres.

Temporary bridges, culverts, and matting will be used where new wetland or stream crossings are required for access. Such temporary structures will be removed upon completion of construction. Crossings will be designed to allow for unaltered flow and hydrology of the affected water resource.

Overland Access with Low-Ground-Pressure Equipment

Large areas of the Sandhills do not have an existing road network, such as section line roads, requiring new access to the transmission line structures. In these areas, overland access with low-ground-pressure equipment will be used to the greatest extent practicable to avoid soil disturbance and compaction associated with the creation of new access. Overland access will utilize existing two-tracks where available, will be conducted with low-ground-pressure tracked or rubber-tired equipment, will not require improvements (blading or fill), and will drive over vegetation rather than remove it, thus retaining ABB habitat. See Section 3.2.1 for additional information regarding low-ground-pressure equipment and potential effects to ABB. The use of overland access with low-ground-pressure equipment avoids impacts to approximately 230 acres of ABB habitat.

Siting Temporary Work Areas in Areas Unsuitable for ABB Use

Where feasible, temporary disturbance areas associated with Covered Activities have been located within the same footprint, which reduces temporary disturbance by approximately 25 acres. Preliminary locations for fly yards/assembly areas and construction yards/staging areas are along existing access roads for easy access. Approximately 37 acres of preliminary locations for fly yard/assembly areas and construction yard/staging areas are in areas unsuitable for ABB use based on aerial photo interpretation (Table 6.1). A field verification of these areas and others will be completed to confirm and identify areas unsuitable for ABB for locating facilities during the final design. NPPD will coordinate site visits with the USFWS and NGPC to confirm areas unsuitable for ABB use prior to final siting of fly yard/assembly and construction yard/staging areas.

TABLE 6-1 AREAS UNSUITABLE FOR ABB USE

DEFINITIONS OF AREAS UNSUITABLE FOR ABB USE	
1.	Land that is tilled on a regular basis, is planted in a monoculture, and does not contain native vegetation.
2.	Pastures or grasslands that are permanently maintained through frequent mowing, grazing, or herbicide application to a height of 20 centimeters (8 inches) or less.
3.	Land that has already been developed and no longer exhibits surficial topsoil, leaf litter, or vegetation.
4.	Urban areas with maintained lawns, paved surfaces, or roadways.
5.	Stockpiled soil without vegetation.
6.	Permanent open or standing water.*

*Areas adjacent to wetlands and/or riparian areas will be considered ABB habitat because these areas are important for ABB seeking moist soils during dry conditions.

Use of Helical Pier Foundations in Sandhills

In areas of the Sandhills where existing publicly maintained access roads are not available, screw-in helical pier foundations will be used for lattice structures. Helical pier foundations for lattice structures require fewer pieces of equipment, a smaller temporary structure work area, and less improved access to each structure than traditional foundations on steel monopole structures. Helical pier foundations do not require excavation, and thus the use of these structures minimizes disturbance. The piers are screwed into the ground by an excavator with a torque head where a bucket typically is located. Because the piers are hollow, no spoils need to be removed from the site and concrete does not need to be brought in.

In addition to requiring less equipment for installation, helical pier foundations also require a much smaller temporary work area. The work area needed is 100 feet by 100 feet in size, whereas an area 200 feet by 200 feet in size is needed for a monopole structure with a concrete foundation. Temporary disturbance for structure work areas is reduced by 75% using helical piers. The reduced work areas and access improvements needed for helical pier foundations will avoid impacts to approximately 254 and 230 acres of potential ABB habitat, respectively.

Helicopter Construction

Helicopter construction techniques will be used for the erection of lattice structures in the Sandhills and stringing of conductor and shield wire sock line. Other R-Project construction activities potentially facilitated by helicopters may include delivery of equipment and materials to structure work areas, structure placement, and hardware installation. Helicopters may be used to support the inspection and management of the R-Project by NPPD.

A helicopter may be used to move personnel and equipment. Helicopters will use temporary work areas such as fly yards and staging areas for landing and refueling.

The use of helicopters for Covered Activities will reduce the need for ground access for large construction equipment at each structure location by approximately 230 acres.

Winter Construction

Overwintering ABB in Nebraska bury to just beneath the frost line, rather than to shallower depths where the soil may freeze (Conley 2014). Covered Activities that do not require the removal and physical alteration of soils are not likely to crush overwintering ABB, due to the greater depth at which individuals are buried. The layer of frozen soil above overwintering ABB will act as a solid surface to disperse the weight of any construction equipment, thus protecting the buried individual. Along specific segments of the route where a field evaluation determines that ABB occurrence is likely and the construction schedule allows, construction may be conducted during the ABB inactive period and the ground is frozen. The University of Nebraska Extension Office stated the duration and timing of ground freeze is variable depending on local conditions (soil moisture, temperature, wind, etc.). However, typical conditions would result in frozen ground from December 1 through February 28 (Niemeyer, Steve. Extension Educator. University of Nebraska-Lincoln Extension Office. Personal communication with Wendy Hosman. 8-28-2015). Under the Winter Construction avoidance and minimization measure, Covered Activities associated with identified structures including work areas, structure erection, and stringing, pulling, and tensioning will occur from December 1 through February 28. When Covered Activities are completed during this time period, effects to individual ABB will be greatly reduced because individuals will be buried to their overwinter depth beneath the frost line and protected by a layer of frozen soil. Covered Activities that result in the physical removal of soil, such as foundation installation, may still impact overwintering ABB if individuals occur in the disturbed soils. Areas for winter construction have not been identified at this time.

Because construction will take approximately 21 to 24 months to complete, some construction activities will be completed during the winter construction timeframe. However, the timing and relative location of construction activities within ABB habitat is not known at this time. Therefore, take estimates calculated in Section 5.2 are based on the conservative assumption that all activities would occur in ABB habitat during the ABB active period. See Section 5.1.1 for a description of potential effects to ABB over multiple ABB active seasons.

Preliminary areas identified for winter construction that will provide a benefit to ABB include mesic grasslands and wet meadows along the North Loup River, State Highway 7, and from the Calamus River east to the Holt County Substation. These preliminary areas will be refined to more specific locations prior to construction.

Limited Nighttime Construction during Periods when ABB are Active

Nighttime construction is not anticipated for the R-Project. However, there may be rare instances where nighttime construction is necessary during the ABB active season, such as the need to complete concrete work on a foundation to ensure stability or the need to complete a structure so as to not stop construction at a perilous point in the erection process. These instances will be limited whenever possible. In the event nighttime construction is required, sodium vapor and downshield lighting would be used. The rare nature of nighttime construction combined with the application of specified lighting will limit the likelihood of attracting ABB to active construction areas at night.

Sodium Vapor Lighting and Downshield Lighting

Permanent lighting will not be required on transmission support structures within the Permit Area. Exceptions to this include structures where permanent lighting is required by the Federal Aviation Administration, such as near regulated airports or structures taller than 200 feet. Permanent lighting of these structures will follow FAA guidelines. The Thedford Substation is located within the Permit Area and will require limited permanent lighting for security purposes. Downshield sodium vapor lighting will be installed in these instances to prevent attracting ABB to the substation.

Limited Mowing and Windrow Vegetation in Specified Areas

Mowing, removing, and maintaining vegetation to less than eight inches will create areas unsuitable for ABB use that will not be occupied by the species (USFWS and NGPC 2008). Mowing and windrowing (i.e., removal) of vegetation, if applied, would be implemented in very limited instances identified with the USFWS and completed prior to the onset of Covered Activities. All instances of mowing and windrow of vegetation are subject to landowner's approval. Areas considered for this minimization measure must have existing access, adequate moisture to ensure plant survival, and adequate vegetative cover to prevent wind erosion after mowing. It is assumed, based on USFWS and NGPC (2008), that ABB would not occupy areas where the vegetation is mowed, windrowed, and maintained at less than eight inches, thus minimizing the likelihood an ABB would occur in that area. Currently, no mowing and windrowing of vegetation, or the potential reduction in take from that effort, has been quantified. Therefore, take estimates calculated in Section 5.2 are based on the conservative assumption that all activities occur in areas that have not been mowed.

Limited Removal of Carrion at Structure Locations along Existing Roads in Specified Areas

In limited instances, NPPD may remove carrion from proposed and operating disturbance, thus reducing the likelihood an ABB would occur in that area. Carrion removal, if applied, would be implemented in very limited instances identified with the USFWS and NGPC and completed prior to the onset of Covered Activities. Areas for carrion removal have not been identified at this time. Carrion removal will only be considered at disturbance areas adjacent to existing publicly maintained roads and will only be used in conjunction with mowing and windrowing of vegetation described above. Environmental compliance monitors will remove any carrion noted at the proposed and operating work sites to outside the disturbance area. Areas for carrion removal cannot be identified at this time, and the potential reduction in take from that effort cannot be quantified. Therefore, take estimates calculated in Section 5.2 are based on the conservative assumption of no carrion removal.

Application of Herbicides during Daytime Hours

All application of herbicides treatments for noxious weeds will be completed during the day time. This will eliminate the possibility that herbicides could be applied directly to an ABB because individuals would be underground when herbicides would be applied.

Restoration of ABB Habitat

Following construction, temporary work and access areas will be revegetated to restore ABB habitat and meet Biological Objective 1b (Section 6.4). Disturbed areas will be stabilized either through use of physical methods (e.g., matting, jute blankets) or vegetative cover. The primary goal of restoration is to complete the proper measures to provide the best chance for disturbed areas to return to, or as close as possible, the condition they were in prior to construction. If initial restoration efforts are unsuccessful in meeting Biological Objective 1b, adaptive management described in Section 6.5.1 will be implemented to continue restoration efforts until Biological Objective 1b is met. Restoration of temporary disturbance areas will reduce long-term disturbance to ABB habitat by approximately 1,042 acres. To ensure restoration is successful, NPPD will establish an Escrow Account. See Section 6.2.2 for a full description of this Escrow Account.

NPPD will restore ABB habitat caused by temporary disturbances from emergency repair activities, if such disturbances resulted in the temporary loss of ABB habitat. Restoration of ABB habitat from emergency repair activities will be held to the same standards as temporary disturbance from initial construction activities. Future landowner input is an important part of restoration and will be incorporated into restoration efforts to the extent that the suggestions are legal, comply with the HCP, are accepted restoration practices, and will help result in successful restoration.

Worker Educational Awareness Program

All personnel entering R-Project work areas, including contractors, will receive environmental training. Training will emphasize compliance with all project-wide environmental requirements, emphasizing stipulations this HCP. Roles and responsibilities will be reviewed and the authority of the compliance monitors will be emphasized. A list of all personnel who successfully completed the environmental training will be maintained and updated as needed.

6.2.2 Mitigation Measures

To mitigate impacts of the taking to ABB as a result of the R-Project, NPPD will protect land providing ABB habitat in perpetuity to support the ABB Sandhills population. NPPD has assumed that all disturbed acres are ABB habitat and present equal high-quality value to ABB. Because all acres of disturbed habitat are assumed to be ABB habitat, all disturbance within the Permit Area will be mitigated at a ratio of three acres of mitigation for every one acre of disturbance (3:1). ABB habitat temporarily disturbed will be restored to its previous vegetation condition after construction is complete as described in the Restoration Management Plan. The R-Project estimates that restoration of vegetation cover will occur in the first five years of the 50-year life of the Project or 10% of the life of the Project. Following this timescale, mitigation acres for temporary construction impacts will be multiplied by 10% to mitigate for five years of ABB habitat loss. The same formula is applied to determine appropriate mitigation acres for temporary emergency repairs impacts. R-Project mitigation ratios and the resulting mitigation acres required are presented in Table 6-2.

TABLE 6-2 R-PROJECT MITIGATION RATIOS AND ASSOCIATED LANDS

TYPE OF IMPACT	AFFECTED ACRES	MITIGATION RATIO (CONSERVED:AFFECTED)	TEMPORARY IMPACT TIMESCALE[1]	MITIGATION ACRES REQUIRED
Temporary construction impact	1,042	3:1	10%	312.6
Permanent impact	33	3:1	--	99
Temporary emergency repairs impact[2]	208	3:1	10%	62.4
TOTAL				**474**

[1]Five years or 10% of the Project life.
[2]208 acres represents 20% of the temporary construction impacts within the Permit Area.

Although the mitigation acres required totals 474 acres based upon the calculations provided in Table 6-2, the amount of habitat conservation to offset temporary and permanent disturbance should be at least 500 acres since it represents the minimum area that can be surveyed by a single ABB trap (USFWS 2014b). NPPD has secured an Option to Purchase approximately 600 acres of mitigation lands in in fee title that include portions of Sections 15 and 22 in T24N, R22W in Blaine County, Nebraska. USFWS has approved this parcel as satisfying NPPD's ABB mitigation obligations for take of ABB. This parcel is a continuous tract of land that has documented ABB presence along the entire tract. NPPD has completed two years of ABB surveys along public roads adjacent to these mitigation lands. ABB densities on portions of the property are within the upper 10% of densities documented in the USFWS ABB database. NPPD, in conjunction with the USFWS and NGPC, will develop a management plan for the mitigation parcel that will address land uses, such as grazing, haying, controlled burning, etc., that will be utilized to maximize ABB density on the parcel. NPPD will implement this plan and maintain the property in its current grassland land cover that provides habitat for ABB in perpetuity.

To ensure restoration is successful, NPPD will establish an Escrow Account with a banking association to serve as a financial guarantee that there is money available to restore temporary disturbance areas if NPPD fails to take the appropriate steps to do so. An Escrow Agreement will be submitted to USFWS and NGPC for review. The funds in the Escrow Account will not be disbursed if NPPD is actively implementing restoration activities including adaptive management. If performance standards are not met as described in Section 6.4 Performance and Success Criteria, NPPD will implement adaptive management measures until restoration success is achieved. Under the adaptive management framework described in Section 6.5 of this HCP, at no point would NPPD cease restoration efforts should their initial attempts fail. NPPD has completed a Restoration Management Plan that details the restoration methods, monitoring, and success criteria to provide information to the banking association escrow agent on the requirements for NPPD to restore temporary disturbance areas. As lands are successfully restored as described under the Performance and Success Criteria, NPPD and USFWS will agree upon the percent of the funds in the Escrow Account that can be returned to NPPD.

6.3 Monitoring

This HCP includes two types of monitoring: (1) compliance monitoring to ensure the permit holder's compliance with requirements and take authorization specified in the HCP and ITP and (2) effectiveness monitoring to measure the progress of the conservation strategy in meeting the HCP's biological goals and objectives. Monitoring also provides information for making adaptive management decisions.

6.3.1 Compliance Monitoring

Compliance monitoring will verify that NPPD will not exceed the take authorized by the permit, and fully implements avoidance, minimization, and mitigation measures described in the HCP and ITP. A Compliance Monitoring Plan is included in Appendix E. A separate plan to monitor ABB populations in the Permit Area is include in Appendix F.

Annual ABB population compliance monitoring will be conducted each August at the same 79 trap locations originally established for the August 2016 survey. Surveys will be completed each August until the completion of construction activities. Results of these annual ABB surveys will be compared to the estimated take number in the HCP and ITP. Annual surveys will determine if ABB take will potentially exceed that estimated in the HCP and ITP. See Appendix F for a complete description of the annual ABB surveys and data interpretation.

Compliance monitoring will include the use of on-site compliance monitors to ensure that avoidance and minimization measures, such as the use of low-ground-pressure equipment and the avoidance of sensitive environmental areas, are followed during construction activities. If compliance monitors determine that an activity is not in compliance with the HCP and ITP, the activity will be reported to the construction manager and NPPD to determine what may be required to return to compliance and USFWS and NGPC will be notified immediately.

Compliance monitoring as described here only will apply to Covered Activities that take place within the Permit Area. Failure to comply with ITP terms and conditions or failure to implement activities prescribed in this HCP may result in suspension or revocation of the ITP (50 CFR Parts 13.27, 13.28).

Areas representing the limits of potential disturbance areas will be identified and flagged prior to the onset of Covered Activities. Compliance monitors will ensure that disturbance boundaries are not violated by construction personnel and that the total disturbance to ABB habitat associated with Covered Activities will not surpass that reported in Table 5-1. Compliance monitors will quantify acres of disturbance located in areas unsuitable for ABB use to report to the USFWS. This will ensure that disturbance acres to ABB habitat do not surpass that reported in Table 5-1.

Compliance monitors will delineate and map sensitive areas prior to the onset of construction to be avoided by construction personnel, including wetlands and areas outside of designated access routes. NPPD will design a final Access Plan for the R-Project that delineates where construction areas will be accessed and what type of equipment will be allowed to use each access route. Environmental compliance monitors will ensure that the Access Plan is followed by construction personnel and will be responsible for approving low-ground-pressure equipment to be used on Access Scenario 1 (Section 2.7). If limited mowing or carrion removal is used during R-Project construction, the compliance monitors will ensure that vegetation is maintained at a height of less than eight inches and that carrion is removed from these agreed to locations prior to the onset of Covered Activities.

Compliance monitors will document results of monitoring to NPPD each month using a compliance checklist. Monthly reports will be compiled and incorporated into the annual monitoring report. See Section 6.6 for details regarding annual reporting requirements.

6.3.2 Effectiveness Monitoring

Effectiveness monitoring will be implemented to evaluate post-construction restoration effectiveness and to inform the adaptive management program where additional restoration is needed. Effectiveness monitoring will include visual assessment and photographs where soil disturbance has occurred, along with sampling basal cover at 30 paired disturbance and reference plots (total of 60 plots). Disturbance plots will be stratified by habitat as described in the Restoration Management Plan so that the number of plots is representative of the number of structures within these landscape positions, with a minimum of five plots for each type. At this point, NPPD is assuming that no structures would be located on dune tops (choppy sands), so no plots would be needed there. Effectiveness monitoring will be conducted during late summer for five consecutive years following restoration, unless restoration objectives are met earlier.

Disturbance plots will be established at randomly selected structures. Each disturbance plot will start three meters from the structure. A meter tape will be laid out at the start and extended 15 meters using a randomly selected azimuth from the structure. A reference plot will be randomly located at an undisturbed area with similar vegetation as the vegetation immediately adjacent to the disturbance plot, in the same grazing pasture, and located no farther than the nearest structures in the ROW in either direction. The reference plot will follow the same methods as the disturbance plot so they can be used to quantify compliance with performance standards.

Starting at the 1-meter mark of a tape stretched tautly for 15 meters and marked with rebar at the 0- and 15-meter marks, a meter stick will be laid on the ground perpendicular to the tape. The number of millimeters intercepted by basal vegetation along the meter stick will be recorded by species. This will be repeated at one meter intervals for a total of 15 readings, ending at the 15-meter mark. Before measuring basal vegetation, one photograph will be taken three meters back from the start of each plot (standing at the structure for disturbance plots) and another from three meters back from the end of the tape.
An annual report will be prepared following each late summer monitoring session; it will include results from the effectiveness monitoring (also see Section 6.6) and document progress toward achieving the performance standards. If performance standards are met, the fifth annual report (end of five-year monitoring) will be the final report on restoration effectiveness. If performance standards are not met within the initial five-year monitoring period, adaptive management measures will be implemented (see Section 6.5.1) and post-construction restoration effectiveness monitoring will be extended until the standards are met. All reports and memos will be submitted to the USFWS.

6.4 Performance and Success Criteria

Performance evaluation for meeting Biological Goal 1, Biological Objectives 1a and 1b, Biological Goal 2, and Biological Objective 2a are described in Table 6-3.

TABLE 6-3 PERFORMANCE STANDARDS

BIOLOGICAL OBJECTIVE	PERFORMANCE STANDARD
Objective 1a: During Project construction, ensure permanent disturbance of ABB habitat does not exceed 33 acres and temporary disturbance of ABB habitat does not exceed 1,042 acres from R-Project Covered Activities (Table 5-1).	Compliance monitoring will document the extent of permanent and temporary disturbance areas within ABB habitat and will quantify disturbed areas that do not present habitat for ABB. Biological Objective 1a will be met if and when temporary disturbance from construction is less than or equal to 1,042 acres and permanent disturbance is less than 33 acres from R-Project Covered Activities (Table 5-1).
Objective 1b: Within five years post-construction, establish vegetation on disturbed sites with basal ground cover at least 80% of adjacent reference plots, thus restoring ABB habitat. Thirty paired disturbance and reference plots (total of 60 plots) will be established so there is approximately one plot pair for every four miles of transmission line within the Permit Area.	Performance evaluation for meeting Biological Objective 1b will be based on the restored areas developing a trend of vegetative cover, diversity, and species dominance that is similar to the naturally occurring habitat in adjacent areas. Success will be based on the establishment of seeded species, the exclusion of non-native or noxious plant species, and adherence to all federal, state, and local regulations. The restoration will be considered successful when the following criteria are achieved: • A self-sustaining, diverse, native (or otherwise approved) plant community appropriate to the surrounding landscape is established on the site with a density sufficient to control erosion and non-native plant invasion. At a minimum, the established plant community will consist of species included

BIOLOGICAL OBJECTIVE	PERFORMANCE STANDARD
	in the seed mix and/or desirable species occurring in the surrounding natural vegetation. Permanent vegetative cover will be determined successful when the basal cover is at least 80% of the basal cover of the adjacent reference plot. • Erosion features are equal to or less than surrounding area and erosion control is sufficient so that water naturally infiltrates into the soil and gullying, headcutting, slumping, and deep or excessive rilling is not observed. • The site is free of noxious weeds, unless they were present at the site prior to construction or are present in surrounding areas. If performance standards are not met within the five-year monitoring period, adaptive management measures will be implemented and monitoring will be extended until the standards are met.
Objective 2a: Protect, in perpetuity, an amount of occupied ABB habitat based on mitigation ratios described in Section 6.2.2.	Biological Objective 2a will be met when NPPD or an approved third party has established conservation lands providing occupied ABB habitat equal to the mitigation ratios described in Section 6.2.2.

6.5 Adaptive Management

Adaptive management addresses uncertainties regarding species biology and the efficacy of avoidance, minimization, and mitigation measures in the conservation of species covered by an HCP. The process allows newly acquired information and experience to be incorporated into future management plans. Implementation of Covered Activities and implementation and efficacy of avoidance, minimization, and mitigation measures towards reaching the biological goals and objectives of this HCP will be monitored and annually reported (Section 6.6). The USFWS developed a framework for addressing adaptive management in HCPs that includes: (1) identifying areas of uncertainty and questions that need to be addressed to resolve the uncertainty; (2) developing alternative management strategies and determining which experimental strategies to implement; (3) integrating a monitoring program that is able to acquire the necessary information for effective strategy evaluation; and (4) incorporating feedback loops that link implementation and monitoring to the decision-making process that result in appropriate changes in management.

6.5.1 Restoration Adaptive Management

Adaptive management may be implemented during the course of vegetation restoration, if after five years restoration has not met the 80% coverage objective described in Table 6-3. As described earlier, funding to complete adaptive management and ensure the successful restoration of all acres of temporary disturbance will be secured by an Escrow Account with a banking association. In order to meet all issuance criteria, NPPD will ensure funding for all aspects of this HCP. The following presents a breakdown of the four adaptive management steps and how they may be applied to restoration adaptive management.

1. *Identifying areas of uncertainty and questions that need to be addressed to resolve the uncertainty.* Areas of uncertainty associated with restoration include the effectiveness of restoration activities and the duration it may take for restoration activities to meet the success criteria. It is possible that restoration may not meet success criteria identified in Table 6-3 within five years if the Sandhills experience prolonged drought following restoration efforts.

2. *Developing alternative management strategies and determining which experimental strategies to implement.* Restoration activities will be based on guidance and recommendations from local NRCS offices, landowners, and other restoration experts. Restoration efforts in the Sandhills have been

successfully completed on previous development projects and lessons learned from previous efforts have been incorporated into the Restoration Management Plan. Alternative management strategies will be developed in coordination with NRCS offices, landowners, and restoration experts in the event that initial restoration efforts do not meet success criteria. Alternative management strategies may include additional seeding, alternate seed mixes, or alternate methods of applying seed.

3. *Integrating a monitoring program that is able to acquire the necessary information for effective strategy evaluation.* Effectiveness monitoring methods identified in Section 6.3.2 were designed to be implemented in association with adaptive management. Effectiveness monitoring will quantify the basal cover of areas undergoing restoration efforts and compare those areas to adjacent control plots.

4. *Incorporating feedback loops that link implementation and monitoring to a decision-making process that result in appropriate changes in management.* Effectiveness monitoring will provide quantifiable data that would support decision making when considering alternative management strategies. Vegetation in the Sandhills varies from year to year given the amount of precipitation. With that in mind, effectiveness monitoring allows for five years of monitoring for the restoration efforts to meet the success criteria before alternative management strategies would be applied. Results of effectiveness monitoring will be included in the annual reports to the USFWS as described in Section 6.6. NPPD will coordinate with USFWS, should the results of effectiveness monitoring indicate that alternative management strategies are necessary.

Some adaptive management options will be developed in advance of a determination that performance standards have not been met. For the most part, adaptive management will not be applied until year 5 of monitoring, recognizing that annual weather patterns greatly influence restoration. However, annual monitoring will note any areas with conditions to be addressed prior to year 5, if necessary (e.g., a blowout begins to form).

6.5.2 Mitigation Parcel Adaptive Management

Adaptive management provisions will be incorporated into the management plan for any mitigation property. Specific adaptive management steps are not known at this time because the mitigation property has not been purchased, and the property-specific management plan has not been prepared. Adaptive management of mitigation property will incorporate the four adaptive management steps identified above. While currently unknown, these adaptive management measures may include, but are not limited to, alterations to current grazing and haying patterns, alterations to current off-road vehicle use allowances, and alterations to development plans. Details regarding the management of mitigation property and the application of adaptive management on that property will be provided in a property-specific management plan, which will require approval by USFWS.

6.5.3 Whooping Crane Adaptive Management

NPPD understands new information could emerge that might suggest that the collision risk to whooping cranes is significantly higher than currently thought. New information relevant to the analysis of the R-Project's whooping crane collision risk includes a whooping crane strike on a transmission line in the United States segment of the Aransas Wood Buffalo population migratory corridor that has two defining characteristics:

(1) The strike must occur on a transmission line designed at 115 kV or higher voltage; and
(2) The transmission line where the strike occurred must have been marked with bird flight diverters with a design that is documented to be at least as effective as those installed by NPPD on the R-Project.

NPPD's response to this new information will be to seek to amend the HCP and incidental take permit for the R-Project to include the whooping crane as a covered species. If NPPD seeks to amend the R-Project HCP to include the whooping crane in response to this new information, NPPD will provide funding equal to the cost to install bird flight diverters on 61.5 miles of transmission line or $615,000 (in 2016 dollars), whichever is less. The funds will be provided to a non-profit organization located in Nebraska or an adjacent state in the Aransas Wood Buffalo Population flyway with a mission to conserve whooping crane habitat or otherwise to benefit specifically the whooping crane, provided that the organization must provide reasonable assurances that the funds will be used solely for that purpose.

At some point in the future, NPPD may seek to obtain a take permit for whooping cranes through either a programmatic permit for NPPD's entire system or as a member of a utility group that obtains take authorization for a larger set of power lines. In such case, the R-Project's ESA-related compliance obligations will likely be covered under that broader effort, and the response to the new information detailed in the preceding paragraph may not be applicable.

6.6 Reporting

NPPD will submit an annual report to the USFWS and NGPC by December 31 of each year during the life of the ITP. Annual reports will include:

- Brief summary or list of Covered Activities accomplished during the reporting year, including construction activities and operations and maintenance activities.
- Disturbances (i.e., number of acres disturbed by Covered Activities).
- Description of potential ABB take that occurred based on disturbances incurred that year.
    - If annual ABB surveys described under Compliance Monitoring indicate take authorized by the ITP may be exceeded, USFWS and NGPC will be notified immediately.
- Brief description of conservation plan implementation, including avoidance and minimization measures implemented as well as conservation lands set aside.
- Monitoring results (compliance and effectiveness monitoring).
- Description of circumstances that made adaptive management necessary and how it was implemented, if applicable.
- Description of any changed or unforeseen circumstances that occurred and how they were dealt with.
- Funding expenditures, balance, and accrual.
- Description of any minor or major amendments.

7.0 PLAN IMPLEMENTATION

7.1 "No Surprises" Assurances

The Habitat Conservation Plan Assurances ("No Surprises") Rule adopted by the USFWS, published in the Federal Register on February 23, 1998 (63 FR 8871), and codified at 50 CFR Part 17.22(b)(5), provides assurances to Section 10 permit holders that, as long as the permittee is properly implementing the HCP and the ITP, no additional commitment of land, water, or financial compensation will be required with respect to species that are adequately covered, and no restrictions on the use of land, water, or other natural resources will be imposed beyond those specified in the HCP without the consent of the permittee. The "No Surprises" assurances only apply to species "adequately covered" in the HCP. The species considered adequately covered in this HCP, and therefore covered by the "No Surprises" assurances, is the ABB. The "No Surprises" Rule has two major components: changed circumstances and unforeseen circumstances.

7.2 Changed Circumstances

Changed circumstances are those changes affecting a species or geographical area covered by an HCP that the applicant and USFWS can reasonably anticipate and plan for during development of the HCP (50 CFR Part 17.3). To the extent these changed circumstances are provided for in the HCP's operating program, NPPD must implement the appropriate measures in response to the changed circumstances as described in the HCP. Changes in circumstances not provided for in this section are considered unforeseen circumstances for purposes of this HCP.

The following provides changed circumstances and methods for adapting the HCP in response to each.

1) The USFWS delists a Covered Species.

   Should a Covered Species be delisted during the term of the ITP, it is expected that the mitigation measures and associated funding provided for in this HCP would have contributed in some part to the delisting of the species. Consequently, NPPD would not seek any mitigation funding refund and operation and maintenance of established mitigation lands would continue in perpetuity. However, delisting of a Covered Species would remove the potential for incidental take from Emergency Repair activities and such activities would no longer be subject to avoidance and minimization measures described in this HCP. NPPD would continue restoration activities until all restoration goals are met so that if the species were subsequently re-listed, take would still be covered under the ITP.

2) The USFWS lists a species occurring in the Study Area.

   In the event that a non-covered species that may be affected by Covered Activities becomes listed under the ESA, the permittee will implement the "no-take/no-jeopardy" measures identified by the USFWS until the permit is amended to include such species, or until the USFWS notifies the permittee that such measures are no longer needed to avoid jeopardy to, take of, or adverse modification of the critical habitat of the non-covered species.

3) Natural/anthropogenic disasters substantially alter the habitat of ABB.

   Natural and anthropogenic disasters have potential to alter the status of listed species. Consequently, this could alter the relative importance of the incidental take of individuals. Such disasters could result in loss of habitat or in decreased suitability of available habitat.

- Drought – One area of concern is the effect of drought during restoration efforts following construction. Prolonged drought in the Sandhills can lead to localized decreases in ABB populations where soil moisture declines. Prolonged drought can also slow the establishment of vegetation following restoration efforts. In the event that drought decreases the success rate of restoration efforts, NPPD will continue those efforts under the Adaptive Management framework described in Section 6.5 and in the Restoration Management Plan. At no point would NPPD cease restoration efforts.
- Wildfire – It is possible that construction, operation, and maintenance activities could ignite a wildfire through contact between dry vegetation and hot vehicle components or as a result of stray sparks from welding and cutting torches. NPPD will have fire suppression tools, including water trucks or air-lifted water tanks, at every construction location with potential for fire ignition. Fire would have a greater likelihood of igniting during periods of prolonged drought. Wildfire would temporarily remove ABB habitat throughout burned areas, making refugia areas such as the lands protected by R-Project mitigation all the more important. In the event of a wildfire occurring after habitat restoration has met the necessary success criteria, NPPD will allow vegetation to naturally regenerate. In the event of a wildfire occurring before restoration efforts have met the necessary success criteria, NPPD will continue restoration efforts under the Adaptive Management framework described in Section 6.5 and in the Restoration Management Plan.
- Severe storms – Severe thunderstorms are common in central Nebraska during the spring and early summer and are not expected to largely influence ABB populations; however, they can cause erosion and sediment runoff from areas undergoing restoration efforts. In the event of severe storms occurring before restoration success criteria have been met, NPPD will continue restoration efforts under the Adaptive Management framework described in Section 6.5 and the Restoration Management Plan. Restoration areas that suffer damaging erosion as an effect of severe storms will be treated with erosion control measures as described in the Restoration Management Plan.

4) Effects of global climate change substantially alter status of ABB.

   Global climate change within the life of the ITP (50 years) conceptually has potential to affect ABB through region-wide changes in weather patterns, average temperature, and levels of precipitation affecting the species or their habitats (Intergovernmental Panel on Climate Change 2007). The ABB may be affected through changes in temperature, precipitation, or possible changes in vegetation at suitable habitats. Effects of anthropogenic or natural disasters that are exacerbated by global climate change will be addressed as described above.

   Overall, if changes substantially affecting ABB occur as a result of global climate change, NPPD will coordinate with USFWS to determine if changes to operation of the HCP and/or mitigation areas are warranted. Any changes will be performed to meet objectives of the HCP. Changes to the operation of the HCP or mitigation areas will not result in the additional commitment of land, water, or financial compensation without NPPD's consent.

5) Empirical data indicate Covered Activities do not result in incidental take of a Covered Species, or result in a significantly different level of incidental take than that anticipated in the HCP.

   Should survey or monitoring results completed by NPPD after the issuance of the ITP indicate ABB is not being incidentally taken, or is being taken at levels different than that anticipated by this HCP, NPPD will consult with USFWS to determine if changes to the Project operation conditions in the HCP are warranted, and if necessary, to seek an amendment to the ITP.

6) Empirical data indicate the range of ABB extends to disturbance areas outside the Permit Area and results in a significantly different level of incidental take than the calculated take in the HCP.

   Should ABB surveys completed by NPPD or other biologists after the issuance of the ITP indicate ABB are being incidentally taken in areas not accounted for in this HCP, NPPD will consult with USFWS to determine if changes to the Project operation conditions in the HCP are warranted, and if necessary, to seek an amendment to the ITP.

7) Emergency repairs result in the disturbance of ABB habitat and take of ABB beyond that estimated as Covered Activities.

   If the rate at which habitat is disturbed by emergency repairs begins to suggest that the future need for these types of disturbances will exceed 208 acres within the Permit Area, NPPD will coordinate with the USFWS to determine if the ITP should be amended and NPPD should implement additional mitigation based on methodologies described in Section 6.2.2 of this HCP. Total mitigation required for the R-Project is a minimum of 500 acres; however, NPPD has an option-to-purchase 600 acres of mitigation based on ABB biology. This parcel, if purchased, will conserve an additional 100 acres of ABB habitat beyond the minimum mitigation requirement. USFWS would examine whether this additional mitigation would sufficiently offset any additional impact of take from repair activities that may exceed the amount in the ITP in the future.

If changed circumstances occur that are not provided for in this section, and the HCP is otherwise being properly implemented, the USFWS will not require any conservation and mitigation measures in addition to those provided for in the HCP without the consent of NPPD.

7.3 Unforeseen Circumstances

Unforeseen circumstances are changes in circumstance affecting a species or geographic area covered by an HCP that were not or could not be anticipated by NPPD and USFWS that result in a substantial and adverse change in the status of a covered species (50 CFR Part 17.3). For the purposes of this HCP, changes in circumstances not provided for in Section 7.2 that substantially alter the status of ABB are considered unforeseen circumstances. In the event that unforeseen circumstances occur during the life of the ITP and the USFWS concludes that ABB are adversely affected as a result, the USFWS may require additional measures of NPPD where the HCP is being properly implemented only if such measures are limited to modifications of the operating HCP program for ABB and maintain the original terms of the HCP to the maximum extent possible. Additional minimization and mitigation measures will not involve the commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources otherwise available for development or use under the original terms of the HCP without the consent of NPPD.

7.4 Notice of Unforeseen Circumstances

The USFWS will have the burden of demonstrating based on best available scientific and commercial data that unforeseen circumstances have occurred. The USFWS will notify NPPD in writing should the USFWS believe that an unforeseen circumstance has arisen.

7.5 Amendment Procedures

Different procedures allow for the amendment to the HCP and ITP. However, the cumulative effect of any amendments must not jeopardize any listed species. USFWS must be consulted on all proposed minor and major amendments. Amendment procedures are described below.

7.5.1 Administrative Changes

Administrative changes may be required to the HCP that will not require additional consultation with USFWS. Such changes are small and may include: corrections of typographical, grammatical, and similar editing errors that do not change intended meanings; correction of minor errors in mapping and figures; and corrections in maps, tables, or appendices to reflect approved amendments to the HCP or ITP.

7.5.2 Minor Amendments

Minor amendments are changes to the HCP whose effects on Covered Species, the conservation strategy, and NPPD's ability to achieve the biological goals and objectives of the HCP are either beneficial or not significantly different than those described in this HCP. Such amendments also will not increase or change impacts to species, their habitats, and the environment beyond those analyzed in the HCP, EIS, and the Biological Opinion or increase the levels of take beyond that authorized by the ITP. Minor amendments may require an amendment to the ITP. A proposed minor amendment must be approved in writing by the USFWS and NPPD before it may be implemented. A proposed minor amendment will become effective on the date of the joint written approval. If a minor amendment requires amending the ITP, the minor amendment would become effective on the date of approval of the amended ITP.

NPPD or the USFWS may propose minor amendments by providing written notice to the other party. The party responding to the proposed minor amendment shall respond within 30 days of receiving notices of such a proposed modification, unless the other party agrees to an extension of that period. Such notice shall satisfy the provisions of 50 CFR Part 13.23 as well as include a description of the proposed minor amendment; the reasons for the proposed amendment; an analysis of the environmental effects, if any, from the proposed amendment, including the effects on Covered Species and an assessment of the amount of take of the species; an explanation of the reason(s) the effects of the proposed amendment conform to and are not different from those described in this HCP; and any other information required by law.

When NPPD proposes a minor amendment to the HCP, the USFWS may approve or disapprove such amendment or recommend that the amendment be processed as a major amendment as provided below. The USFWS will provide NPPD with a written explanation for its decision. When the USFWS proposes a minor amendment to the HCP, NPPD may agree to adopt such amendment or choose not to adopt the amendment. NPPD will provide the USFWS with a written explanation for its decision. The USFWS retains its authority to amend the ITP, however, consistent with 50 CFR Part 13.23.

7.5.3 Major Amendments

A major amendment is any proposed change or modification that does not satisfy the criteria for a minor amendment. Major amendments to the HCP and ITP are required if NPPD desires, among other things, to modify the Covered Activities described in the HCP such that they may affect the impact analysis or conservation strategy of the HCP, affect other environmental resources or other aspects of the human environment in a manner not already analyzed, or result in a change for which public review is required. Major amendments must undergo the same formal review process as the original HCP and ITP, including appropriate NEPA analysis, a Federal Register notice, and an intra-Service Section 7 consultation. For example, a major amendment would be required if the documented level of take exceeds that covered by the ITP. A major amendment may also be required if take of another ESA-listed species not adequately covered by the ITP becomes likely.

The HCP and ITP may be formally amended upon written notification to USFWS with the supporting information similar to that provided with the original ITP application. The specific document requirements for the application may vary, however, based on the substance of the amendment. For instance, if the amendment involves an action that was not addressed in the original HCP or NEPA analysis, the documents may need to be revised or new versions prepared addressing the proposed amendment. If circumstances necessitating the amendment were adequately addressed in the original documents, an amendment of the ITP might be all that would be required. If possible, the need for a major amendment should be determined at least one year before ITP expiration to allow for development of the amendment application and subsequent processing prior to expiration of the original ITP. A major amendment may require additional or modified minimization and/or mitigation measures, and/or additional or modified monitoring protocols.

7.6 Permit Renewal

The expected life of the R-Project transmission line is 50 years. Accordingly, this HCP has been written in anticipation of issuance of an ITP with a 50-year duration. NPPD may seek a permit renewal for continued operations and maintenance of the R-Project if it exceeds its expected 50-year life span.

A Section 10(a)(1)(B) permit may be renewed without the issuance of a new permit, provided that the USFWS has indicated that the permit is renewable and that biological circumstances and other pertinent factors affecting Covered Species are not significantly different than those described in the original HCP. To renew the permit, NPPD shall submit to the USFWS, in writing:

- A request to renew the permit, referencing the original permit number.
- Certification that all statements and information provided in the original HCP and permit application, together with any approved HCP amendments, are still true and correct; or, if such information is no longer current or correct, a list of the corrected information.
- A description of any take that has occurred under the existing permit.
- A description of any portions of the project still to be completed, if applicable, or what activities under the original permit the renewal is intended to cover.

If the USFWS concurs with the information provided in the request, it shall renew the ITP consistent with renewal procedures required by Federal regulation (50 CFR § 13.22). The provisions of 50 CFR § 13.22 govern how the existing ITP can remain in effect during the processing of a new permit or permit extension. However, NPPD may not take Covered Species beyond the quantity authorized by the original ITP, nor may NPPD change the scope of the HCP during this time. If NPPD fails to file a renewal request within 30 days prior to ITP expiration, the ITP shall become invalid upon expiration. NPPD must have complied with all annual reporting requirements to qualify for a permit renewal.

8.0 FUNDING

NPPD is a public corporation and political subdivision of the State of Nebraska and is authorized by Nebraska state statutes to engage in the generation and transmission of electrical energy and to sell electrical energy. Pursuant to Nebraska Statute § 70-655, NPPD also has the power and is required to fix, establish, and collect adequate rates, tolls, rents, and other charges for electrical energy, water service, water storage, or for any other commodities sold, furnished, or supplied by NPPD. The rates, tolls, rents, and charges shall be fair, reasonable, and nondiscriminatory, and so adjusted as in a fair and equitable manner, to confer upon and distribute among the users and consumers of commodities and services furnished or sold by NPPD the benefit of a successful and profitable operation and conduct of the business of NPPD.

NPPD will fund implementation of the HCP using the operating budgets of NPPD and using its ability to fix, establish, and collect adequate rates and other charges to operate its business. NPPD produces revenues in each fiscal year sufficient to pay the sum of: (a) all amounts estimated to be required to pay operating expenses during such fiscal year; (b) a sum equal to 100 percent of the aggregate debt service for such fiscal year computed as of the beginning of such fiscal year; (c) the amount, if any, to be paid during such fiscal year into the Debt Service Reserve Fund; and (d) amounts necessary to pay and discharge all charges and liens payable out of the revenues during such fiscal year, including, but not limited to, payment of Reimbursement Obligations, Credit Obligations, and Financial Contracts. For the fiscal year 2014, the amount NPPD collected from sales and other operating revenues totaled $1,122,454,000.

NPPD is also a member of SPP and, as such, is part of the Integrated Transmission Planning process, which is an iterative three-year process that includes 20-year, 10-year, and Near-Term Assessments. SPP's expansion planning process and transmission cost allocation have been approved by the Federal Energy Regulatory Commission. The Integrated Transmission Planning process seeks to target a reasonable balance between long-term transmission investment and congestion costs to customers. Plans developed in this process are reviewed by the SPP Markets and Operations Policy Committee and approved by the SPP Board of Directors. This process allows SPP staff to issue NTC letters for approved projects needed within the four-year financial commitment horizon.

The R-Project, as an SPP NTC project, is expected to be financed from General Bonds with a substantial amount of the debt service to be reimbursed by SPP based on SPP's load-sharing cost methodologies. Costs that are not covered by the SPP load-sharing cost methodology and costs for the ongoing mitigation and maintenance for right-of-way areas obtained for the R-Project that are incurred over the life of the permit will be included in the annual rate setting budgets of NPPD.

In summary, costs related to the implementation of the HCP—such as restoration, compliance/effectiveness monitoring, the migratory bird conservation plan, and acquisition and maintenance of compensatory mitigation acres—will be paid under the following financial processes: (1) the SPP load-sharing cost methodology; (2) the General Bonds issued for the R-Project; and (3) the annual rate-setting budgets of NPPD. NPPD intends to issue General Revenue Bonds for the R-project that will cover the costs of construction. The funds from the General Revenue Bonds will also pay for the costs necessary to acquire mitigation acres. Maintenance for the mitigation acres will be covered through collections through rates, with required amounts determined as part of NPPD's annual rate-setting and budgeting process.

NPPD would promptly notify USFWS of any material change in NPPD's financial ability to fulfill its obligations and commitments required under the implementation of the HCP. In addition to providing any such notice, NPPD can provide USFWS with a copy of its annual report for each year of the ITP or with other reasonably available financial information that would provide adequate evidence of NPPD's ability to fulfill its obligations under the implementation of the HCP.

9.0 GLOSSARY

Biological Opinion. The U.S. Fish and Wildlife Service's (USFWS) document issued at the conclusion of formal consultation pursuant to Section 7(a)(2) of the Endangered Species Act that generally includes: (1) the opinion of the USFWS as to whether or not a federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of designated critical habitat; (2) a summary of the information on which the opinion is based; and (3) a detailed discussion of the effects of the action on listed species or designated critical habitat (50 Code of Federal Regulations [CFR] §§ 402.02, 402.14(h)).

Candidate species. A species for which the USFWS has on file sufficient information on biological vulnerability and threats to support a proposal for listing as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher priority listing actions (79 Federal Register [FR] 72450).

Conductor. The wire cable strung between transmission towers through which the electrical current may flow. May be aluminum, bundle, expanded, non-specular, single, or stranded conductor.

Construction yard/staging area. Temporary work areas located along existing public roads that are used for storing and staging materials and assembling structures during project construction. Also serve as field offices and reporting locations for workers and parking space for vehicles and equipment.

Consultation. A process that: (1) determines whether a proposed federal action is likely to jeopardize the continued existence of a listed species or destroy or adversely modify designated critical habitat; (2) begins with a federal agency's written request and submittal of a complete initiation packet; and (3) in the case of formal consultation, concludes with the issuance of a Biological Opinion and incidental take statement by the USFWS. If a proposed federal action may affect a listed species or designated critical habitat, formal consultation is required (except when the USFWS concurs, in writing, that a proposed action "is not likely to adversely affect" listed species or designated critical habitat) (50 CFR Parts 402.02, 402.14). In the context of a Habitat Conservation Plan, the consultation is an "intra-Service" consultation among USFWS personnel.

Covered Species. The federally listed species to be included on and covered by an Endangered Species Act Section 10(a)(1)(B) incidental take permit.

Delist. To remove a species from the Federal list of endangered and threatened species (50 CFR §§ 17.11, 17.12) because the species no longer meets any of the five listing factors provided under Section 4(a)(1) of the Endangered Species Act and under which the species was originally listed (i.e., because the species has become extinct or is recovered).

Endangered species. "any species [including subspecies or qualifying distinct population segment] which is in danger of extinction throughout all or a significant portion of its range" (Section 3(6) of Endangered Species Act, 16 United States Code [U.S.C.] § 1532(6)).

Endangered Species Act of 1973, as amended. 16 U.S.C. §§ 1531–1544; Federal legislation that provides means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, and provides a program for the conservation of such endangered and threatened species.

Evaluated Species. Species that may occur in the project area but for which authorization of incidental take is not being requested. Take will be avoided through measures described in this HCP.

Federally listed. Species included in the list of endangered or threatened species maintained by the USFWS and the National Marine Fisheries Service under Section 4 of the Endangered Species Act of 1973, as amended, and therefore protected by the Act.

Fly yard/assembly area. Temporary work areas used to support helicopter construction techniques and serve as a base of helicopter operations during project construction. Steel lattice towers will be assembled here and delivered to the structure location via helicopter.

Habitat. The location where a particular taxon of plant or animal lives and its surroundings, both living and non-living; the term includes the presence of a group of particular environmental conditions surrounding an organism including air, water, soil, mineral elements, moisture, temperature, and topography.

Habitat Conservation Plan (HCP). Under Section 10(a)(2)(A) of the Endangered Species Act, a planning document that is a mandatory component of an incidental take permit application.

Helical pier foundation. Foundation used for steel lattice towers that has an extendable deep-foundation system with helical plates welded to a central hollow shaft, which is then screwed into the ground avoiding the need for concrete foundations. Under this HCP, helical pier foundations will be used in areas of the Sandhills that lack existing access roads.

Permit Area. Lands and other areas encompassed by specific boundaries that are affected by the conservation plan and incidental take permit.

Harm. Defined in regulations promulgated by the U.S. Fish and Wildlife Service to implement the Endangered Species Act as an act "which actually kills or injures" listed wildlife. Harm may include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR § 17.3).

Harass. An intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding, and sheltering (50 CFR § 17.3).

Incidental take. Take of any federally listed wildlife species that is incidental to, but not the purpose of, otherwise lawful activities (see definition for "take") (Endangered Species Act Section 10(a)(1)(B)).

Incidental Take Permit (ITP). A permit that exempts a permittee from the take prohibition of Section 9 of the Endangered Species Act issued by the USFWS pursuant to Section 10(a)(1)(B) of the Endangered Species Act. Also sometimes referred to as a "Section 10(a)(1)(B)," "Section 10 permit," or "ITP."

Lattice tower. A free-standing transmission support structure consisting of a framework of steel anchored to four foundations.

Low-ground-pressure equipment. Equipment used during construction that can travel overland with no improvements to the access path. Low-ground-pressure equipment will not require the removal of vegetation and will not cause a temporary disturbance to the landscape.

Mitigation. Under the Endangered Species Act, the applicant must demonstrate that the applicant for an ITP will, to the maximum extent practicable, minimize and mitigate the impacts of take of species. According to the HCP Handbook, typical mitigation actions under HCP and incidental take permits include the following: (1) avoiding the impact (to the extent practicable); (2) minimizing the impact; (3)

rectifying the impact; (4) reducing or eliminating the impact over time; or (5) compensating for the impact. Under National Environmental Policy Act (NEPA) regulations, mitigation includes: (1) avoiding the impact by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or (5) compensating for the impact by replacing or providing substitute resources or environments (40 CFR § 1508.20).

National Environmental Policy Act (NEPA). Federal legislation establishing national policy that environmental impacts will be evaluated as an integral part of any major federal action. Requires the preparation of an Environmental Impact Statement for all major federal actions significantly affecting the quality of the human environment (42 U.S.C. §§ 4321–4327).

Recovery Plan. A plan developed under Section 4(f) of the Endangered Species Act, 16 U.S.C. § 1533(f), by the USFWS for the conservation and survival of listed species. Recovery plans are required to include (1) a description of site-specific management actions necessary to achieve the plan's goal for conservation and survival of the species; (2) objective, measurable criteria that, when met, would result in the species' removal from the list; and (3) estimates of the time and cost required to achieve the recovery goals.

Right-of-way (ROW). The legal right, established by usage or grant, to pass along a specific route through grounds or property belonging to another. Right-of-way for the R-Project will be 200 feet wide (100 feet either side of centerline) along the route of the transmission line.

Sandhills. Ecoregion in central Nebraska represented by grass-stabilized sand dunes with little to no trees or developed agriculture. The main land use of the Sandhills is cattle ranching.

Section 7. The section of the Endangered Species Act that describes the responsibilities of federal agencies in conserving threatened and endangered species. Section 7(a)(1) requires all federal agencies "in consultation with and with the assistance of the Secretary [to] utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species." Section 7(a)(2) requires federal agencies to "ensure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of" designated critical habitat.

Section 9. The section of the Endangered Species Act dealing with prohibited acts, including the take of any listed species without specific authorization of the USFWS. Federal regulations generally provide the same taking prohibitions for threatened wildlife species (50 CFR § 17.31(a)).

Section 10. The section of the Endangered Species Act dealing with exceptions to the prohibitions of Section 9 of the Endangered Species Act.

Section 10(a)(1)(B). That portion of Section 10 of the Endangered Species Act that authorizes the USFWS to issue permits for the incidental take of threatened or endangered species.

Study Area. An area that encompasses the starting, ending, and intermediate points along a proposed transmission line and represents the boundaries designated when selecting potential routes for the proposed transmission line.

Take. Under Section 3(18) of the Endangered Species Act, "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

Threatened species. "Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (Endangered Species Act, Section 3(20), 16 U.S.C. § 1532(20)).

Transmission line. A power line capable of transferring high voltages of electricity (typically 115,000 volts or higher) over long distances.

Tubular steel monopole. A free-standing transmission support structure consisting of one steel pole anchored to a concrete foundation.

Two-track. A path commonly used by ranchers when driving to access portions of rangeland. Two-tracks are named by the two tire tracks through the range caused by repeated use. Note that two-tracks typically do not have any associated ground improvements.

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APPENDIX A WHOOPING CRANE HABITAT ASSESSMENT

June 21, 2016

NEBRASKA PUBLIC POWER DISTRICT

R-Project Transmission Line

Whooping Crane: Potentially Suitable Habitat Assessment

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POWER ENGINEERS

Whooping Crane: Potentially Suitable Habitat Assessment

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ACRONYMS AND ABBREVIATIONS

CWS	Canadian Wildlife Service
DEM	digital elevation model
ESA	Endangered Species Act
FR	Federal Register
GIS	geographic information system
kV	kilovolt
NESCA	Nebraska Nongame and Endangered Species Conservation Act
NHD	National Hydrography Dataset
NPPD	Nebraska Public Power District
NRCS	Natural Resource Conservation Service
NWI	National Wetlands Inventory
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

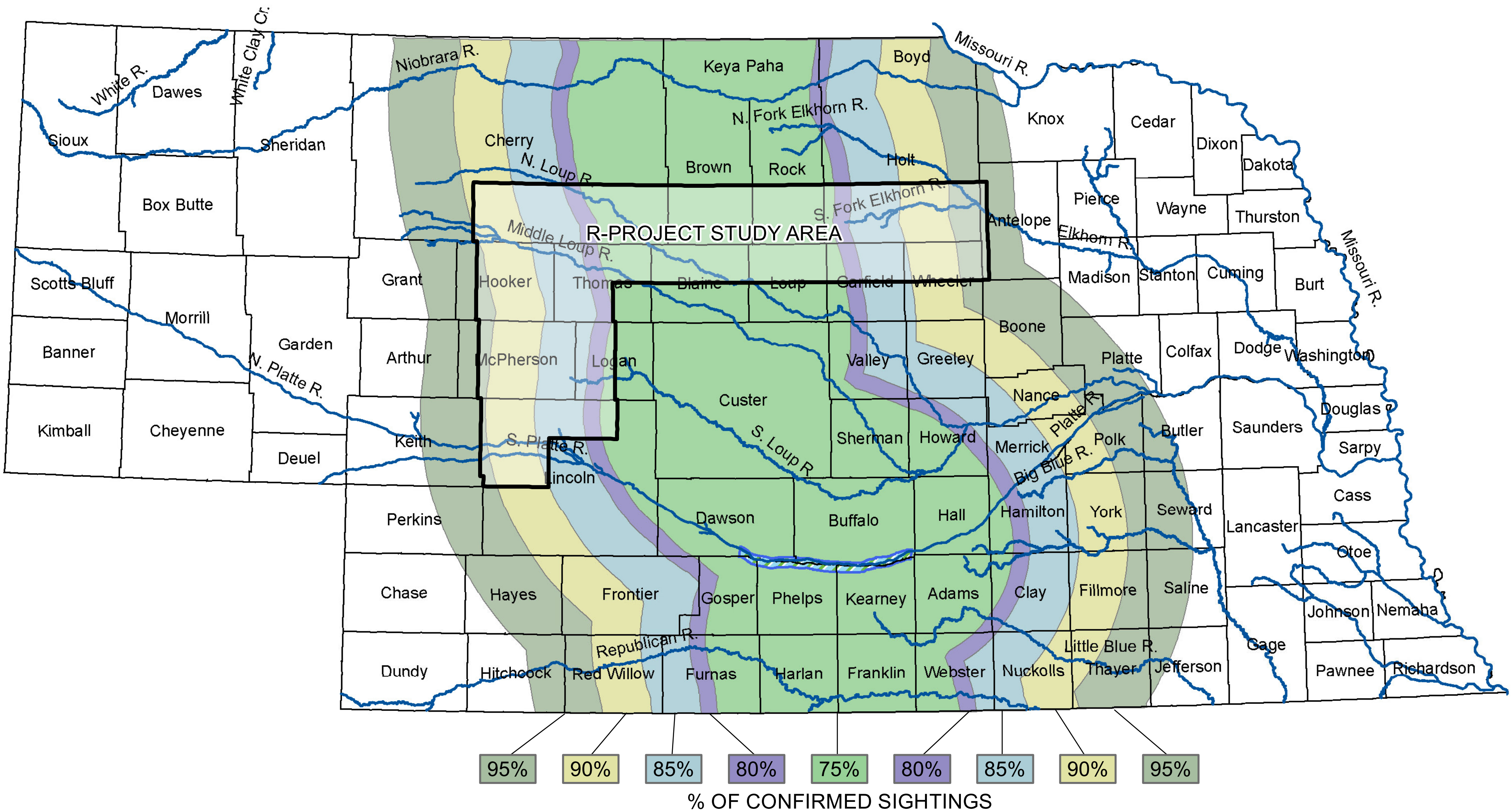
1.0 INTRODUCTION

The Nebraska Public Power District (NPPD) proposes to construct a 345 kilovolt (kV) transmission line from NPPD's Gerald Gentleman Station near Sutherland, Nebraska north to the Thedford substation, and then east to a new substation at Western Area Power Administration's existing Fort Thompson to Grand Island 345 kV transmission line along the western boundary of Antelope County. This line is referred to as the R-Project. The approximately 220-mile-long line will help enhance operation of NPPD's electric transmission system, ensure reliable supplies of power, relieve congestion from existing lines within the transmission system, and provide additional opportunities for development of renewable energy projects. The R-Project project area intersects the Nebraska Sandhills grassland region in the whooping crane (*Grus americana*) migration corridor.

The whooping crane migration corridor is defined in the U.S. Fish and Wildlife Service (USFWS) memo from February, 2010 titled *Region 6 Guidance for Minimizing Effects of Power Line Projects within the Whooping Crane Migration Corridor.* The corridor is based on 100- and 200-mile thresholds around a center line determined using confirmed whooping crane sitings (Stehn and Wassenich 2008; USFWS 2009). The 100-mile corridor incorporates 82 percent of all confirmed observations as of 2007; and the 200-mile corridor incorporates 94 percent of all sightings as of 2007. These data were adapted to create a 95 percent sighting corridor and a 75 percent sighting corridor. Figure 1 depicts where the R-Project area falls within the 95 percent sighting corridor in Nebraska.

This document provides a proposed method for identifying potentially suitable whooping crane habitat along the R-Project and subsequently identifies portions of the project to be marked to minimize the potential for whooping crane collisions. The USFWS recommends marking future power lines that occur within one mile of "potentially suitable habitat" in the whooping crane migration corridor. The R-Project crosses the Calamus River, North Loup River, South Loup River, Middle Loup River, North Platte River, South Platte River, and Birdwood Creek. These riverine/riparian areas are known whooping crane stopover habitats. Other potentially suitable habitats include shallow emergent wetlands, sub-irrigated wet meadows, and farmed wetlands that were identified using the methods set forth in this document.

Data Source: USFWS Cooperative Whooping Crane Tracking Project Database



LEGEND

% OF CONFIRMED SIGHTINGS

75% | 80% | 85% | 90% | 95%

Whooping Crane Designated Critical Habitat

Major Streams

R-PROJECT - NPPD's 345 kV Transmission Line Project

FIGURE 1
WHOOPING CRANE 95% SIGHTING CORRIDOR

2.0 SPECIES INFORMATION

Status and Distribution: The whooping crane was given legal protection under the Endangered Species Preservation Act (P.L. 89-699) in 1967 (32 Federal Register [FR] 4001) and the Endangered Species Conservation Act (P.L. 91-135) in 1970 (35 FR 6069), each of which were incorporated into the current Federal Endangered Species Act (ESA) in 1973. The Nebraska Nongame Endangered Species Conservation Act (NESCA) states that a species occurring in the state of Nebraska protected under the ESA will also receive the same listing status under NESCA. Therefore, the whooping crane also is protected as a state of Nebraska endangered species under NESCA. Federally designated critical habitat for the whooping crane occurs in Nebraska along the Platte River approximately 80 miles south of the R-Project area. The critical habitat includes an area of land, water, and airspace in Dawson, Buffalo, Hall, Phelps, Kearney, and Adams Counties along the Platte River bottoms from the junction of U.S. Highway 283 and Interstate 80 to the interchange for Shelton and Dehman near the Buffalo-Hall County line (43 FR 20941) (Figure 1).

Whooping cranes that may occur in the R-Project area are part of the Aransas-Wood Buffalo migratory population. The Aransas-Wood Buffalo population is the only remaining naturally migrating population of whooping cranes. Whooping cranes in this population nest in Wood Buffalo National Park in Northwest Territories, Canada and winter in Aransas National Wildlife Refuge in Texas. Spring migrants leave Aransas National Wildlife Refuge in March and April, arriving on the nesting grounds in April and May (Canadian Wildlife Service [CWS] and USFWS 2007). Fall migrants leave the nesting grounds in Wood Buffalo National Park in September and October, and arrive on the wintering grounds in October and November. States and provinces which fall within the identified migration corridor include Texas, Oklahoma, Kansas, Nebraska, South Dakota, North Dakota, Montana, Manitoba, Saskatchewan, Alberta, and Northwest Territories (Stehn and Wassenich 2008).

The Aransas-Wood Buffalo population is the only completely self-sustaining population of whooping cranes remaining. Surveys to count whooping cranes within the Aransas-Wood Buffalo population occur multiple times each winter while the birds are at Aransas National Wildlife Refuge. The latest available population surveys occurred in 2013 – 2014. The peak estimated whooping crane abundance within the sampled area indicated 304 whooping cranes (260 to 354, 95 percent confidence interval) were present within the surveyed area. This was up from an estimate of 257 birds in 2012 – 2013. It is not possible to know the exact number of cranes outside the surveyed area. However, it is unlikely that the entire population of whooping cranes was within the surveyed area during the January survey (Harrell 2014).

Three other populations of whooping cranes have been reintroduced in their historic range. One population migrates between Florida and central Wisconsin. The second population is a group of non-migratory birds in central Florida, and the third is a non-migratory flock at White Lake, Louisiana. Each of these populations is established and supplemented by whooping cranes raised in captivity and released into the populations until such time that the population becomes self-sustaining or it is determined that natural reproduction will not sustain the reintroduced population.

Habitat Characteristics/Use: Whooping cranes do not breed in Nebraska. Rather, they occur in the state only while migrating between Aransas National Wildlife Refuge and Wood Buffalo National Park. Migration is generally very fast, lasting two to four weeks in the spring and one to two weeks in the fall (CWS and USFWS 2007), and migrating individuals may occur in Nebraska during the spring and fall intervals.

Whooping crane sightings in Nebraska have primarily been in palustrine wetland (56 percent) and riverine habitats (40 percent) (Austin and Richert 2005). During migration, whooping cranes roost in shallow depressional wetlands or large, shallow riverine habitat, typically adjacent to agricultural fields. Whooping cranes will use small, isolated wetlands for migratory stopover habitat, but prefer larger wetlands over 2.5 acres and shallow broad river channels (Armbruster 1990; Watershed Institute, Inc. 2013). Additionally, USFWS defines potentially suitable migratory stopover habitat as wetlands with areas of shallow water without visual obstructions (i.e., high or dense vegetation) and submerged sandbars in wide, unobstructed river channels that are isolated from human disturbance. Roosting wetlands are typically located within one mile of grain fields (USFWS 2010). Agricultural fields provide stopover habitat by providing food, and subsequently, energy to whooping cranes during migration. Whooping cranes may spend several days resting in a given area and making short flights between roosting and foraging areas, generally less than 0.62 mile apart (Howe 1987). Migrating whooping cranes rarely use the same specific roosting habitat year after year, preferring to find suitable roosting habitat in their vicinity when conditions are no longer optimal for migrating. The exceptions to this include several large wetland complexes along the migration corridor which have been designated as critical habitat, and the stretch of Platte River bottoms which has been designated as critical habitat.

The diet of migrating whooping cranes is poorly documented. However, individuals are known to consume frogs, fish, crayfish, insects, plant tubers, and agricultural waste grain during migration (CWS and USFWS 2007). Feeding sites of migrating whooping cranes noted from 1977 through 1999 were largely upland crops. Seasonal or permanent wetlands or upland perennial cover was used less frequently (Austin and Richert 2005).

The two most commonly identified sources of whooping crane mortality within the Aransas-Wood Buffalo population are shootings and power line collisions (Stehn and Strobel 2011). However, in over 90 percent of all mortality cases a carcasses is not found and the cause of mortality is unknown and speculative (Stehn and Strobel 201). In water bird studies, collisions typically occur when a transmission line bisects roosting and foraging habitats (Brown et al. 1987; Morkill and Anderson 1991). It is not possible to predict which row crop agriculture fields would be used by whooping cranes for foraging, and therefore not possible to predict where foraging might take place; however, a field’s proximity to wetlands provides insight into where whooping cranes may to occur. Kaufield (1981) found that optimal stopover habitat for migrating whooping cranes had adequate roosting and foraging sites within two kilometers of one another and that foraging locations more than ten kilometers from the roost site were not used. Austin and Richert (2005) found that approximately two-thirds of whooping crane foraging locations during migration were within 0.5 mile of the roost site. Howe (1989) observed 27 whooping cranes, seven of which were radio tracked, and found that whooping cranes travelled up to 5.0 miles to upland feeding sites from their roost sites, but that 56 percent travelled less than 0.62 mile.

3.0 METHODS CONSIDERED

Currently published methodologies for identifying potentially suitable habitat for whooping cranes were reviewed and evaluated to determine the most applicable method for the R-Project. The Watershed Institute's "Potentially Suitable Habitat Assessment for the Whooping Crane" ([TWI method], Watershed Institute, Inc. 2013) was selected as the best method for the R-Project because it is applicable to transmission lines, uses available desktop GIS data, is the most comprehensive, and is easily replicable. The TWI method was determined to be the most applicable of the methods evaluated and follows the *Region 6 Guidance for Minimizing Effects of Power Line Projects within the Whooping Crane Migration Corridor*. Two levels of desktop analyses are used within one mile on each side of a proposed power line project. The TWI method is broken into two main steps, the Initial Analysis and the Secondary Analysis. The Initial Analysis eliminates wetlands from consideration as potentially suitable habitat based on wetland size, visibility obstructions and slope, and distance to disturbances. The Secondary Analysis then ranks the wetlands which remained after the Initial Analysis based on wetland water regimes, wetland size, proximity to food sources, natural versus man-made wetlands, and wetland density.

The following methods were considered but not selected for use on the R-Project because each was developed for assessing potential impacts to whooping cranes from proposed wind generation facilities. The additional methods considered did not analyze the landscape and potentially suitable habitat surrounding a proposed project to the same degree of specificity as the TWI method. A brief description of the evaluation completed for each is provided.

Predicting and Mapping Potential Whooping Crane Stopover Habitat to Guide Site Selection for Wind Energy Projects (Belaire et al. 2013). This method originally was developed to identify potential effects to whooping cranes from wind energy development. This method analyzed land use variables including agricultural land, roads, urban areas, and wetlands/water as factors determining potentially suitable habitats with whooping crane distribution (based on sightings), and wind resources/site suitability locations. As the location of potential wind resources was the primary factor for this method, it was determined not to be appropriate for the R-Project. Additionally, several factors related to potentially suitable habitat for whooping cranes (wetland size, visibility obstructions, distances from disturbances, water regime, and wetland density) were not considered in this assessment method.

Whooping Crane Likelihood of Occurrence Report – Cimarron Wind Energy Project – Phase 1 Gray County, Kansas (Tetra Tech EC, Inc. 2010). This method originally was developed to identify potential effects to whooping cranes from wind energy development by using National Wetlands Inventory (NWI) and U.S. Geological Survey (USGS) National Land Cover Database data to identify wetland locations and cropland in comparison to a specific wind energy project area. A likelihood of occurrence formula was created by utilizing the location of the project in comparison to the whooping crane migration corridor, a suitable wetlands ratio (suitable wetlands in the project area to suitable wetlands in a 35-mile area around the project), and a wetland-agricultural matrix score (distance between wetlands and agricultural land cropland). Suitable wetlands in this method were wetlands greater than one acre in size and less than 0.62 mile from cropland foraging locations. This method was designed for a specific wind farm project area, not for a linear project like the R-Project. Several factors related to potentially suitable habitat for whooping cranes (visibility obstructions, distance from disturbances, water regime, and wetland density) were not considered in this assessment method.

Whooping Crane Desktop Stopover Risk Assessment: Grande Prairie Wind Farm Holt County, Nebraska (Stantec 2014). This method originally was developed to identify potential effects to whooping cranes from wind energy development and included a review of available data regarding the potential for whooping crane interactions with a specific wind farm project area. Data analyzed included whooping crane migration ecology and potentially suitable habitat requirements, potential impacts from wind development and wind development guidance, federal and state conservation areas near the project area, characteristics and conservation issues of Nebraska's wetlands, confirmed whooping crane record locations, and wetland resources in the project area and vicinity. Additionally, a site-specific wetland delineation was completed for the project area. Risk associated with the project development was then determined utilizing the previously mentioned factors. Several factors related to potentially suitable habitat for whooping cranes (visibility obstructions, distance from disturbances, water regime, proximity to food sources, and wetland density) were not considered in this assessment method.

Guidelines for Wind Energy and Wildlife Resource Management in Nebraska (Nebraska Wind and Wildlife Working Group 2013). This method originally was developed to identify potential effects to whooping cranes from wind energy development. This method is very brief and describes that a desktop assessment should be completed utilizing information including whooping crane ecology, location of a project site relative to the whooping crane migration corridor, and a low-level geographic information system (GIS) analysis of wetland and habitat resources located within and adjacent to a project site. No further specifications were provided in this method. This was not selected to identify whooping crane potentially suitable habitat for the R-Project because of the low level of analysis and the original application to wind energy development.

Wind Energy and Nebraska's Wildlife: Avian Assessment Guidance for Wind Energy Facilities; Whooping Crane Desktop Stopover Risk Assessment (NGPC and USFWS 2012). This method originally was developed to identify potential effects to whooping cranes from wind energy development. This method considers whooping crane migration ecology, the specific location of a proposed project relative to the whooping crane migration corridor, and a low-level GIS analysis of wetland and habitat resources within and adjacent to a proposed project site. A fatal flaw analysis is completed to indicate if construction of a wind project in a specific location would be detrimental to whooping cranes. Known occurrences of whooping cranes, NWI data, and Natural Resource Conservation Service (NRCS) hydric soil data are reviewed. Several factors related to potentially suitable habitat for whooping cranes (visibility obstructions, distance from disturbances, proximity to food sources, and wetland density) were not utilized in this method.

4.0 UTILIZED METHODOLOGY

As described above, the TWI method was selected for determining potentially suitable habitat for whooping cranes along the R-Project. It is likely that a site visit with USFWS and Nebraska Game and Parks Commission staff will be required to groundtruth areas of potentially suitable habitat in the field once right-of-entry is acquired along the transmission line route.

The following sections outline the utilized methodology to identify potentially suitable habitat in the R-Project Whooping Crane Study Corridor (defined in Section 4.1 below). The Initial Analysis eliminated wetlands that were determined to not meet the requirements of potentially suitable habitat based on wetland size, visibility obstruction, and distance from disturbances. Following the elimination of unsuitable wetlands during the Initial Analysis, the remaining wetlands were analyzed in the Secondary Analysis to rank the habitat quality (suitability) based on water regime, distance to food, wetland size, natural vs. manmade wetland, and wetland density.

4.1 Whooping Crane Study Corridor

As specified in the *Region 6 Guidance for Minimizing Effects of Power Line Projects within the Whooping Crane Migration Corridor*, new power lines within one mile of potentially suitable habitat should be marked to reduce the risk of a line strike by whooping cranes. Therefore, the study corridor for the R-Project included one mile on each side of the proposed transmission line (two-mile width) for its entire length (approximately 220 miles long) (Figure 2). This corridor will subsequently be referred to as the "Whooping Crane Study Corridor."

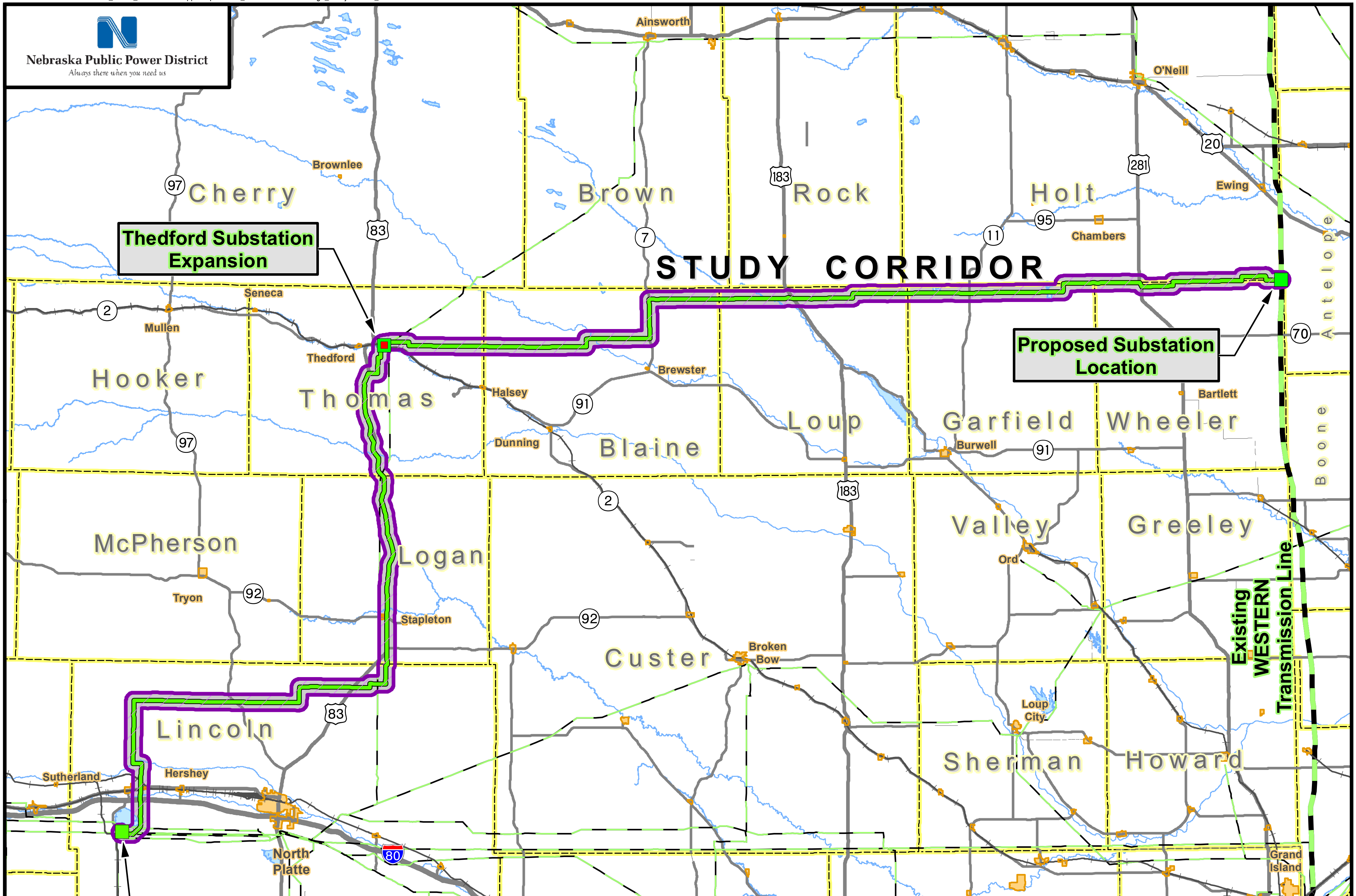
4.2 Potentially Suitable Habitat Components

The components for wetlands to be used by whooping cranes during migration are provided in Table 1. These habitat components are described in general terms here and will be described in greater detail in Sections 4.4 and 4.5.

TABLE 1 POTENTIALLY SUITABLE HABITAT COMPONENTS

HABITAT COMPONENT	DEFINITION
Wetland Size	Greater than 0.25 acre; larger than 7.0 acres preferred.
Open sight lines	No visibility obstructions, including slopes, within 328 feet.
Limited human disturbances	No human disturbances within specified distances from habitat.
Suitable water regime	Maintains water during migratory season. Preferably permanent/perennial, intermittently exposed, or semi-permanently flooded.
Close proximity to food source	Row crop agriculture within 0.93 mile.
Wetland type	Natural wetland preferred over manmade or highly modified wetland.
Wetland complexes	Several wetlands grouped close to one another with no obstruction in between.

Date: 2/2/2015 Path: W:\128143_NPPD_SPP\DD\GIS\Apps\Reports\WC_HabitatAssessment\Fig2_StudyCorridor_8x11.mxd



NPPD's R-Project
FIGURE 2
WHOOPING CRANE STUDY CORRIDOR

4.3 Available GIS Data

GIS software (ArcMap) was used to analyze available GIS data for the Whooping Crane Study Corridor. Table 2 identifies the available GIS data that were used in the Initial and Secondary Analyses.

TABLE 2 AVAILABLE GIS DATA USED IN ANALYSES

GIS RESOURCE DATA	SOURCE	ANALYSIS STEP
Aerial photography (aerial interpretation of surface waters)	Westwood Imagery 2013	Initial Analysis
Wetland polygons (wetland size, type, water regime, density, and manmade vs. natural)	USFWS National Wetland Inventory 2011	Initial and Secondary Analysis
Hydric soils (used with NWI to identify wetlands)	NRCS	Initial Analysis
Open and surface water (lakes, rivers and streams)	National Hydrography Dataset	Initial Analysis
Slope (visibility obstruction)	Digital Elevation Model – auto classification from aerial photograph terrain model	Initial Analysis
Disturbances (roads, dwellings, railroads, commercial developments, bridges, etc.)	Aerial interpretation (residences, commercial developments, and bridges). Transportation data - Nebraska Department of Natural Resources (roads, railroads), aerial photography, ground-based survey.	Initial Analysis
Cropland (food source)	Aerial Interpretation and Landfire data	Secondary Analysis

4.4 Initial Analysis

Analysis of potentially suitable habitat for whooping cranes was limited to the Whooping Crane Study Corridor. A GIS based desktop wetland layer was developed utilizing aerial photographs, USFWS NWI polygons, NRCS hydric soil polygons, open water/surface water data from USGS National Hydrography Dataset (NHD), and rivers/streams digitized from detailed aerial imagery. Only soils identified as “all hydric” were utilized for inclusion in the analysis. Partially hydric soils in the Whooping Crane Study Corridor have varying percentages of hydric soils, with the majority of the polygons less than five percent hydric. Following development of the desktop wetland layer, the Initial Analysis determined if identified wetlands met the requirements for size, visibility obstructions, and disturbance to qualify as potentially suitable habitat that were carried forward to Secondary Analysis.

4.4.1 Wetland Size

Wetlands larger than 2.5 acres are optimal for whooping crane stopover habitat; however, smaller wetlands are used (Watershed Institute, Inc. 2013). Armbruster (1990) concluded that a wetland equal to or less than 0.25 acre is not potentially suitable habitat. Therefore, the initial analysis eliminated all wetlands within the Whooping Crane Study Corridor that are equal to or less than 0.25 acre in size.

4.4.2 Visibility Obstruction

Visibility obstructions can be any feature greater than 4.6 feet in height (height at crane eye level) and can include vegetation, buildings, and topography. Potentially suitable habitats do not have visibility obstructions within 328 feet (Armbruster 1990). Wetlands not eliminated in the above step were evaluated for obstructions within 328 feet using GIS. If wetlands were identified as palustrine scrub-shrub (vegetation is less than 20 feet tall) or forested wetlands (vegetation equal to or greater than 20 feet tall; possible along streams. rivers or lakes), those areas were determined to have vegetation visibility obstructions and were eliminated. Any wetlands with manmade visibility obstructions, such as buildings within 328 feet were also eliminated.

Tall vegetation was not included in the visibility obstruction analysis due to a lack of sufficient data. Existing vegetation data, such as LandFire landcover data, did not provide sufficient detail to identify tall vegetation.

The TWI method includes an analysis of topography surrounding potential roost sites. The TWI method considers topography to be a visibility obstruction when the average slope is greater than 1.5 percent within 328 feet of the roost site (Watershed Institute 2013). During draft development of the current habitat assessment, it was determined that inclusion of slopes greater than 1.5% within 328 feet eliminated a substantial portion of potentially suitable habitat. Given the rolling terrain nature of the Sandhills, it was decided that a slope analysis would not be included in this habitat assessment.

4.4.3 Disturbance

Whooping crane-specific data regarding the species reaction to various human disturbances are limited. However, sandhill crane (*Grus canadensis*) responses to human activities have been documented (Armbruster 1990). Given the similarities between whooping cranes and sandhill cranes, the TWI method uses the sandhill crane as a surrogate species with regard to human disturbances. Table 3 identifies types of disturbance and distance from the disturbance assumed to influence potentially suitable habitat. Wetlands were analyzed for proximity to human disturbances described in Table 3.

TABLE 3 TYPES OF DISTURBANCE AND DISTANCE FROM AFFECTED AREA ASSUMED TO INFLUENCE ROOSTING SITES[1]

TYPE OF DISTURBANCE	WIDTH OF AFFECTED AREA (FEET)
Paved Road	1,312
Gravel Road	656
Private Road	328
Urban Dwelling[2]	2,625
Single Dwelling	656
Railroad	1,312
Commercial Development	2,625
Recreational Area[3]	656
Bridges	1,312

Notes:
1. Watershed Institute, Inc. 2013.
2. An urban dwelling is a residence located in an area characterized by a higher population density/human features in comparison to the areas surrounding it (i.e., a town, city, or community).

3. A recreational area is classified as any park, picnic area, river access site, etc. where concentrated human activity occurs related to recreation.

Roads in the Whooping Crane Study Corridor were identified from county-based road databases. Paved roads included those categorized as paved or bituminous surface. Gravel roads will include those categorized as gravel, one-lane oil, dirt, or minimum maintenance surface. Private roads are those categorized as driveways. Other road categories in the county-based road databases include primitive, trail, and unimproved. These categories were not included in the analysis because they do not represent actual roads in the Whooping Crane Study Corridor and are not frequently traveled.

Disturbance buffers were created in GIS for each type of disturbance according to the distances provided in Table 3. Wetlands located within the disturbance buffers were not considered potentially suitable habitat and were eliminated from the analysis. If any wetlands were partially within the disturbance buffers, the portion of those wetlands within the disturbance buffers was removed from consideration as suitable habitat. The area of the remaining portion of wetlands that did not fall within disturbance buffers was recalculated and analyzed further if greater than 0.25 acre in size (see Section 4.4.1).

4.5 Secondary Analysis

Wetlands meeting Initial Analysis criteria were analyzed further to score potentially suitable habitat in the Secondary Analysis. Wetland habitat criteria considered in the Secondary Analysis are water regime, distance to food, additional wetland size criteria, natural wetland habitat, and wetland density. Each habitat criteria was assigned a value resulting in a habitat score for wetlands. Wetlands with higher scores indicate a higher suitability for whooping crane use.

4.5.1 Water Regime

Palustrine and lacustrine wetlands that maintain permanent/perennial water, are intermittently exposed, or are semi-permanently flooded have been identified as preferred whooping crane stopover habitat (Armbruster 1990). Table 4 scores wetlands based on these water regimes. NWI water regime data for each wetland was reviewed and a rating was assigned according to Table 4.

TABLE 4 WATER REGIME HABITAT SCORE[1]

WATER REGIME[2]	SCORE
Permanent	5
Intermittently Exposed	4
Semi-Permanent	3
Seasonally Flooded	2
Intermittent/Temporarily Flooded	1

Notes:
1. Watershed Institute, Inc. 2013.
2. Cowardin et al. 1979.

The water regime classifications identified above are derived from Cowardin et al. (1979) and are typically included in NWI data. However, potentially suitable habitat analyzed includes data from the NHD waterbodies, rivers and streams, and soils classified as “all hydric”, which do not include the Cowardin et al. classifications. In these instances, polygons consisting of NHD waterbodies and rivers and streams were assigned a water regime of “permanent”, and polygons derived from the “all hydric” soils will be assigned a water regime of “intermittent/temporarily flooded”.

4.5.2 Proximity to Food Source

Whooping cranes prefer roost sites that are located near food sources (cropland). Armbruster (1990) found that a food source within 0.93 mile from roosting sites provide optimal conditions for whooping cranes. Each wetland was evaluated for its proximity to cropland. The distance from each wetland area to cropland was measured and a score was assigned according to Table 5. For the purposes of this analysis, any mechanized irrigation (i.e., pivots) or dry-land farmed row-crops was considered a potential food source.

TABLE 5 PROXIMITY TO FOOD HABITAT SCORE[1]

DISTANCE TO FOOD SOURCE (MILES)	SCORE
Within or Adjacent to Cropland	5
<0.31	4
0.32-0.62	3
0.62-0.93	2
>0.93	1

Note:
1. Watershed Institute, Inc. 2013.

4.5.3 Wetland Size

Whooping cranes have been observed utilizing wetlands of varying sizes. However, Armbruster (1990) identified the preferred wetland size as being greater than 7.8 acres as larger wetlands provide greater distances from disturbances located onshore. Additionally, Armbruster (1990) concluded that the probability of a suitable roost site was higher for wetlands greater than 2.5 acres in size. The area for each wetland was calculated using GIS. A score for wetland size was then assigned to each wetland according to Table 6. Note that wetlands smaller than 0.25 acre were removed from consideration as potentially suitable habitat under the Initial Analysis in Section 4.4.1.

TABLE 6 WETLAND SIZE HABITAT SCORE[1]

WETLAND SIZE (ACRES)	SCORE
>7.0	5
5.0 - 6.9	4
3.0 - 4.9	3
1.0 - 2.9	2
0.25-1.0	1

1. Watershed Institute, Inc. 2013.

4.5.4 Natural Wetlands

Studies indicate that man-made palustrine wetlands, stock ponds, and other man-made water features do not maintain quality whooping crane roosting habitat due to the proximity to human disturbances, water depths being too deep for adequate shallow areas, and steeper slopes adjacent to the features creating visibility obstructions (Stahlecker 1997). Therefore, natural wetlands are thought to be preferred roosting habitats to man-made wetlands. NWI data provide modifiers for wetlands such as “diked/impounded” and “excavated” that indicate a wetland is man-made or substantially altered by man. All polygons derived from NHD, rivers and streams, and the “all hydric” soils data were classified as "natural" for scoring purposes. A score was then assigned to each wetland according to Table 7.

TABLE 7 NATURAL WETLAND HABITAT SCORE[1]

WETLAND TYPE	SCORE
Natural	2
Man-made	0

Note:
1. Watershed Institute, Inc. 2013.

4.5.5 Wetland Density

As previously stated, whooping cranes have been documented to prefer large wetlands and wetland complexes as they provide less visibility obstruction, typically have perennial surface water, and less human disturbance. For the purposes of this methodology, wetland complexes were defined as five or more wetlands located within a one-quarter section without identified visual obstructions between the wetlands (Watershed Institute, Inc. 2013). A wetland density score was then assigned to each wetland according to Table 8.

TABLE 8 WETLAND DENSITY HABITAT SCORE[1]

WETLAND COMPLEX	SCORE
Yes	3
No	0

Note:
1. Watershed Institute, Inc. 2013.

4.5.6 Total Habitat Quality Score

The Watershed Institute (2013) utilized the Quivira National Wildlife Refuge in central Kansas as a reference location for assessing potentially suitable habitat. Quivira National Wildlife Refuge is a traditional migratory stopover wetland and federally designated critical habitat for whooping cranes. The Watershed Institute concluded that total habitat scores of 12 or higher were considered potentially suitable habitat after analyzing approximately 500 wetland features at Quivira National Wildlife Refuge (Watershed Institute, Inc. 2013).

The habitat scores from the Secondary Analysis were totaled for a possible maximum score of 20. Wetlands scoring between 13 and 20 (Table 9) were considered potentially suitable habitat for whooping cranes (Watershed Institute, Inc. 2013). A wetland score of 13 was the mean Secondary Analysis score from all analyzed wetlands.

TABLE 9 WETLAND HABITAT QUALITY SCORE

TOTAL HABITAT SCORE	POTENTIALLY SUITABLE HABITAT?
13 - 20	Yes
0 - 13	No

5.0 RESULTS

A one-mile buffer was placed around the potentially suitable habitat identified to determine which portions of the transmission line require marking based on the Region 6 Guidance. Based on results of this analysis, a total of 113 miles of the R-Project falls within one mile of potentially suitable habitat. However, NPPD's local knowledge of the R-Project landscape along with further conversation with USFWS and NGPC identified additional portion of the R-Project which will be marked. In total, NPPD will mark 123 miles of the R-Project according to NPPD's company standard to satisfy the Region 6 Guidance and minimize the potential for whooping crane collisions.

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APPENDIX B R-PROJECT WHOOPING CRANE SURVEY PROTOCOL

Whooping Crane Fact Sheet

Whooping Cranes in Flight

Foraging Whooping Cranes

Adult with juvenile

The Whooping Crane (*Grus americana*) is a federal and state listed endangered migratory species. The Whooping Crane was federally listed as endangered in 1967. Major river systems used by whooping cranes in Nebraska include the Platte, Loup, Republican, and Niobrara rivers. Additionally, a 3-mile-wide, 56-mile-long reach of the Platte River between Lexington and Denman, Nebraska, has been federally designated as critical habitat for whooping cranes. (Information from U.S. Fish and Wildlife Service)

Whooping Crane (*Grus americana*)
Order: *Gruiformes*
Family: *Gruidae*

Status: State and Federally Endangered. **Description:** L 52"(132 cm) W 87"(221 cm). Sexes similar but males are larger. White body with red and black facial markings. Yellow bill and long dark legs. Immature is white with tawny head and neck, and reddish-brown mottling on rest of body. **Habitat:** In Nebraska is found along the Platte Valley, with its wide slow moving river and associated sandbars and islands. Nearby wet meadows, croplands, and marshlands are important for foraging. **Status/Range:** Occasional spring and fall migrant along Platte Valley. 90% of sightings within 30 miles of Platte River, and 80% occurred between Lexington and Grand Island. **Call:** Shrill "*ker-loo-ker-lee-loo"* trumpet. **Comments:** Endangered. Management and protection programs slowly succeeding.

Similar: Sandhill Crane, Snow Geese, and especially American White Pelicans in flight:

(Information from Nebraska Game and Parks Commission website)

American White Pelican

The Whooping Crane is one of the rarest birds in North America and also one of the largest. Whooping cranes are vulnerable to accidents during migration. Each spring they travel north from their wintering grounds around Aransas National Wildlife Refuge in Texas to their breeding grounds in Wood Buffalo National Park in central Canada (2,400 miles). Each fall this route is reversed. Their journey traverses eastern Montana, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma and Texas. In Nebraska, they stop to rest and feed on the Platte, North and Middle Loup and Niobrara Rivers. (Information taken from the USFWS Draft Revised International Whooping Crane Recovery Plan Jan 2005)

August 2015

Whooping Crane Survey Protocol

Whooping Cranes can be disturbed by sights (human figures, equipment within sight) and sounds (loud equipment, banging, etc.) that are abnormal (roadway traffic is normal). Therefore surveys are needed to ensure disturbance is minimized.

Dates of Survey:

- Spring Migration – March 23 – May 10*
- Fall Migration – September 16 – November 16*
- When construction activities are occurring, surveys should be conducted daily during these two time frames.

** Birds can migrate earlier and later than these dates. The Nebraska Game and Parks Commission (Commission) and/or the U.S. Fish and Wildlife Service (Service) will contact project proponents if the survey periods need to be adjusted based on the status of the migration during any given year.*

Method of Survey

- Surveys will ensure that all area within 0.5 miles of work areas can be seen.
- Surveys will be conducted so the surveyor is looking from the east to the west and from south to north.
- Surveys may be done from the ground or aerially
- Aerial surveys may be done using fixed wing or helicopters. All surveys will be done from an elevation greater than 750 feet.
- Use of a drone or other methods of completing survey may be explored.

Time of Survey:

- Survey project each day within one hour prior to the start of the workday, with at least one survey done no later than 10 am. Record start and stop time.
- Survey area within 0.5 miles of project using binoculars or spotting scope.

If Whooping Cranes are not seen during the morning survey, work may begin after completion of the survey.

If Whooping Cranes are spotted within 0.5 miles of the active construction at any time:

- Do not start work. Immediately contact the Commission[1] or the Service[2] for further instruction.
- Stop work if seen at times other than the morning survey.
- Work can begin or resume if birds move and are greater than 0.5 miles from the construction/activity area; record sighting, bird departure time, and work start time on survey form.

[1] Nebraska Game and Parks Commission Point of Contact:

Joel Jorgensen, Nongame Bird Program Manager
office: (402) 471-5440
cell: (402) 533-0924

Michelle Koch, Fish and Wildlife Specialist
office: (402) 471-5438
cell: (308) 380-7647

[2] U.S. Fish and Wildlife Service, Nebraska Field Office Point of Contact:

Matte Rabbe, Wildlife Biologist
office: (308) 382-6468 ext. 205
cell: (308) 379-5562

August 2015

APPENDIX C R-PROJECT WHOOPING CRANE MORTALITY RISK ASSESSMENT

R-Project Whooping Crane Mortality Risk Assessment

Nebraska Public Power District (NPPD) recognizes that power lines within the Aransas-Wood Buffalo Population (AWBP) migration corridor represent a mortality source to whooping cranes. There are 10 documented power line collision mortalities in the AWBP, which include 2 chicks, 3 sub-adults, and 5 adults. Because there has not been a systematic means to detect whooping mortalities, known sources of mortality are often extrapolated out to the 546 individual fledged whooping cranes that have died between 1950 and 2010 (Stehn and Haralson-Strobel 2014). However, this number is calculated from counts on the wintering ground and thus may have missed some fledged chicks that died during their first migration.

Of the 546 dead individuals, only 50 carcasses have been found. This very low recovery rate of carcasses means that timing and cause of mortality must be extrapolated from the available data with a large amount of uncertainty as to timing and cause. It is assumed that timing of mortality is correctly identified when it occurs on the wintering ground. Mortality of cranes at their summer areas is assumed to be low but is unknown because of the low probability of finding carcasses in the summer areas (Stehn and Haralson-Strobel 2014). Based upon these sparse data, it was concluded that power lines are the greatest known cause of mortality to fledged whooping cranes (Stehn and Wassenich 2011). However, more recent data from a satellite tracking study are not consistent with past publications that asserted that the majority of mortality occurs during migration (Pearse et al. 2018). These recent data also indicate that mortality on both the wintering and summer areas has likely been underestimated (Pearse et al. 2018).

The documented AWBP whooping crane mortalities from collision with power lines have occurred in locations that range from southern Saskatchewan to Texas and from the very center line of the migration corridor to outside the 95% corridor (Stehn and Wassenich 2008). The highly dispersed nature (both temporally and spatially) of these historic mortality data makes predicting where a collision is likely to occur impossible at the local scale. Intuitively, one would expect areas with more crane use to have more collisions. However, the available data (Stehn and Wassenich 2008, Stehn and Haralson-Strobel 2014) do not support that conclusion. For instance, none of the known collisions have occurred in or near critical habitat where crane use is very high and power lines are present.

While it may seem reasonable to assume that collision incidents would increase as the miles of power line increase, NPPD evaluated the available data and found no corresponding increase in mortality during migration as power line miles increased (Figure 1). Therefore, the rate of mortality as measured using mortalities per mile of line is actually decreasing (Figure 2), indicating that new power lines do not automatically equate to new mortality. While the increase in transmission lines miles is shown as straight line due to use of an annual rate estimate from the Western Area Power Administration, it should be noted that both annual transmission line construction rates and annual mortality rates are variable. NPPD did not attempt to address this variability statistically but rather provides this analysis to show that there is not a positive relationship between new miles of transmission line and crane mortality rates.

We also evaluated whether an increasing population equates to increasing collisions. To do this, we used data from Stehn and Haralson-Strobel (2014) to calculate cumulative crane years (1 crane at Aransas National Wildlife Refuge equals 1 crane year) and divided that total by the cumulative collision mortalities. Figure 3 shows that the number of cranes years between documented collisions is increasing, meaning that it may not be reasonable to assume more collisions with increased populations. The empirical data would also support this. Since 2002, the date of the last documented power line collision, the population has grown from 184 individuals to 505 (US Fish and Wildlife Service 2018) with no documented collisions. NPPD recognizes not all collisions are documented. However, it is likely that detection rates and biases have remained constant or have increased with increased human populations (i.e., there more people to find the crane) and increased awareness of the issue. A linear regression looking at the relationship between cumulative crane years and cumulative mortalities is a significantly negative ($P<0.001$, $R^2=0.35$), indicating that it is not sound to assume that mortality is increasing at the same rate as the population.

In sum, whooping crane mortality on power lines has been documented, but the data do not indicate an increasing rate of incident, even though both the number of whooping cranes and miles of power line have been and continue to increase. Against this backdrop, NPPD completed a risk assessment to evaluate the likelihood of take on the R-Project using a mathematical approach based upon the available historic information. In this approach, we have stated our assumptions and, where possible, have included a sensitivity analysis that acknowledges the small amount of data available upon on which those assumptions are based.

U.S. Fish and Wildlife Service (USFWS) Region 6 has issued guidance that indicates that marking new power lines within one mile of potentially suitable stopover habitat, together with an equal amount of existing power lines within one mile of potentially suitable stopover habitat, should be sufficient to maintain the baseline condition for power line mortality threat to whooping cranes and result in an insignificant and/or discountable effect on the species. This approach is based on the concept that risk posed by new structures can be mitigated by marking existing power lines in the migration corridor (USFWS 2010). NPPD is committed to following this Region 6 guidance for the R-Project.[1] Based on this guidance, and the risk analysis described below, NPPD does not believe that the R-Project is reasonably certain to result in take of a whooping crane and, thus, no incidental take permit for the crane is necessary.[2]

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[1] The USFWS has recently indicated that it believes that the effectiveness of bird flight diverters for whooping cranes is in the range of 40-60% rather than the 60-80% indicated in the Region 6 guidance. As discussed further below, this analysis acknowledges that lower range.

[2] See the adaptive management section of the R-Project Habitat Conservation Plan for addressing future changes in collision-risk information.

Available Data

Population Data. In 1939, the total number of individuals in the AWBP was 18 birds (Texas 2013 and Didrickson 2011). In 2018, it is estimated that the AWBP has increased to 505 on traditional wintering areas plus an additional 21 individuals outside the traditional wintering areas (USFWS 2018).

Power Line Data. The USFWS (2009) estimated transmission line miles in the AWBP states using a Western Area Power Administration data set. NPPD used that same data set to estimate that there are 86,657 miles in 2016. Table 1 below provides the breakdown of those transmission line miles by state, as well as the amount that are estimated to be within the whooping crane migratory corridor.

Table 1. Transmission Line Miles

State	Transmission Line Miles in State	Percent of State in Migratory Corridor	Transmission Line Miles in Migratory Corridor
Texas	44,199	28.0%	12,375
Oklahoma	8,696	49.7%	4,322
Kansas	9,538	47.7%	4,550
Nebraska	9,377	51.8%	4,857
South Dakota	6,227	47.1%	2933
North Dakota	8,617	60.7%	5,231
Total	**86,654**	--	**34,268**

Based on inquiries to the state rural electric associations, there are roughly 689,000 miles of rural distribution lines, not including most municipalities in the six central flyway states. Table 2 below provides the breakdown of those distribution line miles by state, as well as the amount that is estimated to be within the whooping crane migratory corridor.

Table 2. Distribution Line Miles

State	Distribution Line Miles in State	Percent of State in Migratory Corridor	Distribution Line Miles in Migratory Corridor
Texas	257,000	28.0%	71,960
Oklahoma	117,000	49.7%	58,149
Kansas	91,000	47.7%	43,407
Nebraska	100,000	51.8%	51,800
South Dakota	65,000	47.1%	30,615
North Dakota	59,000	60.7%	35,813
Total	**689,000**	--	**291,744**

These data indicate that there are approximately 326,000 miles of transmission and distribution lines within the AWBP migratory corridor. This number is obviously dynamic and thus was rounded to the nearest thousand miles. Most, if not all, of these power lines were built after the Rural Electrification Act of 1936.

<u>Satellite Tracking Data.</u> In the fall of 2017, data from 58 individual cranes that were fitted with satellite tracking devices became available to the public, including NPPD. At that time, NPPD engaged Headwaters Corporation, an environmental and statistical consulting firm that participated in the tracking study on behalf of the Platte River Recovery Implementation Program, to summarize the data and compare it to a modeling effort done by Ecosystems Advisors during the public comment period on the Draft Environmental Impact Statement for the R-Project. There were no documented power line collisions by satellite-tracked birds. However, the results did provide information on timing of mortality during the crane life cycle and locations of mortality. The satellite data were collected after previously published information on whooping mortality, specifically Stehn and Wassenich (2008) and Stehn and Haralson-Strobel (2014). The U.S. Geological Survey compared the data from the tracking study satellite to the assumptions regarding mortality in those previous publications and concluded that past means of identifying causes and sources of mortality were unreliable (Pearse et al. 2018).

While migrating, cranes tend to fly between elevations of 1,000 to 6,000 feet (Kuyt 1992 in Stehn and Wassenich 2008), well above any potential for collision with power lines. It is at the start of the day, taking off from their roosting or feeding location, and at the end of the day, coming down to feed or roost, that cranes are most susceptible to collision (Stehn 2007). As noted above, the 2010 USFWS Region 6 guidance recommends marking new power lines and an equal amount of existing power lines that are located within one mile of potentially suitable stopover habitat. NPPD presumes that this one-mile distance is based on Brown et al. (1987), which supports the conclusion that the threat to cranes posed by collision decreased to zero when the power line was located a mile (1600 meters) or more from where the bird took flight. These data do not indicate the type of relationship between distance from flight origin and potential for collision; they only state no collision mortalities were documented at or beyond one mine. The actual relationship is likely a high reduction in risk within only a short distance. Morkill and Anderson (1990) indicates that sandhill cranes that initiated flight more than 250 meters from the line were significantly higher than those that initiated or terminated flight closer than 250 meters. Studies on the Platte River indicate that more than 60 percent of collisions at night occurred when sandhill cranes flushed at less than 500 meters from the line (Murphy et al. 2009). NPPD is unaware of any data that show birds are at risk of collision when flight is initiated more than a mile from the line.

Wetlands suitable for overnight roost sites for migrating whooping cranes are available throughout the migration corridor. Associated feeding sites within agricultural fields that are proximate to wetlands are also available throughout the corridor (Stehn 2007 from Stahlecker 1997). Currently, no model is available to estimate how many power line miles are within one mile of suitable habitat, nor is there a model to exclude miles of line that may not be a threat to whooping cranes. The information regarding whooping crane collisions is very limited in describing the habitat conditions at collision sites. But when cover type at the collision site is noted, information shows that the collisions occurred in agricultural areas (Stehn and Wassenich 2008) and not at wetlands. Agricultural areas typically have more power lines than wetland areas and more potential human disturbance to whooping cranes. Past studies of sandhill cranes indicate that collisions usually occur when birds are moving about in agricultural areas and between roosts and feeding areas (Brown et. al 1987, Morkill and Anderson 1990).

Collision Data. Between 1959 and 2010, 49 whooping cranes were documented as being killed by colliding with power lines. The bulk of power line mortalities have occurred in the experimental introduced flocks (i.e., the Rocky Mountain, Florida Non-Migratory, and the Wisconsin-Florida Migratory). Of these 49 deaths, ten have occurred in the AWBP between 1956 and 2014 (Stehn and Haralson-Strobel 2014) (note that this conflicts with the nine reported in Stehn and Wassenich 2008), 21 in the Florida Non-Migratory Flock between 1997 and 2010, 13 in the non-extant Rocky Mountain Flock between 1977 and 2000, and six in the Wisconsin-Florida Migratory Flock between 2001 and 2009 (Stehn and Wassenich 2008, USFWS 2009). The ten documented mortalities of whooping cranes in the AWBP are detailed in Table 3, below.

Table 3. Ten Whooping Crane Collisions in AWBP Flock

Month	Year	State/Province	Line Type
May	1956	TX	Transmission
November	1965	KS	Distribution
April	1967	KS	Distribution
October	1981	SK	Distribution
October	1982	TX	Distribution
October	1984	ND	Not Available
October	1988	NE	Distribution
October	1989	NE	Distribution
October	1997	SK	Distribution
April	2002	TX	Distribution

The R-Project will not have the potential to take any of the individuals from the experimental flocks. Data from those flocks are not used in this analysis because the differences between the experimental flocks and the AWBP are considerable; these differences include biological, behavioral, managerial, and environmental factors. Most notably, (1) exposure rates to power lines are much higher in all experimental flocks, (2) there is greater human incursion into stopover habitat along the migratory pathway of the experimental flocks, and (3) the AWBP is the only self-sustaining flock and, thus, the only flock where young learn from the experiences of their parents. Thus, because consolidating the data for the experimental flocks and the AWBP does not accurately reflect what the AWBP encounters relative to mortality sources in the central flyway, this analysis does not use any of the information related to the experimental flocks.

To perform its analysis, NPPD first considered the ten whooping crane power line mortalities within the AWBP in the last 60 years, proportionally expanded to account for unknown mortalities as described in the next section below. However, in light of the physical differences between transmission and distribution lines and the differences in their respective prevalence on the landscape, NPPD used only transmission line data to estimate the risk for the R-Project.

Mortality Estimate. According to Stehn and Haralson-Strobel (2014), the total mortality in the AWBP between 1950 and 2010 is 546 (taken from the text; note that Table 1 in Stehn and Haralson-Strobel indicates 541 total mortalities). Only 50 of these 546 deaths, or about 9.2%, identified the cause of mortality, as the majority of birds that disappear from the AWBP are completely unaccounted for (Stehn and Haralson-Strobel 2014). It has been reported that 80% of mortality occurs off the wintering grounds and likely occurs during migration (Lewis et al. 1992, Stehn and Haralson Strobel 2014). However, a recent satellite tracking study indicates that this past assumption is incorrect and that mortality is proportional to the whooping crane's life cycle (Pearse et al. 2018).[3] It should be noted that the total of 546 mortalities is based on birds that made it to the Aransas National Wildlife Refuge and thus would not include mortality of juvenile cranes pre-fledge or during their first fall migration. One documented migration mortality and one suspected mortality in the satellite tracking study involved juvenile cranes during their first migration. The satellite tracking study showed that mortality on the winter grounds occurred at times when individuals were still migrating in or starting to migrate out, which would have likely been attributed to non-winter mortality using historical methods (Pearse et al. 2018). The satellite tracking study showed a great deal more mortality on the nesting grounds than had previously been documented (Pearse et al. 2018), although it had been speculated that it could be occurring (Stehn and Haralson-Strobel 2014).

The whooping crane is in migration approximately 17% of the year (USFWS 2009). Thus, the number of mortalities that occurred during migration is estimated at 93 (17% of 546). Out of the 50 recovered carcasses, 28 occurred during migration (Stehn and Haralson-Strobel 2014). The probability of detection of carcasses in migration areas is likely much higher than either the wintering or summering areas. Both the traditional winter areas and the nesting areas have very limited human access, due to both their location and their status as a National Wildlife Refuge and a National Park, respectively. Out of those 28, one is reported to be caused by collision with a transmission line (Stehn and Haralson-Strobel 2014). In other words, approximately 3.6% (1/28) of identified mortalities during migration can be attributed to transmission lines. Applying this ratio to the 93 estimated mortalities during migration, it is estimated that approximately 4 whooping cranes (rounded up from 3.3) have collided with transmission lines in the migratory corridor in the United States and Canada since 1956. Although only 80% of the known power line collisions occurred in the United States (8 out of the 10), we assumed all 4 collisions transmission lines occurred in the United States. This equates to 0.067 crane collisions with transmission lines per year (estimated 4 collisions with transmission lines over the 60-year period from 1956 to 2016).

As noted above, there is no indication that there is a causal relationship between the number of miles of power line and the number of whooping crane collisions. As both the number of whooping cranes and number of miles of power line have increased, there

[3] Approximately 15% of the mortality of the marked whooping cranes during the tracking study occurred during migration (Pearse et al. 2018). NPPD is conservatively using 17%, as that represents the proportion of the whooping crane's life cycle that is spent in migration.

has not been a corresponding increase in collision mortality (Figure 2). As a result, the mortality rate per mile, or as a percentage of the population, is actually lower then if the analysis had been done in 1956 when the collision was reported.

Potential Risk-Assessment Methods

Exposure Rates. One potential method of risk assessment would be to estimate the number of mortalities calculated as a percentage of the number of times cranes crossed a power line. This method has been used in evaluating the effectiveness of line markers for sandhill cranes and waterfowl (Brown and Drewien 1995, Morkill and Anderson 1990) and has been estimated based on available habitat for blue cranes using GIS (Shaw 2010) because it standardizes collisions relative to the exposure rate. This risk-analysis method requires extensive exposure-rate data that do not exist for the AWBP. Sandhill cranes in Nebraska have a mortality rate of approximately 1 mortality per 100,000 exposures (Morkill and Anderson 1990), while mortalities in the San Luis Valley of Colorado had a mean of 20 mortalities per 100,000 exposures to unmarked lines (Brown et al. 1987). Due to the dispersed nature of whooping crane stopover sites, collecting actual data for whooping cranes would not be possible, and estimation of exposure (like was done by Ecosystems Advisors) would require assumptions that cannot be verified. Brown and Drewien (1995) indicate that environmental factors other than just exposure rates likely play a role in crane power line collision rates, which makes them unpredictable. The significantly different collision rates available in existing literature (Brown and Drewien 1995, and Morkill and Anderson 1990) support the conclusion that factors other than just exposure rates influence collision rates, and application of collision rates from one study to a different area or even a different time would result in highly uncertain predictions. Therefore, NPPD did not use this method.

While NPPD did not utilize this methodology, we recognize that the recently available telemetry data could theoretically be utilized in this type of analysis. However, because no tagged birds collided with a power line, it is not possible to get a collision rate from those data. The telemetry data do allow us to calculate how often whooping cranes are within one mile of a transmission line with no collision. Of the 58 whooping cranes that were tracked, 53 had at least one use point within a mile of a transmission line, and 11.5% (1510/13150) of all use points were within one mile of a transmission line. GIS data are not available for distribution lines. However, the tracking partnership did site visits to 4,937 use locations, and, of those locations, 66% were within a mile of a power line, 95% of which were distribution lines.

During the public comment period on the Draft Environmental Impact Statement, the USFWS received comments suggesting the use of an exposure model created by Ecosystems Advisors derived from historic crane sightings, satellite tracking use locations, a maximum average distance moved during stopovers calculated from the satellite data, and assumptions on how often a whooping crane flies over a line. NPPD and the USFWS both hired independent reviews of the model, which identified numerous issues with the model and the results. The model was:

Miles of power line in a whooping crane use cluster*collision rate*migration reoccurrence*flights over line or

147*0.0041*1.34*2.15=1.73

While the authors of the model asserted that they validated their model, it was not clear how. Their estimated annual mortality without the R-Project was 0.19 to 3.37 power line mortalities a year. Yet their model predicted that the R-Project—which represents only a 0.07% increase in line miles—was going to create an *additional* 1.73 to 4.46 mortalities *per year*. Their model predicted that the R-Project was going to somehow result in more mortality than the other 99.3% of the lines combined.

Presumably, Ecosystems Advisors' model can be applied to any power line, including those that already exist and that have documented use close to them. Application of that model to those existing lines with proximal whooping crane use would result in high levels of annual mortality in the AWBP that does not reflect reality. Since NPPD, the independent reviewers hired by NPPD, and the independent reviewers hired by the USFWS could not figure out the basis for key elements of the Ecosystem Advisor model or how they worked and had significant concerns about Ecosystem Advisors' assumptions, and because that model predicted more mortality on the 225 miles of the R-Project than has occurred on the other 326,000 miles of existing power line, NPPD does believe the model is useful representation of mortality. Therefore, NPPD has concluded that the data still do not exist for these types of exposure models; there is a lack of data regarding when whooping cranes were exposed to but did not collide with a line. This information may become available with better tracking mechanisms but does not exist today.

Probability of Collision Based on Line Miles. Another risk-assessment methodology is to estimate risk based on the number of collisions as compared to the number of miles of power lines. Ideally, the miles of line would be stratified as to the level of risk they pose (Shaw et al. 2010). As discussed above, there are approximately 326,000 miles of overhead power line within the U.S. portion of the AWBP migratory corridor. NPPD has reported data on all line types for the reader's reference. However, our analysis only includes those data relevant to transmission lines. If we assume that all 34,268 miles of transmission line (conservatively rounded down to 34,000 for analysis) have an equal probability of collision, the per-mile risk of mortality would be 0.00000197 cranes per mile per year (0.067 crane per year divided by 34,000).

NPPD recognizes it is unlikely that all of the 34,000 estimated miles of transmission line pose a similar level of threat to the crane. NPPD is aware of several different efforts to model whooping crane habitat in the flyway relative to the probability of use. However, due to the very limited number of documented mortalities on any overhead lines and the fact that documented collisions are widespread, both temporally and spatially (Figure 4), and do not appear to be related to areas with frequent use, it is difficult to envision how a model that accurately predicts probability of use could meaningfully predict probability of collision. NPPD completed an analysis to identify potentially suitable stopover habitat as a means to comply with the Region 6 Guidelines on marking power lines but did not attempt to create a model that predicts probability of use due to the apparent lack of correlation between use and collisions. Additionally, NPPD does not know how a model of predicted use would relate to the places mortality has occurred. For this reason, NPPD used the entire 34,000 miles of transmission line and addressed this assumption in a sensitivity analysis included herein.

NPPD recognizes that the state of the science is not settled to the point that broad consensus exists on the best approach to modeling. Both the FWS and its independent expert concluded that the paucity of data on collision mortality, coupled with the temporal and spatial scale at which it occurs, leads to final conclusions that have so much uncertainty that they cannot be defended from a scientific view. NPPD agrees that is a reasonable conclusion. That very lack of certainty is why NPPD incorporated a sensitivity analysis into its evaluation of how likely it was to take a whooping crane.

Application to the R-Project

For the proposed R-Project, 225 miles of new transmission line would be constructed in the AWBP migratory corridor. Applying the probability-collision-risk estimation methodology from above (using all 34,000 miles of transmission line) to the 225-mile R-Project would equate to a risk of 0.00044 cranes per year (225 * 0.00000197) or 0.022 cranes per the 50-year project life (0.00044 * 50).[4] This risk does not take into account that approximately 45% of the line is likely not near suitable habitat or the 40% to 60% collision reduction achieved through line marking.

Assumption Sensitivity Analysis

There are assumptions used in the above estimation, and the data set is very small. Therefore, a sensitivity analysis is provided below for the reader to evaluate the effects of those assumptions.

Data Assumption 1 – NPPD used all 34,000 miles of existing transmission line. Use of all miles was based on the following facts: (1) there is currently no defensible method for correlating habitat quality and collision risk; (2) analysis of the GPS tracking data presented in Pearse et al. (2015) indicates that areas of high-density habitat do not necessarily have the highest levels of whooping crane use along the R-Project route; (3) collisions where land cover was documented have occurred in agricultural lands (Stehn and Wassenich 2008), and (4) when a one-mile buffer is placed around NWI wetlands, it encompasses virtually the entire flyway. Further modification of how NWI data may represent suitable habitat may be possible, but USFWS (2009) also indicates that wetland habitat is available throughout the flyway, so this effort was not undertaken. While figuring out a logical way to identify which miles of power line to use may be difficult, understanding the implications of reducing the number of miles is not. The collision estimate is simple division and multiplication with the following equations.

[4] This equates to one crane every 2273 years.

Crane mortalities per year/miles of power line = collision/mile/year

Collision/mile/year*Miles of R-Project*Years in Service= Number of collisions in life of line.

Because of that, a reduction in line miles produces an equal but inverse result in the number of collisions (i.e., decreasing line miles by half doubles the collision estimate).

- Original analysis = 0.067/34,000 = 0.00000197 collision/mile/year
  0.00000197*225*50 = 0.022 collisions in 50-year period

- "Half of all lines" risk analysis = 0.067/17,000 = 0.0000039 collision/mile/year
  0.0000039*225*50 = 0.044 collisions in 50-year period

- "10% of lines" risk analysis = 0.067/3400=0.0000197 collision/mile/year
  0.0000197*225*50 = 0.22 collisions in 50-year period

In the absence of an assessment that evaluates potential stopover habitat along all the existing miles of transmission line or an identified correlation between probability of habitat use and collision risk, it is not possible to determine which transmission line miles would not be considered a risk. Therefore, any reduction in line miles would be arbitrary. Since there has only been a single documented whooping crane collision with a transmission line, and that collision occurred in 1956, NPPD did not undertake an effort to model which miles of the existing transmission lines are within 1 mile of potentially suitable habitat. Such a modeling effort would be a major undertaking and outside the scope needed for this analysis. However, NPPD reviewed the location of NWI wetlands within the central flyway and found that virtually all 34,000 miles of transmission line are within 1 mile of such a wetland. The sensitivity analysis above shows the effect of reducing miles and that the equations underlying NPPD's analysis are easily modified if new data or models of crane habitat become available.

NPPD did complete a habitat assessment to identify the areas where a whooping crane may initiate flight within 1 mile of the R-Project (potentially suitable stopover habitat). That assessment indicated that 123 miles of the R-Project are within one mile of potential suitable stopover habitat. NPPD has agreed to mark those 123 miles with bird flight diverters.

Data Assumption 2 – Power line mortality estimates are proportionally assigned to all mortality during migration, requiring an assumption of equal probability of detection. While it seems highly likely that not all power line mortality is observed, it also seems likely that it is detected at higher levels than numerous other sources of mortality, such as predation, disease, and even intentional shooting. However, like the assumption regarding transmission line miles, there is currently no defensible approach to address this assumption. However, it can be bracketed as to the outer extremes.

- Based on the available data, which do not allow for adjustment due to detection bias without introducing new assumptions, the original analysis—which proportionally increased collision mortality to the total estimated missing cranes—would be the upper limit of estimated collision mortality.
- Assume all collisions have been documented. Total of 1 individual collided or 0.017 individuals per year (1/60 years). This equates to a mortality rate of 0.0000005/mile/year (0.017/34,000). Using this rate, the original analysis equation is 0.0000005*225*50=0.006 collision in 50 years.

It should be noted that, whether using the 10 documented collisions on all overhead lines or the 1 reported collision on a transmission line, any analysis is based on very low sample sizes over long periods and thus should be viewed only as an estimate of the risk associated with a new line in 2018. Obviously, the addition of just a few more data points may affect this analysis and the resultant calculation of take of a whooping crane.

Conclusion

Intuitively, it is tempting to assume that any new miles of power line will create a new source of potential mortality for whooping cranes; however, the above analysis demonstrates that any actual incremental risk is very small. Empirical data indicate that the reality of adding new power lines, coupled with a growing whooping crane population, has not resulted in an increase in mortality due to collisions (Table 1, Figures 1 and 2). Since 1993, it is estimated that number of miles of transmission line in the flyway has increased by approximately 11,000 miles and the whooping crane population has doubled, and yet there are no documented collision mortalities with transmission lines in that time period.

With only ten documented power line mortalities in the AWBP in the past 60 years, any interpretation of the threat that power lines pose to this population requires making numerous assumptions and extrapolation of a very limited data set. Further reducing that number to the data only relevant transmission lines results in extrapolation from a single reported incident to the overall impact. NPPD has clearly stated our assumptions and how the data were extrapolated in this analysis and evaluated the sensitivity of those assumptions to change. NPPD concludes that it is not reasonably certain that whooping crane mortality on the R-Project will occur. The estimated risk is extremely low enough and is further reduced by marking portions of R-Project. This conclusion is based on the limited empirical data at hand, which are:

- Only 10 documented mortalities in the AWBP in 60 years with only one of those on a transmission line.
- The population has grown from 15 birds to the current 505 at the same time power lines went from basically zero on the landscape to what exists today.
- The AWBP has grown at 4.6% annually over the past 70 years.
- Documented mortality has not occurred in the identified high-use areas, which makes predicting where mortality will occur using past data impossible.

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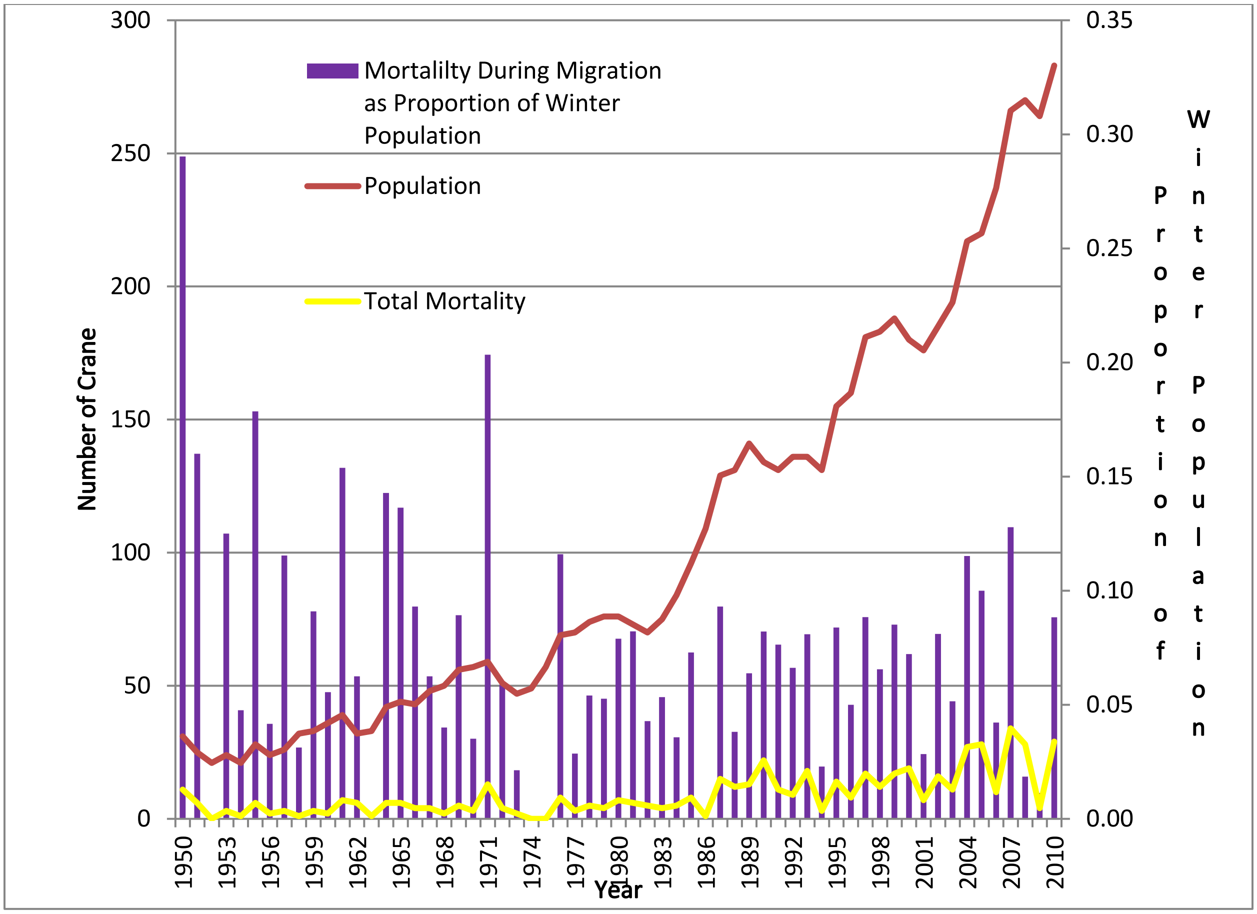


Figure 1. Whooping crane population growth and mortality from 1950 to 2010. Data from Stehn and Haralson-Strobel (2014).

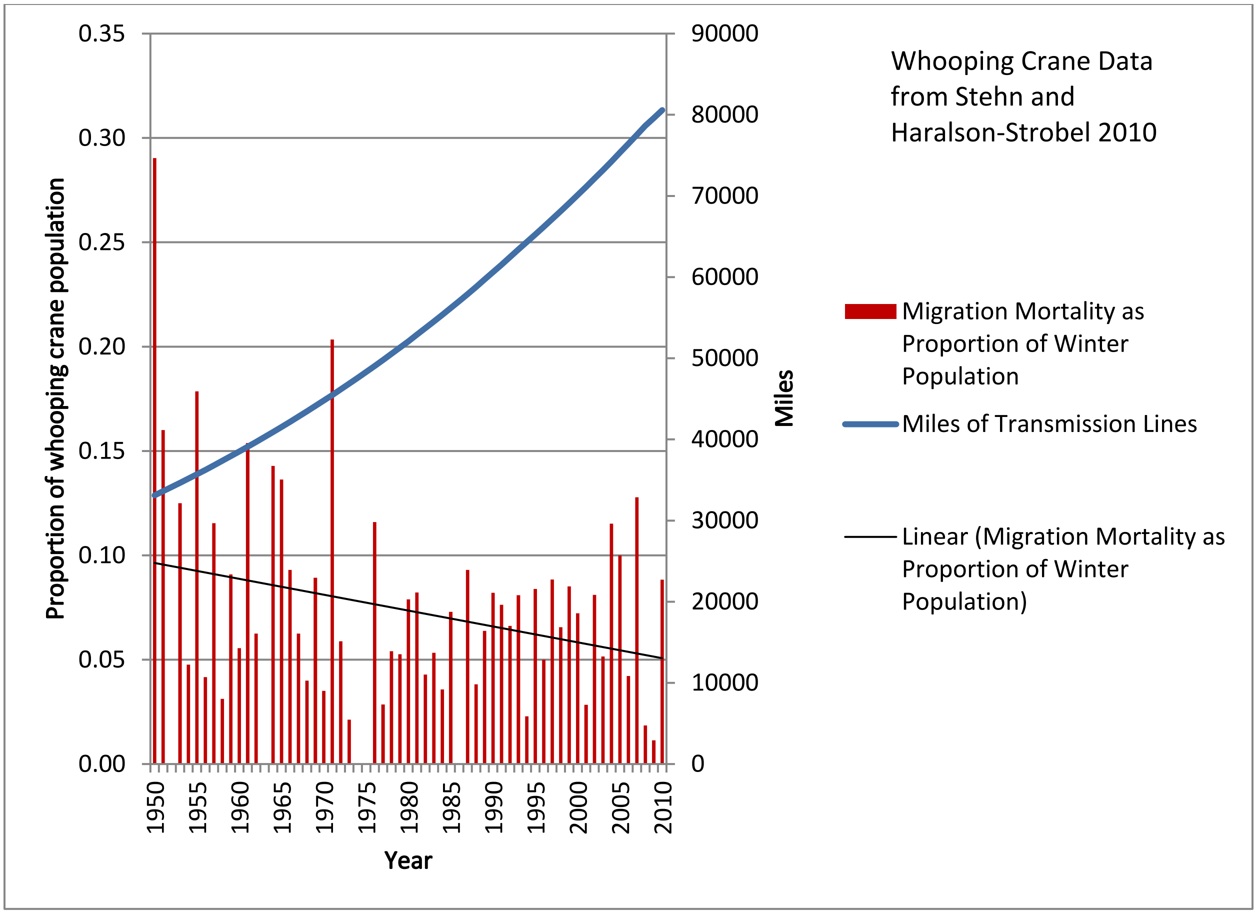


Figure 2. Transmission line development and whooping crane mortality. Whooping crane data from Stehn and Haralson-Strobel (2014). Transmission line data from the Western Area Power Administration (2012).

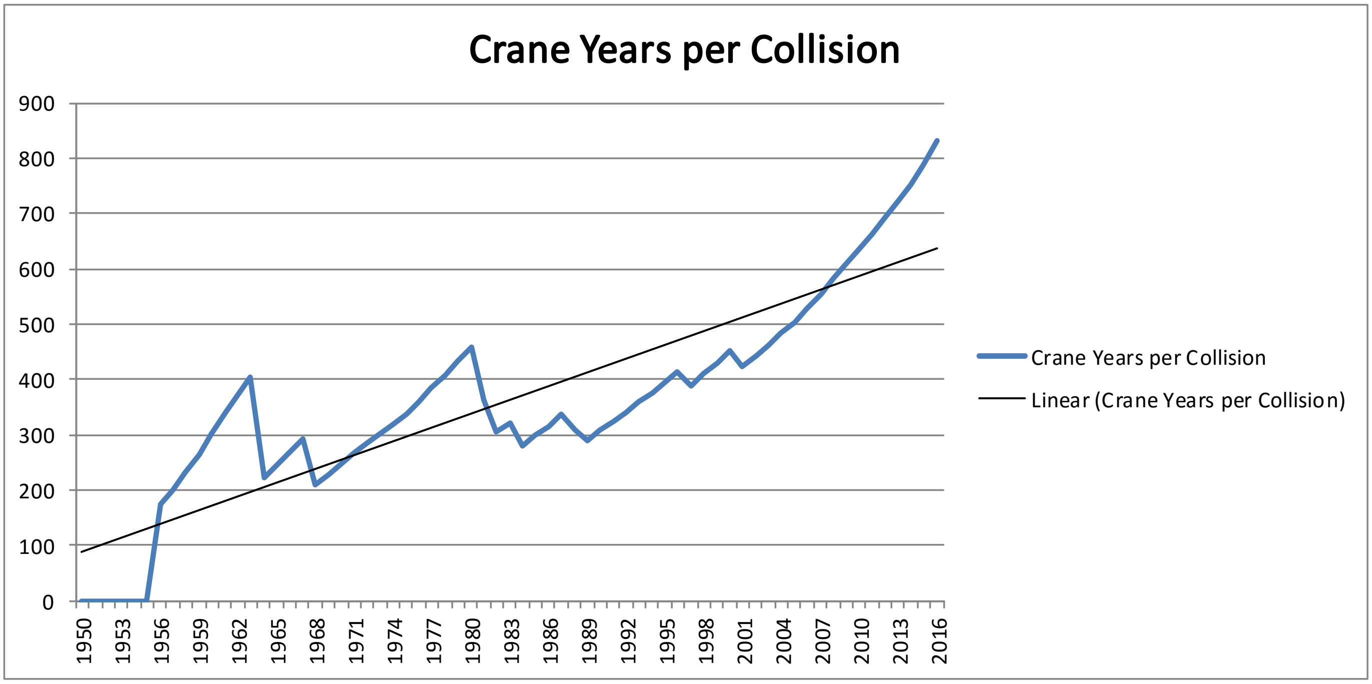
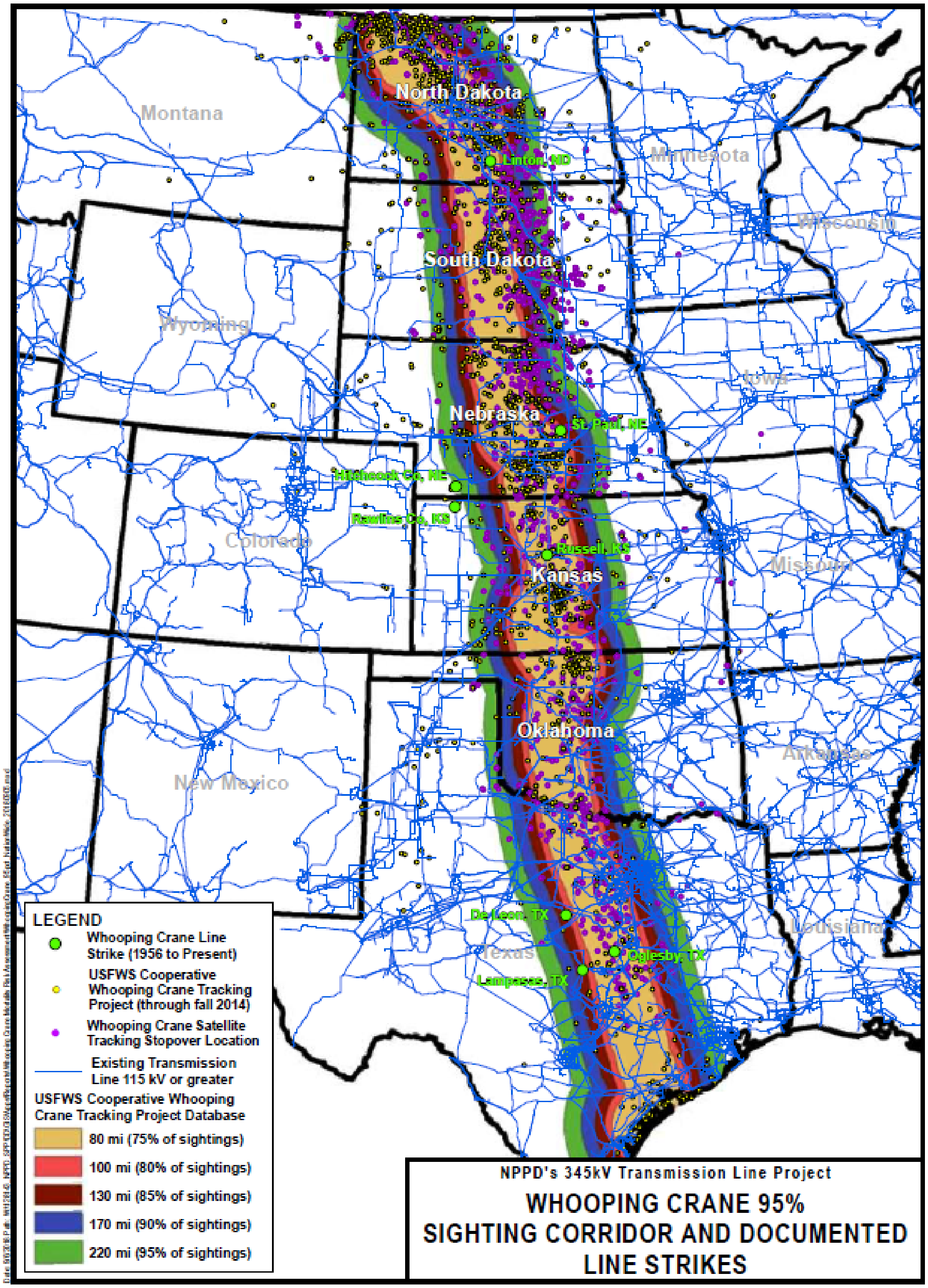


Figure 3. Crane years per collision is calculated as the cumulative sum of crane years divided by the cumulative sum of collisions on an annual basis. Increasing trend suggest fewer collisions per crane year as the population grows.

Figure 4. Map of mortality verses observational and satellite tracking data, transmission lines are shown as blue lines.



APPENDIX D WHOOPING CRANE REGION 6 GUIDANCE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO:
FWS/R6
ES

MAILING ADDRESS:
P.O. Box 25486, DFC
Denver, Colorado 80225-0486

STREET LOCATION:
134 Union Boulevard
Lakewood, Colorado 80228-1807

FEB 04 2010

Memorandum

To: Field Office Project Leaders, Ecological Services, Region 6
Montana, North Dakota, South Dakota, Nebraska, Kansas

From: Assistant Regional Director, Ecological Services, Region 6

Subject: Region 6 Guidance for Minimizing Effects from Power Line Projects Within the Whooping Crane Migration Corridor

This document is intended to assist Region 6 Ecological Services (ES) biologists in power line (including generation lines, transmission lines, distribution lines, etc.) project evaluation within the whooping crane migration corridor. The guidance contained herein also may be useful in planning by Federal action agencies, consultants, companies, and organizations concerned with impacts to avian resources, such as the Avian Power Line Interaction Committee (APLIC). We encourage action agencies and project proponents to coordinate with their local ES field office early in project development to implement this guidance.

The guidance includes general considerations that may apply to most, but not every, situation within the whooping crane migratory corridor. Additional conservation measures may be considered and/or discretion may be applied by the appropriate ES field office, as applicable. We believe that in most cases the following measures, if implemented and maintained, could reduce the potential effects to the whooping crane to an insignificant and/or discountable level. Where a Federal nexus is lacking, we believe that following these recommendations would reduce the likelihood of a whooping crane being taken and resulting in a violation of Endangered Species Act (ESA) section 9. If non-Federal actions cannot avoid the potential for incidental take, the local ES field office should encourage project proponents to develop a Habitat Conservation Plan and apply for a permit pursuant to ESA section 10(a)(1)(B).

Finally, although this guidance is specific to impacts of power line projects to the whooping crane within the migration corridor, we acknowledge that these guidelines also may benefit other listed and migratory birds.

If you have any questions, please contact Sarena Selbo, Section 7 Coordinator, at (303) 236-4046.

Region 6 Guidance for Minimizing Effects from Power Line Projects Within the Whooping Crane Migration Corridor

1) Project proponents should avoid construction of overhead power lines within 5.0 miles of designated critical habitat and documented high use areas (these locations can be obtained from the local ES field office).

2) To the greatest extent possible, project proponents should bury all new power lines, especially those within 1.0 mile of potentially suitable habitat[1].

3) If it is not economically or technically feasible to bury lines, then we recommend the following conservation measures be implemented:

   a) Within the 95-percent sighting corridor (see attached map)

      i) Project proponents should mark[2] new lines within 1.0 mile of potentially suitable habitat and an equal amount of existing line within 1.0 mile of potentially suitable habitat (preferably within the 75-percent corridor, but at a minimum within the 95-percent corridor) according to the U.S. Fish and Wildlife Service (USFWS) recommendations described in APLIC 1994 (or newer version as updated).

      ii) Project proponents should mark replacement or upgraded lines within 1.0 mile of potentially suitable habitat according to the USFWS recommendations described in APLIC 1994 (or newer version as updated).

   b) Outside the 95-percent sighting corridor within a State's borders

   Project proponents should mark new lines within 1.0 mile of potentially suitable habitat at the discretion of the local ES field office, based on the biological needs of the whooping crane.

   c) Develop compliance monitoring plans

   Field offices should request written confirmation from the project proponent that power lines have been or will be marked and maintained (i.e., did the lines recommended for marking actually get marked? Are the markers being maintained in working condition?)

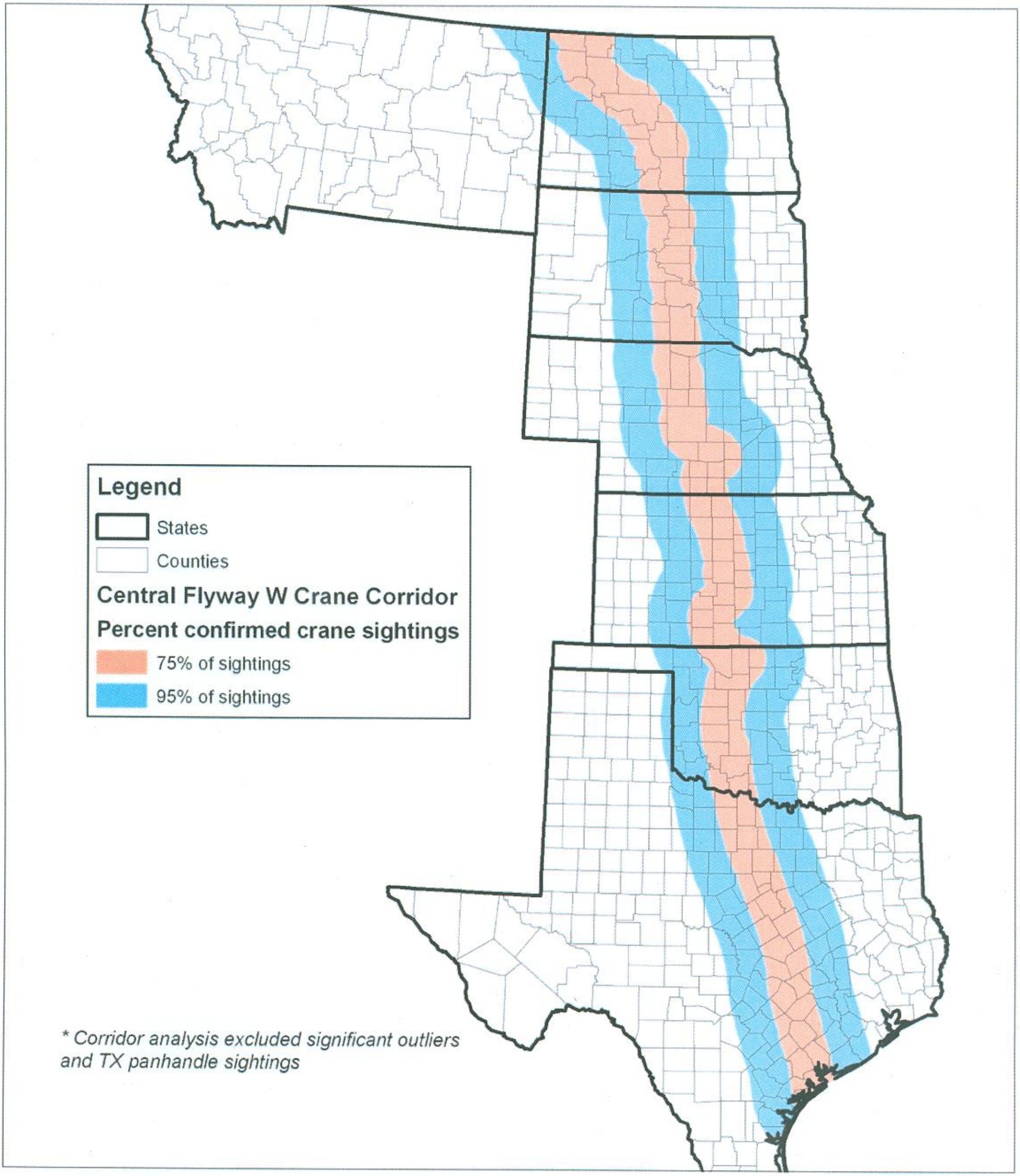
---

[1] Potentially suitable migratory stop over habitat for whooping cranes includes wetlands with areas of shallow water without visual obstructions (i.e., high or dense vegetation) (Austin & Richert 2001; Johns et al. 1997; Lingle et al. 1991; Howe 1987) and submerged sandbars in wide, unobstructed river channels that are isolated from human disturbance (Armbruster 1990). Roosting wetlands are often located within 1 mile of grain fields. As this is a broad definition, ES field office biologists should assist action agencies/applicants/companies in determining what constitutes potentially suitable habitat at the local level.

[2] Power lines are cited as the single greatest threat of mortality to fledged whooping cranes. Studies have shown that marking power lines reduces the risk of a line strike by 50 to 80 percent (Yee 2008; Brown & Drewien 1995; Morkill & Anderson 1991). Marking new lines and an equal length of existing line in the migration corridor maintains the baseline condition from this threat.

U.S. Fish & Wildlife Service

United States Central Flyway Whooping Crane Migration Corridor *



Produced for Ecological Services
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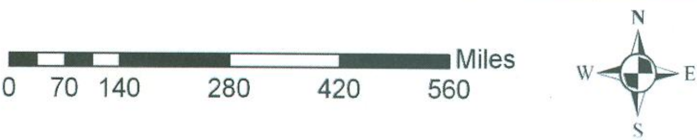
Basemap (Date): U.S. Counties
Meridian:
File:



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APPENDIX E COMPLIANCE MONITORING PLAN

December 5, 2018

NEBRASKA PUBLIC POWER DISTRICT

R-Project HCP

Final Compliance Monitoring Plan

Final Compliance Monitoring Plan

PREPARED FOR: *NEBRASKA PUBLIC POWER DISTRICT*
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ACRONYMS AND ABBREVIATIONS

ABB	American burying beetle
BGEPA	Bald and Golden Eagle Protection Act
BMP(s)	best management practice(s)
CMP	Compliance Monitoring Plan
ECMs	Environmental Compliance Monitors
ESA	Endangered Species Act
HCP	Habitat Conservation Plan
ITP	Incidental Take Permit
kV	kilovolt
MBTA	Migratory Bird Treaty Act
NESCA	Nebraska Nongame Endangered Species Conservation Act
NGPC	Nebraska Game and Parks Commission
NPPD	Nebraska Public Power District
R-Project	Gerald Gentleman Station to Holt County 345 kV Transmission Project
SWPPP	Stormwater Pollution Prevention Plan
USFWS	United States Fish and Wildlife Service
WEAP	Worker Educational Awareness Program

1.0 INTRODUCTION

1.1 Background

Nebraska Public Power District (NPPD) proposes to construct a new 345 kilovolt (kV; 345,000 volt) electric transmission line and two new substations in north central Nebraska (R-Project). The R-Project will run from the NPPD Gerald Gentleman Station near Sutherland north to a new substation to be sited adjacent to NPPD's existing substation east of Thedford, and then east to a new substation to be constructed in Holt County for interconnection to Western Area Power Administration's Fort Thompson to Grand Island 345 kV transmission line (Figure 1). The approximate length of the transmission line is 225 miles. This includes a large portion of the Nebraska Sandhills that is home to the federally endangered American burying beetle. NPPD has drafted a Habitat Conservation Plan (HCP) to support the application of an Incidental Take Permit (ITP) for this species.

1.2 Purpose

As a part of the HCP, this Compliance Monitoring Plan (CMP) was developed to ensure all avoidance and minimization measures stipulated in the HCP are adhered to. This CMP is to be implemented during the pre-construction and construction phases of the R-Project. This provides an on-the-ground approach to compliance during project development and is designed to facilitate successful implementation.

1.3 Objectives

The overall objective of the CMP is to clarify agency requirements of NPPD and the Compliance Monitoring Team during pre-construction and construction phases of the R-Project. The following elements are included in the CMP to support this objective:

- A description of the roles and responsibilities of the Compliance Monitoring Team.
- A definition of the decision-making authority for each role within the Compliance Monitoring Team.
- Communication protocols among Compliance Monitoring Team members.
- A description of the monitoring, reporting, and documentation requirements and adaptive management processes during construction.
- A description of avoidance and minimization measures to be implemented that are specific to federally protected species.

Monitoring of restoration efforts following the completion of construction activities is included in the Restoration Management Plan, available on the United States Fish and Wildlife Service (USFWS) R-Project-specific website, and is not included in this CMP.

1.4 Plan Updates

This Plan may be revised periodically based on updates to species avoidance and minimization measures, new information, and the involvement of the selected construction contractor.

2.0 ROLES AND RESPONSIBILTIES

This section describes the roles, responsibilities, level of effort, and authority of key project personnel within the Compliance Monitoring Team and other compliance-related personnel.

2.1 U.S. Fish and Wildlife Service

The USFWS administers the Endangered Species Act (ESA), the Bald and Golden Eagle Protection Act (BGEPA), and the Migratory Bird Treaty Act (MBTA). The HCP considered all of these Acts when determining the avoidance and minimization measures to be implemented to reduce impacts to covered and evaluated species.

The USFWS issues the ITP and has authority over the conditions of the permit. Designated representatives of the USFWS may visit Project construction areas at any reasonable and safe time and may require information regarding the status of compliance with the ITP permit conditions including implementation of species avoidance and minimization measures.

The USFWS has identified a single point of contact, the Assistant Field Supervisor, to which the Compliance Monitoring Team should direct all compliance-related issues. NPPD's Compliance Monitoring Team will contact the USFWS Assistant Field Supervisor to report compliance issues and submit weekly/monthly reports documenting compliance-related activities. The Assistant Field Supervisor will involve USFWS resource specialists as needed.

2.2 Nebraska Game and Parks Commission

The Nebraska Game and Parks Commission (NGPC) provides oversight for the Nebraska Nongame Endangered Species Conservation Act (NESCA) and is a cooperating agency in development of the HCP. Designated representatives of the NGPC may visit Project construction areas at any reasonable and safe time and may require information regarding the status of compliance avoidance and minimization measures applicable to species included in the HCP that are also listed under NESCA.

2.3 NPPD

NPPD will establish a Compliance Monitoring Team for the R-Project. This team will oversee pre-construction and construction activities and ensure that specified species avoidance and minimization measures are being implemented in accordance with the ITP/HCP. The Compliance Monitoring Team will track, document, and report (Section 4.0) on the implementation of these measures.

A Final HCP will accompany the ITP. As stipulated in the Final HCP and ITP, NPPD will not begin project construction activities until specific pre-construction avoidance and minimization measures have been satisfied and the area cleared for construction. Additionally, the ITP may include other measures as required by the USFWS that NPPD must satisfy prior to the start of work or during construction.

2.3.1 Compliance Monitoring Team

2.3.1.1 Compliance Manager

The Compliance Manager will be the primary point of contact on the Compliance Monitoring Team regarding all compliance-related issues. Specific responsibilities of the Compliance Manager include, but are not limited to:

- Overseeing implementation of the CMP.
- Participating in pre-construction meetings.
- Supervising the Environmental Compliance Monitors (ECMs) monitoring activities and schedules.
- Providing guidance on and review of compliance issues.
- Participating in weekly construction progress meetings and providing weekly status updates.
- Managing project documentation with respect to compliance.
- Disseminating weekly reports.

In order to ensure a collaborative approach to environmental compliance, the Compliance Manager will maintain close coordination with the Construction Manager to keep current on the construction schedule and have a clear understanding of the status of construction activities in specific locations along the route. This will ensure the Compliance Manager has sufficient ECMs on-site to provide necessary compliance surveys or monitoring.

2.3.1.2 Environmental Compliance Monitors

The ECMs will serve as the on-the-ground personnel responsible for observing and reporting compliance with the ITP/HCP for all phases of project construction. The ECMs report to the Compliance Manager, but also collaborate with the Construction Manager, on a daily basis. The ECMs will be present during construction activities as required in this CMP (Section 7.0).

The ECMs on-site will have the authority to halt a construction activity in non-compliance with the avoidance and minimization measures in the HCP and Section 7.0 of this CMP or a construction activity outside the HCP permitted area of disturbance.

Prior to the start of construction, the ECMs will become familiar with NPPD's approved project design, Construction Contractor(s) work plan, and the CMP; participate in pre-construction meetings; and participate in the Worker Environmental Awareness Program (WEAP) on an as-needed basis. The ECMs will become familiar with the roles and responsibilities of NPPD's construction team and the chain of command.

Should they be required, ECMs will provide pre-construction surveys for federally protected species as described in the HCP and Section 7.0 below. These surveys may be required on a daily basis (e.g., during whooping crane migrations) or prior to construction beginning in an area (e.g., migratory bird nest surveys). Additionally, ECMs will ensure that environmentally sensitive areas (e.g., special-status species habitat) are flagged and that it is clear to crews that designated construction boundaries are adhered to. ECMs will regularly inspect these areas to ensure the resources are being protected.

Throughout construction, the ECMs will document compliance and/or non-compliance with the environmental requirements through the use of approved forms. The ECMs will record observations, including digital photo documentation, at each location visited. This process will ensure consistent and accurate reporting of site conditions at the time of inspection and will serve to record the evolution of the site with respect to development. Each activity monitored will be assigned a compliance level (see Section 5.1 below).

In consultation with the Compliance Manager, the ECMs will regularly evaluate the effectiveness associated with the environmental compliance monitoring process to ensure the intent of this CMP is being adequately met.

2.4 Construction Manager

NPPD will provide a Construction Manager to coordinate between the selected construction contractor and NPPD. Duties of the Construction Manager will include organizing and conducting weekly construction progress meetings, tracking all on-going construction activities and progress throughout the R-Project construction, submitting monthly construction updates to NPPD, and acting as liaison between the selected construction contractor and the Compliance Manager and support compliance staff (Section 2.3.1). The Construction Manager will coordinate all construction-related activities.

2.5 Construction Contractor(s)

The Construction Contractor(s) will be responsible for coordinating with the Construction Manager and Compliance Monitoring Team. All Contractor employees will be required to attend WEAP training (see Section 6.0 below). Construction foremen and/or crew leads will be familiar with the conditions of the ITP/HCP. Construction Manager will communicate construction plans to the Compliance Manager in a timely manner to allow for ECMs to be present or conduct pre-construction surveys, if necessary. Foremen must also ensure that the Compliance Manager is alerted to changes in construction activities or schedule.

3.0 COMMUNICATION

On all construction projects, communication and collaboration are critical components of a successful environmental compliance program and project. All parties are to interact regularly and are to maintain professional and responsive communications at all times. This section provides tools for open and transparent communication throughout the project. It is meant to facilitate efficient dissemination of project information including pre-construction surveys, implementation of avoidance and minimization measures, construction activities, and planned or upcoming work.

3.1 Pre-Construction Compliance Coordination

A pre-construction meeting and/or several meetings will be held with NPPD, the Compliance Monitoring Team, the Construction Manager, and the Construction Contractor(s). Agency personnel may or may not be involved in these meetings. The goal of the pre-construction meetings will be to review the CMP and refine as appropriate; agree on the project's communication protocol and chain of command; and fully understand compliance requirements and expectations.

3.2 Construction Meetings

The Construction Manager will conduct weekly construction meetings in the field with Construction Contractor(s) supervisors and foremen and the Compliance Manager to discuss work completed, work anticipated, and the implementation status of avoidance and minimization measures. The field meetings will also be a forum for discussing safety and environmental compliance issues.

Daily tailgate meetings should also occur prior to initiation of work each morning. Compliance Monitoring Team members should participate in these daily construction and safety briefings to facilitate communication. This is an opportunity for the ECMs to learn exactly what the construction crews will be doing and any dangers they should be aware of for that day's work and is also a time when the ECMs can inform the crew of sensitive resources that will be in close proximity to that day's work area.

3.3 Communication Protocol During Construction

The following protocols are an initial draft and may be revised once the exact team and staffing arrangement is determined. This is a general guideline of the protocol.

- All communications to USFWS and NGPC will be completed by NPPD personnel.
- NPPD will ensure communication is facilitated between the Construction Contractor(s), Construction Manager, and the Compliance Monitoring Team.
- The Compliance Manager will coordinate with the Construction Manager to ensure the ECMs are keeping pace with the construction schedule. The Compliance Manager will alert the Construction Manager if areas are cleared for construction activities or if surveys are still required before work can commence.
- The Compliance Manager will coordinate with the ECMs to ensure that sufficient monitors are present for each day's construction activities. The Compliance Manager will also alert ECMs should there be last-minute changes to the schedule due to delays in work, weather, fire, or other unanticipated circumstances.
- The ECMs will coordinate with construction crew leads to ensure monitors are observing the activities that require monitoring and to ensure that the crews are aware that the monitors will be working with them on any given day.
- The ECMs will inform the Compliance Manager of any potential problem areas or compliance issues as they arise. The Compliance Manager will then immediately notify the Construction Manager and/or Construction Contractor(s).
- The Construction Manager will coordinate with NPPD and with the Compliance Monitoring Team regarding safety requirements and to alert others to schedule changes and how crews are progressing with their tasks.

3.4 Coordination with Agencies

The Compliance Manager will coordinate with the USFWS with respect to non-compliance events. The steps below are to be used for potential non-compliance or problem areas that could lead to non-severe non-compliance events. Severe non-compliance events, such as unauthorized take or failure to take corrective actions, will result in an immediate work stoppage, and the Compliance Manager will contact the Construction Manager and NPPD.

Step 1. ECMs document the potential non-compliance or problem area on the daily compliance form. ECMs alert the Compliance Manager of the potential issue.

Step 2. The Compliance Manager notifies the Construction Manager and the Construction Contractor(s) of the potential issue and provides advice on measures that should be taken to avoid non-compliance.

Step 3. The Construction Manager and Construction Contractor(s) acknowledge the potential issue and provide a response for corrective action. The Construction Contractor(s) disseminate this change to their crew members.

Step 4. The Compliance Manager notifies the ECMs of the change. The ECMs will track the corrective action and report on its status.

Step 5. If the corrective action is insufficient, additional actions are taken to attain compliance or non-compliance may be reached. Should non-compliance be reached, work will be halted in the problem area and USFWS will be contacted to determine further corrective action.

4.0 REPORTING AND DOCUMENTATION

4.1 Daily Report

The ECMs will provide a daily construction site monitoring form to the Compliance Manager at the completion of daily site monitoring. The ECM’s report will identify compliance levels (Section 5.1) with environmental avoidance and minimization measures and communications with construction personnel. If the ECM daily report notes a problem area or non-compliance, the Compliance Manager will distribute those immediately to the Construction Manager and NPPD.

4.2 Weekly Report

The Compliance Manager will submit weekly progress reports to the Construction Manager and NPPD. The Weekly Report will include, but will not be limited to, descriptions of activities relating to site mobilization, temporary staging, and construction; maps; photos; and a discussion of implementation of avoidance and minimization measures.

4.3 Annual Construction Compliance Report

NPPD will coordinate with the Compliance Manager to complete an annual compliance report for submittal to the USFWS and NGPC. The Annual Compliance Report will be submitted to the

USFWS and NGPC by March 31 following the end of each calendar year. The Annual Construction Compliance Report will include, but will not be limited to:

- Construction activities accomplished along the selected route.
- Summary of environmental compliance monitoring reports.
- Temporary and permanent disturbances incurred.
- Description of American burying beetle (ABB) habitat temporarily and permanently disturbed.
- Disturbance located in areas unsuitable for ABB use.
- Avoidance and minimization measures implemented.
- Status of mitigation lands established.

4.4 Construction Compliance Final Report

NPPD will coordinate with the Compliance Manager to prepare a final compliance closeout report after construction is completed documenting the applied avoidance and minimization measures, CMP, daily and weekly reports, and a final administrative record regarding issue resolution. The final compliance closeout report will be submitted to USFWS and NGPC within 120 days of completion of construction activities. This includes initial restoration activities such as seedbed preparation and seeding.

5.0 COMPLIANCE MONITORING DURING CONSTRUCTION

The ECMs will perform compliance monitoring throughout construction of the R-Project to ensure compliance with all applicable avoidance and minimization measures described in the HCP and Section 7. At least one ECM will accompany each construction activity, including but not limited to pulling and tensioning teams, foundation installation teams, and structure erection teams. The ECMs will document observations in construction areas through the use of field notes, maps, and digital photography. The photos will be provided in weekly reports and correlate to a discussion of specific construction or compliance activities. In addition, standardized daily construction site-monitoring forms will be utilized in the field to document compliance levels described below.

5.1 Compliance Levels

ECMs shall document all observations and communications in daily construction site monitoring forms. ECMs will determine whether the observed construction activities are implementing the required species avoidance and minimization measures as described in the HCP and Section 7.0 of this CMP. The activities will be assigned a compliance level: Acceptable, Problem Area, and Non-Compliance.

5.1.1 Acceptable

An Acceptable compliance level will be assigned to an activity when an inspected area of activity complies with the project specification and all avoidance and minimization measures have been adequately implemented. No corrective action is necessary.

5.1.2 Problem Area

A Problem Area compliance level will be assigned when an activity does not meet the definition of Acceptable, but is not considered in non-compliance. This level indicates that a minor deviation from an approved activity or condition has occurred and action is being addressed in the field to immediately remedy the situation. ECMs must confirm that no federally protected species are being impacted and no potential for unauthorized take exists. If a minor deviation is not corrected in a timely fashion, it could become a cumulative issue and result in Non-Compliance status.

The Problem Area category will be used to report a range of events and observations including the following:

- An unforeseeable action that occurs not in conformance with, but not in violation of, certain specifications, and the contractor's response is appropriate and timely (e.g., a fuel drip from heavy equipment where project personnel respond properly by stopping, containing, and cleaning up the spill in accordance with the required Spill Prevention and Response Plan).

- A location where the project is not out of compliance with the specifications, but, in the judgment of the ECMs, damage to resources could occur if corrective actions are not taken (e.g., an improperly constructed/located erosion control structure; trash that scatters on the project site).

If a Problem Area is resolved in a timely manner, it is not likely to be considered non-compliant. If a Problem Area is found to be a repeat situation or multiple instances of a similar nature occur, is not corrected within the established time frame, or results in resource damage because timely corrective action failed to occur, the ECMs may document the Problem Area as a Non-Compliance as described below.

5.1.3 Non-Compliance

A Non-Compliance level will be assigned to an activity when the activity results in damage to federally protected species, places federally protected species at unnecessary risk, or is a repeated scenario of actions noted as "Problem Areas." Non-Compliance may also include deficient or non-existent implementation of avoidance and minimization measures, ultimately having the potential to result in irreversible environmental damage. This can include not implementing avoidance and minimization measures in accordance with stipulated seasonal timing restrictions.

Examples of Non-Compliance include, but are not limited to:

- Use of construction access, staging areas, or work areas not identified on the project drawings, not approved for use during construction, and/or outside the permanent or temporary disturbance areas.

- Use of construction access, staging areas, or work areas located in ABB habitat outside the designated HCP Permit Area (Figure 1).
- Conducting ground-disturbing construction activities without an ECM on site, if presence is required per stipulations.
- Failure of erosion or sediment control structures if it puts a sensitive resource at risk.
- Clearing vegetation outside the approved work limits.
- Construction activity in locations where seasonal restrictions exist (e.g., active eagle nesting).

Protocols for communication for potential or confirmed Non-Compliance are identified in Section 3.3.

6.0 WORKER ENVIRONMENTAL AWARENESS PROGRAM TRAINING

As specified in the HCP, prior to project initiation, NPPD shall develop and implement a WEAP. WEAP training will be provided to all construction personnel prior to conducting any work activities.

The Compliance Manager will be provided the opportunity to participate in the WEAP training to present an overview of the CMP and to inform the Construction Manager and the construction crew members of the environmental monitoring that will be ongoing throughout the pre-construction and construction processes of the project.

The WEAP training should be provided in both English and Spanish (if necessary) to ensure the workers are fully aware of the environmental compliance measures to be implemented during construction activities. The initial WEAP training will be conducted by the Compliance Manager and/or appropriate ECMs. The WEAP training, at a minimum, shall include the following:

- An overview of the CMP and the associated reporting protocols, roles, and responsibilities.
- An explanation of the function of flagging that designates authorized work areas.
- An explanation of the sensitivity of certain habitats (e.g., sensitive species habitat) adjacent to work areas.
- An explanation of survey and work-stoppage requirements that pertain to whooping cranes.
- An explanation on Blanding’s turtle identification and avoidance and minimization measures.
- An explanation of additional special-status wildlife species that could be present on-site and the measures required to minimize impacts (e.g., reduced speed limit and monitoring).
- An explanation of spill cleanup procedures and measures being implemented to minimize impacts to water quality.
- Waste management and importance of maintaining good housekeeping practices.

- Fire prevention measures and points of contact and steps to be implemented in the event a fire occurs.

- Communication and reporting protocols describing what needs to be implemented for situations where a sensitive resource may have been impacted during construction activities.

Sign-in sheets will be provided to document that all personnel have attended the WEAP. All attendees will receive a handout summarizing the information they were taught in the training. This handout will also include contact information for the Compliance Manager and other key compliance personnel. All WEAP attendees will be provided with a hardhat sticker to indicate the worker has attended WEAP training.

7.0 SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES AND MONITORING REQUIREMENTS

7.1 American Burying Beetle

The ABB (*Nicrophorus americanus*) is listed as endangered under the ESA and is protected as an endangered species under NESCA. The geographic extent within which incidental take of ABB is expected to occur is defined as the Permit Area (Figure 1) and is representative of the ABB's range along the R-Project. A total of 1,042 acres of habitat may be temporarily disturbed and a total of 33 acres may be permanently disturbed within the Permit Area. To ensure this, work areas will be clearly flagged and ECMs will be present during construction activities within the Permit Area. ECMs will ensure disturbance remains within the flagged work boundaries to ensure that take of ABB allowed under the ITP is not exceeded.

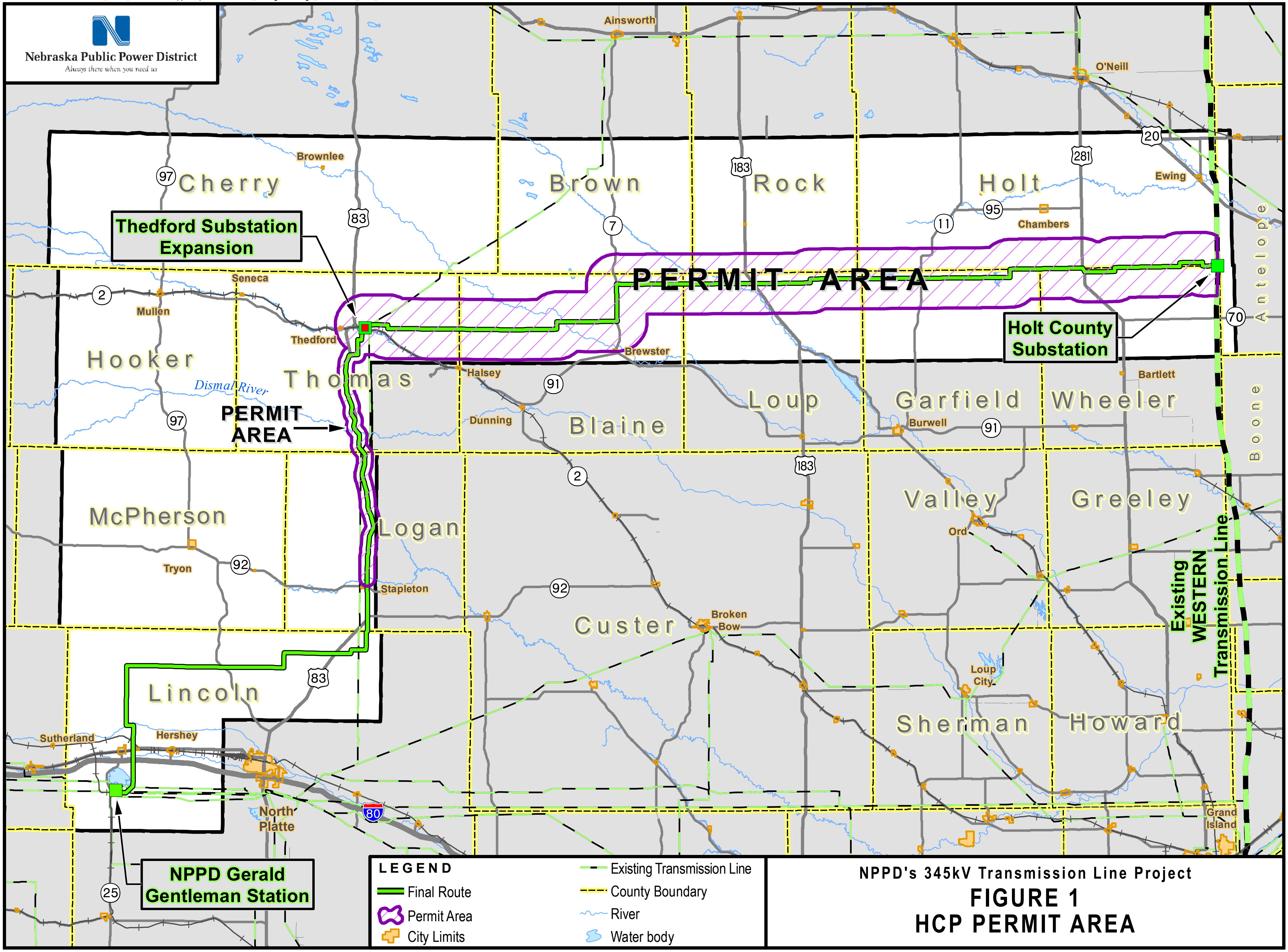
Prior to the onset of construction, NPPD biologists will delineate and record disturbance areas that will occur in areas unsuitable for ABB use. Areas that are unsuitable for ABB use are defined in Table 1. For purposes of calculating take, the HCP and ITP assume that all acres of temporary disturbance occur in areas that are currently occupied by ABB. Temporary disturbance areas that are sited in habitat described in Table 1 will be noted in the first Annual Compliance Report described in Section 5.4.

TABLE 1 AREAS UNSUITABLE FOR ABB USE

	AREAS UNSUITABLE FOR ABB USE DEFINITIONS
1.	Land that is tilled on a regular basis, planted in a monoculture, and does not contain native vegetation.
2.	Pastures or grasslands that are permanently maintained through frequent mowing, grazing, or herbicide application to a height of 20 centimeters (8 inches) or less.
3.	Land that has already been developed and no longer exhibits surficial topsoil, leaf litter, or vegetation.
4.	Urban areas with maintained lawns, paved surfaces, or roadways.
5.	Stockpiled soil without vegetation.
6.	Permanent open or standing water*.

*Areas adjacent to wetlands and/or riparian areas will be considered ABB habitat because these areas are important for ABB seeking moist soils during dry conditions.

Date: 6/8/2016 Path: W:\128143_NPPD_SPP\DD\GIS\Apps\Reports\Restoration_Management\Fig1_PermitAreas_8x11_20160608.mxd



NPPD's 345kV Transmission Line Project

FIGURE 1

HCP PERMIT AREA

The following list of measures/practices will be used to avoid and minimize impacts on ABB. according to additional details contained in the HCP:

- Use of low-ground-pressure equipment in designated areas of construction.
- Use of helicopters to erect lattice structures, string sock line, and mobilize certain equipment.
- Use of helical pier foundations (for lattice structures) in the Sandhills where there is limited existing access.
- Use of existing roads and two-tracks for access.
- Use of temporary improvements for access.
- Siting of construction yards on previously disturbed lands (Table 1) where available.
- Siting of structures and access roads to avoid and minimize impacts to wetlands, which can serve as ABB habitat.
- Construction during the winter in specified areas.
- Mowing and windrowing/removing vegetation in specified areas.
- Removal of carrion at structure locations along existing roads and in previously established work areas.
- Working during daylight hours and limiting nighttime construction during ABB active periods.
- Use of sodium vapor lighting and down-shield lighting at substations

7.2 Whooping Crane

The whooping crane (*Grus canadensis*) is listed as endangered under the ESA and is protected as an endangered species under NESCA. As such, monitoring and surveys for whooping cranes will be required during the whooping crane migration seasons (spring: March 23 – May 10; fall: September 16 – November 16). During these times, work areas will need to be surveyed each morning prior to the initiation of construction activities that day. If helicopters are scheduled to be utilized, surveys of the helicopter flight paths should be conducted via helicopter at a higher altitude than during the construction efforts.

Surveys should be conducted within 0.5 mile of construction activities in accordance with the NGPC standard protocol (HCP Appendix B). If no whooping crane is observed within 0.5 mile, work will commence. If a whooping crane is observed within 0.5 mile of any construction-related activities (e.g., structure erection sites, fly yard/assembly areas, pulling and tensioning sites, overland access paths, and helicopter flight paths), work will not be allowed to begin until the whooping crane(s) vacates the area of its own accord. If a whooping crane is observed, the ECM will notify the Compliance Manager, who will immediately notify NPPD. NPPD will contact USFWS and NGPC.

If, during the day, a whooping crane lands within 0.5 mile of construction activities, all work will cease and will not resume until the whooping crane(s) leaves the area or moves at least 0.5 mile away from the construction area of its own accord.

ECMs will maintain documentation of daily whooping crane surveys and occurrences of whooping cranes within 0.5 mile of construction activities. Checklists will be completed by the ECMs and submitted to the Compliance Manager, who will compile and submit these to the Construction Manager weekly. NPPD will submit all checklists to the USFWS at the completion of each whooping crane migration season.

7.3 Interior Least Tern

The interior population of least tern (*Sterna antillarum*) is listed as endangered under the ESA and is protected as an endangered species under NESCA. Currently, no interior least tern nesting habitat occurs along the R-Project selected route. If interior least tern nesting habitat is identified in the future, such habitat will be flagged as avoidance areas prior to initiation of construction.

7.4 Piping Plover

In the area where the R-Project is located, the piping plover (*Charadrius melodus*) is listed as threatened under the ESA and is also protected as a threatened species under NESCA. Currently, no piping plover nesting habitat occurs along the R-Project selected route. If piping plover nesting habitat is identified in the future, such habitat will be flagged as avoidance areas prior to initiation of construction.

7.5 Bald Eagle

The bald eagle (*Halieaeetus leucocephalus*) is protected by BGEPA and MBTA. Bald eagle nest surveys completed in 2014 and 2016 identified two active bald eagle nests within 0.5 mile of construction access. Construction activities, including the use of the identified construction access and helicopter flight paths, will not be allowed within 0.5 mile of occupied bald eagle nests during the nesting season (February 1 – August 31). Prior to the initiation of construction, additional bald eagle nest surveys will be conducted during the spring to determine the status of known nests and if any new nests have been constructed within 0.5 mile of R-Project construction activities. If an occupied bald eagle nest is identified during the pre-construction survey, construction will not be allowed within 0.5 mile of the occupied nest during the bald eagle nesting season (February 1 – August 31). Depending upon when construction begins, NPPD will consult with USFWS and NGPC regarding the need for a second follow-up pre-construction survey.

If active construction is to take place in areas of suitable winter roost habitat (e.g., riparian habitat along river corridors) between October 1 and January 31, surveys for winter roosts will occur in accordance with the Nebraska Bald Eagle Survey Protocol. If active roosts are located within 0.25 mile of construction activities, work will be delayed until the eagles leave the roosts for the day.

All trash must be disposed of properly in sealed containers. This will minimize the attraction of the construction areas to scavenging bald eagles.

7.6 Golden Eagle

The golden eagle (*Aquila chrysaetos*) is protected by BGEPA and MBTA. All trash must be disposed of properly in sealed containers. This will minimize the attraction of the construction areas to scavenging golden eagles.

7.7 Rufa Red Knot

The rufa red knot (*Calidris canutus rufa*) is listed as threatened under the ESA and is protected as a threatened species under NESCA. Wetlands were identified and avoided to the extent practicable during project design. Any wetlands adjacent to temporary disturbance areas will be flagged as exclusion areas to minimize impacts to rufa red knot potential habitat.

7.8 Northern Long-Eared Bat

The northern long-eared bat (*Myotis septentionalis*) is listed as threatened under the ESA and is protected as a threatened species under NESCA. Because northern long-eared bats use trees as maternity roosts, no tree clearing will be permitted where the R-Project falls within the USFWS-identified white-nose syndrome zone during the pup season (June 1 – July 31). This includes all tree clearing in Holt, Wheeler, Garfield, and Loup counties.

7.9 Blanding's Turtle

The Blanding's turtle (*Emydoidea blandingii*) is currently under review for listing under the ESA. Prior to initiation of construction, biologists will flag wetland habitat as exclusion areas to the maximum extent practicable.

During construction in suitable habitat for Blanding's turtles, ECMs will use a utility task vehicle or all-terrain vehicle with ground visibility to lead construction equipment into work areas. The ECMs will be inspecting the access route for Blanding's turtles as well as controlling speeds to ensure adequate inspection for turtles. ECMs will remove Blanding's turtles from disturbance areas or access routes immediately prior to construction activities and will relocate them to adjacent suitable habitat within 100 yards of the initial observation site. ECMs will also remove any Blanding's turtle that strays into construction areas during times of active construction.

All trenches and excavation left open overnight must be covered and/or fenced with temporary turtle-proof fencing (e.g., silt fencing) to prevent Blanding's turtles from falling in the open trench or excavation. During the Blanding's turtles' active period (April 1 – October 31), pipes, culverts, or similar structures with a diameter greater than three inches that are left aboveground on-site overnight must be inspected for Blanding's turtles before the material is moved, buried, or capped.

Fly yards, assembly areas, construction yards, and/or staging areas must be surrounded by turtle-proof fencing (e.g., silt fencing) to prevent Blanding's turtles from entering the work area.

7.10 Topeka Shiner

The Topeka shiner (*Notropis topeka*) is listed as endangered under the ESA and is protected as an endangered species under NESCA. To minimize impacts to the Topeka shiner, no work will be conducted within the water of small streams.

When streams need to be crossed, existing stream crossings will be used to the maximum extent practicable. If a small stream needs to be crossed by construction equipment and an existing crossing is not available, a temporary crossing (e.g., bridge or culvert) will be installed temporarily. Temporary crossings must be installed so as to not alter the stream's flow.

Best management practices (BMPs) described in the R-Project's Stormwater Pollution Prevention Plan (SWPPP) will be implemented to control erosion and sediment runoff from construction areas that could impact waters that are inhabited by Topeka shiners.

7.11 Blowout Penstemon

The blowout penstemon (*Penstemon haydenii*) is listed as endangered under the ESA and is protected as an endangered species under NESCA. All suitable blowout penstemon habitat will be flagged and avoided.

A pre-construction blowout penstemon survey will be conducted prior to the onset of construction activities to ensure that occupied habitat will be avoided. Surveys will take place between June and July, the recognized flowering period, or during other times of the growing season as determined by a local species expert. All identified blowout penstemon occurrences will be flagged as avoidance areas.

7.12 Western Prairie Fringed Orchid

The western prairie fringed orchid (*Platanthera praeclara*) is listed as threatened under the ESA and is protected as a threatened species under NESCA. All field-verified orchid habitat will be flagged and avoided to the maximum extent practicable.

A pre-construction survey will be conducted during the survey window (the recognized flowering period, mid-June and July) prior to the onset of construction activities to ensure that occupied habitat will be avoided. All identified western prairie fringed orchid occurrences will be flagged as avoidance areas.

BMPs described in the R-Project's SWPPP will be implemented to control erosion and sediment runoff from construction areas that could impact waters and wetlands that are inhabited by western prairie fringed orchid.

7.13 Migratory Birds

Active nests of migratory birds are not to be disturbed per the MBTA. Tree clearing will be completed outside of the migratory bird nesting season to the extent practicable. If clearing must be completed during the migratory bird nesting season, clearance surveys will be conducted by a qualified biologist to identify occupied nests for avoidance. Birds are not limited to nesting in trees and may also nest on the ground or in low vegetation. R-Project construction activities scheduled between April 1 and July 15 will include an on-site investigation to determine if any occupied nests are present. If active nests are found construction activities will be delayed or the area around the nest(s) left undisturbed until all active nests are no longer active.

Because raptors may use the same nests from year to year, seasonal avoidance of these nests will be implemented to reduce impacts to nesting raptors. NPPD biologists will complete a pre-construction raptor survey to identify nests and the species occupying the nest. Because the USFWS Nebraska Ecological Services Field Office has not published a list of seasonal and spatial raptor nest buffers, for the R-Project, NPPD will adhere to the buffers identified by the USFWS Wyoming Ecological Services Field Office. Those raptors that are likely to nest in close proximity to the R-Project and their respective seasonal and spatial buffers are provided in Table 2. Construction will not occur within the species-specific spatial buffer during the nesting periods described in Table 2. Seasonal and spatial buffers described in Table 2 will only apply to active nests. Construction will be able to resume if a nesting attempt fails or after the young have fledged and are no longer dependent on the nest.

TABLE 2 RAPTOR NEST SEASONAL AND SPATIAL RESTRICTIONS

SPECIES	NESTING PERIOD	SPATIAL BUFFER (MILES)
Swainson's hawk	April 1 – August 31	0.25
Red-tailed hawk	February 1 – August 15	0.25
American kestrel	April 1 – August 31	0.125
Barn owl	February 1 – September 15	0.125
Great horned owl	December 1 – September 15	0.125
Burrowing owl	April 1 – September 15	0.25
Eastern screech owl	March 1 – August 15	0.125

Source: USFWS Wyoming Ecological Services Field Office.

APPENDIX F ANNUAL ABB SURVEY PLAN

December 20, 2016

NEBRASKA PUBLIC POWER DISTRICT

R-Project

Annual ABB Survey Plan

PROJECT NUMBER:
128143

PROJECT CONTACT:
Ben Bainbridge
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208-788-0391

POWER ENGINEERS

ABB Survey Plan

PREPARED FOR: NEBRASKA PUBLIC POWER DISTRICT
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ACRONYMS AND ABBREVIATIONS

ABB	American burying beetle
ESA	Endangered Species Act
HCP	Habitat Conservation Plan
ITP	Incidental Take Permit
NGPC	Nebraska Game and Parks Commission
NPPD	Nebraska Public Power District
ROW	Right-of-Way
U.S.	United States
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

Nebraska Public Power District (NPPD) plans to construct a 345,000 volt transmission line from NPPD's Gerald Gentleman Station near Sutherland, Nebraska to a new substation to be sited adjacent to NPPD's existing substation east of Thedford, Nebraska. The new line will then proceed east and connect to the proposed Holt County Substation to be sited in Holt County at the intersection of Holt, Antelope, and Wheeler counties (Figure 1). Referred to as the R-Project, the approximately 225-mile-long line will help enhance operation of NPPD's electric transmission system, relieve congestion from existing lines within the transmission system, and provide additional opportunities for development of renewable energy projects.

The R-Project crosses occupied habitat for the American burying beetle (ABB; *Nicrophorus americanus*), a federally endangered insect. The purpose of this ABB Survey Plan document is to ensure that all future population monitoring surveys completed on behalf of the R-Project will be replicable and follow the same standards and protocol designated by the U.S. Fish and Wildlife Service (USFWS). Following this document will allow any permitted ABB-biologist to complete the necessary annual R-Project ABB surveys.

1.1 R-Project Habitat Conservation Plan

Because the R-Project may result in impacts to ABB, NPPD is currently in the process of developing a Habitat Conservation Plan (HCP) to accompany an application for an Incidental Take Permit (ITP) under Section 10(a)(1)(B) of the federal Endangered Species Act (ESA). An ITP authorizes "take" of threatened or endangered wildlife that cannot be avoided and is incidental to otherwise lawful activities. An HCP must accompany an application for an ITP. The purpose of the habitat conservation planning process associated with the ITP is to ensure there is adequate minimization and mitigation of the effects of the authorized incidental take. The purpose of the ITP is to authorize the incidental take of a federally listed species, not to authorize the activities that result in take. "Take" is defined in the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" of any federally listed threatened or endangered species. Harm may include significant habitat modification where it actually kills or injures a listed species through impairment of essential behavior (e.g., nesting or reproduction).

An HCP requires the permit applicant to define a Permit Area. The Permit Area for this HCP is defined as the geographical area within which incidental take resulting from covered activities is expected to occur. The Permit Area incorporates 671,429 acres of the ABB range and begins where the R-Project crosses Nebraska Highway 92 at the town of Stapleton, Nebraska and continues north to the Thedford Substation and then east to the new Holt County Substation (Figure 1). The Permit Area includes all portions of the R-Project that fall within areas with a greater than one percent probability of ABB occurrence based on the species distribution model for ABB in Nebraska's Sandhills described in Jorgensen et al. (2014). The Permit Area from Stapleton to the Thedford Substation includes one mile on either side of the R-Project centerline (two miles wide total), while the Permit Area from the Thedford Substation to the Holt County Substation includes four miles on either side of the R-Project centerline (eight miles wide total). The varying Permit Area width incorporates all potential impacts occurring outside the transmission line right-of-way (ROW) including construction access and construction yards. The Permit Area is narrow between Stapleton and the Thedford Substation because the R-Project largely follows United States (U.S.) Highway 83 along this segment and all temporary disturbances will be within one mile of the transmission line. This includes those portions of the route between Stapleton and the Thedford Substation where the R-Project is not adjacent to U.S. Highway 83. Conversely, from the Thedford Substation to the new Holt County

Substation, existing access is limited, and the Permit Area must be wider to encompass all construction access. While the Permit Area incorporates all areas where potential disturbance may occur, it is estimated that only 0.2% (1,283 acres) of the Permit Area will actually be disturbed.

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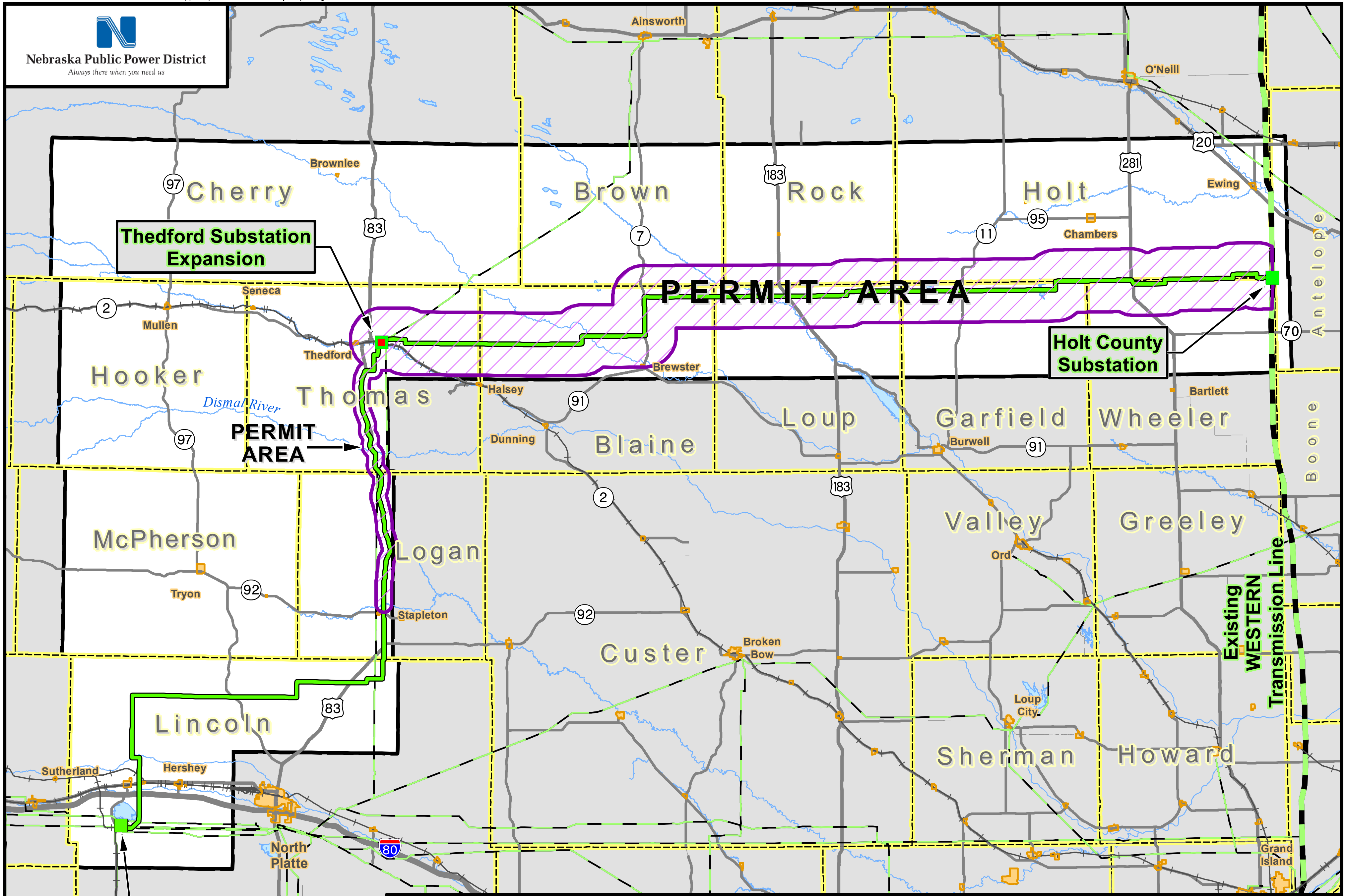


NPPD's 345kV Transmission Line Project

FIGURE 1

HCP PERMIT AREA

2.0 SURVEY NEED

Take as calculated in the R-Project HCP is based upon a density derived from the 99th percentile value of historic sampling data collected from 1996 through 2016. The 99th percentile density estimate from this historic sampling data was 0.130 ABB/acre and resulted in a take estimate of 167 ABB.

The USFWS indicated that NPPD would need to conduct annual ABB surveys to provide sufficient recent data to confirm that the take calculation in the HCP will not be surpassed during construction of the R-Project. The survey effort documented here was requested by the USFWS, and future survey efforts will be completed under existing ESA Section 10(a)(1)(A) permits.

3.0 SURVEY PROTOCOL

3.1 Survey Period and Duration

Surveys described in this plan will occur annually during the August survey period (August 1 – August 31) until the completion of R-Project construction activities. Currently, R-Project construction activities are scheduled to start in fall 2017 and be completed in fall 2019. All surveys will include five survey nights that meet the weather criteria described below. Surveys may begin before the protocol-stated August 7 start date if ABB activity is documented at control trap sites. Surveys following this protocol were successfully completed in 2016 from August 1 –6. Control traps to verify that ABB were active prior to August 7 were four traps placed in the area of Chambers, Nebraska. These four traps are used annually as control traps by Dr. Wyatt Hoback. Dr. Hoback also participated in the August 2016 surveys.

3.2 Survey Method

Surveys described in this plan will follow the USFWS Region 6 Presence/Absence Survey Protocol American Burying Beetle (Nicrophorus americanus) (USFWS 2016) (Appendix A). Presence/absence trapping must include at least five suitable trap nights of trapping. Any night in which the temperature drops below 60˚F at midnight, or in which precipitation throughout the night is greater than 0.5 inch, will not be counted as one of the five trap nights.

Daily survey results for each individual trap will be recorded on the USFWS's ABB Survey Data Collection Form (Appendix B). A single sheet will completed each day for each trap. At the conclusion of each annual survey, the lead biologist will complete the USFWS's ABB Survey Summary Report in excel format (https://www.fws.gov/southwest/es/oklahoma/ABB_Add_Info.htm).

3.2.1 Trap Placement and Removal

Five-gallon plastic buckets will be buried in the ground so the lip of the bucket is slightly higher than the surface of the ground. Approximately four centimeters of soil will be placed in the bottom of the trap to allow captured beetles to bury. A wood cover will be placed over each bucket to protect captured beetles from rain and sunlight. The cover will be raised above the lip of the buckets approximately four centimeters to allow access by the beetles. Dirt and/or a plug of sod from the hole will be placed on the covers to help hold them down and insulate the traps. Traps will be removed after five protocol-level survey nights. Upon removal of each trap, the resulting hole will be refilled with the original dirt and the plug of sod replaced. Photos will be taken of each trap location to document the site condition before the trap is placed and after the trap is removed. Each trap has an attraction radius of approximately 0.5 mile for burying beetles.

3.2.2 Bait

Bait will consist of euthanized white laboratory rats with a mass ranging from 200 to 250 grams. Baits must be removed from the freezer and allowed to thaw and age in a sealed container. One whole decaying rat will be placed in each trap when the traps are set. A second bait will be added to each trap following the third trap night.

3.2.3 ABB Processing and Marking Patters

All carrion beetles captured in the traps will be removed, identified to species, counted, and released at the trap location. All captured ABB will be identified for sex, measured for pronotum width, aged as teneral or senescent, and marked using a micro-cauterizer on the elytron.

The pattern for marking ABB is described in Table 1 and Figure 2. All other species will be counted and released, and captured ABB will be released after marking approximately 50 meters from the trap.

TABLE 1 ABB MARKING PATTERN

TRAP NIGHT ABB IS CAPTURED	MICRO-CAUTERIZER MARK LOCATION
1	Upper Right
2	Lower Right
3	Upper Left
4	Lower Left
5	No mark

3.2.4 Trap Locations

Based upon analysis of sample size and recommendations from Dr. Wyatt Hoback, NPPD randomly identified 80 trap locations throughout the Permit Area. Trap locations were grouped into eight strings of traps placed along existing access in the Permit Area that could each be surveyed by a single team of biologists in the allotted time frame. The initial trap location was randomly selected within each grouping, and the remaining traps in each group were spaced one mile apart, as per protocol (USFWS 2015). Using this method, NPPD identified 79 trap locations spread throughout the Permit Area (Figure 3) along publicly accessible roads.

General trap locations include the following areas: Highway 83, East of Thedford, Brewster, Highway 7, Calamus River, Gracie Creek Road, Highway 11/844 Road, and 846 Road.

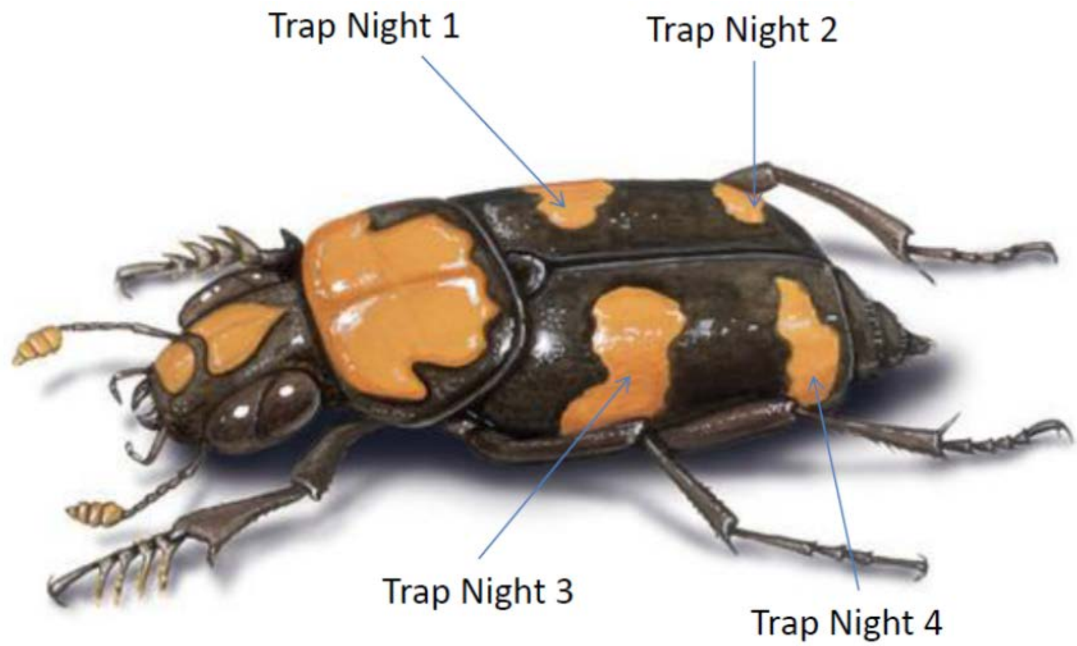
See Appendix B for mapping of unique trap locations and the latitude and longitude for each trap location. Trap locations are provided in decimal degrees WGS84.[1] These trap locations were successfully surveyed in August 2016. Surveys at these specific trap locations will be repeated annually each August until construction of the R-Project is complete. Actual trap locations may vary slightly on a yearly basis depending upon current conditions at the trap locations, such as the presence of an ant colony or standing water.

POWER Engineers biologists completed a high-level ABB habitat assessment of disturbance areas associated with the R-Project and proposed traps. The ABB habitat assessment was conducted using a combination of field- and aerial-imagery-based visual interpretation of the available habitat. The habitat in potential disturbance areas was compared to the habitat along the survey routes to ensure that the habitat potentially disturbed by construction of the R-Project was proportionally represented

[1] WGS84 refers to the world geodetic system that was established in 1984, with periodic updates, that is the reference system being used by the Global Positioning System.

by habitat along the proposed traps. Traps occur in a variety of habitats including dry sandy dune grasslands and low wet meadows.

FIGURE 2 ABB MARKING PATTERN



4.0 DATA PROCESSING

Surveys completed using this Survey Plan fall under Compliance Monitoring described in the HCP. Take estimates derived from the Compliance Monitoring will be compared to the take of 167 ABB described in the HCP. Take estimates from this survey will use the visual habitat assessment originally developed by Dr. Wyatt Hoback. Habitat category definitions in the assessment include:

- **Prime** – Undeveloped wet meadows with some trees (especially cottonwoods [*Populus deltoides*]) or forest areas visible. Water sources available including the presence of a river, stream or sub-irrigated soils (water is close to the surface as a result of shallow aquifer). Cropland not visible or at a distance greater than 2.0 miles.

- **Good** – Native grassland species (tall or mixed grass prairie) with forbs. Low wetland meadows that are grazed by cattle or used for haying. Trees (usually cottonwoods) present. Sources of water within a mile, but the area has either some cropland or sources of light pollution including yard lights or houses within a mile.

- **Fair** – Grassland with exotic species such as brome grass (*Bromus* spp.) or dry upland areas with exposed soil and scattered plans such as yucca (*Yucca* spp.). Or otherwise good habitat with row crop agriculture located within 0.5 mile.

- **Marginal** – Potential habitat restricted to one side of the survey route, with row crop agriculture on one side or very dry, sandy, upland areas with exposed soil, such as a blowout, and abundant dry-adapted plants, such as yucca (*Yucca* spp.).

- **Poor** – Both sides of the survey route with row crop agriculture or habitat with the potential for large amounts of light pollution and disturbance associated with town or city edge.

Take estimates derived from Compliance Monitoring will be determined using the following steps. Table 2 provides a framework for determining ABB take each year.

1. Determine a habitat category of each trap surveyed.

2. Determine a unique mean density for each habitat category using all traps in that habitat category. Density will be determined using the following equation:

   a. (Total ABB captures / 0.9) / total acres trapped = ABB/acre

3. Determine a habitat category for each section (one square mile) that contains a project-related disturbance that occurred that year and total the disturbance acres for each habitat category. Disturbance areas that were disturbed during the previous year will not be re-counted.

4. Multiply the total disturbance acres for each habitat category by the density determined for that habitat category (Step 2). This will result in a total ABB estimated to occur in disturbance areas within each habitat category.

5. Total the ABB estimated to occur in disturbance areas within each habitat category to determine the total number of ABB likely to be taken that year.

TABLE 2 ANNUAL ABB TAKE ESTIMATION

HABITAT CATEGORY	UNIQUE MEAN DENSITY	ACRES OF DISTURBANCE FOR THAT YEAR	ESTIMATED ABB
Prime			
Good			
Fair			
Marginal			
Poor			
TOTAL	--	X	Y

The ABB take estimate derived from the annual survey, represented by Y in Table 2 will be compared to the take of 140 ABB issued in the HCP/ITP for the construction phase of the R-Project.

The USFWS 2016 survey protocol states results of presence/absence surveys are only valid until the next ABB active period. The purpose of the surveys described in this plan is to estimate an annual ABB density, not to determine presence or absence. ABB populations are higher in August when senescent and recently metamorphosed teneral beetles emerge. Therefore, results of each annual ABB survey described in this survey plan will be valid until the next August survey period.

5.0 SURVEY RESULTS REPORT

Written documentation of the annual survey results will be drafted and submitted to the USFWS and Nebraska Game and Parks Commission (NGPC) by November 1 each year following completion of surveys. The results report will include the following:

- Brief description of the survey protocol followed
- Dates of survey
- Weather conditions during survey
- Total ABB captured
- Total ABB recaptures and unique individuals
- Number of traps that captured ABB
- Number of traps with no ABB captures
- Annual ABB take estimate based on calculation described in Section 4.0 of this document.
- Summary of ABB density and take estimates from each previous year of survey
- HCP/ITP implications – is annual take estimate greater than or less than that described in the HCP/ITP?

APPENDIX A REGION 6 PRESENCE/ABSENCE SURVEY PROTOCOL

Region 6
Presence/Absence Survey Protocol
American Burying Beetle
(*Nicrophorus americanus)*

February 2016

Introduction

This document provides guidance for designing and conducting live-trapping presence/absence surveys for the endangered American burying beetle *(Nicrophorus americanus,* ABB) throughout its current and historical range. This guidance replaces any previous U.S. Fish and Wildlife Service (Service) recommended ABB survey guidance. These surveys may only be conducted by individuals possessing a valid Federal Fish & Wildlife Permit (Recovery Permit) for scientific recovery of the ABB (surveyors), as defined under section 10(a)(1)(A) of the Endangered Species Act (ESA). Other state permits to conduct ABB surveys may also be required for a federal recovery permit to be valid. Surveyors should contact the respective state resource agency to determine if other guidelines apply and state permits are required. Additional permits and/or authorizations may also be required for surveying on lands managed by other federal agencies.

Surveyors must contact the state ecological services field office prior to conducting **any** ABB surveys to determine where and in what cases surveys are recommended. The responsibility to ensure that ABB surveys are conducted in accordance with this protocol and cover all potential ABB habitats within a project area will lie with the surveyor. The Service expects surveyors to adhere to the protocols outlined within this document. If upon review, the Service discovers a survey to be invalid for any reason, the Service will return the project to the proponent as incomplete with directions to resubmit the project once they have conducted a valid survey. Additional reporting details are found below in the *Reporting Procedures* section of this document.

This guidance is based on the most current scientific data available at this time and will be updated as new information becomes available. Check with the local ecological services field office for any updates.

Areas Unfavorable for the ABB

The selection of areas to survey can be based on two perspectives. One is to determine if ABB's are present in an area and therefore whether or not a project has the potential to impact ABBs. The second is to determine if ABBs are present at a specific site and if the selection of that site will avoid impacts to ABBs.

The following information can be used to help determine whether surveys are appropriate and provides guidance for areas to avoid when selecting the placement of traps. While the ABB uses a wide variety of habitats, the Service currently believes that areas exhibiting the following characteristics are *unfavorable* for use by ABBs based on disturbance regime, vegetation structure, unsuitable soil conditions, and carrion availability:

1. Land that is tilled on a regular basis.
2. Land that has already been developed and no longer exhibits surficial topsoil, leaf litter, or vegetation.
3. Urban areas with maintained lawns, paved surfaces, or roadways.
4. Stockpiled soil without vegetation.
5. Wetlands with standing water or saturated soils (defined as sites exhibiting hydric-soils, and vegetation typical of saturated soils, and/or wetland hydrology).

NOTE: Areas adjacent to wetlands and/or riparian areas such as subirrigated wet meadows could be suitable for the ABB, as they may be important for ABBs seeking moist soils during dry conditions. ABBs have been shown to seek out moist soils when available.

Traps should not be placed in locations that are susceptible to disturbance or destruction (i.e., cattle trails, areas where livestock congregate, etc.)

Seasonal Parameters

<u>Time of Year for Surveys</u>

A valid ABB survey is one that has occurred during the ABB active period.

- The Service considers the ABB active period to begin after five consecutive nights when the minimum nightly temperature reaches 12.8 degrees Celsius/55 degrees Fahrenheit (°F) or greater (Bedick 1997, Kozol 1991, USFWS 1991). Surveyors will need to ensure nightly temperature criteria have been met before trapping begins by monitoring the closest weather station to the survey site (see more information in the Reporting Procedures section below) or by using data loggers.

- Surveys should not be conducted during the brood-rearing period (July 1-August 7) when most ABB are underground and trapping results may give false negatives in states (Nebraska and South Dakota) located in the northern portion of the ABB range. Alternatively, ABB survey results may be accepted if control traps reveal that teneral beetles are above ground before August 7. An acceptable survey, however, will need to demonstrate that the ABB active season began earlier in May than normal due to an early summer.

- ABB breeding activity tends to be asynchronous in the southern portion their range because they are not constrained by weather conditions (i.e., shorter active season) as they are in their northern range. For this reason, surveys in Kansas may be conducted during the ABB active time without concern for avoiding the brood-rearing period as would be necessary in Nebraska and South Dakota.

- Surveys may continue until the first night when the minimum temperature falls below 55°F after August 31, which generally signals the beginning of reduced ABB activity and thereby increases the probability of false negative results.

Control

A positive control trap should be used in association with ABB surveys. A positive control establishes that conditions were correct in a given geographic area and that ABB were active during the timeframe of the trapping. Only one ABB capture is necessary to establish a positive control. The positive control window may be up to seven days prior to trapping, or during, but not after the trapping timeframe. Positive control trapping should be done in areas with a recent history of populations that have been documented through regular survey work. Check with the local ecological services field office to determine if a positive control is required. In some locations, use of a control may be difficult because the ABB population is extremely small (Kansas) whereas in other locations (Nebraska) use of a control is essential.

Timeframe Surveys are Valid

Surveys conducted for ABBs are valid for the active season when the survey was done or until the next active season. ABB density is cyclical and thus, can vary by active season. Additionally, other circumstances (e.g., flooding, drought) can alter ABB density beyond that expected due to normal population fluctuation.

Following metamorphosis from larva to adult, tenerals (adult ABBs newly emerged from the pupal case) typically emerge from underground in mid-summer; though timing can vary based on latitude and weather conditions. Presence/absence surveys in the Nebraska Sandhills have documented tenerals in early August. Tenerals over-winter as adults and comprise the breeding population the following spring and summer (Kozol 1990). ABBs have a one-year life cycle; all ABBs that overwinter were produced the previous summer. In Oklahoma, by July 28, most new or teneral ABBs should have emerged and be actively seeking carcasses. In Nebraska, by August 7, most new or teneral ABBs should have emerged and be actively seeking carcasses. Surveys completed after tenerals have completed emergence more accurately represent the density of ABBs prior to overwintering.

Trap Design

General

The Service requires surveyors to use an 18.92-liter (5-gallon) bucket-style trap when conducting ABB presence/absence surveys. Traps must be light in color, have smooth sides, and be free of any texture or ridges to prevent ABBs from climbing out. Each trap consists of a bucket with a cover and bait. Utilization of trap designs and equipment that deviate from the traps described herein must be coordinated with and approved by the Service prior to deployment. Surveyors may place buckets above ground or bury them as a pitfall trap, as described below. Check with the local ecological services field office for guidance on the use of above versus below ground pitfall traps for ABB surveys.

Figure 1. 5-gallon Above-ground Bucket Trap (typically used when soil is rocky and is difficult to dig)

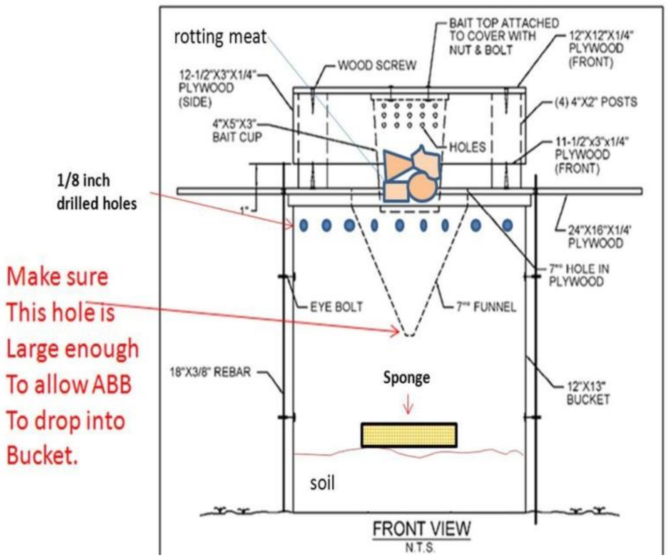


Figure 1 shows an alternate form of Leasure et al. 2012, pictured using soil and a sponge in the bottom of the bucket. This allows beetles to find refuge from other congeners, decreases competition, provides access to bait to replenish depleted energy, and reduces stress to captured ABBs.

See Appendix C (Leasure et al. 2012) for instructions, materials, figures and schematics. Funnels used to make these traps can come in different sizes. When selecting a funnel for your trap, the small end of the funnel MUST be large enough to allow a large ABB to fall through into the bucket (approximately 55 mm – 2.16 inches). If the funnel's small end opening is not large enough, you may need to cut it off to make the hole larger (Figure 1). Surveyors should drill additional 3.2 mm (1/8 inch) holes around the top edge of the bucket (see figure 1) to allow air circulation through the bucket while preventing beetles from escaping.

<u>5-gallon Pitfall Bucket-Trap</u>

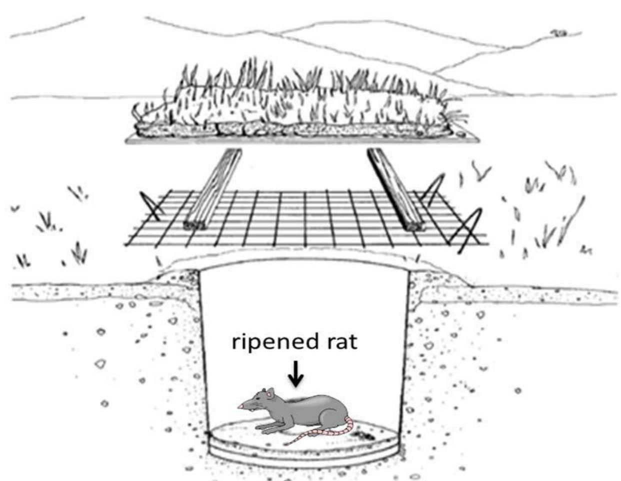
This pitfall trap design follows Bedick et al. (2004), although biologists have recommended a few modifications to this trap over the years to provide for better performance, such as allowing ABB access to bait within the trap to decrease competition and provide moisture for captured beetles. A schematic of the improved design is pictured in Figure 2. The following is a list of items needed to build these pitfall traps.

Materials

1. Single 18.92 liter (5-gallon) bucket with a diameter of 28.5 centimeters (11.2 inches) or greater
2. Piece of plywood at least 10.2 centimeters (4 inches) wider than diameter of bucket
3. Piece of wire mesh (≥ 2.5 centimeters [1-inch] mesh size) to allow ABB to enter but still exclude scavengers.
4. Four garden staples

5. Two 2.5 centimeters by 2.5 centimeters (1-inch by 1-inch) sticks large enough to hold the cover off the bucket
6. Shovel or ground auger

Figure 2. Pitfall trap design typically used when soil is sandy or loamy and can be easily dug (based on Bedick et al. 2004)



Pitfall trap design (Bedick et al. 2004). Place ripened carrion on top of soil in bottom of bucket.

Dig a hole approximately the size the bucket. Place the bucket in the hole. The rim of the bucket should be 5 to 8 centimeters (2 to 3 inches) above ground level and a berm of soil built up to the rim of the bucket to form a gradient from ground level upwards to the rim for ABBs to access the bucket. The higher level is necessary to prevent runoff from entering the survey buckets. This also prevents water runoff from filling the bucket and drowning ABBs and other insects. Place approximately 5-8 cm of moist soil in the bottom of the bucket to give trapped carrion beetles room to burrow into the soil to avoid competitors, high temperatures and low moisture levels.

If using a pit-fall trap design in areas where scavengers are a significant problem, surveyors should install wire mesh between the pitfall trap and the cover as pictured in Figure 2. Place the wire mesh over the buckets and secure in place with the garden staples to help exclude vertebrate scavengers. The openings in the wire mesh should allow ABBs access to the trap, but prevent larger animals from stealing the bait. Surveyors should secure the wire mesh to the ground with stakes.

Lay the 1 x 1 sticks over the wire mesh and place a hard cover on top of the sticks.

Place additional weight (plug of sod from bucket excavation, soil, rocks, etc.) on top of the trap cover to reduce bait loss due to vertebrate scavengers and prevent wind or small animals from moving the cover, as depicted in Figure 2.

Do not place traps in areas where inundation during rainfall events could occur as ABBs can drown easily in even a small amount of water. Often trapping occurs along public road right of ways—do not place traps in the bottom of ditches where water could inundate the trap and drown

ABBs and other insects. Close traps if high winds or severe thunderstorms are predicted for the survey area.

A cover is required to deter scavenger's access to the trap, to prevent rainfall from entering the trap, and to provide shade to captured insects to inhibit desiccation. The cover should be rigid, light in color, and weighted or secured to the trap or ground. Covers over pitfall traps should be raised off the trap about 1 inch to allow ABBs to crawl into the trap and to allow the scent of the bait to better permeate the air.

Trap Deployment

Minimum Survey Effort (Temporal Scale)

To determine presence/absence of ABBs, surveyors shall set traps for a minimum of **five (5) consecutive nights**. Surveys with 5 consecutive nights reduce the potential for false negatives and are consistent with recommendations in Bedick et al. (2004), Butler et al. (2012), and guidance used in other portions of the ABB range. A minimum survey effort of 5 nights was required to eliminate false negatives in 123 surveys conducted in 2011 (Hoback 2011 Unpublished). See "Weather Requirements" section below for additional information about timing of surveys with invalid nights.

Weather Requirements

The following environmental conditions are not conducive to ABB presence/absence surveys and therefore invalidate survey results unless additional nights of surveying are added. Additional night(s) of surveying are required when:

- Nighttime temperature falls below 55ºF (during the survey period),
- Wind speed is greater than 10 mph in excess of 20% of the time (1 hour 24 minutes) between 9:00 p.m. and 4:00 a.m.,
- Precipitation exceeds 0.5 inches between 9:00 p.m. and 4:00 a.m., or
- Surveys are interrupted by 3 nights of unsuitable weather conditions.

Minimum survey effort shall include five consecutive nights of suitable weather conditions. Surveyors should collect the necessary precipitation, temperature, and wind information from the closest weather station to the survey site to establish that surveys were conducted when conditions were favorable for ABB activity (see more information in the Reporting Procedures section below). If unsuitable weather conditions invalidate one or more survey nights during the overall survey effort, surveyors should continue surveying until they reach five valid nights. It is not necessary to restart surveys to obtain five (5) consecutive nights of sampling, unless surveys are interrupted by three (3) consecutive nights of unsuitable weather. Record which survey nights did not meet weather requirements on the "*ABB Survey Data Collection Form*" (Appendix A) and the total number of nights with unsuitable weather conditions on the "*ABB Survey Summary Report*" (Appendix B).

Disturbed bait or traps

An additional night of trapping is required for every night the trap or bait is disturbed. Record which survey night(s) the disturbance occurred on the "*ABB Survey Data Collection Form*"

(Appendix A) and the total number of nights of trap disturbance on the "*ABB Survey Summary Report*" (Appendix B).

Trap Spacing and Placement

The effective survey radius for each trap is 0.8 km (0.5 miles). Therefore, surveyors should space traps 1.6 km (1.0 mile) apart to achieve adequate survey results. The Service determined this effective survey radius based on the ABB's mobility, size, recorded movement distances, and the distance from which ABBs can detect carrion. Surveyors should place traps along the upwind edge of the survey area, if possible. In general, low elevation, mesic meadows with a thick layer of vegetation litter is more conducive to ABB capture than dry, elevated areas.

Baiting and Checking Traps

Any type of carrion is suitable for use as bait, as long as it is the appropriate size in correlation with trap size and produces a pungent odor that ABBs are able to detect (Bedick et al 2004, Leasure *et al*. 2012). All bait must be aged or ripened and emit a pungent odor to be effective. Surveyors should store the bait outside in airtight containers for 2 to 3 days, or until adequately aged to produce a sufficiently robust odor. Do not fill the container or bag completely full, because as the bait rots, gas pressure inside the container increases, and expands the container.

The Service recommends that surveyors bait the bottom of the pitfall bucket traps with whole carcasses, hair/feathers intact. Surveyors may use previously frozen, 275-374 gram (9.7-13.2 ounce) laboratory rats (*Rattus norvegicus*), available from pet stores and online dealers (RodentPRo.com), as bait. If rats are not available, bait items of comparable size and structure may be used. Additionally, if using the aboveground 5-gallon bucket, surveyors will utilize the bait cup attached to the lid to ensure that the pungent odor of carrion is effectively dispersed. This bait need not be a whole carcass and may consist of aged pieces that have neither skin nor hair. Baiting traps consists of:

1. Secure the bucket to the ground.
2. Place approximately 2.5 to 5.1 centimeters (2 to 3 inches) of loose, friable, moist (but not wet) soil with little or no clay content in the bottom of the pitfall bucket or above-ground bucket if bait is placed in the bottom. When checking traps, care must be taken when sifting the dirt to determine ABB presence.
3. Place a wetted sponge and/or soil in the bottom of the 5-gallon bucket. The rotting carcass in below and above ground traps also releases moisture during decomposition that often provides sufficient soil moisture.
4. If you are using a pitfall trap, place the carcass on top of the soil in the bottom of the trap. OR if you are using the 5-gallon above-ground bucket trap, surveyors may place the bait in the perforated bait cup that is attached to the lid and/or may place additional bait in the bottom on top of the soil layer.
5. During trapping efforts, surveyors must replace or supplement any bait that has dried out, is full of maggots, and/or no longer emits a pungent odor with new, prepared bait. Generally, supplemental bait will need to be provided on the third day of trapping. Do not leave discarded or old bait at or near the current trapping area while trapping. This could lure ABBs away from the baited traps. Leave old bait in the pitfall trap (unless excessive maggots are present) and supplement with new prepared bait. Surveyors must wash all buckets with bleach and thoroughly rinse with water prior to each

trapping survey effort.

6. Secure the tops of the traps to ensure predators do not have access to the contents of the bucket.
7. All traps must be in place and baited by dusk each night.

Surveyors must check and clear all ABB traps by 12:00 p.m. every day the traps are set. Exposure to full sunlight and temperatures over 25ºC (77ºF) even for a few hours, can result in mortality (Kozol 1990, USFWS 1991, Kozol 1992) therefore traps must be checked no later than 12:00 p.m. daily to minimize any temperature-related mortality. On days of extreme heat, checking traps prior to 12:00 p.m. may be necessary to avoid 77ºF. Delay in checking traps subjects trapped ABBs and other insects to heat stress and mortality. Surveyors may bait traps at the same time they check traps each morning, provided the bait does not dry out. Because ABBs are nocturnal, the risk of ABB captures during the day is extremely low.

Checking traps consists of:

1. Record and release all *Nicrophorus* and *Silphidae* species.
2. Replace any missing or dry bait and moisten the sponge (when used in above ground trapping).
3. Replace/repair any disturbed parts of the trap.
4. Return the bait to the trap after recording all *Nicrophorus* and *Silphidae* species.
5. Replace the cover.

Surveyors should immediately release any injured or lethargic ABBs that are clearly alive. Surveyors should monitor all ABBs that appear to be dead, holding for at least 20 minutes for accurate determination of their condition. Process any dead ABBs as described below under "*Accidental Death of ABBs"*. All ABBs held for observation are to be placed in ventilated containers that are kept out of direct sun and in a cool, shaded location.

<u>Ants</u>

Surveyors should not place traps within 7 meters (23 feet) of any ant colonies. If ants are in a trap, the surveyor should relocate the trap at least 23 feet away.

Processing Captures

<u>Identification and processing of *Nicrophorus* Species</u>

A complete Survey Package will include the daily field data sheets, the electronic summary sheet, and weather data. Photographs of each ABB collected may also be required if deemed necessary and feasible by the ecological service field office. Only complete packages will be accepted. The Service prefers information be sent using electronic media. If the "*ABB Survey Data Collection Form*" (Appendix A) is sent by U.S. Mail, then the accompanying "*ABB Survey Summary Report*" (Appendix B) must also be submitted at this time so that all data and summaries are received together. This can be accomplish by sending a CD of the information in lieu of the abbcontact@fws.gov

Surveyors must identify and record all *Nicrophorus* and *Silphidae* species. Appendix D provides descriptions of the *Nicrophorus* species, and Appendix E provides a dichotomous key.

Processing ABBs includes collecting data on gender determination, age determination, pronotal width, marking (if authorized,) and data recording of all ABBs captured. Surveyors must record all information on the "*ABB Survey Data Collection Form*" (Appendix A.)

ABBs are sensitive to prolonged heat exposure. Surveyors should not hold captured ABBs for longer than 30 minutes, preferably much less. If more than 10 minutes is required for processing, surveyors should place ABBs in a hard plastic container with a damp sponge or moistened paper towels, which should be stored in an ice cooler until processing commences. The plastic container should be held away from direct sunlight.

Surveyors should not mark (clipping of elytra, adhesion of bee tags, painting) ABBs in any way unless approved by the Service. Morphometric measurements of individuals, such as pronotal width, can be measured using a caliper or photographic images taken in the field on a piece of reference grid paper and analyzed using freeware such as ImageJ (http://imagej.nih.gov/ij/).

ABBs are to be released near (within 609 meters/2,000 feet) the transect where they were captured, but at least 3 meters (10 feet) away from foot traffic along the transect and a minimum of 152 meters (500 feet) from any vehicle pathway, to avoid trampling. Excavate a small diameter hole approximately 5 inches deep in moist soil and gently place the individual ABB in the excavated hole. ABBs may be released into grass/leaf litter if litter is a minimum of 3" thick.

Age Determination

ABBs that have pupated during the current active period are referenced as new (i.e., newly emerged or teneral) and ABBs pupated the previous year are referenced as old (emerged the previous active period and overwintered as teneral adults). Surveyors can distinguish newly emerged ABBs from older ABBs by their softer bodies, a more shiny appearance, and the pronotum appears more orange (less red) and lighter in hue (Figure 3). An older ABB's pronotum appears red rather than orange, is deeper in hue, body parts (especially legs or antennae) are often missing, and their mandibles appear more worn at the tip. Surveyors must record the ages of ABBs as mature, senescent, teneral, or unknown, on all data forms. It is also important to consider the time of year when assessing age. More mature ABBs will emerge earlier in the period while there may be higher numbers of younger ABBs captured later in the period.

Gender Determination

The gender of ABBs is distinguishable by the orange-red marking located between the frons and mandibles on the head. These markings are rectangular on males and triangular on females (Figure 3). Surveyors must record ABB gender on the "*ABB Survey Data Collection Form*".

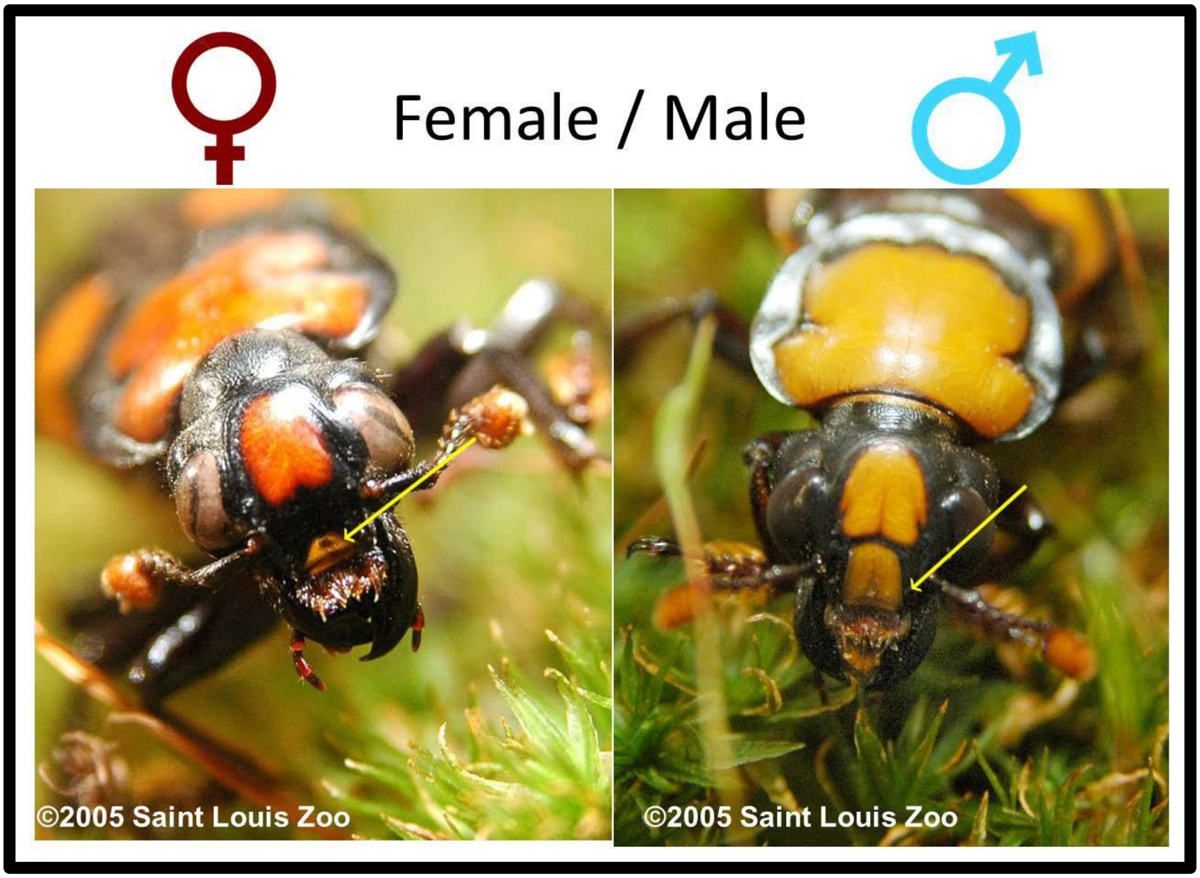


Figure 3. Distinguishing female from male ABB. Color variations can be seen within the species. This female is darker in hue and appears more red (left,) consistent with an older adult senescent coloring; while this male (right) is lighter in hue and appears more orange, consistent with characteristics of a teneral adult.

Reporting Procedures

Surveyors should collect the necessary precipitation, temperature, and wind information from the weather station closest to the survey site, which can be found at ***http://www.wunderground.com/history/*** (or other appropriate weather reporting website, such as a Mesonet site). Local temperatures during the survey should also be collected using an on-site data logger. Print out and submit all data logger information along with information from the weather reporting website and submit data with survey results. Surveyors must record this information on the "*ABB Survey Data Collection Form*" and include the total number of valid nights surveyed on the "*ABB Survey Summary Report*" (Appendix B).

To automatically find the closest weather station:

- From the homepage, hover over the <u>Weather tab</u> and click on the bold Weather History heading.
- Enter the closest town to the survey site and the date of the survey into the drop down menus. Remember that the valid hours of a survey are from 9:00 p.m. to 4:00 a.m. This requires the surveyor to review the weather data for two consecutive days for each night of survey effort (i.e., the night of the 3rd and morning of the 4th to determine if the survey effort for the 4th is valid).
- The weather data for the day selected will display at the top of the page. Scroll down this page to view the hourly weather data.
- If the weather station that Weather Underground takes you to does not contain all the necessary information, you will need to search for a personal weather station using the Personal Weather Station (PWS) option in Weather Underground.

To locate the closest Personal Weather Station in Weather Underground:

- Type ***http://www.wunderground.com/weatherstation/setup.asp*** in your web browser.
- Under the PWS network box on the right side of the page, select the state that you are working at from the "select a state" drop down box.
- Review the list of weather stations and select the closest **reputable** weather station to your survey site (i.e., city hall, hospital, emergency management center).
- Enter the date into the drop down box and click view.
- Ensure that the weather station contains all the required data to validate the survey effort.

<u>Location Data</u>

At each trap, a GPS location (in decimal degrees, NAD 83) must document the location of the trap and note the general habitat characteristics of the trap site. Note whether the area is disturbed or native, woodland or grassland, and note any other component of the landscape that has the potential to affect the trapability of the ABBs within the survey radius.

Submission

For each survey effort, surveyors should complete an "*ABB Survey Data Collection Form*" (Appendix A), an "*ABB Survey Summary Report*" (Appendix B), and if required by the ecological services field office, a digital photo of each ABB captured. Surveyors should electronically submit Appendix B ("*ABB Survey Summary Report"*) and the digital photographs (if required) to the local ecological services field office and ***ABBContact@fws.gov*** for **every** survey conducted. Surveyors should submit Appendix B in Excel format only. Surveyors may decide whether to submit the *"ABB Survey Data Collection Forms"* either electronically or by mail. When submitting the data forms, everything should be included in a single pdf file. If sending survey information by U.S. Mail, all information should be contained within the submission. Electronic information should be placed onto a CD or other similar electronic media. Surveyors must ensure all reports are **accurate** and **complete**. The Service will consider incomplete and/or inaccurate submissions as invalid. When sending corrected forms, surveyors should indicate on the form that it is a corrected form, the project name, and identify each specific correction.

Permittees must submit the results of their ABB surveys with the required end of year recovery permit reports. However, surveys may be submitted at any time. The Service reserves the right to request that surveyors provide ABB survey results at any time.

It is the project proponent and surveyor's responsibility to ensure that the surveys are conducted in accordance with this protocol and cover all potential ABB habitats within a project area. The Service will, however, periodically spot check submitted surveys for accuracy and review all surveys that are part of a submitted Project Review Package (as part of the Endangered Species Act Consultation or Technical Assistance process).

Specific data entry criteria is required to maintain functionality of the Service's ABB database. All names of companies, months, locations, soil types, plant species, persons, etc. are to be spelled out, no abbreviations (i.e., May instead of 5, Joe Smith instead of J. Smith, with no punctuation (i.e., Joe L Smith instead of Joe L. Smith). Report all latitude and longitude data in decimal degrees with NAD 83 coordinate system/projection. Longitude should have a negative sign preceding the number. Do not include the N or W with the latitude or longitude number. Each survey should have a specific and individual name to distinguish it from other surveys (e.g., Acme oil well 14). Specific and individual survey report identifiers are necessary to ensure the proper survey is referenced when the Service responds to a survey effort, if questions arise, or if the survey is for a specific project. Specify the project proponent and their project name in the ABB survey report and any other correspondence submitted to the Service (Acme Company, XYZ pipeline). The project proponent is the company that is ultimately responsible for the project, not just the consulting firm that may have hired you to perform these surveys.

Accidental Death of ABBs

Surveyors must record all mortalities of ABBs on the "*ABB Accidental Death Form"* (Appendix F). Surveyors must submit this form electronically within two (2) calendar days of collection via email to the local ecological services field office and ***abbcontact@fws.gov***. The recovery permit should be checked to ensure that other requirements related to notification have been met. Surveyors must also submit the electronic version of the "*ABB Accidental Death Form*" with their annual recovery permit report.

Surveyors should put any dead specimens on ice until they can be prepared for submission. When storing and submitting dead specimens, surveyors will preserve all ABB mortalities in 70-90% ethanol (preferable; better) or 70% Isopropyl (rubbing alcohol; easier) rather than preserving as dried specimens. Mortalities thus preserved should then be stored in a freezer until delivered to the Service or Service-approved facility. Each specimen must have a unique alphanumeric name assigned by the surveyor and included inside each container to ensure future identification. This alphanumeric name should be the first letter of the first two (2) words of the permittee company or individual (e.g., Acme Company, first dead ABB = AC001). Additionally, a label must accompany the specimen and include: the date the ABB was found dead, permittee, legal description of where the beetle was found (down to quarter section at least), and a latitude and longitude coordinate in decimal degrees; NAD 83.

Surveyors should deliver dead specimens, along with a hardcopy of the "*ABB Accidental Death Form*" (Appendix F) to the local ecological services field office or a Service-approved facility. Contact your local ecological services field office for recommendations as to which facility or facilities would be acceptable for deposits.

Protocols and Forms

All forms (including the ABB survey guidance appendices listed below) are located on the Oklahoma Ecological Services Field Office's website ***http://www.fws.gov/southwest/es/Oklahoma/ABB_Add_Info.htm***.

ABB Survey Guidance Appendices

Survey Guidance Appendix A- ABB Survey Data Collection Form
Survey Guidance Appendix B- ABB Survey Summary Report
Survey Guidance Appendix C- Leasure et al. 2012
Survey Guidance Appendix D- Description of Nicrophorus Species
Survey Guidance Appendix E- Dichotomous Key
Survey Guidance Appendix F- ABB Accidental Death Form
Survey Guidance Appendix G – Carrion Types for Attracting ABBs
Other Appendices on webpage:

- ABB Summary Report Entry Guidance
- USFWS Automated Surveyor Forms

Other Federal and/or State Requirements

Federal recovery permits are only valid if accompanied by a state permit. Contact the local state conservation agency to determine if state permits are also necessary.

Conclusion

The Service appreciates compliance with this protocol and associated reporting. The reports enable the Service to monitor the status of the ABB. However, these surveys also provide the necessary information for companies to avoid impacts to ABBs from project implementation. Additionally, maintaining a survey database provides data that can be utilized by the public during project planning.

Points of Contact

Questions about this ABB survey protocol should be directed to:

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U.S. Fish and Wildlife Service
Oklahoma Ecological Services Field Office
9014 East 21st Street
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Phone: (918) 382-4516
E-mail: kevin_stubbs@fws.gov

Robert Harms, Region 6 ABB Contact
U.S. Fish and Wildlife Service
Nebraska Ecological Services Field Office
9325 South Alda Road
Wood River, NE 68883
Phone: (308) 382-6468, extension 208
E-mail: robert_harms@fws.gov

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APPENDIX B INDIVIDUAL TRAP LOCATIONS

TABLE B-1 INDIVIDUAL ABB TRAP LOCATION

TRAP	LATITUDE[1]	LONGITUDE[1]
Hwy 83 – 1	41.707232	-100.513252
Hwy 83 – 2	41.721495	-100.510343
Hwy 83 – 3	41.735879	-100.510795
Hwy 83 – 4	41.746905	-100.523272
Hwy 83 – 5	41.760917	-100.525066
Hwy 83 – 6	41.775029	-100.526290
Hwy 83 – 7	41.786389	-100.537994
Hwy 83 – 8	41.800620	-100.536610
Hwy 83 – 9	41.813049	-100.535322
Hwy 83 – 10	41.827591	-100.544519
East of Thedford – 1	42.030158	-100.320611
East of Thedford – 2	42.023102	-100.308301
East of Thedford – 3	42.009245	-100.304069
East of Thedford – 4	41.998349	-100.292329
East of Thedford – 5	41.988050	-100.282427
East of Thedford – 6	41.973710	-100.283719
East of Thedford - 7	41.959919	-100.278327
East of Thedford – 8	41.946801	-100.277565
East of Thedford – 9	41.951965	-100.295632
East of Thedford – 10	41.959908	-100.311671
Brewster – 1	41.957703	-99.851836
Brewster – 2	41.972158	-99.851672
Brewster – 3	41.981208	-99.822218
Brewster – 4	41.981973	-99.802669
Brewster – 5	41.981504	-99.783642
Brewster – 6	41.981855	-99.764190
Brewster – 7	41.984432	-99.744869
Brewster – 8	41.948603	-99.899545
Brewster – 9	41.956950	-99.918476
Brewster – 10	41.957190	-99.938487
Brewster – 11	41.957298	-99.956932
Brewster – 12	41.969410	-99.976158
Hwy 7 – 1	41.993749	-99.859060
Hwy 7 – 2	42.008241	-99.859318
Hwy 7 – 3	42.022733	-99.859575
Hwy 7 – 4	42.037225	-99.859832
Hwy 7 – 5	42.051715	-99.860192
Hwy 7 – 6	42.066206	-99.860559
Hwy 7 – 7	42.080251	-99.864285
Calamus River – 1	42.086449	-99.651749
Calamus River – 2	42.086436	-99.612965
Calamus River – 3	42.086405	-99.593509
Calamus River – 4	42.086545	-99.574064
Calamus River – 5	42.086552	-99.554628

TRAP	LATITUDE[1]	LONGITUDE[1]
Calamus River – 6	42.086633	-99.535171
Calamus River – 7	42.080859	-99.520178
Calamus River – 8	42.069258	-99.508519
Calamus River – 9	42.057650	-99.496879
Calamus River – 10	42.046053	-99.485218
Gracie Creek Road – 1	42.033199	-99.472918
Gracie Creek Road – 2	42.047621	-99.473475
Gracie Creek Road – 3	42.061972	-99.472773
Gracie Creek Road – 4	42.065268	-99.459926
Gracie Creek Road – 5	42.065938	-99.441464
Gracie Creek Road – 6	42.071903	-99.426688
Gracie Creek Road – 7	42.076820	-99.410051
Gracie Creek Road – 8	42.082127	-99.394921
Gracie Creek Road – 9	42.087027	-99.380497
Gracie Creek Road – 10	42.086915	-99.361061
Hwy 11/844 Road – 1	42.087562	-99.273331
Hwy 11/844 Road – 2	42.066704	-99.194874
Hwy 11/844 Road – 3	42.059040	-99.182876
Hwy 11/844 Road – 4	42.058973	-99.163443
Hwy 11/844 Road – 5	42.058921	-99.143996
Hwy 11/844 Road – 6	42.058817	-99.124556
Hwy 11/844 Road – 7	42.058700	-99.105316
Hwy 11/844 Road – 8	42.058698	-99.085902
Hwy 11/844 Road – 9	42.061434	-99.070254
Hwy 11/844 Road – 10	42.072668	-99.070289
846 Road – 1	42.088557	-98.819274
846 Road – 2	42.088567	-98.799818
846 Road – 3	42.088621	-98.780361
846 Road – 4	42.088543	-98.760908
846 Road – 5	42.088544	-98.741452
846 Road – 6	42.088558	-98.721995
846 Road – 7	42.088571	-98.702538
846 Road – 8	42.088596	-98.683080
846 Road – 9	42.088604	-98.663623
846 Road – 10	42.088591	-98.644170

[1] Decimal Degrees WGS84