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NEBRASKA PUBLIC POWER DISTRICT

R-Project

Revised Habitat Conservation Plan

Revised Habitat Conservation Plan

PREPARED FOR: NEBRASKA PUBLIC POWER DISTRICT
PREPARED BY: BEN BAINBRIDGE
208-788-0391

ben.bainbridge@powereng.com

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ACRONYMS AND ABBREVIATIONS

%	percent
°F	degrees Fahrenheit
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
C.F.R.	Code of Federal Regulations
cm	centimeters
CWS	Canadian Wildlife Service
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FR	Federal Register
GGS	Gerald Gentleman Station
GIS	geographic information system
HCP	Habitat Conservation Plan
IPaC	Information for Planning and Consultation
ITP	Incidental Take Permit
kcmil	circular mils
kg/cm^2	kilograms per square centimeter
km	kilometer
km^2	square kilometers
kV	kilovolt
LIDAR	laser imaging, detection, and ranging
MBTA	Migratory Bird Treaty Act
MDNR	Minnesota Department of Natural Resources
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
NWI	National Wetlands Inventory
OPGW	optical ground wire
P.L.	Public Law
POWER	POWER Engineers, Inc.
RCK	Reasonably Certain Knowledge
ROW	right-of-way
SCADA	Supervisory Control and Data Acquisition
SPP	Southwest Power Pool
SSA	Species Status Assessment
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
WEST	Western EcoSystems Technologies, Inc.
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 (GGS) Substation near Sutherland to an expansion of NPPD's existing substation east of Thedford. The new line will then proceed east and connect to the Holt County Substation 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 226-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 Revised Habitat Conservation Plan (HCP)[1] serves as the basis of an application to the United States 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), the American burying beetle (*Nicrophorus americanus*, threatened; 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 operation 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 (C.F.R.) Parts 17 and 13 and has been developed in coordination with the USFWS and Nebraska Game and Parks Commission (NGPC).

In 2018, NPPD finalized a prior version of this HCP in support of a previous ITP application for the R-Project. The USFWS issued ITP #TE72710C-0 for the R-Project and associated substations to NPPD on June 12, 2019, which required compliance with that prior version of the HCP. Shortly after issuance of the ITP, the Oregon-California Trails Association, Western Nebraska Resources Council, Hanging H East, L.L.C., and Whitetail Farms East, L.L.C. (collectively, "petitioners") challenged the USFWS's action in federal district court, arguing that the USFWS's decision to issue the ITP violated the ESA, the National Environmental Policy Act (NEPA), and the National Historic Preservation Act.

[1] For convenience, this document uses "HCP" throughout to refer to this Revised HCP, except when necessary to distinguish this version of the HCP from the prior version, which is discussed in the subsequent text.

After petitioners filed suit, NPPD, the USFWS, and the petitioners agreed that certain activities associated with the R-Project could be completed under a Joint Stipulation and Proposed Scheduling Order ("Joint Stipulation Agreement") while the litigation was pending. Under this Joint Stipulation Agreement, approved by the federal district court on August 14, 2019, NPPD agreed to adjust the R-Project's construction schedule to defer major construction-related activities pending the court's review on the merits, while other specific activities enumerated in the agreement could proceed.

Between June 12, 2019, and June 17, 2020, NPPD completed certain construction activities on the R-Project under ITP #TE72710C-0 and the Joint Stipulation Agreement. Actions agreed upon in the Joint Stipulation Agreement that NPPD undertook during that time included right-of-way (ROW) acquisition, relocation of distribution lines, transmission line and access staking, development of material delivery yards and fly yards as well as storage of materials in those yards, installation of fences and gates as necessary, tree clearing, and substation work and construction at GGS Substation, Thedford Substation, and Holt County Substation.[2] In 2019, NPPD purchased in fee title 594 acres of mitigation lands to offset the impacts of all anticipated ABB take under the prior version of the HCP; that mitigation land remains in place and is being managed for ABB conservation purposes.

On June 17, 2020, the federal district court issued its opinion, which rejected some of petitioners' claims and agreed with others. *Oregon-California Trails Ass'n v. Walsh*, 467 F. Supp. 3d 1007 (D. Colo. 2020). The court vacated ITP #TE72710C-0 and remanded the matter to the USFWS for further proceedings consistent with its order. While the court remanded certain issues regarding the USFWS's Final Environmental Impact Statement (EIS) and Biological Opinion and the R-Project's Programmatic Agreement under the National Historic Preservation Act, it did not identify shortcomings in the prior version of the HCP. This Revised HCP includes updates to the prior version of the HCP in response to new information and minor changes to the project.[3] This Revised HCP will support NPPD's renewed ITP application for the R-Project.

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.

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[2] See Section 1.2.1 for a discussion of developments in 2021 that removed the construction of the Holt County Substation, with the exception of installation of certain line bay terminal equipment, from the R-Project. See Section 6.2.2 for a discussion of mitigation for incidental take, if any, that occurred from these activities.

[3] On March 18, 2020, USFWS approved NPPD's request for minor amendments to the prior version of the HCP to change the timing of the annual report, revise the Compliance Plan to make it consistent with the HCP, allow NPPD to use the most current whooping crane survey protocols, allow NPPD to summarize the results of those surveys, and provide for an alternative to the use of sodium vapor lighting, if approved by the USFWS and NGPC. This Revised HCP reflects those minor amendments to the prior version of the HCP.

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 Planning Process. 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, ROW acquisition, construction, and construction management of the project.

Based on requirements identified in SPP's 2012 Integrated Transmission Plan 10-Year Assessment Report, 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 substation located in Holt County.

On November 4, 2021, SPP issued a revised Notice to Construct the R-Project, which removed the majority of the Holt County Substation from the R-Project, allowing construction of that substation to proceed separate from and regardless of the R-Project. NPPD completed construction of the Holt County Substation in May 2022. The only portion of the substation that remains part of the R-Project is the addition of line bay terminal equipment to connect the R-Project to the substation.

The SPP's 2012 10-Year Assessment Report 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.

NPPD employed numerous local mitigation plans in the north-central Nebraska area during the summer of 2017 due to excessive load levels in that area. These local mitigation plans included a temporary undervoltage load-shedding scheme, renting mobile diesel generators, renting a mobile 115 kV capacitor bank, and temporary increases in the size of existing capacitor banks in this area. NPPD has also constructed a new substation, added new capacitor banks, and expanded the size of existing capacitor banks in the north-central Nebraska area prior to the summer of 2018. All of these actions were accelerated due to the continued delays associated with the R-Project. NPPD deployed mobile diesel generators in the north-central Nebraska region during the summer of 2021 and also utilized local undervoltage load-shedding schemes at certain critical locations as planned mitigations to survive the peak load levels projected in this area in 2021. NPPD again deployed mobile diesel generators in the north-central Nebraska region in 2022, 2023, and 2024 as well as utilizing additional load transfers. In addition, SPP reconfigured the transmission system and re-dispatched higher-cost generation to alleviate congestion due to the R-Project not being in service. If there had been a sustained transmission outage during this period, local rotating blackouts would have been utilized to serve the load since adequate transmission would not be available due to the ongoing delay of the R-Project. The R-Project is critical to providing the source strength into this area in order to serve existing and new load additions in a reliable manner. NPPD evaluates Zone 5 mitigation strategies every year that the R-Project continues to be delayed. Further delays in the R-Project construction will create pressure to expand the local mitigation needs listed previously, which will result in local area reliability issues for customers served in this north-central Nebraska area.

Congestion Relief

Gerald Gentleman Station Stability is a defined NERC Flowgate limited by transient stability, transient voltage, and post-contingent thermal overloads.[4] 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. Congestion impacts have already increased costs to all of NPPD’s customers because they do not have access to the lowest-cost generation resources to serve the load within the market. The GGS Stability Flowgate continues to result in excessive congestion in the Nebraska region. A recent evaluation by SPP has documented congestion costs due to the GGS Stability Flowgate in excess of $34 million over a four-year review period (SPP 2020 ITP Assessment).

In addition, the transmission capacity in western Nebraska is currently fully subscribed due to transient stability limitations defined by the GGS Stability Flowgate. There is no available existing transmission capacity to interconnect any new generating resources in western Nebraska without exceeding the GGS Stability Flowgate limits. Generating resources elsewhere in Nebraska may also be limited in the absence of the R-Project or similar addition to the transmission grid.

[4] 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 7, 2025, available at https://www.nerc.com/pa/Stand/Pages/USRelStand.aspx.

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 GGS. 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.

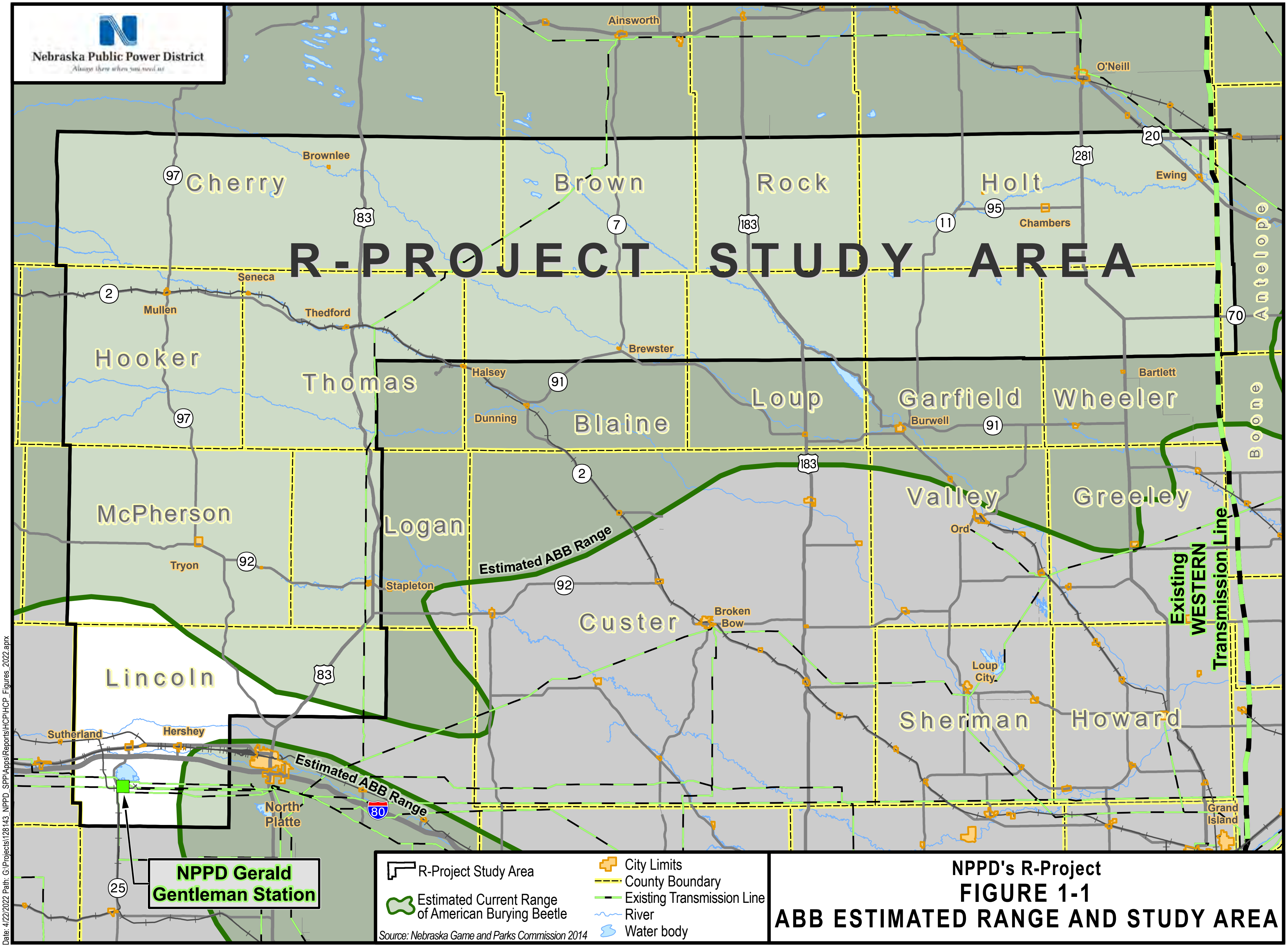
Renewable Resource Access

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 renewable energy project 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. NPPD identified a Study Area early on in the development of the R-Project. The Study Area was used as the area where potential route corridors would be identified. The Study Area included portions of the ABB estimated range, and complete avoidance of the species is not likely (Figure 1-1; NGPC 2015). 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. As noted in Section 1.1, NPPD completed certain limited construction-related actions for the R-Project under the previously issued ITP for the project. Because those actions are complete, they are not included as Covered Activities in this Revised HCP.

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 take of federally listed species and species that could become listed during implementation of an HCP. Therefore, NPPD has prepared this Revised HCP as part of its renewed 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 Holt County Substation (Figure 1-2). A distribution model for ABB in Nebraska's Sandhills was developed by Jurzenski et al. (2014) and updated by Jorgensen et al. (2014). The model was developed using a logistic regression model for presence/absence data and a number of climates, soil texture, and landcover variables. The updated Jorgensen et al. (2014) publication, which included authors from the USFWS and NGPC, 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 1.0% probability of occurrence begins at approximately Stapleton. The R-Project does cross areas with greater than 1.0% probability of occurrence in northern Lincoln County; however, this was not included in the Permit Area following consultation with the USFWS because ABB have never been captured in northern Lincoln County.

The Permit Area from Stapleton to the Thedford Substation includes one mile on either side of the R-Project centerline (two miles wide total). 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 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 Holt County Substation because the R-Project terminates at the 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 and because, as described in Section 1.2.1, the construction of the Holt County Substation, aside from installation of line bay terminal equipment within the footprint of the substation, is no longer part of the R-Project.

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

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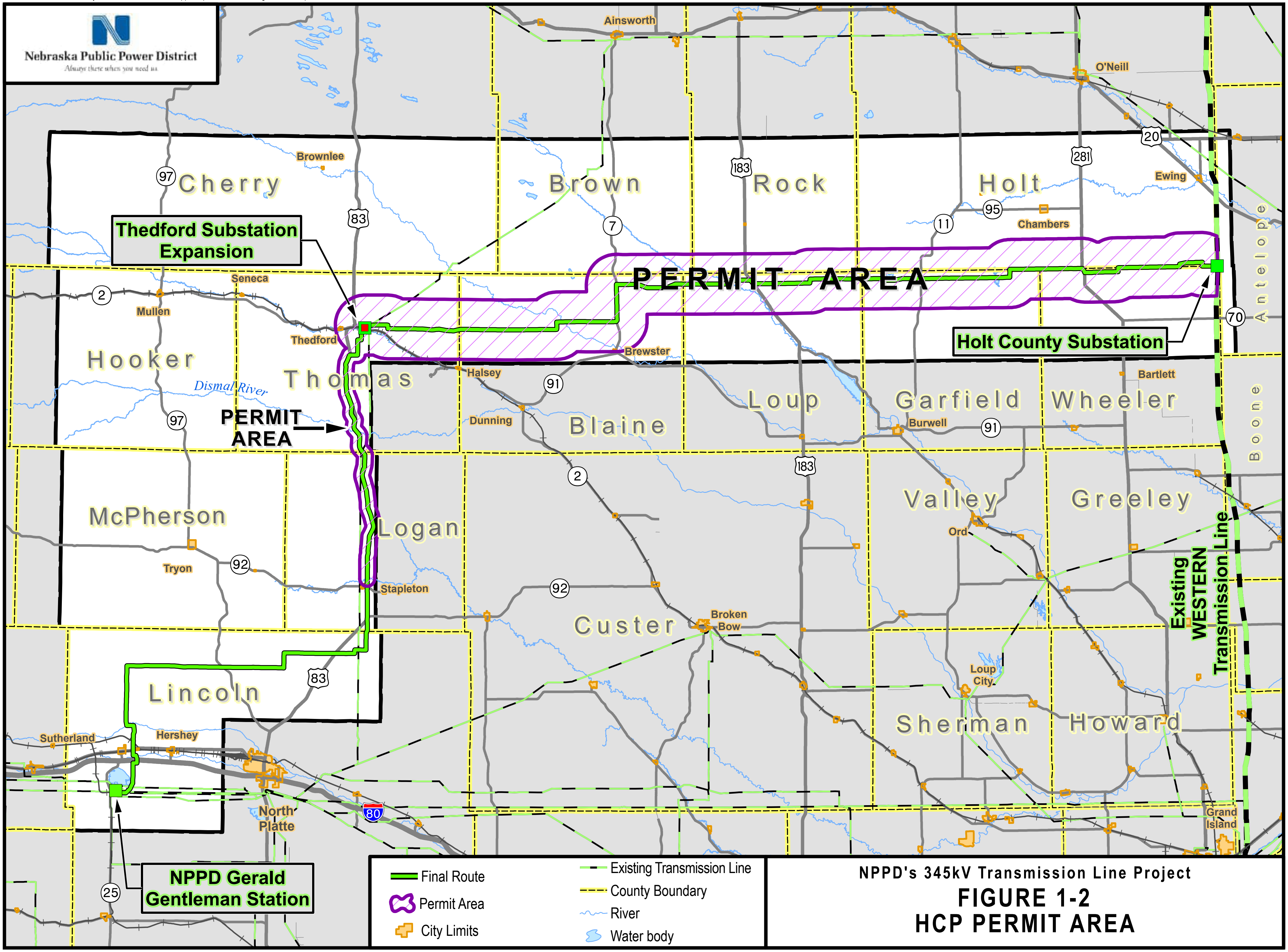


NPPD's 345kV Transmission Line Project

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 using the USFWS Information for Planning and Consultation (IPaC) tool. The list was further refined during coordination with the USFWS's Nebraska Field Office and NGPC. The species in Table 1-1 include those that are 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 C.F.R. §§ 17.11, 17.12) and species protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. §§ 668-668d). While the majority of the species considered are listed as threatened or endangered, the HCP analyzes one species proposed to be listed, one species under review for listing, and two species protected under BGEPA.

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*)	Threatened	Threatened	X	
Birds				
Whooping crane (*Grus americana*)	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*)	Endangered	Endangered		X
Tricolored bat (*Perimyotis subflavus*)	Proposed Endangered	None		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

SPECIES	FEDERAL STATUS[1]	STATE STATUS[2]	COVERED SPECIES	EVALUATED SPECIES
Western prairie fringed orchid (*Platanthera praeclara*)	Threatened	Threatened		X

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

The prior version of the HCP that accompanied the 2019 ITP included potential effects and avoidance and minimization measures for the interior least tern (*Sternula antillarum*). The USFWS published a final rule to remove the inland population of the interior least tern from the ESA on January 13, 2021. Subsequently, the interior least tern has been removed from this Revised HCP.

The IPaC tool also included the federally endangered pallid sturgeon (*Scaphirhynchus albus*). While pallid sturgeon does occur in low numbers in the Platte River, the current estimated range ends at the convergence of the Platte River and Loup River near the town of Columbus, Nebraska (USFWS 2014a). This is approximately 220 river miles downstream of the R-Project on the Platte River and approximately 165 miles downstream from the R-Project on the Loup River system. These are the closest instances of the pallid sturgeon range in river systems crossed by the R-Project. Because the Study Area is outside the range of pallid sturgeon, the species was not included as an Evaluated Species.

NPPD has decided not to include the monarch butterfly (*Danaus plexippus*) or regal fritillary (*Speyeria idalia*), both proposed to be listed as threatened, in the HCP at this time as it does not have the necessary information to analyze potential impacts to the species. In the event USFWS issues final rules listing either of these species, the Changed Circumstances described in Section 7.2 if this HCP will apply.

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 $63,991 for each violation or criminal penalties up to $50,000 and/or imprisonment of up to one year.

Section 4(d) of the ESA directs the USFWS to issue regulations deemed “necessary and advisable to provide for the conservation of threatened species.” These Section 4(d) rules for threatened species can provide flexibility in implementing the ESA. Through a Section 4(d) rule, USFWS may choose to modify the ESA’s standard protections with take prohibitions and exceptions tailored to those that provide conservation benefits for a species. This tailored approach can reduce ESA conflicts by allowing some activities that do not harm a species to continue, while focusing restrictions on potential threats that affect species' recovery. When USFWS downlisted the ABB to threatened, it issued a Section 4(d) rule with tailored protections.

Individuals and state and local agencies proposing an action that does not have a federal nexus and 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 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 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. USFWS prepared an EIS in association with the prior version of the HCP. USFWS has prepared a Supplemental EIS to address the court's remand, new developments and information, and updates to the 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 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 C.F.R. § 22.6).

Upon delisting of the bald eagle from the ESA in 2007, the USFWS issued the National Bald Eagle Management Guidelines, which were 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 $16,170.

Federal regulations set forth in 50 C.F.R. Part 22 provide for issuance of permits to take bald eagles and golden eagles and their nests under certain conditions. The R-Project is not expected to result in 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 implements four treaties between the United States and other countries. 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 C.F.R. Part 21). The current position of the Department of the Interior is that the MBTA does not prohibit incidental take.[5]

The MBTA protects the majority of birds that occur in in the United States. Based on revisions to the list in 2023, 1,106 bird species are protected under the MBTA, including raptors, waterfowl, shorebirds, seabirds, and songbirds (50 C.F.R. § 10.13). The MBTA does not protect species that do not belong to families or groups referred in one of the four underlying treaties—such as upland game birds (e.g., quails, turkeys, and grouse), house sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris*), and monk parakeet (*Myiopsitta monachus*)—and 121 specified non-native species, such as the rock pigeon (*Columba livia*).

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 -814) 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 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 adverse modification of any designated critical habitat.

[5] See Solicitor's Opinion M-37085 - Withdrawal of Solicitor Opinion M-37065 "Permanent Withdrawal of Solicitor Opinion M-37050 'The Migratory Bird Treaty Act Does Not Prohibit Incidental Take.'"

In 2024, the State of Nebraska approved changes to NESCA, which included stipulations for incidental take. In accordance with NESCA (Nebraska Revised Statutes §§ 37-807(6)), if a federal incidental take statement is issued for the action pursuant to the ESA, the NGPC shall issue a written statement with the same terms as the federal incidental take statement. It is anticipated that NGPC will utilize the USFWS's Section 7 biological opinion and issue a state incidental take statement to the Nebraska Power Review Board with the same terms as a federal ITP. Prior to July 2024, NESCA had no formal process for issuing an ITP. Previously under NESCA, take could only be allowed if mitigation for such take would 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 previous 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. Changes to avoidance and minimization measures outlined in this HCP will be applied to NESCA-listed species and will ensure continued 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 to the taking evaluated and why these alternatives were not proposed to be utilized.

2.1 Transmission Line Design

The R-Project involves the construction of a 226-mile-long 345 kV transmission line in two segments. The north/south segment is 101 miles long and starts at the GGS Substation near Sutherland, proceeds north across the South Platte and North Platte rivers, 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 and connects to a new expansion of NPPD's existing substation east of Thedford. The east/west segment is 125 miles long and starts at the Thedford Substation expansion 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 transmission line at the Holt County Substation located in the southeast corner of Holt County.

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.

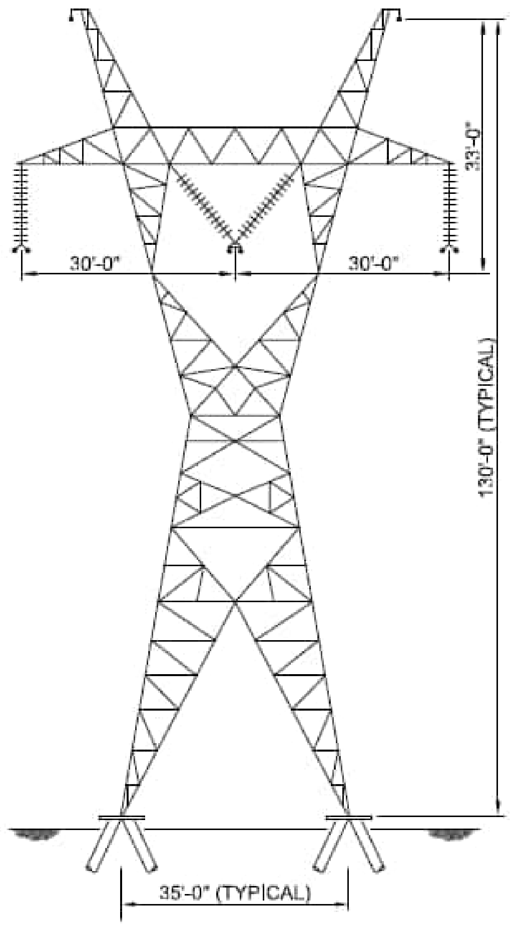
Tubular steel monopoles require cast-in-place concrete foundations. In areas where sloughing or water-compromised soils are present, underground temporary steel casings may be used to hold excavated walls for monopole foundations. Cast-in-place concrete foundations are typically seven feet in diameter 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

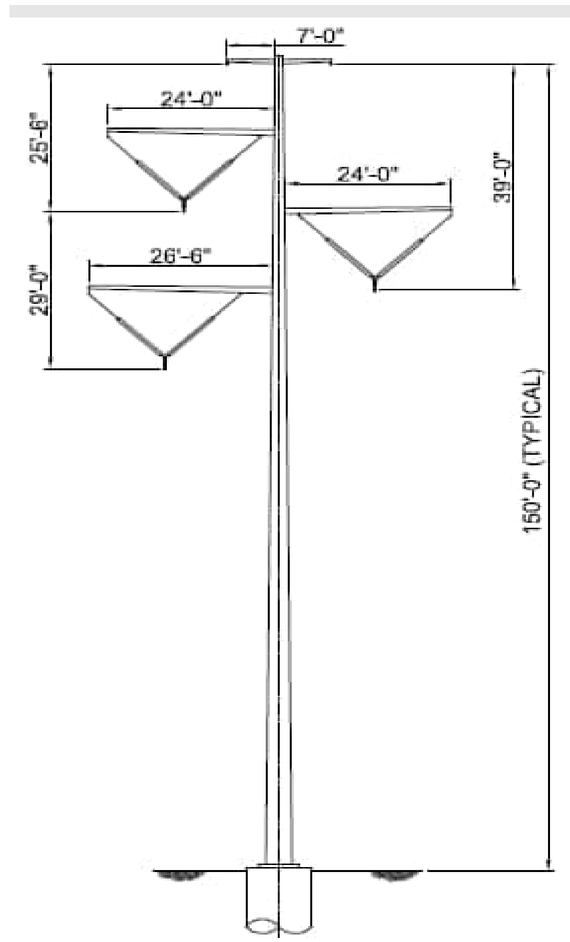
ROW width will typically be 200 feet (100 feet each side of centerline) for the entire transmission line unless otherwise specified.

FIGURE 2-1 PROPOSED STRUCTURE TYPES

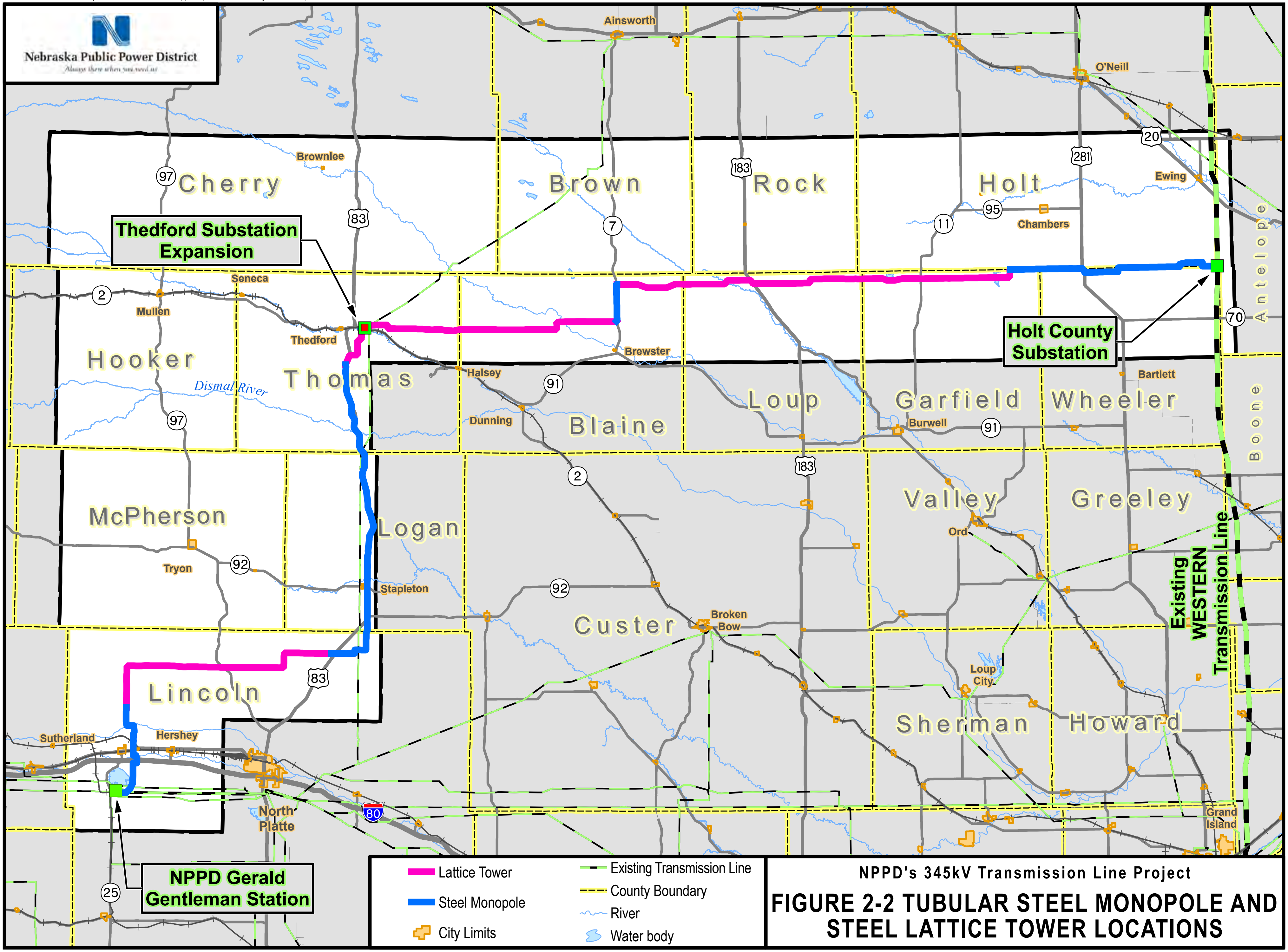
Lattice Tower



Tubular Steel Monopole



Date: 4/22/2022 Path: G:\Projects\128143_NPPD_SPP\Apps\Reports\HCP\HCP_Figures_2022.aprx



NPPD's 345kV Transmission Line Project

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[6] 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.

[6] 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.

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 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 (1) construction of a new 345 kV bay within the existing GGS Substation footprint; (2) construction of a new 345 kV substation expansion at the existing Thedford 115 kV substation; and (3) installation of line bay terminal equipment at the Holt County Substation.

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. NPPD completed the groundwork for the expansion of the Thedford Substation, which encompassed approximately 13 acres, in 2020 under ITP #TE72710C-0 (see Sections 1.1 and 6.2.2). The site currently includes a lined and graveled footprint where future substation components will be erected, a control building, a transformer, 345 kV reactors, the ground grid, an exterior chain-link security fence, and permanent all-weather access off State Highway 2. The major components of the substation include 345 kV breakers and associated disconnect switches, 345 kV dead-end structures, 345 kV bus, and associated support structures.

2.2.3 Holt County Substation

The Holt County Substation is located in Holt County on the northwest corner of the intersection of 846th Road and 510th Avenue. As noted in Section 1.2.1, SPP's November 4, 2021 Notice to Construct removed the construction of the Holt County Substation from the R-Project. The revised Notice to Construct includes adding the line bay terminal equipment necessary to connect, commission, and operate the 345 kV R-Project, which will occur within the footprint of the substation.

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 are 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.

2.4 Transmission Line Construction

2.4.1 Sequence of Construction

As noted in Section 1.1, NPPD completed certain construction activities between July 2019 and June 2020 under ITP #TE72710C-0. Construction of the 345 kV transmission line will recommence after the ITP and Record of Decision are issued for this Revised HCP. Electrification of the transmission line would occur approximately 21 to 24 months after reinitiating 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 construction yards/staging areas) 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. Surveying and staking activities were completed on properties with signed ROW easement agreements in 2019. However, stakes that remain on the landscape for prolonged periods of inactivity may be damaged or knocked over by cattle or the elements. All areas will be revisited and restaked, if necessary, prior to the initiation of construction.

2.4.3 Noxious Weed Management

The Nebraska Department of Agriculture tracks noxious weeds in the state. The term “noxious” means to be harmful or destructive; it is the legal term used to denote a destructive or harmful pest for the purpose of regulation. Management of noxious weeds is addressed in the Restoration Management Plan to prevent and control the spread of noxious 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.

An estimated 42.1 acres of tree clearing remain necessary for the R-Project. Tree clearing was estimated using laser imaging, detection, and ranging (more commonly referred to as LIDAR) aerial imagery taken specifically for the R-Project ROW to digitize the overall crown area. The actual areas of ground disturbance associated with ROW tree clearing may be less than 42.1 acres, given the estimate is based on aerial imagery of the overall crown area and not the actual tree trunk at the ground. NPPD previously cleared approximately 6.9 acres of trees under ITP #TE72710C-0 (see Section 5.1.1).

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, temporary access routes have been designated for construction access. The alignment of 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 two categories:

- **Temporary Access** – All construction-related travel off currently existing and maintained roads is included under temporary access. Temporary access includes the use of overland travel, creation of new access paths, and improvement of existing two-tracks for construction. All temporary access routes have an assumed width of 16 feet, although the final width will be dependent on terrain. All improvements will be restored at the end of construction based on the requirements specified under Section 6.3.2 – Effectiveness Monitoring. Compacted areas may be disced or ripped to loosen soil prior to reseeding. Areas where a sidehill is flattened for safety during construction access will not be recontoured to allow future maintenance access, if necessary, but will be reseeded.
- **Permanent Access** – Permanent access includes new improvements that will be left in place and not restored and revegetated following completion of construction activities. Permanent access will be used at substation locations and specific circumstances where improvements may be left in place at the landowner's request following the completion of construction. NPPD will create no more than 26 acres of new permanent access for the entire project and no more than 19 acres

of new permanent access in the Permit Area, including those left in place at the landowner's request.

Equipment used in the construction of access improvements 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 or wetland crossings will be removed upon completion of construction. Any temporary culverts installed will maintain the existing hydrology of the drainage and will not alter or impede flow.

Access routes used to estimate potential effects to species in this HCP are based on preliminary design and may require changes based on conditions identified in the field. NPPD established 3.44 acres of temporary access via the placement of construction matting under ITP #TE72710C-0 (see Section 5.1.1). These construction mats have been removed, and the area underneath has been restored to native vegetation.

2.4.6 Fly Yards / Assembly Areas and Construction Yards / Staging Areas

Temporary work areas will be required for materials and equipment storage and staging for construction activities. The construction yards/staging areas 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 construction yards/staging areas will be located along existing access roads and in previously disturbed areas when practicable. Grading and fill or the placement of construction matting on these sites may be required to prevent soil erosion and sediment runoff or soil compaction. Equipment used to construct and operate within fly yards/assembly areas and construction yards/staging areas 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 materials including gravel will be removed, soils will be decompacted (if necessary), and the area will be revegetated to the appropriate specifications.

Sixteen fly yards/assembly areas were established in 2019; however, only a small portion of these yards was used at that time. Construction matting was placed on 4.73 acres of fly yards/assembly areas in 2019 and 2020. The construction matting was removed from these yards, and the area covered by mats was revegetated in 2022. Cattle-exclusion fencing installed at these yards remains in place. The full extent of the fly yards/assembly areas will be used when construction resumes.

Four construction yards/staging areas were established in 2019. Like the fly yards/assembly areas, only a small portion of these yards was used at that time. Construction matting, overland travel, and material storage impacting approximately 11.5 acres occurred in 2019. These construction yards/staging areas remain in place currently and house construction materials such as anchor bolt cages, crane mats, and construction matting.

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, such as construction matting or leveling, 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 (to 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 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 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 Construction Contingency

Construction contingency is identified here because there may be instances during construction where additional work that could not have been predicted becomes necessary. The construction contingency may include any of the Covered Activities identified in Table 2-1 and may require additional work following the initial construction effort. An example of a construction activity that would fall under the construction contingency category would be the relocation of an access route or work area developed for construction purposes that became flooded during the course of construction. Other instances that may trigger the construction contingency include, but are not limited to, unforeseen sensitive-resource discoveries, landowner changes to the existing land use that necessitate a change in the construction process, or NPPD’s accommodation of landowner requests that result in minor changes in the construction process. While the exact location of construction contingency cannot be predicted, NPPD will limit disturbance under this category of activities to a maximum of 40 acres.

2.4.15 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

2.5.1 GGS Substation

As noted in Section 1.1, some R-Project-related activities have already occurred at the GGS Substation. These activities include the following.

- Removal of a portion of existing perimeter fence.
- Installation of rock over expansion area (approximately 1,300 square feet or 0.03 acre).
- Installation of an oil containment structure within the original substation footprint to prevent reactor oil from reaching the ground or water bodies in the event of rupture or leak.
- Installation of concrete reactor pad foundation, ground grid, and conduit.
- Delivery and installation of reactor.
- Installation of control cable for monitoring reactor.
- Delivery and staging of steel poles and other miscellaneous parts and supplies for future installation.
- Installation of perimeter chain link fence around the expansion area.

Work that remains to be completed at the GGS Substation includes the following.

- Installation of concrete piers for steel poles and anchoring structures.
- Installation of foundations for bus, switch, and metering stands.
- Installation of steel, bus, switches, breakers, arrestors, and all other associated electrical components required for substation operation.

All remaining work will be performed within the existing footprint of the GGS Substation.

2.5.2 Thedford Substation

Like the GGS Substation, some R-Project-related activities have already occurred at the Thedford Substation. Work that has been completed includes the following activities.

- Survey work and geotechnical sample drillings to determine foundation requirements and soil resistivity measurements used in the final design phases of the station.
- Grubbing and reshaping the grade to form a relatively flat (1.0% slope) working surface.
- Construction of permanent all-weather access.
- Erection of an eight-foot-tall permanent chain link fence around the perimeter of the substation to prevent unauthorized personnel from accessing the substation.
- Compaction of excavated and fill areas to the required densities to allow structural foundation installations.

- Installation of oil-containment structures to prevent oil from transformers, reactors, circuit breakers, etc., from reaching the ground or water bodies in the event of rupture or leak.
- Installation of foundations, the ground grid, transformers, reactors, and the control building.
- Placement of a crushed-rock surface on the subgrade to make for a stable driving and access platform for the maintenance of equipment.

Work that remains to be done at the Thedford Substation includes the following activities.

- Steel structure erection.
- Installation of substation components including bus, switches, breakers, arrestors, and all other associated electrical components.
- Installation of area lighting.
- Testing of the various systems.
- Energization of the facility.

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 energization of the facility generally is timed to take place with the completion of the transmission line work and other required facilities.

2.5.3 Holt County Substation

As noted in Section 1.2.1, with the exception of future installation of certain equipment, the construction of the Holt County Substation is no longer part of the R-Project as a result of SPP's November 4, 2021 revised Notice to Construct. Future activities related to the R-Project at the Holt County Substation include the work associated with the line bay installation to accommodate the incoming R-Project line, including installation of a 345 kV breaker, 345 kV reactor, and 345 kV dead-end structure. All remaining work will be performed within the completed footprint of the Holt County Substation.

2.6 Special Construction Practices

2.6.1 Helicopter Construction

The type of helicopters needed and the duration that they may be used are dependent on the selected contractor's overall approach to project construction and the availability of equipment. 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. Relocation of these distribution lines is necessary for safety reasons and can be accomplished by relocating them as an overhead or underground line. Of these 28 miles of existing distribution power lines, 19 miles were relocated under ITP #TE72710C-0, while 4.5 miles of underground and 4.5 miles of overhead distribution line relocation have yet to be completed. This could conservatively result in an additional 13.6 acres of temporary disturbance and 0.02 acre of permanent disturbance. 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-track trenching machine that uses a knife or vibrating plow that cuts a six-inch slit in the ground as it lays a small-diameter utility cable or pipe. The oscillation of the blade makes the excavation faster and more efficient than a static blade. No spoils are cast to the side, and all soil is replaced by the same machine. A 14-foot-wide travel path is assumed for the trenching machine to move down the underground distribution line ROW.

As noted above, NPPD relocated 19 miles of distribution power lines under ITP #TE72710C-0 (15.5 miles as overhead lines and 3.5 miles as underground lines). Using the disturbance estimates associated with work areas and travel paths, that effort could have created up to 29.4 acres of temporary disturbance. However, the distribution power-line relocation activities were almost entirely completed from adjacent existing roadways,[7] and the use of horizontal boring or knifing via a small plow that did not side-cast spoils temporarily disturbed approximately 0.2 acre of soil. New pole locations resulted in 0.07 acre of permanent disturbance.

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-track 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.

[7] NPPD completed a limited amount of distribution line moves from a bucket truck within the distribution ROW near Stapleton. These distribution line relocation activities did not result in any temporary disturbance and did not require any restoration activities.

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. Woody vegetation will be removed before it reaches a height that would threaten the transmission line. These trees and shrubs will be removed by manual or mechanized clearing. 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 restoration goals described in the Restoration Management Plan are met, 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, drones, 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 and light vehicles 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 ABB active season and, when possible, the spring and fall whooping crane migration periods to the maximum extent practicable.

2.7.6 Emergency Repairs

Emergency repairs include those which require a timely 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. Instances where the same access identified for construction may not be used include stream crossings that have changed due to changes in stream course during permit duration, landowner construction of a new road or two-track that is more efficient for emergency repair access, or other changes in land use that may have occurred since construction.

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 activities that have not yet been completed. 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 that are likely to result in take of ABB and were not completed under ITP #TE72710C-0 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.

Installation of lighting at the Thedford Substation, lighting for nighttime construction activities, and the application of herbicides are not considered Covered Activities. All herbicides used in vegetation management or to spread the control of noxious weed populations would be applied during daylight hours when ABB are underground. Additionally, any herbicide application would only take place in areas that have been or would be disturbed for construction purposes. Those acres would be accounted for in the Covered Activity taking place at that location. Lighting installed at the Thedford Substation would be shielded and low temperature so as to not cause light pollution beyond the substation footprint, thus avoiding potential impacts to ABB. Nighttime work is not anticipated during construction of the R-Project. However, if nighttime construction becomes necessary, construction crews would use downshielded and low-temperature lighting to avoid attracting ABB to the construction area. While as an insect, ABB may be attracted to any light source, the use of downshielded and low-temperature lighting would reduce or eliminate any potential negative impacts to the species.

Routine maintenance and repairs are not included as a Covered Activity. It is estimated that routine scheduled 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) 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 is not included as a Covered Activity. See Section 6.2.1 for additional details regarding these applicable avoidance and minimization measures.

TABLE 2-1 PROJECT ACTIVITIES INCLUDING COVERED ACTIVITIES

ACTIVITY	DESCRIPTION	ADDITIONAL DETAILS	EQUIPMENT LIST	POTENTIAL ABB HABITAT EFFECTS	TAKE OF ABB LIKELY (YES/NO)	COVERED ACTIVITY (YES/NO)
Access – Departure from existing hard-surfaced roads						
Temporary Access Routes (Section 2.4.5)	Temporary access routes include all access to structures and temporary work areas. Temporary access routes may include installation of improvements, overland travel, and use of existing ranch roads. Improvements may include blading, matting, placement of fill material on geofabric, or other improvements where required.	Access location and distance to be identified in Access Plan at preliminary and final design (field verified). Access required for construction equipment. Temporary bridges and/or culverts installed for stream or wetland crossings will be removed upon completion of construction. Temporary 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.	Temporary disturbance to occupied habitat.	YES	YES
Permanent Access Roads (Section 2.4.5)	Permanent access roads are a subset of temporary access routes – blade, fill, surface Predominantly used at substations or selected roads left at landowner's request.	Access location and distance to be identified in Access Plan at preliminary and final design (field verified). Permanent improvements constructed for access may be left in place at selected roads.	Bulldozers, front-end loaders, dump trucks, backhoes, excavators (both tracked and rubber-tired), graders, roller compactor, water trucks, crane trucks, and light vehicles.	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. While tree removal will alter the habitat characteristics, the area will still be suitable for ABB. Nonetheless, the impacts of this permanent alteration of habitat will be conservatively assessed 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. Grade pad and fill with gravel or geotextile and gravel where required.	Approximately 10 acres each. Located approximately every 5 – 10 miles. Vegetation in areas of temporary disturbance will be restored following completion of construction activities.	Earthmoving equipment required to prepare area. Heavy crane, helicopter, support vehicles.	Temporary disturbance to occupied habitat.	YES	YES
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

ACTIVITY	DESCRIPTION	ADDITIONAL DETAILS	EQUIPMENT LIST	POTENTIAL ABB HABITAT EFFECTS	TAKE OF ABB LIKELY (YES/NO)	COVERED ACTIVITY (YES/NO)
Batch Plant (Section 2.4.7)	Use existing batch plants and/or previously 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)	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
		One structure work area required at each structure.				
		Majority of structure work areas temporary disturbance. Permanent contouring dependent on local topography.				
		Vegetation in areas of temporary disturbance will be restored following completion of construction activities.				
Foundation installation (Section 2.4.10)	Screw-in helical pier foundations to be used in Sandhills where existing access roads not available.	Permanent habitat loss limited to footprint of each foundation.	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
	Anchor bolt or stub angles to secure structure to foundation.	Four helical pier foundations required per lattice structure.				
Structure erection (Section 2.4.11)	Install base plate and leg extensions.	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
	Structure assembled at fly yard/assembly area and flown to structure work area.					
Standard Foundation – Steel Monopole						
Structure work areas (Section 2.4.8)	Work area for steel monopole with standard foundation to be used along major existing access roads.	Limits of ground disturbance: 200 feet x 200 feet (0.92 acre).	Preparation of structure work area completed by small earthmoving equipment, if necessary.	Temporary disturbance to occupied habitat.	YES	YES
		One structure work area required at each structure.				
		Vegetation in areas of temporary disturbance will be restored following completion of construction activities.				
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.	One foundation required per steel monopole structure.				
	Guy anchors for select dead-end structures.					
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

ACTIVITY	DESCRIPTION	ADDITIONAL DETAILS	EQUIPMENT LIST	POTENTIAL ABB HABITAT EFFECTS	TAKE OF ABB LIKELY (YES/NO)	COVERED ACTIVITY (YES/NO)
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 temporary access routes. 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.	No effect. All grading and ground disturbance was completed under ITP #TE72710C-0 and trapping data indicate no ABB were present.	NO	NO
	Addition of a new transmission bay in the Holt County Substation at Western 345 kV transmission line.	All work at the Holt County Substation related to the R-Project will occur within the footprint of the existing substation.	NA	No effect. No new surface disturbance at the existing substation, which is located in non-ABB habitat, will be required.	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 may require temporary access.	Digger-derrick truck, tracked trencher	Temporary disturbance to occupied habitat.	YES	YES
Well Relocation						
Well relocation (Section 2.6.3)	Relocation of existing livestock and center-pivot irrigation wells to outside ROW.	Necessary equipment will require temporary access.	Well truck, tracked trencher	Temporary disturbance to occupied habitat.	YES	YES
Construction Contingency						
Construction contingency (Section 2.4.14)	Additional disturbances that may be necessary and cannot be predicted at this time.	May include any of the activities described in Sections 2.4.5 through 2.4.12.	Equipment will be based on the type of activity that may need to be relocated to respond to future changes in on-the-ground conditions.	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 activity in occupied habitat unlikely to result in effect to ABB.	NO	NO
Routine scheduled maintenance and repairs (Section 2.7.5)	Routine scheduled maintenance and repairs will use ATVs, light vehicles, 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 activity in occupied habitat unlikely to result in effects to ABB.	NO	NO

ACTIVITY	DESCRIPTION	ADDITIONAL DETAILS	EQUIPMENT LIST	POTENTIAL ABB HABITAT EFFECTS	TAKE OF ABB LIKELY (YES/NO)	COVERED ACTIVITY (YES/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 toolbox 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 helical pier foundations in Sandhills with no existing access to reduce disturbance.
- Use of existing access roads including two-tracks to the extent practicable.
- Non-active season construction in specified areas.
- Siting of disturbance areas on previously disturbed lands or unsuitable habitat to the extent practicable.
- Downshielded and low-temperature LED 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. A comparison of temporary disturbance between alternatives and the current project design is not possible because a complete design effort was not completed for the alternatives.

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 (1) complete avoidance of ABB and its suitable habitat within the current estimated range (NGPC 2015) or (2) rendering the ABB habitat to be unsuitable for ABB so that ABB would not be present when such disturbance occurred. The USFWS indicated to NPPD that rendering areas unsuitable to ABB may not be an appropriate avoidance measure, as the process of rendering habitat unsuitable may result in take as well. 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 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, 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. This alternative would not result in a difference in the level of estimated ABB take. Steel monopoles require a work area that measures 200 by 200 feet to accommodate structure assembly and erection by crane. Lattice towers that would replace those structures would likely still require a 200-foot by 200-foot work area because the structures would be erected at the structure location and set with a crane, rather than assembled at an off-site fly yard and set with a helicopter. The steel monopoles were purposefully placed adjacent to existing access roads to accommodate concrete truck and cranes. Cranes would likely be used to set lattice towers in this scenario because they are much less expensive than helicopters. Even if helicopters were used to assemble all lattice towers, the reduction of workspace required at the structure locations would likely be mostly or totally offset by the need for additional fly yards located approximately every five miles along the route. Thus, in addition to the increased impacts to agricultural operations and visual resources noted above, the costs to employ helicopters for minimal, if any, reduction in disturbance would be unreasonable.

2.10.4 Non-Active Season Construction Alternative

Under this alternative, NPPD would construct within the Permit Area 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. Equipment accessing structure work areas and pulling and tensioning sites do not compact the ground to a degree that would impact overwintering ABB (Willemssens 2015).

Restricting all construction activities within the permit area 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 the entire process of structure erection and stringing, pulling, and tensioning in a single ABB inactive period. Because this alternative does not meet the construction schedule and has increased cost, it was not offered as the proposed action.

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 Headwaters, Upper Loup Rivers, Cherry County Wetlands, and Elkhorn River 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 average 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.

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 support 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 harvested annually for hay production.

While some renewable energy development, typically wind energy, has occurred in Nebraska, only a portion of one renewable energy project, the Thunderhead Wind Energy Center, is currently in operation in the Study Area.

3.2 Covered Species

3.2.1 American Burying Beetle (*Nicrophorus americanus*)

Status and Distribution: The ABB was listed as federally endangered under the ESA in August 1989 (54 FR 29652) and was downlisted to threatened in November 2020 (85 FR 65241). 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 threatened 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 (not documented since 2008), and Arkansas. Populations of ABB have been reintroduced into Ohio, southwestern Missouri, and Nantucket Island off the coast of Massachusetts (USFWS 2019a).

In 2019, the USFWS completed a Species Status Assessment (SSA) for ABB throughout its range (USFWS 2019a). The SSA divides ABB populations in Nebraska into three separate analysis areas: the Loess Canyons, the Niobrara River, and the Sandhills. The Loess Canyons analysis area is located in south central Nebraska primarily south of the Platte River. The Niobrara River analysis area is located north of the Niobrara River along the Nebraska/South Dakota border and includes portions of southern South Dakota. The largest analysis area and largest corresponding ABB population in Nebraska occurs in the Sandhills of north central Nebraska (USFWS 2019a). The Permit Area occurs in the Sandhills analysis area. Trapping efforts throughout Nebraska have confirmed ABB occurrence within 17 Nebraska counties (USFWS 2019a). Efforts to model high probability of ABB occurrence identified the highest likelihood of occurrence in Holt, Rock, Brown, and northern Loup counties (Jorgensen et al. 2014).

Habitat Characteristics/Use: 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 that have sufficient appropriately sized carrion and suitable soil composition (USFWS 2019a). 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 (NGPC 2011), which is known for a high water table and a high density of subirrigated meadows and wetlands. The highest-quality ABB habitat typically has some form of wetland or wet meadow in the immediate vicinity (USFWS 2019a). 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 2018a; USFWS 2019a).

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; USFWS 2019a).

The lifecycle of the ABB can be divided into three parts: (1) the early-late summer active period (mid/late May to late June; and August to early September), (2) the reproductive period when adults are underground actively tending to broods (late June through early August), and (3) the winter inactive period (October to mid/late May). Adult ABB that 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 2018a). 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. 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 (24 inches) underground (Scott 1998). Studies conducted in a laboratory setting indicate that ABB may bury to a depth of 16 cm (six inches) during daily periods of inactivity (W. Hoback unpublished) in the summer active time. Smith and Clifford (2006) found that ABB at the Camp Gruber Training Site in Oklahoma buried brood carcasses to an average depth of 15.9 cm (six inches) as indicated by depth to the bottom of the chamber. The top of the brood carcass chamber averaged 9.4 cm (3.7 inches) deep. However, the research conducted by Smith and Clifford (2006) may not be applicable to ABB populations in the Sandhills given the differences in soil type. Soils in the Sandhills have a much lower clay component and likely allow for easier digging.

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 2018a; USFWS 2019a).

Research indicates that burying beetles in the Sandhills are freeze-avoidant species that lower their body temperatures during winter but avoid completely frozen soils. Burying beetles burrow below the frost line during the winter and move vertically in the soil throughout the winter to remain below the frost line (Conley 2014).

ABB have been shown to be quite mobile and typically move to carcasses by flying. 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 2018a). 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 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 loss and fragmentation (USFWS 1991; USFWS 2019a). 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 2019a). 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 (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; USFWS 2019a).

Although lacking in scientific evidence, another potential 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), though the negative effects of artificial lighting on ABB appear to have been minor relative to other influences (USFWS 2019a).

The USFWS's ABB recovery plan and SSA do not address direct mortality from farm and construction-type equipment as a potential threat to ABB (USFWS 1991; USFWS 2019a). 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 3.0 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).

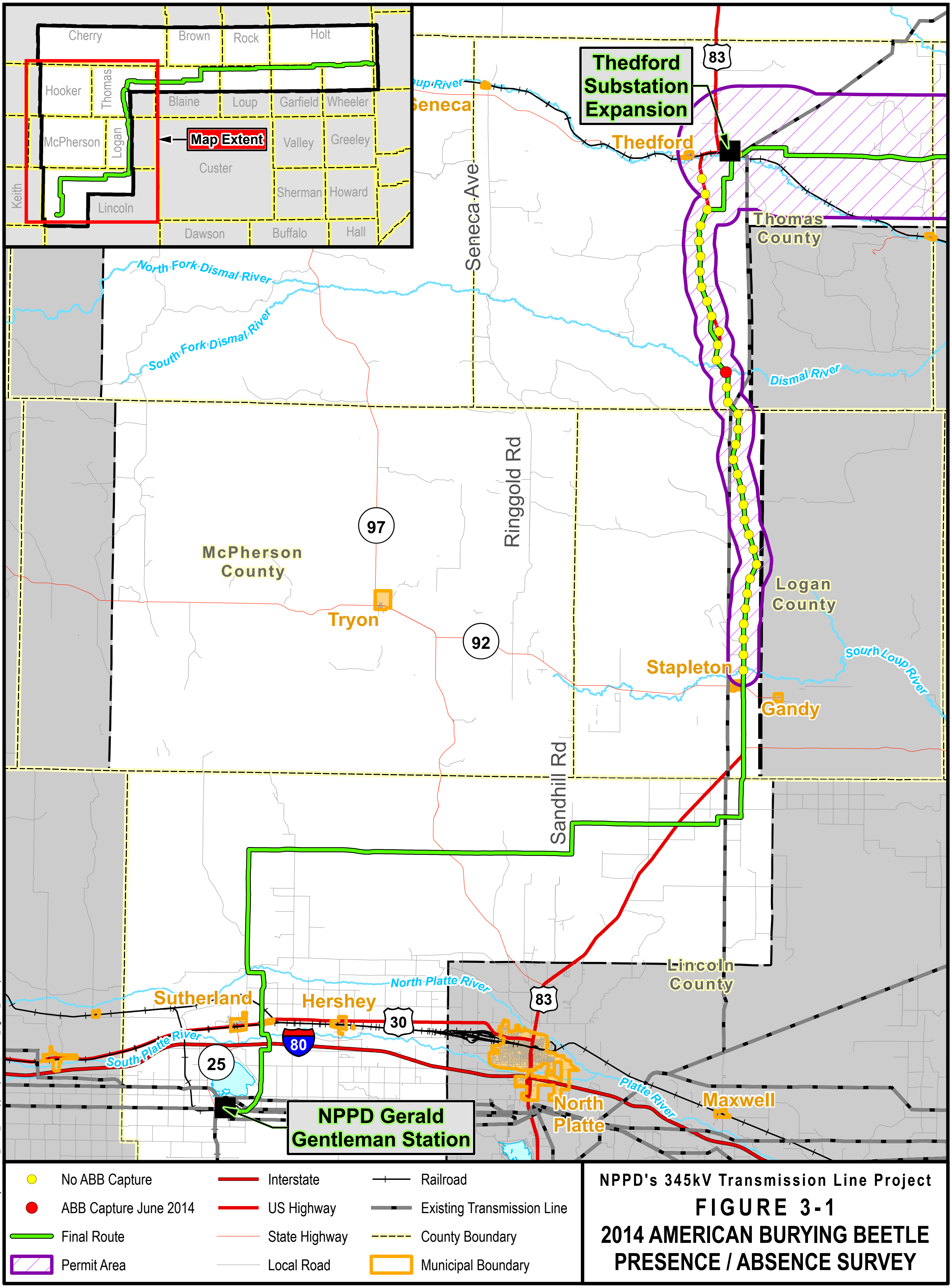
The mean soil compaction after a full-size pick-up truck drove over a soil sample was 1.14 kg/cm^2, and accordingly very low mortality was observed in the buried beetles that were driven over. Mortality did increase when the pick-up truck was parked over the soil sample for an extended period (Willemssens 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.

<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. This dataset represents the most recent dataset maintained by the USFWS that has been subject to quality assurance and quality control review. 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. Published literature from mark-recapture studies indicate that, while ABB are capable of traveling long distances, more often than not they are recaptured at the same trap (Creighton and Schnell 1998; Bedick et al. 1999; Peyton 2003).

NPPD has conducted extensive presence/absence surveys within the Permit Area. Surveys to determine ABB presence and establish a population density within the Permit Area have been conducted every year from 2014 through 2021. A summary of these surveys is presented below.

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 in place at that time (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 wet meadow habitat along the North Loup River.



NPPD's 345kV Transmission Line Project

FIGURE 3-1

2014 AMERICAN BURYING BEETLE PRESENCE / ABSENCE SURVEY

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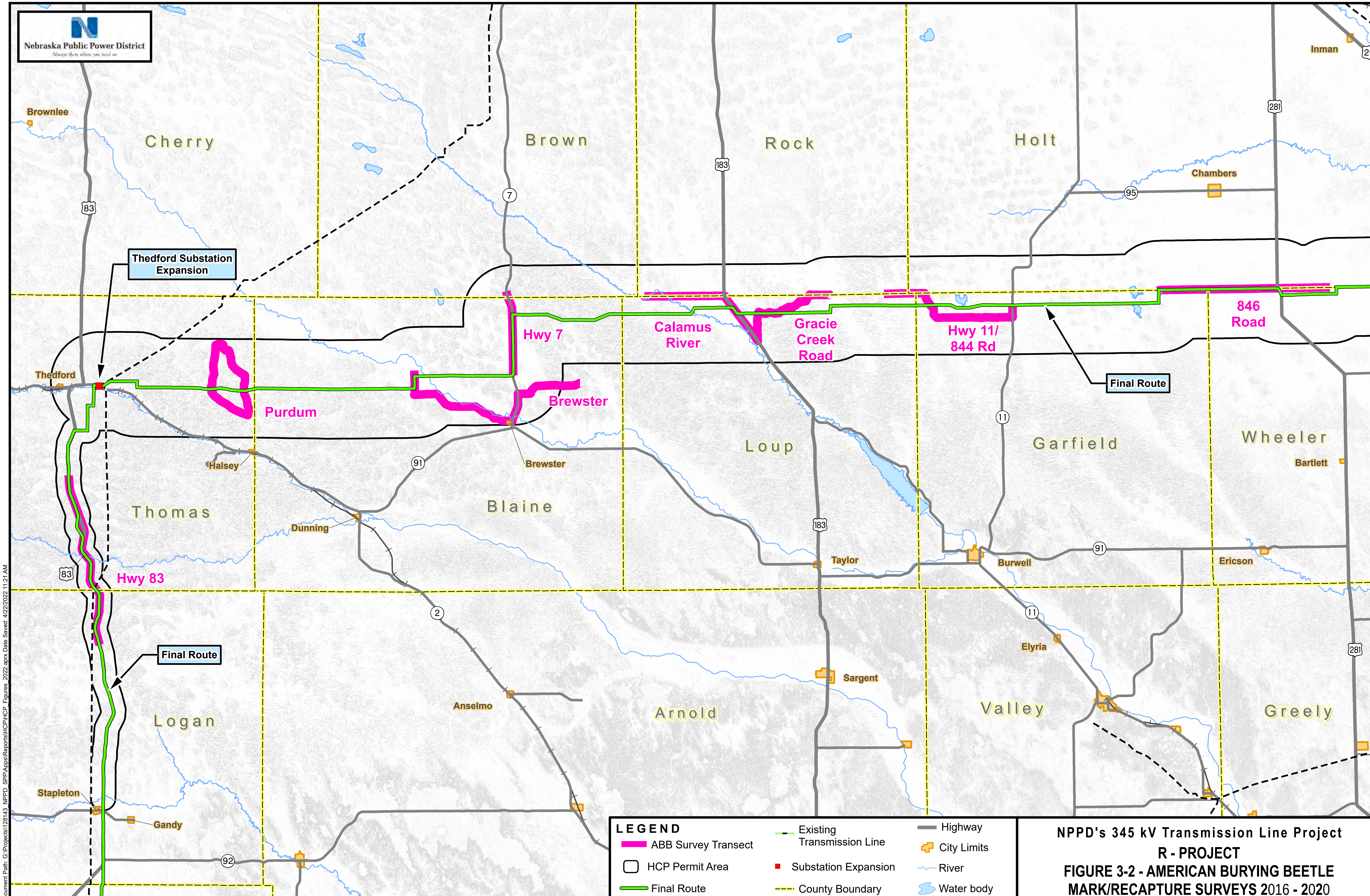
In August 2016, NPPD began annual ABB monitoring using a large-scale protocol-level mark/recapture survey that includes 79 traps spread along public road ROW throughout the Permit Area (Figure 3-2).[8] This survey effort was completed for a minimum of five consecutive trap nights during the first week in August from 2016 through 2020. ABB were captured each year throughout the east-west portion of the R-Project, but no ABB were captured along Highway 83. A summary of survey results from 2016 through 2020 is provided in Table 3-1, including an annual population estimate for the overall survey area, calculated using the Schnabel Method. 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.

TABLE 3-1 RESULTS OF NPPD AMERICAN BURYING BEETLE MONITORING: 2016 - 2020

SURVEY LOCATION	INDIVIDUAL ABB CAPTURED				
	2016	2017	2018	2019	2020
Hwy 83	0	0	0	0	0
Purdum	2	3	0	1	0
Brewster	99	46	77	38	62
Hwy 7	118	49	27	12	12
Calamus River	63	8	43	16	15
Gracie Creek Rd	23	23	33	20	27
Hwy 11	122	74	30	13	14
846 Rd	64	91	17	12	33
TOTAL	491	294	227	112	163
Total Survey Area Population Estimate[1]	1,281	714	1,017	343	842

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

[8] During the 2017 survey effort, one trap was removed the same day it was installed at the request of an adjacent landowner. Thus, only 78 traps were surveyed that year.



NPPD's 345 kV Transmission Line Project
R - PROJECT
FIGURE 3-2 - AMERICAN BURYING BEETLE MARK/RECAPTURE SURVEYS 2016 - 2020

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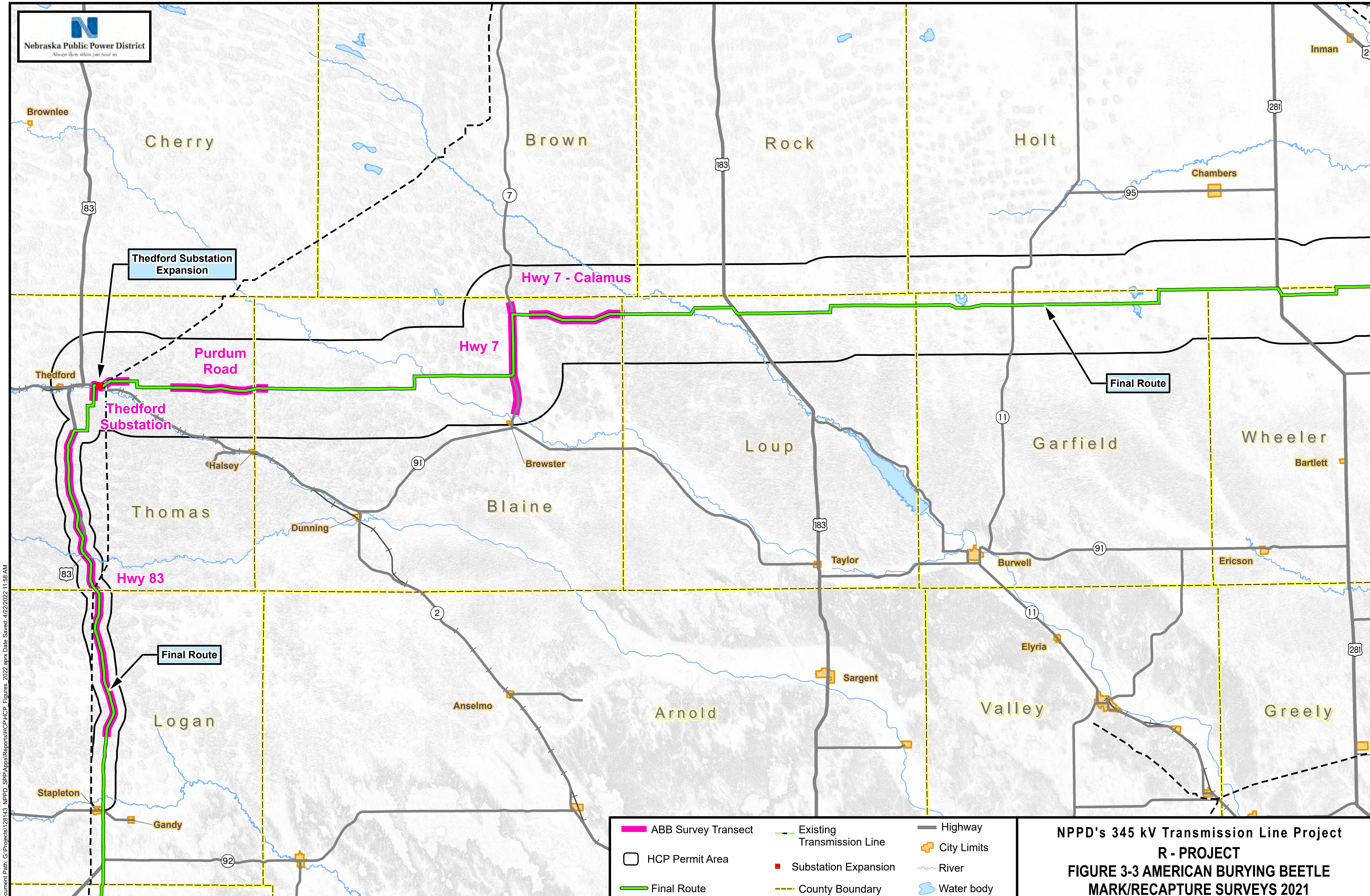
In August 2021, NPPD completed mark/recapture surveys within the R-Project ROW in an effort to sample areas of Project where ABB populations are low (Figure 3-3). The 2021 surveys differed from the 2016-2020 surveys in that the 2021 surveys were completed immediately within the R-Project ROW and were generally not located adjacent to existing roads. Surveys were conducted in early August. Survey transects in the 2021 survey that had been surveyed from 2016 through 2020 include Highway 83 and Highway 7. The transect labeled as Purdum in 2021 is not the same transect that was trapped in 2016 through 2020, but it was located in the same general area. The Highway 7 transect was included in the 2021 survey to act as control traps. The Highway 7 transect from 2016 through 2020 included seven traps. These seven traps captured 61 individual ABB in 2021. Three additional traps were added in 2021 to ensure ABB would be captured to act as the control. A summary of survey results from 2021 are provided in Table 3-2.

TABLE 3-2 RESULTS OF NPPD AMERICAN BURYING BEETLE SURVEY: 2021

Survey Area	# Traps Surveyed	Individual ABB Captured
Hwy 83	27	0
Thedford Substation	5	0
Purdum Road	9	1
Hwy 7	10	111
Hwy 7 to Calamus River	9	3



NPPD's 345 kV Transmission Line Project
R - PROJECT
FIGURE 3-3 AMERICAN BURYING BEETLE MARK/RECAPTURE SURVEYS 2021

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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; Pearse et al. 2020).

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. Surveys completed in the 2024 - 2025 wintering period estimate the whooping crane population at 557 whooping cranes within the surveyed area (478 to 644, 95% confidence interval) (USFWS 2025). 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; in the 2022 - 2023 survey period, it is estimated that an additional 14 whooping cranes were beyond the primary survey area (USFWS 2023a).

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 was 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 sighting corridors were updated in 2018 using current opportunistic sightings and locations of 58 satellite-tracked whooping cranes (Pearse et al. 2018; Figure 3-4).

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 Corporation 2018; Pearse et al. 2020). 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 Phase 1 of the satellite tracking study, provided valuable information on whooping crane use and habitat selection in central Nebraska.

Phase 2 of the tracking effort was initiated by the same team of biologists in the winter of 2017. This tracking effort involved placing cellular transmitters on 17 adult whooping cranes. These cellular transmitters are programmed to collect up to 48 locations per day at equal time intervals and upload the recorded data every 24 hours. This will allow for the collection of highly detailed information on diurnal and nocturnal (roosting) habitat use during all stages of the year (Harrell and Bidwell 2020). Phase 2 of the tracking effort is currently ongoing, and results are not yet publicly available.

Whooping crane observational sightings in Nebraska have primarily been in palustrine wetland (56%) and riverine habitats (40%) (Austin and Richert 2005), with riverine sightings comprising the majority of roost sites. 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 (<1.0 hectare) and less than 28 cm deep (Armbruster 1990). Phase 1 of 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 for whooping cranes during migration by providing forage and energy in the form of waste grain following fall harvest. 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). 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 (Pearse et al. 2020). Phase 1 of the satellite tracking study showed that very few 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 Corporation 2018; Pearse et al. 2020). 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 various 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; 2020).

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).

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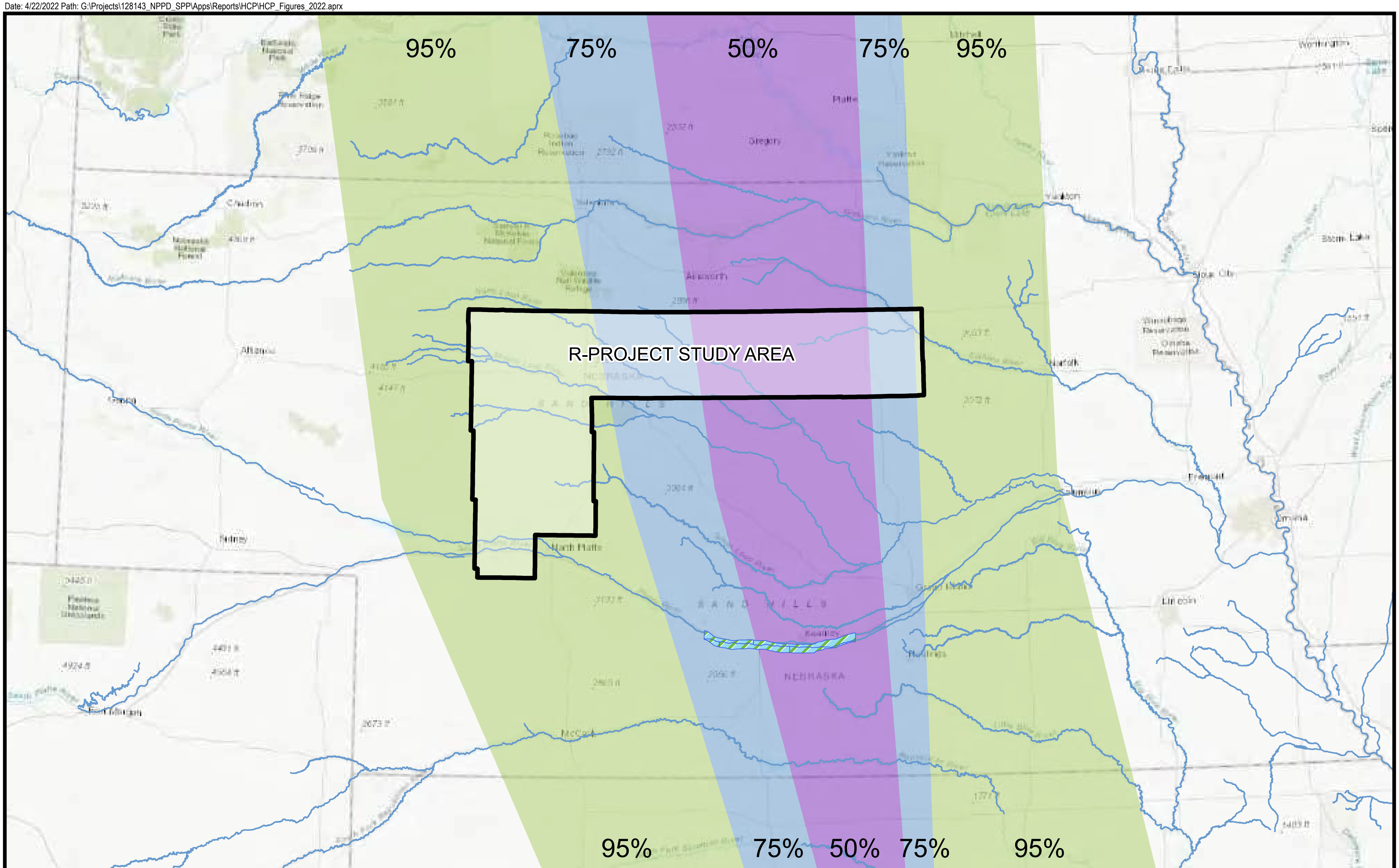

% OF CONFIRMED SIGHTINGS

50% 75% 95%

Whooping Crane Designated Critical Habitat

River or Major Steam

NPPD's 345kV Transmission Line Project

FIGURE 3-4
WHOOPING CRANE 95% SIGHTING CORRIDOR

Phase 1 of the satellite tracking study found that predation was the highest cause of whooping crane mortality (Pearse et al. 2019). No whooping cranes tracked in Phase 1 of the satellite tracking study collided with a power line. However, one whooping crane tracked in Phase 2 of the satellite tracking study struck a transmission line during migration in North Dakota in April 2020 (M. Rabbe. Biologist, USFWS. Personal communication via phone call with Jim Jenniges, March 2022).[9] 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. Kauffeld (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 Corporation 2018).

Occurrence within Study Area: 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 4% 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 highlights the importance of studies like the satellite tracking study to evaluate whooping crane migrations.

Of the 58 whooping cranes tracked by Phase 1 of 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.

[9] One additional whooping crane tracked as part of Phase 2 of the satellite tracking study collided with a power line in 2019 on the wintering grounds. This bird is not further considered due to the behavioral differences of whooping cranes occupying wintering habitat and during migration. The R-Project would only pose a potential risk to migrating whooping cranes.

- 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. They indicate that 94 whooping cranes have been observed in the Study Area since 1968, the most recent being 2021 (USFWS 2022a). However, similar to the results of the satellite tracking study, few of these birds were close to the R-Project. Only 17 birds from USFWS (2022) 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.

The authors of the 2015 study refined their analysis in Pearse et al. (2020). The refined analysis 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. Further analysis of the data presented in Pearse et al. (2015) and Pearse et al. (2020) was not conducted for this HCP because their spatial scale of analysis is much larger than the applicable spatial scale of analysis for the R-Project. As described further in Section 4.1.2 below, 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. Pearse et al. (2015) and Pearse et al. (2020) show where whooping cranes had stopover sites somewhere within a 400 km^2 and 346 km^2 cell, respectively. Because of the cell's large size and the use of a centroid to create the cell, a slight shift in the start point of cell mapping could result in changes to a cell's classification. Also, a comparison of Pearse et al. (2015) and Pearse et al. (2020) 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 Pearse et al. (2020) 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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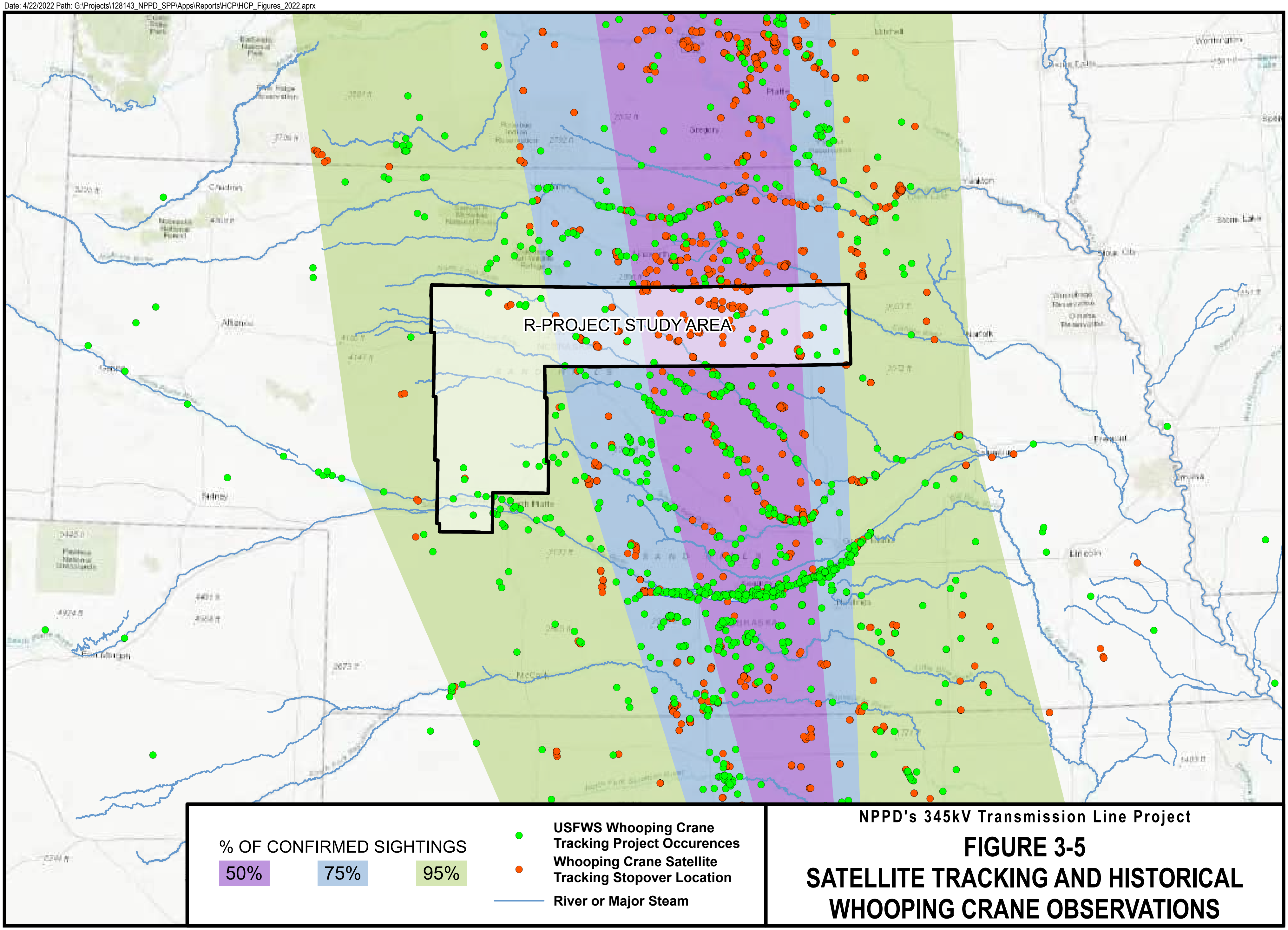


3.3.2 Piping Plover (*Charadrius melodus*)

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 decision was issued 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, and populations throughout its range have increased since the time of listing (USFWS 2016a). Current management by the USFWS divides the Northern Great Plains population of piping plover into four metapopulations: Northern Rivers Management Region, Alkali Lakes Management Region, Southern Rivers Management Region, and Prairie Canada Management Region. The R-Project falls within the Southern Rivers Management Region that includes the Missouri River system from Fort Randall Dam, South Dakota to Ponca, Nebraska; the Niobrara River; the Loup River system; and the Platte River system in Nebraska (USFWS 2020a). Populations within the Southern Rivers Management Region steadily increased from a low of approximately 400 individuals in 2011 to approximately 1,400 individuals in 2017 (USFWS 2020a).

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 2016a). 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. 2012; USFWS 2020a). 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).

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). 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).

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. 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). Piping plover food items in nesting areas 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. 2012). Incubation and brooding duties area shared by the male and female. Broods remain in nesting territories until they mature unless they are disturbed.

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. 2012). 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).

Occurrence within Study Area: Data received from the NNHP do not indicate any occurrences of piping plover within the Study Area (NGPC 2015 and 2022); however, an unpublished and unverified occurrence was documented at Carson Lake within the Study Area (Ducey 2014). 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 (POWER 2014). 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.

3.3.3 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 destruction and degradation, application of organochlorine pesticides (such as DDT) that contaminated food sources, and mortality from illegal shooting. Since its listing in 1978, the population trend for the bald eagle has been increasing. The bald eagle was downlisted 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 2018, there were 196 active nests in Nebraska (Jorgensen et al. 2019). Bald eagles regularly occur in Nebraska as spring and fall migrants and winter residents in Nebraska (Silcock and Jorgensen 2022). The average number of wintering bald eagles in the state from 1996 to 2011 was 990 individuals (NGPC 2013). 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 and 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 2013). 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.

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. In Nebraska, the bald eagle nesting season starts mid-December and runs through mid-July depending on the weather conditions in a given year (Silcock and Jorgensen 2022). 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 2013). Waterfowl are another important source of winter food. Bald eagles will occasionally hunt upland areas for birds or small mammals (Buehler 2000).

New electrical transmission and distribution lines, including the R-Project, are specifically designed to provide sufficient space between energized conductor and ground wires to avoid eagle electrocution; bald 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.

<u>Occurrence within Study Area</u>: The NNHP maintains a record of bald eagle nests and communal winter roosts identified throughout the state (NGPC 2015 and 2022). Table 3-3 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 3-3 BALD EAGLE NESTS AND WINTER CONCENTRATION AREAS DOCUMENTED OCCURRENCES IN STUDY AREA

OCCURRENCE TYPE	WATER BODY	YEAR LAST OBSERVED
Nest	Sutherland Reservoir	2025
Nest	Swan Lake	2008
Nest	North Loup River	2025
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	2020
Nest	Unnamed wetland	1996
Nest	Birdwood Creek	2025
Nest	Sunfish Lake	2019
Nest	Chain Lake	2019[1]
Nest	Middle Loup River	2025
Nest	South Platte River	2025
Winter Concentration Area	Sutherland Reservoir	1992
Winter Concentration Area	Sutherland Reservoir	1992
Winter Concentration Area	North Platte River	1991

1. Nests observed during 2019 Bald Eagle Aerial Nest Survey and were verified as active in 2019.

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 2013). 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, 2018, 2019, and 2025 nesting seasons. Surveys included the Sutherland Reservoir, 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 Road in Holt County (starting 2018), the area around

Sunfish Lake and Brush Lake (starting 2017), and cottonwood stands along Highway 7 in Blaine County (starting 2018). Aerial surveys were attempted in 2020 but were cancelled due to poor weather conditions. Surveys in 2020 were conducted from the ground at known nest sites.

Aerial surveys from 2014 to 2019 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 through 2019 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 from 2016 through 2019 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. NPPD repeated aerial surveys in the 2025 nesting season. The 2025 aerial surveys used a helicopter rather than a fixed-wing plane; all other survey methods were the same. The results of the eagle surveys are summarized in Table 3-4.

TABLE 3-4 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, 2019, 2020, 2025	1.4 miles to the west; 0.2 mile from access route
North Loup River	2016, 2017, 2018, 2019, 2020, 2025	0.56 mile to the south
Between Sunfish Lake and Brush Lake	2017, 2018, 2019, 2020[3], 2025	0.4 mile to the north
Middle Loup River	2018, 2019[4], 2025[5]	0.35 mile to the west
Chain Lake	2018[6]	2.6 miles to the north
Goose Lake Wildlife Management Area	2018, 2019, 2020	0.9 mile to the north
South Platte River	2025	0.25 mile to the west

[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, 2019, and 2020.
[4] Nests could not be verified from the ground in 2020 due to landowner restrictions.
[5] The nest observed on the Middle Loup River in 2018 and 2019 was found to be in poor condition in 2025; however, the eagle pair had rebuilt a replacement nest in an immediately adjacent tree.
[6] 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. Nests were not surveyed in subsequent years because they are outside the survey area.

3.3.4 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; Silcock and Jorgensen 2022). 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.

<u>Habitat Characteristics/Use</u>: 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*) (Katzner 2020). 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, such as illegal shooting or poisoning. 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 nests within the Study Area, all of which were located along Birdwood Creek north of the North Platte River (NGPC 2015 and 2022). These occurrences were documented in 1972, 1979, and 1982.

3.3.5 Rufa Red Knot (*Calidris canutus rufa*)

Status and Distribution: The USFWS issued its decision to list the rufa red knot as threatened under the ESA in December 2014 (79 FR 73706) and reaffirmed its threatened status in a recent 5-year review of the species (USFWS 2021a). 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).

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). The rufa red knot is considered a rare casual spring and fall migrant in Nebraska (Silcock and Jorgensen 2022). The USFWS's revised proposed designation of critical habitat for the rufa red knot in 2023 did not include any areas in Nebraska (88 FR 22530).

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 and along the southern end of Hudson Bay (Skagen et al. 1999; Central Flyway Council 2013; USFWS 2020b). 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 (USFWS 2020b). 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 28 confirmed occurrences of rufa red knots within the state of Nebraska since 1963 (Silcock and Jorgensen 2022). A 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).

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

Status and Distribution: The USFWS issued a final rule to list the northern long-eared bat as threatened under ESA on April 2, 2015 (80 FR 17974). On November 30, 2022, the USFWS uplisted the species to endangered. This listing went into effect on March 31, 2023 (88 FR 4908). With the uplisting to endangered, the USFWS published a species-specific Determination Key and the *Interim Voluntary Guidance for the Northern Long-Eared Bat: Forest Habitat Modification* to provide guidance for projects on the conservation and avoidance of take of northern long-eared bat.

The northern long-eared bat ranges across much of the eastern and central U.S. and Canadian provinces west to the southern Northwest Territories (78 FR 61046). However, 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 occurs in the eastern, southern, and northern parts of the state, typically along riparian corridors (Geluso et al. 2015; USFWS 2022b). The species has been identified near limestone quarries in east-central Nebraska, Robber's Cave in Lancaster County, and 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).

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). Individual bats that survive white-nose syndrome coming out of hibernation also remain vulnerable to other threats, including habitat loss, modification, and wind energy development (USFWS 2022b). White-nose syndrome was first detected in Nebraska in 2015 in an eastern Nebraska mine, was more established in 2016, and spread to additional local hibernacula in 2017 (White et al. 2016, Bockart 2020, White et al. 2022). A sharp decline in northern long-eared bats was observed at hibernacula in 2017, two years post arrival of white-nose syndrome in the state (Bockart 2020, White et al. 2022). Although these observations were made at hibernacula, it is unknown if white-nose syndrome has impacted the occurrence of northern long-eared bats in roosting habitats across the state, particularly in the Pine Ridge, along the Niobrara River, and Republican River.

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. 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 winter hibernacula. Winter hibernacula are typically located in caves or abandoned mines with small cracks or crevices in the ceiling (Caceres and Pybus 1997). Hibernacula in Nebraska also include rocky cliff faces that contain deep fracturing where the species can hibernate (White et al. 2020). 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).

Occurrence within Study Area: Data received from the NNHP have no record of the northern long-eared bat occurring within the Study Area (NGPC 2015 and 2022); 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). There are no known hibernacula, maternity roosts, or other roost trees in the Study Area. Although the species presence has not been documented, northern long-eared bats may migrate through the Study Area.

3.3.7 Tricolored Bat (*Perimyotis subflavus*)

Status and Distribution: On September 14, 2022, the USFWS issued a proposed rule to list the tricolored bat as endangered under ESA (87 FR 56381). If the rule is finalized as proposed, this species will be added to the List of Endangered and Threatened Wildlife. The proposed rule found that designating critical habitat for tricolored bat would not be prudent. Because all species federally protected under the ESA are also protected under NESCA, it is anticipated that the tricolored bat will be listed as endangered by the state of Nebraska, if and when the USFWS proposed rule is finalized.

The tricolored bat is a wide-ranging species that occurs throughout the eastern half of the U.S. and Central America from the Atlantic coast to the western edge of the Great Plains in Wyoming and

Colorado, and from Nicaragua north to southern Canada (USFWS 2021b). The species presence in the western Great Plains is the result of a westward range expansion in recent decades, attributed to increasing numbers of trees along Great Plains rivers and anthropogenic sources of suitable winter hibernacula sites, such as abandoned mines and structures (Geluso et al. 2005; Damm and Geluso 2008; USFWS 2021b). Within Nebraska, tricolored bats have been documented most frequently in the southeastern part of the state but have also been documented in a number of scattered locations in central and western Nebraska (Damm and Geluso 2008, White et al. 2016, Seguin 2019). Summer occurrences in Nebraska have been recorded outside the Study Area along the Niobrara, Middle Loup, North Platte, and Republican rivers. Winter hibernacula have been recorded at the Happy Jack Mine in southwest Greeley County and in Cass and Sarpy counties in southeastern Nebraska (Damm and Geluso 2008, White et al. 2016, University of Nebraska-Lincoln 2022).

The largest threat to the tricolored bat is white-nose syndrome (USFWS 2021b). White-nose syndrome has led to documented declines in northern long-eared bats in Nebraska (White et al. 2016, Bockart 2020, White et al. 2022). Such declines have not been documented in tricolored bat populations but have likely occurred, nonetheless. While Bockart (2020) documented drastic declines in northern long-eared bat populations but not tricolored bat populations, this was likely a result of the tricolored bat's extended hibernation period; i.e., most of the tricolored bats had likely already left the study area for their wintering grounds. Other threats to the tricolored bat identified by the USFWS include wind-energy-related mortality, climate change, and habitat loss (87 FR 56381).

Habitat Characteristics/Use: The primary elements of habitat for tricolored bats include caves, mines, and potentially rock crevices for winter hibernacula; trees for summer roosts and maternity roosts; and forest edges and open water for foraging habitat (Lemem et al. 2016). In Nebraska, most tricolored bats enter hibernacula in late September or October and exit in May (Damm and Geluso 2008). Documented winter hibernacula in Nebraska are limited to mines in the southeast part of the state (Cass and Sarpy counties) approximately 125 miles from the Project area, Robber's Cave in Lancaster County, and at Happy Jack Mine in Greeley County, approximately 65 miles from the Project area (Damm and Geluso 2008, White et al. 2016, University of Nebraska-Lincoln 2022). At the Happy Jack Mine in central Nebraska, numbers of hibernating bats peaked between November and February, and several marked individuals were absent in early April and present on the subsequent visit. As no other mines or caves are known to occur in the vicinity, the authors suspected some of the bats may have moved between the mine and other types of winter roosts in the vicinity (Damm and Geluso 2008).

During the summer active season (May to October), tricolored bat habitat in Nebraska is primarily associated with forested areas, such as along rivers and breaks, that provide roost trees (White et al. 2016, Fill 2020). Summer roosts include day or night roosts used by adult bats and also maternity roosts used by females and their pups. Tricolored bats primarily roost in tree foliage—especially among live or dead leaf clusters in live or recently dead deciduous trees but sometimes among pine or juniper foliage. Occasionally tree cavities, squirrel nests, buildings, bridges, caves, and mines are used (Damm and Geluso 2008, NatureServe 2022). While males roost singly during summer, females form small maternity colonies, with documented sizes ranging from one to 39 females and their pups. While females have high site fidelity, commonly returning to the same general colony locations each year to roost, they often switch specific roost trees every few days. In June or early July, females give birth to one to three young that grow rapidly, begin to fly at three weeks, and achieve adult-like foraging ability at four weeks of age (NatureServe 2022).

Tricolored bats are insectivorous and, with short wings and slow maneuverable flight, are adapted for foraging in high-clutter environments. They sometimes glean insects off of leaf surfaces, as well as hawking them from the air (Fill 2020). They are primarily associated with forests and most often forage near trees, along forest edges, and along waterways, but they occasionally have been observed foraging over open grassland or cropland (Fill 2020; USFWS 2021b; NatureServe 2022). Reproductive females have been documented foraging up to 2.7 miles from their maternity roost, while males have been documented foraging up to 15 miles from their day roost. Tricolored bat summer activity areas may be located far from winter hibernacula, with documented migration distances of up to 150 miles between winter and summer roosts (USFWS 2021b).

Occurrence within Study Area: Data received from the NNHP have no record of the tricolored bat occurring within the Study Area (NGPC 2015 and 2022). Publications do not identify any winter hibernacula within the Study Area (Damm and Geluso 2008, White et al. 2016, University of Nebraska-Lincoln 2022). Although forested areas likely to provide optimal summer roosting and foraging habitat are generally lacking from the Study Area, species occurrence is possible. The largest contiguous wooded area in the Study Area is along the North Platte River crossing near the west end of the Project in Lincoln County, with a wooded area approximately 0.25-mile wide at the crossing. Several smaller woodlots occur within various areas along or near the route. These areas of trees, as well as buildings and bridges in the Study Area, could provide suitable summer roost and maternity roost habitat. Potentially suitable foraging habitat in the Study Area includes areas in and near the wooded areas and open water areas associated with rivers and sloughs.

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 (Minnesota Department of Natural Resources [MDNR] 2008). Bury and Germano (2003) found that 80% 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% occupied the periphery of larger lake habitat (greater than one hectare). In the same study, Bury and Germano (2003) had a 100% 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).

Seasonal movements are typically diurnal (Hjort Toms et al. 2022). Refsnider and Linck (2012) found that females on nesting forays spent 49% 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) (USFWS 2022c). 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 17 Blanding's turtle occurrences in the Study Area (NGPC 2015 and 2022). Occurrences have been documented in Lincoln, Cherry, Brown, Loup, Rock, and Holt counties.

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. 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. Occupied streams in Nebraska include Taylor Creek and an unnamed tributary to Union Creek in the Elkhorn River watershed in Madison County and Big Creek in the North Loup River watershed in Cherry County (USFWS 2018b).

Habitat Characteristics/Use: Habitat of the Topeka shiner is characterized as small, low-order prairie streams with pools that are of good water quality and have cool temperatures. Suitable streams maintain low to intermittent flows. When surface flows drop or there is no flow, 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 often rely on the breeding nests of native sunfish (orange-spotted sunfish (*Lepomis humilis*) or green sunfish (*Lepomis cyanellus*)), 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 2009a). 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 2018b; Panella 2012b).

Occurrence within Study Area: The USFWS Species Status Assessment for Topeka shiner indicate that Taylor Creek, Union Creek, and Big Creek are the only verified extent populations in Nebraska (USFWS 2018b). 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 2015, 2022). Both Brush Creek and Big Creek are tributaries of the North Loup River to the west of Brownlee, Nebraska in Cherry County. The Topeka Shiner SSA indicated that Brush Creek may also be occupied but had not been surveyed since 1989 (USFWS 2018b). Brush Creek was surveyed by the USFWS in July 2019 after publication of the Topeka Shiner SSA, and no Topeka shiners were found. The status of the species in Brush Creek remains unknown (USFWS 2018b).

3.3.10 Blowout Penstemon (*Penstemon haydenii*)

Status and Distribution: Blowout penstemon is a federally and state-listed 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 32,944 plants in 2016, with an additional 5,000 – 10,000 plants in Wyoming (USFWS 2012a; 2022c). 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 populations, 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 following Biologically Unique Landscapes identified in the Nebraska Natural Legacy Project: 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 (Schneider et al. 2011).

<u>Occurrence within Study Area</u>: Based on data provided by the NNHP, there are 28 occurrences of blowout penstemon in the Study Area (NGPC 2015, 2022). Of these, two occurrences are historical, one is possibly extirpated, and the remaining 25 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*)

<u>Status and Distribution</u>: Western prairie fringed orchid is a federally and state-listed 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 2021). 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).

The USFWS's most recent 5-Year Review for western prairie fringe orchid states there are extant populations in ten Nebraska counties and a current population of 2,731 plants in the Sandhills (USFWS 2021). Other publications indicate there may be an estimated 2,000 to 5,000 plants throughout Nebraska (Schneider et al. 2018). There are conservation concerns from its population decline and associated habitat loss and other issues related to it being an orchid species (Schneider et al. 2011). 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 2021; Schneider et al. 2011).

Habitat Characteristics/Use: 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 2021). The western prairie fringed orchid is associated with eastern cordgrass wet prairie, northern cordgrass wet prairie, wet-mesic tallgrass prairie, and tallgrass prairie in the Sandhills Ecoregion (Schneider et al. 2011).

Occurrence within Study Area: Based on data provided by the NNHP, there are 63 occurrences of western prairie fringed orchids in the Study Area (NGPC 2015 and 2022). 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 (NGPC 2019).

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 access restrictions imposed by landowners 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 remaining 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. Note that permanent disturbance of 13 acres resulting from expansion of the Thedford Substation was completed in 2019 and 2020 under ITP #TE72710C-0. Additional activities completed in 2020 include 6.9 acres of tree removal, establishment of 11.5 acres of construction yards/staging areas, temporary matting of 4.73 acres of fly yards and 3.44 acres of access, and distribution line relocation (originally estimated at 29.4 acres but completed with minimal disturbance). Because the disturbance associated with these activities has already occurred, those acres are not reported in Table 4-1; however, potential impacts resulting from these activities have been considered in the analysis for each applicable Evaluated Species.

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		
Temporary Access	527	--
Permanent Access	--	26[1]
ROW Preparation		
ROW Tree Clearing[2]	42.1[3]	
Temporary Work Areas		
Fly Yards/Assembly Areas	279	--
Construction Yards/Staging Areas	96.5[4]	--
Pulling and Tensioning Sites	359	--
Temporary Structure Work Areas		
Lattice Tower	137	--
Steel Monopole	262	--
Structure Foundation Excavation/Installation		
Helical piers – lattice tower	--	0.9
Standard foundation – steel monopole	--	0.4
Construction Contingency		
Construction contingency	40	
Distribution Power Line Relocation		
Distribution power line relocation	13.6[5]	0.02[5]
Well Relocation		
Well relocation	0.4	--
Construction Subtotal	1,756.6	27.3
Operation and Maintenance[6]		
Emergency Repairs[6]	351	--
TOTAL	2,107.6	27.3

[1]Temporary access routes 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 permanent access and represent a permanent impact. No more than 26 acres of permanent access 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]This does not include approximately 6.9 acres of trees that were cleared when ITP #TE72710C-0 was in effect.
[4]This does not include approximately 11.5 acres of construction yards/staging areas that were put in place when ITP #TE72710C-0 was in effect.
[5]This does not include approximately 29.4 acres of temporary disturbance originally estimated for distribution power line relocations in the Permit Area when ITP #TE72710C-0 was in effect. As noted in Section 2.6.2, the relocation efforts were able to be conducted with minimal impacts.
[6]Disturbance from emergency repairs is estimated at 20% of the remaining construction subtotal. 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. The potentially suitable whooping crane habitat analysis methodology developed by the Watershed Institute was specifically designed for use on power line projects. The potentially suitable whooping crane habitat analysis is a landscape-scale analysis and is not intended to represent every conceivable potential use location 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). Further analysis of additional satellite tracking data examined over 8,000 whooping crane roost sites and showed that the whooping crane adapts roost sites in relation to drought and non-drought conditions (Pearse et al. 2024). 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 289,280 acres within one mile of the R-Project, there are approximately 8,969 acres (3.1% of the total) of potentially suitable whooping crane stopover habitat as determined by NPPD's analysis and consistent with Pearse et al. (2017) as described above. 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)
Temporary Access	11.0	--
Fly Yards/Assembly Areas	0.7	--
Construction Yards/Staging Areas	0	--
Temporary Structure Work Areas	8.3	--
Pulling and Tensioning Sites	8.3	--
Distribution Relocation	0.6	--
Well Relocation	0	--
Helical piers – lattice tower	--	0.007
Standard foundation – steel monopole	--	0.006
TOTAL	28.9	0.013

Construction activities associated with the R-Project will result in the total temporary disturbance of 28.9 acres of potentially suitable whooping crane habitat (Table 4-2) or 0.3% of such habitat within one mile of the R-Project. 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. Rivers, streams, and wetlands were avoided by temporary access during the preliminary design phase; however, an estimated 11.0 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. Disturbance in potentially suitable whooping crane habitat will be avoided where possible using measures such as construction matting and overland travel. These measures will reduce ground disturbance and accelerate restoration of habitat. The need for permanent access roads is dependent on landowner requests and requirements for operation and maintenance of the line but would not exceed 26 acres throughout the entire length of the Project. Permanent access roads will not create any additional disturbance beyond that incorporated under temporary access. Permanent access will avoid potentially suitable whooping crane habitat.

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. Pearse et al. (2021) found that whooping cranes during migration utilize areas more than five kilometers from wind turbines less than expected. Ellis et al. (2022) found evidence of a “zone of influence” around transmission lines that extends to two kilometers during times of non-drought. However, Ellis et al. (2022) also recognizes that whooping cranes will use habitat within that zone of influence and that it does not represent an exclusionary avoidance area.

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 and 2020) also quantified whooping crane use throughout the Central Flyway, including central Nebraska, using data from the satellite tracking study. Pearse et al. (2015 and 2020) 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 28.9 and 0.013 acres, respectively, of potentially suitable whooping crane habitat from the R-Project will not likely result in adverse effects 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 2020) and as identified by the desktop habitat assessment. Based upon available information, it is likely that whooping cranes will recognize the existence of the R-Project and adjust habitat use accordingly. The abundance of wetland resources in the Sandhills means such adjustments will likely be minor and likely less than natural whooping crane responses to changing environmental conditions.

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	80	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 Interstate 80. Interstate 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.

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 10% 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 that will meet or exceed the standard agency protocol in place at the time of construction. The USFWS and NGPC's current protocol includes spring and fall whooping crane migration periods of March 6 to April 29 and October 9 to November 15, respectively (Appendix B). For all construction that takes place during these migration periods (or the revised migration periods, if any, of the preconstruction survey protocol in place at the time of construction), 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, 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. NPPD completed daily whooping crane presence/absence surveys during migration periods in the Fall 2019, Spring 2020, Fall 2020, Spring 2021, and Fall 2021 for a total of 699 surveys before construction or restoration activities. No whooping cranes were observed during these daily whooping crane presence/absence surveys.

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 and USFWS 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 2009b), 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 (2009) each document whooping crane power line collisions (distribution and transmission). Brightwell et al. (in press) worked with biologists from the USFWS and U.S. Geological Survey (USGS) to definitively identify all confirmed fledged whooping crane mortalities in the AWBP, which included confirmed mortalities from transmission and distribution line collision. 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. Conceptually, power lines placed in close proximity to suitable whooping crane habitat are more likely to present a risk of collision than those located farther away from suitable habitat. Ellis et al. (2022) showed that given an option of habitat selections, whooping cranes may purposefully avoid habitat near transmission lines, thus reducing the likelihood of collision. Research on similar conspecifics, such as sandhill crane (*Grus canadensis*), support this conclusion (Brown et al. 1987, Shaw et al. 2010); however, insufficient data are available to reliably evaluate this concept specific to whooping cranes. Because the risk of a whooping crane colliding with the R-Project is not zero, NPPD will minimize that risk by marking the entirety of the R-Project with bird flight diverters.

Using the 95% whooping crane migration corridor from Pearse et al. (2018) and Platts Electric Transmission Lines data (April 2021), 46,851 miles of transmission line (≥69kV) exist in the whooping crane migration corridor in the United States, and 4,808 miles exist in the state of Nebraska. The R-Project will increase the transmission line miles in these areas by 0.48% and 4.7%, respectively. 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; Appendix C) indicates that, to maintain baseline threat to whooping cranes, all new lines within 1 mile of potentially suitable habitat and an equal amount of existing line should be marked with bird flight diverters. Using the habitat assessment described in Section 4.1.1, NPPD estimates that there are 124 miles of the R-Project within 1 mile of suitable whooping crane habitat. To maintain the baseline threat to whooping cranes per the Region 6 Guidance, NPPD will mark 124 miles of its existing transmission system in the state of Nebraska (Figure 4-1). 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.

Brown et al. (1987) and Shaw et al. (2010) support the one-mile distance identified in the Region 6 Guidance. Brown et al. (1987) found that the threat to cranes posed by collision decreased to zero when the power line was located a mile (1,600 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 no collisions were observed if the bird took flight more than one mile from the power line. 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 do not appear to 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 Phase 1 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 Phase 1 of 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 Phase 1 of the satellite tracking study collided with a power line (Headwaters Corporation 2018; Pearse et al. 2019).

Over the previous decades, whooping crane populations have increased from 18 birds in 1938 (Gil de Weir 2006) to 536 birds in 2023 in the Aransas-Wood Buffalo population (USFWS 2023a). 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 in the migration corridor. The majority of known power line collision mortalities have occurred in the experimental introduced flocks. The Aransas-Wood Buffalo population has had 12 known or assumed whooping cranes collisions with power lines during migration in the United States from 1956 through the spring 2025 migration. Of the nine known or assumed collisions in the Aransas-Wood Buffalo population, six involved distribution lines, two involved a transmission line, and one involved an unknown power line. Three suspected collisions possibly involved an unknown power line type. A summary of all confirmed and suspected whooping crane/power line collisions is provided in Appendix D.

NPPD examined three separate analyses to evaluate the likelihood of a whooping crane take from collision with the R-Project. The first analysis is the one completed by NPPD in 2018 that was included in the prior version of this HCP (hereinafter the "2018 Analysis"). The second analysis is a 2025 update to the Reasonably Certain Knowledge (RCK) analysis completed by the USFWS in 2018 (USFWS 2019b). While preparing this update, NPPD was unable to replicate all the original inputs to the RCK approach and surmised that the different approaches to the treatment of distribution versus transmission lines played a large role in the outcome. Thus, NPPD engaged Western EcoSystems Technologies (WEST) to independently review the available data sets to determine if the RCK model could be modified to evaluate transmission mortality only. A full description of each analysis is provided in Appendix D. Each of these analyses is summarized below.

2018 Analysis

The 2018 analysis used known miles of transmission lines, total known whooping crane mortalities as reported by Stehn and Haralson-Strobel (2014), the estimated migration mortality, and the estimated migration collisions with transmission lines each year 1956 to 2018 to determine the estimated collision risk of any one mile of transmission in the central flyway. This estimated collision risk of any one mile was then applied to the 225 miles of the R-Project, resulting in an estimated collision risk of 0.00044 whooping cranes in any one year and a total of 0.022 whooping cranes over the 50-year life of the permit. The 2018 analysis was not updated for the current HCP because it begins with total known whooping crane mortalities reported by Stehn and Haralson-Strobel (2014), and that document has not been updated with a more recent publication that uses the same or similar methodology for counting and reporting total whooping crane mortalities. The 2018 analysis is fully presented in Appendix D.

Updated Reasonably Certain Knowledge Analysis (2025)

In order to address the scarcity of whooping crane collision data, numerous risk analyses proposed by various parties, and differing assumptions, the USFWS developed the 2018 RCK analysis, which identified data that were reasonably certain and other best available information, to analyze the risk of whooping crane collision for the R-Project. NPPD has updated the 2018 RCK analysis with current (as of May 2025) whooping crane information that has been recorded since the original was developed in 2018. The updated RCK analysis takes into account the following variables relating to the Aransas-Wood Buffalo whooping crane population to provide an estimated annual and total mortality from the R-Project over the 50-year life of the project:

- Population estimate from the Traylor-Holzer (2018) Population Viability Analysis (PVA).[10]
- Estimated annual migration mortality in the United States from all causes: 0.9483%.
- Estimated proportion of migration mortality that results from power lines: 37.5%.

[10] The 2018 RCK analysis used an estimated average population over the 50-year life of the project of 1,500 whooping cranes. At the request of the USFWS, NPPD instead used the population estimates in the PVA in the updated RCK analysis.

- Number of identified power-line mortality: 9 individuals.
- Number of potential power-line mortality (includes unidentified trauma): 12 individuals.
- Estimated proportion of the power-line mortality during migration that may occur in Nebraska: 8.33%.
- Estimated proportion of power-line strikes that occur on transmission lines: 25%.

This updated analysis is referred to as the PVA Updated RCK analysis. Because the R-Project would add 226 miles of transmission line in Nebraska, all of which are within the whooping crane migratory corridor, the R-Project would increase the length of transmission for collision in Nebraska by 4.7%. When considered over the 50-year life of the transmission line, the PVA Updated RCK analysis predicts that the R-Project may result in 0.3722 whooping crane collisions throughout the expected life of the project. This does not take into account the risk reduction achieved through marking the line with bird flight diverters, which is identified as 50% to 80% in the Region 6 Guidance and APLIC (2012). To fully minimize potential impacts to whooping cranes, NPPD will mark all 226 miles of the R-Project, regardless of proximity to whooping crane suitable habitat. If the line marking achieved a reduction of 50%, the low end of the range noted in the Region 6 Guidance, the risk projection would be reduced to 0.1861 whooping crane collisions over the life of the R-Project.

In addition to updating the RCK analysis with the PVA, the RCK analysis was also re-run with population estimated from the 2022-2023 Whooping Crane Survey Report, which included a population estimate of 550 cranes, and a 4.34% long-term population growth rate. Based on those inputs, the estimated whooping crane population would be 5,010 whooping cranes at 50 years with a total of 0.375 predicted whooping crane collisions. Note the total of 0.375 predicted whooping crane collisions does not include risk reduction as a result of line marking.

WEST Analysis

NPPD's inability to fully replicate the RCK analysis led NPPD to engage WEST to review all data inputs and examine steps in the RCK analyses that were identified as not being reasonably certain and identify potential alternative approaches. The result was a risk assessment that is similar to the RCK analyses but is simplified and can be applied to any transmission line within the 95% migratory corridor. The WEST analysis applies the PVA completed by Traylor-Holzer (2018). Additionally, the WEST analysis uses only known mortality data specific to transmission lines, which reduces the uncertainty associated with applying distribution-line strikes to estimate transmission-line strikes. It also eliminates the need to use distribution-line strikes in Nebraska to estimate transmission-line strikes in Nebraska, which was necessary in the RCK analysis due to the lack of known transmission-line strikes in Nebraska. Variables considered in the WEST analysis include:

- Estimated annual migration mortality in the United States from all causes: 0.9483%.
- Known and attributed transmission-line migration mortalities: 2.462 whooping cranes.
- Estimated annual migration mortality rate attributable to transmission-line strikes: 0.0008337 whooping cranes.
- Estimated R-Project annual mortality rate: 0.000004021 whooping cranes.

As noted above, in order to account for increases in the whooping crane population over the 50-year life of the transmission line, the WEST analysis uses a published PVA to estimate the whooping crane population (Traylor-Holzer 2018). When the annual estimated mortality specific to the R-Project is applied to the population model, the WEST analysis predicts the R-Project may result in 0.351 whooping crane collisions throughout the expected life of the project, not accounting for any risk reduction from marking the line with bird flight diverters.

Bird Flight Diverters

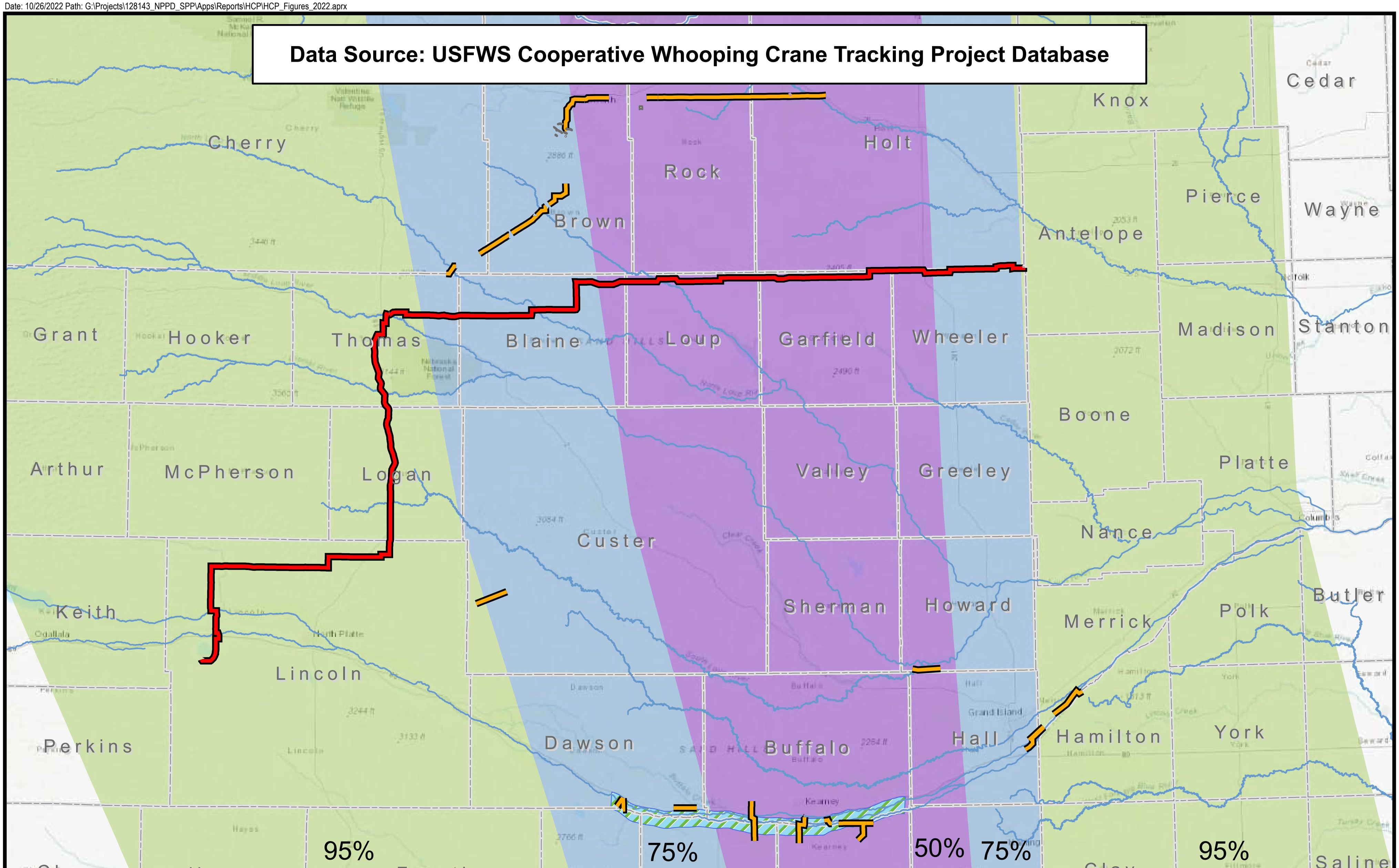
To minimize potential impacts on whooping cranes, NPPD will mark all 226 miles of the R-Project. As per the Region 6 Guidance, NPPD will also mark at least 124 miles of existing line, which is equal to the amount of the R-Project within one mile of potentially suitable stopover habitat. Existing lines 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 potential collisions. The NPPD 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). A few 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 Murphy et al. (2009) acknowledge that direct comparison of the effectiveness of different marker types has not been done and that 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 (Jenkins et al. 2010). These same sorts 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. While NPPD’s standard is to employ spiral bird flight diverters, expanded use of other marking devices is increasing due to ease of installation (including the use of drones for installation) and compatibility with marked lines. Because of these changing and evolving technologies, the final marker type will be determined at the time of construction.

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 did not believe that an increase in the take of one federally endangered species outweighed the potential decrease in the already low likelihood of take of a whooping crane.

Date: 10/26/2022 Path: G:\Projects\128143_NPPD_SPP\Apps\Reports\HCP\HCP_Figures_2022.aprx



% of Confirmed Sightings

50% 75% 95%

Marking of R-Project Line

Marking of Existing Line

Whooping Crane Designated Critical Habitat

River or Major Stream

NPPD's 345kV Transmission Line Project

FIGURE 4-1
WHOOPING CRANE LINE MARKING

Collision-Risk Conclusion

While numerous approaches to evaluate the likelihood of a whooping crane take from collision with the R-Project have been proposed, each has similar data limitations and is highly influenced by assumptions regarding data uncertainties. None of the three analyses presented here are unique to the R-Project and could, with little or no modification, be applied to all power lines. These analyses must be viewed in light of the plausibility of applying such take estimates to all transmission lines.

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, despite the different approaches taken in the three analyses above, each concludes that the risk of whooping crane mortality on the R-Project is extremely low. This is consistent with the fact that the R-Project will increase the miles of transmission line in the whooping crane migration corridor by only 0.048%. When the low likelihood of collision is considered along with implementation of line marking, 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).

New information, data, or research results could alter the understanding, reduce uncertainties, or increase scientific vigor of the analysis of potential impacts to the whooping crane as compared to what was available at the time this HCP was prepared. If USFWS, NGPC, or NPPD becomes aware of credible, empirical data that could materially alter the whooping crane risk analyses prepared for this HCP, NPPD will coordinate with USFWS and NGPC to discuss how best to analyze those data. New information may inform a novel approach to assessing risk or improve the existing approaches. If credible, empirical data do emerge to modify the risk analyses, and based on that analysis, USFWS, NGPC, and NPPD agree that take of the whooping crane is reasonably certain to occur, NPPD will coordinate with USFWS and NGPC to determine whether additional measures could be implemented to avoid take or whether amendment of the ITP to seek incidental take coverage for the whooping crane is warranted.

If NPPD, the USFWS, or NGPC becomes aware of a wounded or deceased whooping crane discovered in the vicinity of the R-Project, the party that learned of the incident will informally notify the other parties by telephone call or email within 24 hours of obtaining credible knowledge of the discovery. Within one week of the initial notification, the notifying party will send a written notification to the other parties that includes, to the extent known, the date of discovery, a description of the location of the individual or carcass, notes on the condition of the individual or carcass that might help indicate how and when it died or was wounded, and notes on the characteristics of the individual or carcass. If possible, such documentation should include photographs and location coordinates.

If the wounding or death is determined to be attributable to the R-Project, then NPPD will consult with the USFWS and NGPC to determine what actions are necessary to address the impacts of the collision-associated take.

NPPD, USFWS, and NGPC will jointly analyze the information gathered with respect to the wounding or death of the whooping crane to determine if any additional avoidance measures that were not in place at the time this HCP was prepared are warranted or if additional actions are warranted. Based on that analysis, and accounting for any such additional actions or measures that NPPD agrees to implement, NPPD, USFWS, and NGPC will determine if future take of a whooping crane on the R-Project can likely be avoided or if future take is reasonably certain to occur. If NPPD and the USFWS determine that future take of the whooping crane is reasonably certain to occur, NPPD will seek an amendment to the HCP, ITP, and related documents (as applicable) following the measures described in Section 7.5. NPPD will also notify NGPC to address any amendment to the state incidental take statement and consultation with the Nebraska Power Review Board. The amendments will address the amount of collision-associated take of the whooping crane that is reasonably certain to occur during the remainder of the ITP term. However, if at the time of the collision-associated take, NPPD has already started the process 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, NPPD may choose to respond by ensuring that the R-Project is included in that broader effort, in lieu of seeking an amendment to the R-Project's existing ITP.

Potential Effects from Distribution Line Relocation. 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 20 miles that have been or 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. Burial of the distribution lines is undertaken at the request of the local public utility district that manages those lines. The intent of placing distribution lines underground is not to reduce potential impacts to whooping cranes, but it will have the added beneficial effect of reducing the potential risk of collisions.

Potential Effects from Routine Inspection, Maintenance, and Repairs. Routine inspection of the transmission line will be completed by helicopter, fixed-wing aircraft, drone, 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. The whooping crane monitoring protocol will be implemented prior to routine maintenance and repair activities that occur during the whooping crane migration season.

Potential Effects from Emergency Repairs. Emergency repairs may temporarily disturb an estimated 351 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. If emergency repairs do occur during the whooping crane migration season, those repairs will be preceded by a whooping crane presence/absence survey that will meet or exceed the standard agency protocol in place at the time of the repair.

Potential Effects from Vegetation Management. 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 the most current protocol (Appendix B) prior to the initiation of all construction activities during migration periods for habitat within 0.5 mile of construction activities. The USFWS and NGPC's current protocol includes revised spring (March 6 – April 29) and fall (October 9 – November 15) 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 a summary of all whooping crane survey checklists to the USFWS and NGPC at the completion of each whooping crane migration season. NPPD will maintain copies of all checklists and can provide the USFWS or NGPC with copies upon request.
  - Any emergency repairs required during the whooping crane migration period will be preceded by a whooping crane presence/absence survey that will meet or exceed the standard agency protocol in place at the time of the repair.
- All personnel including contractors will be required to complete the Worker Environmental 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 specialized equipment, 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 all 226 miles of the R-Project, 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 124 miles 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.

4.2 Piping Plover

4.2.1 Potential Effects from Construction

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 2015). 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 (POWER 2014). 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 262 feet (80 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 shoreline 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.

4.2.2 Potential Effects from Operation and Maintenance

The transmission line span over the North Platte and South Platte rivers presents a potential collision hazard for piping plovers. A 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 2016; USFWS 2020a). 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 351 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 351 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.

4.2.3 Avoidance and Minimization Measures Proposed for Piping Plover

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

- The R-Project avoids piping plover nesting habitat. 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.
- 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 specialized equipment, temporary matting, or other BMPs.
- Bird flight diverters 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.

4.3 Bald Eagle

4.3.1 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, 2018, 2019, 2020, and 2025 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. All nests identified as occupied were in use during the 2025 bald eagle nest survey. One bald eagle nest was identified approximately 0.25 mile from the Project centerline on the northern bank of the South Platte River. This nest was first identified in 2025. One bald eagle nest was identified within 0.5 mile of the R-Project centerline near Sunfish Lake in northern Garfield County. This nest was last confirmed as occupied during the 2019 survey but was not occupied and was in poor condition during the 2025 survey. 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.[11] One public road that may be used for access is located approximately 0.2 mile from this nest. One nest is located on the Middle Loup River approximately 0.35 mile west of the Project centerline. Note the nest located on the Middle Loup River was previously 0.6 miles west of the R-Project centerline. That nest had deteriorated but the eagles had constructed a new nest prior to the 2025 nest survey which was

[11] See Table 3-4 in Section 3.3.3 for information about the years in which nests were identified and occupied.

located farther east along the river and closer to the Project. 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.[12] 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 2025 survey. 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 nest 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 (NGPC 2015 and 2022). 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 and USFWS 2020). 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.

4.3.2 Potential Effects from Operations and Maintenance

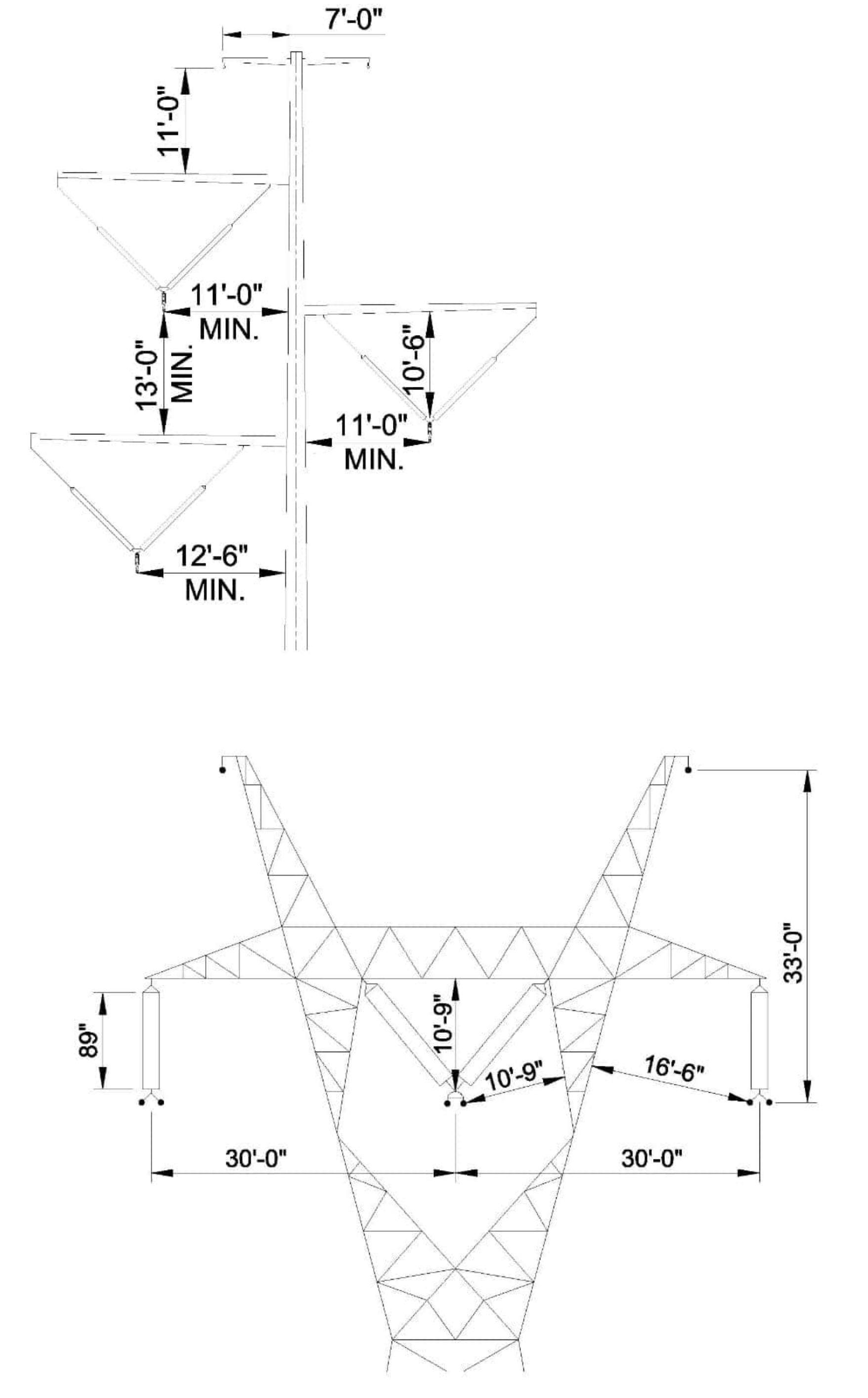
A common concern regarding transmission lines is the possibility of raptor electrocution. Transmission lines require large spacing between conductors to prevent flashover between phases and to prevent

[12] In its latest revisions to the eagle permit program, USFWS indicated that bald eagles are generally unconcerned with activities beyond 660 feet from the nest, and disturbance is unlikely for activities beyond this distance. 89 Fed. Reg. 9920, 9937 (Feb. 12, 2024).

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) and repeated in *Eagle Risk Framework: A Practical Approach for Power Lines* (APLIC 2018). 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 recommends 60 inches of spacing between energized portions of transmission lines or grounds (APLIC 2006 and 2018).

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 and 2018). 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, bird flight diverters will be installed on overhead shield wires along the entire length of the project (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 near lakes or in riparian habitats used by the species for hunting and nesting.

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), APLIC (2012), and APLIC (2018), 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, two known nests occurs within 0.5 mile of the R-Project centerline (South Platte River and Middle Loup River), and two nests occur within 0.5 mile of proposed access routes (Birdwood Creek and North Loup River). 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 351 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).

4.3.3 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 Bald Eagle Survey Protocol (NGPC and USFWS 2020). 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 and USFWS 2020). 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.
- Bird flight diverters will be installed on the overhead shield wire along the entire length of the project 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.

4.4 Golden Eagle

4.4.1 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 2015 and 2022), 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. As noted in Section 1.1, approximately 13 acres of grassland habitat that may have supported foraging golden eagles were cleared for the Thedford Substation when ITP #TE72710C-0 was in effect. It is unlikely the removal of 13 acres of grassland impacted golden eagles in light of the ample foraging habitat in the area and the low likelihood of the species' presence in this portion of its range. The extent of permanent access is not known at this time, but it is anticipated to be minimal and will be no more than 26 acres, and permanent structure foundations will affect approximately one acre. This permanent disturbance is also likely to have negligible, if any, impacts on golden eagles.

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.

4.4.2 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 and 2018) (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 entirety of the transmission line, including at river crossings and wetlands crossings (see Section 4.1.2) that attract waterfowl, will reduce the risk of collision for golden eagle. 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 2015) and the project's use of bird flight diverters, 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), APLIC (2012), and APLIC (2018), 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 351 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 351 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.

4.4.3 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 along the entire project 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.

4.5 Rufa Red Knot

4.5.1 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. Rufa red knot has only been observed in Nebraska 28 times over the last 60 years (Silcock and Jorgensen 2022).

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 primarily in May; 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.

4.5.2 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 entirety of the transmission line, including at river and wetland crossings (see Section 4.1.2), 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 351 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.

4.5.3 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 specialized equipment, temporary matting, or other BMPs.
- Line marking devices will be installed on the overhead shield wires along the entire length of the project according to APLIC Guidelines (2012) and NPPD construction standards.

4.6 Northern Long-eared Bat

4.6.1 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, will result in the removal of 42.1 acres of trees. Trees to be removed may provide habitat for dispersing individuals. The R-Project falls 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 serve as hibernacula occur within the counties intersected by the R-Project. NPPD will avoid tree clearing within potential northern long-eared bat habitat during the summer occupancy season (April 1 – September 30) to eliminate the potential for impacts to roosting and maternity roosting bats, in the unlikely event they occur in the areas to be cleared.

The USFWS's endangered listing (87 FR 73488) stated that habitat loss alone is not considered to be a key stressor to northern long-eared bat populations and that habitat does not appear to be limiting. The R-Project will remove an estimated 42.1 acres of trees across the entire ROW (tree-clearing estimates were based on crown coverage from LIDAR imagery; actual areas for removal may be less). Tree removal will be at river crossings and planted windrows and will not result in the removal of large, intact, unfragmented forests. The loss of potential summer roosting habitat will have little to no effect on the northern long-eared bat because there are no documented occurrences throughout the Study Area and, as the USFWS states, suitable habitat is not a limiting factor for the species.

NPPD completed the northern long-eared bat Determination Key, which concluded with a draft Consistency Letter stating that, depending on specifics of the project, incidental take of northern long-eared bat could occur. The Consistency Letter then directs the reader to the *Interim Voluntary Guidance for the Northern Long-Eared Bat: Forest Habitat Modification* (USFWS 2023), which were recently replaced by measures described in the *Northern Long-eared Bat and Tricolored Bat Voluntary Environmental Review Process for Development Projects* (USFWS 2024a). According to the Determination Key and subsequent guidance documents, take of northern long-eared bat is not reasonably certain to occur if vegetation management activities are avoided in close proximity to bats during the pup season. While the voluntary guidance documents associated with the Determination Key recommend avoidance of tree clearing during the pup season, the USFWS Nebraska Ecological Services Field Office has produced additional guidance that recommends avoidance or removal of suitable roosting habitat during the summer occupancy period (USFWS 2024b). NPPD will restrict all tree clearing to outside the summer occupancy period of northern long-eared bat (April 1 – September 30). The Determination Key and interim guidance support the conclusion that the R-Project is not likely to impact the northern long-eared bat given the small amount of suitable habitat in the R-Project area, the avoidance of tree clearing in the pup season, the absence of documented hibernacula given the sandy nature of the Sandhills, and the lack of previously documented occurrences.

4.6.2 Potential Effects from Operations and Maintenance

Vegetation management of trees in the ROW would not impact suitable northern long-eared bat habitat because vegetation within the ROW would not be allowed to regrow to a height or diameter that would provide suitable habitat. Any removal of danger trees that encroach on the ROW would be completed outside the summer occupancy period (April 1 – September 30). Such tree removal would not affect northern long-eared bat.

Emergency repairs may temporarily disturb an estimated maximum of 351 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 would not be allowed to regrow.

4.6.3 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 potential northern long-eared bat habitat during the summer occupancy period (April 1 – September 30).
- Routine operation and maintenance activities will be scheduled during the ABB inactive season, which would coincide with when tricolored bats are in winter hibernation.
- Potential roost trees would not be removed by routine operation and maintenance activities during the summer occupancy period (April 1 – September 30)

4.7 Tricolored Bat

4.7.1 Potential Effects from Construction

The tricolored bat occurs primarily in forested habitats in Nebraska, with most documented occurrences in the southeastern part of the state and scattered observations in central and western Nebraska (White et al. 2016; USFWS 2021b). The same Determination Key examined for the northern long-eared bat is also applicable to the tricolored bat. Completion of the Determination Key resulted in a No Effect determination for tricolored bat. The R-Project ROW lacks large continuous forested habitats but does include forested riparian areas, small, isolated woodlots, and shelterbelts that may provide summer roosting, maternity roosting, and foraging habitat for tricolored bat. Limited tree removal, including planted shelterbelts and riparian areas, will result in the removal of approximately 42.1 acres of trees. Trees to be removed may provide summer roost, maternity roost, and foraging habitat for tricolored bats. The R-Project does not cross any documented occurrences of tricolored bats, and the likelihood of maternity roost trees is low. No underground caves or mines that may serve as hibernacula occur within the counties intersected by the R-Project. NPPD will avoid tree clearing within the transmission line ROW in potential tricolored bat habitat during the summer occupancy period (April 1 – September 30) to eliminate the potential for impacts to maternity roosts, in the event they occur in the areas to be cleared (USFWS 2024b).

The USFWS's proposed listing decision stated that the current impacts of habitat loss to tricolored bat are low because the severity of population-level declines from habitat loss is slight. Given the results of the Determination Key, small amount of suitable habitat in the R-Project area, and the avoidance of tree clearing in the pup season, it is unlikely that the project will have an effect on the tricolored bat.

4.7.2 Potential Effects from Operations and Maintenance

Vegetation management of trees in the ROW would not impact suitable tricolored bat habitat because vegetation within the ROW would not be allowed to regrow to a height or diameter that would provide suitable habitat. Any removal of danger trees that encroach on the ROW would be completed outside the summer occupancy period (April 1 – September 30). Such tree removal would not affect the tricolored bat.

Emergency repairs may temporarily disturb an estimated maximum of 351 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 tricolored bat habitat because trees are cleared from the ROW during construction and would not be allowed to regrow.

4.7.3 Avoidance and Minimization Measures Proposed for Tricolored Bat

The avoidance and minimization measures proposed for the tricolored bat are:

- No tree clearing in potential tricolored bat habitat during the summer occupancy period (April 1 – September 30).
- Routine operation and maintenance activities will be scheduled during the ABB inactive season, which would coincide with when tricolored bats are in winter hibernation.
- Potential roost trees would not be removed by routine operation and maintenance activities during the summer occupancy period (April 1 – September 30)

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 0.01% of the total wetlands available in the Study Area identified by NWI (115,224 acres; USFWS 2022d).

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 construction activities would not occur within a one-meter radius of the nest, until either the nest fails due to natural causes or the hatchlings emerge and disperse. Under the current ESA-listing status of Blanding's turtle (under review), individual Blanding's turtles would be identified and removed from disturbance areas immediately prior to construction activity. 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 direct injury or mortality to 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 Administrative Code Title 163, Chapter 4, Section 010.04 stipulates that it is unlawful to release any reptile or amphibian that has been transported from one location to another over a distance of 100 yards without authorization from NGPC. If suitable adjacent habitat is not available within 100 yards of the disturbed area, NPPD will notify USFWS and obtain the appropriate authorization from NGPC. If the Blanding's turtle becomes listed under the ESA prior to construction, construction monitors would not capture and remove Blanding's turtles from disturbance areas. Individuals would not be disturbed, and construction activities would halt until the turtle has moved out of the path of construction, or NPPD will follow commitments under Changed Circumstances (Section 7.2) in coordinating with the USFWS on development of take avoidance measures or applying for incidental take permit coverage for the species.

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. 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 (USFWS 2009c). This will not be the case for Blanding's turtle since water sources (rivers and wetlands) are abundant in the R-Project Area, and individual Blanding's turtles will be relocated to suitable aquatic habitat.

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 likely not begin until 30 years after the transmission line is energized. Routine operation and maintenance activities are planned to 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 351 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.
- If the species is not listed under the ESA at the time of construction, trained construction monitors working under a NGPC Scientific and Education Take Permit 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, Sections 010.02 and 010.04.
- Construction monitors clearing ahead of equipment will use a Utility Task Vehicle 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.
- Routine operation and maintenance activities will be scheduled during the ABB inactive season, which would coincide with the Blanding's turtle's non-active season.

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 351 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 (POWER 2015a).

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.

Temporary disturbance areas have been sited to avoid blowouts where possible based on engineering constraints such as structure span distances and access to those structures. 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 during the flowering period 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 where possible based on engineering constraints, 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 351 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:

- Disturbance has been sited to avoid blowouts where possible based on engineering constraints such as structure span distances and access to those structures.
- 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 (POWER 2015b). Potentially suitable habitat included in the desktop and field verification was 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, 2018, and 2019 (optimal flowering period) (POWER 2015b, 2016, 2017, 2018, 2019). Surveys were conducted on foot or Utility Task Vehicle in potentially suitable orchid habitat identified by the desktop habitat assessment along the R-Project ROW and off-ROW disturbance areas. Western prairie fringed orchids were found in 2015 at two locations 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, 2018, or 2019, but known populations were re-visited and verified to be extant (POWER 2017, 2018, 2019).

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 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 additional occupied habitat is identified during preconstruction survey, the R-Project design would be adjusted to avoid impacts. 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 320 acres of unoccupied western prairie fringed orchid habitat that was field-verified as suitable during the surveys. 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 have been sited to avoid field-verified suitable habitat where possible based on engineering constraints such as structure span distances and access to those structures. 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 unoccupied 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

No ground disturbance will occur in field-verified suitable habitat from routine inspections. 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 351 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.
- Routine operation and maintenance activities will be scheduled during the ABB inactive season, which would coincide with when western prairie-fringed orchids are dormant and not actively growing.

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. These disturbance values were used to estimate potential effects and approximate take of ABB. As noted in Section 1.0, NPPD completed activities in 2019 and 2020 under ITP #TE27210C-0. Covered Activities completed in 2019 and 2020 are provided in Table 5-2.

When the ABB was downlisted to threatened in October 2020 (85 FR 65241), the USFWS also published a final 4(d) rule describing prohibited and non-prohibited take of the species. Under the final 4(d) rule, in the Northern Plains Analysis Area, incidental take from ranching and grazing activities is allowed; however, other activities that would result in take from soil disturbance within the ABB range would still be required to seek incidental take authorization from the USFWS under Section 7 or Section 10 of the ESA. (50 C.F.R. § 17.47(d)). Soil disturbance is defined under the 4(d) rule as "movement or alteration of soil. Soil disturbance includes actions such as grading, filling, soil excavating, or topsoil stripping. Soil disturbance also includes non-physical alterations such as chemical treatment." (50 C.F.R. § 17.47(d)(3)(v)).

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	387	--
Permanent Access[1]	--	19
ROW Preparation		
ROW Tree Clearing[2]	22	--
Temporary Work Areas		
Fly Yards/Assembly Areas	221	--
Construction Yards/Staging Areas	38.5	--
Pulling and Tensioning Sites	251	--
Temporary Structure Work Areas		
Lattice Tower	103	--
Steel Monopole	173	--
Structure Foundation Excavation/Installation		
Helical piers – lattice tower	--	0.61
Standard foundation – steel monopole	--	0.25
Construction Contingency		
Construction Contingency	40	--
Distribution Power Line Relocation		
Distribution power line relocation	13.6	0.02
Well Relocation		
Well relocation	0.4	--
Construction Subtotal	1,249.5	19.86
OPERATION AND MAINTENANCE		
Emergency Repairs[3]	250	--
TOTAL	1,499.5	19.86

[1]Temporary access routes 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 permanent access and represent a permanent impact. No more than 19 acres of permanent access will be left in place in the Permit Area 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 construction subtotal in the Permit Area. Disturbed areas would be restored if conditions require restoration efforts.

TABLE 5-2 TEMPORARY AND PERMANENT DISTURBANCE COMPLETED IN 2019 AND 2020

COVERED ACTIVITY	ESTIMATED TEMPORARY DISTURBANCE (ACRES)	ESTIMATED PERMANENT DISTURBANCE (ACRES)
Access		
Temporary Access	3.44[1]	--
ROW Preparation		
ROW Tree Clearing	6.9	--
Temporary Work Areas		
Fly Yards/Assembly Areas	4.73	--
Construction Yards/Staging Areas	11.5	--
Distribution Power Line Relocation		
Distribution power line relocation	0.2	0.07
Thedford Substation		
Thedford Substation Construction	--	13
TOTAL	26.77	13.07

[1]0.25 acre of temporary access was disturbed in 2019. The remaining disturbances occurred in 2020.

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 by direct habitat disturbance.
- Fragmentation of habitat.
- Degradation of habitat from lighting.
- Temporary disruption of behavior.

Crushing and Desiccation of Individuals by Direct Habitat Disturbance

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. Direct habitat disturbance, including the 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 direct habitat disturbance 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 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 because the area would not provide suitable vegetative cover until restoration activities are complete. 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, such as grading or excavation, 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, and the areas where construction may occur during the active season have not been fully identified. 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. Construction is estimated to last up to 24 months, and ABB are only active above ground from May through September. Because a large portion of construction activities will occur outside the ABB active season, this assumption that all Covered Activities will result in take 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, (3) the use of helical pier foundations for lattice structures, (4) minimizing structure work areas for lattice structures, (5) helicopter construction of lattice structures, and (6) siting disturbance areas on areas unsuitable for ABB use to the maximum extent practicable. Helical pier foundations for lattice structures require fewer and smaller pieces of construction equipment and a smaller temporary structure work area 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.

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 1,249.5 acres during construction (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 Analysis Area (Table 5-3).

TABLE 5-3 TEMPORARY DISTURBANCE COMPARED TO AVAILABLE ABB HABITAT

GEOGRAPHIC AREA	ACRES TEMPORARY DISTURBANCE	ACRES OF AVAILABLE ABB HABITAT	% DISTURBED
Permit Area	1,249.5	671,423	0.18%
Sandhills Analysis Area[1]	1,249.5	8,633,685	0.014%

[1] Favorable and Conditional Habitat as identified in the SSA (USFWS 2019a).

All acres of temporary disturbance that were 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 for use in breeding, feeding, or sheltering in the duration between the completion of construction activities and successful restoration of vegetation, which can be three to five years. However, this temporary impact will be minor and will not result in a loss of ABB production given the abundance of adjacent habitat (Table 5-3).

Portions of the Permit Area containing trees are mostly forested riparian areas and planted windrows and shelterbelts. These habitats may support ABB. Approximately 6.9 acres trees were cleared within the Permit Area under ITP #TE72710C-0. Remaining ROW clearing within the Permit Area will result in the removal of approximately 22 additional acres of trees. Shelterbelts are an important landscape feature to landowners because they provide shelter and a windbreak for calving. The number of acres removed was and will be reduced where 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. 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. The need for permanent access roads is dependent on landowner requests and requirements for operation and maintenance of the line. However, disturbance for permanent access will not exceed 19 acres within the Permit Area. Permanent access roads will not create any additional disturbance beyond that incorporated under temporary access. 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 2019a). The SSA for ABB ties fragmentation to the conversion from habitat to developed and agricultural lands (USFWS 2019a). The ABB Recovery Plan relates habitat fragmentation to an increase in edges between two habitat types: one being suitable habitat (e.g., grassland) and the other being unsuitable (e.g., agricultural and developed areas) (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 permanent access. 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 roadsides 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 2018a), during which construction activities will be completed during the daytime to the maximum extent possible. Lighting installed at the Thedford Substation would be shielded and low temperature so as to minimize light pollution beyond the substation footprint, thus avoiding potential impacts to ABB. Nighttime work is not anticipated during construction of the R-Project. However, if nighttime construction becomes necessary, construction crews would use downshielded and low-temperature lighting to avoid attracting ABB to the construction area. While, as an insect, ABB may be attracted to any light source, the use of downshielded and low-temperature lighting would reduce or eliminate any potential negative impacts to the species. 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. 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 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 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 250 acres 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. Some repairs may require heavy equipment that would disturb ABB habitat.

Potential effects from 250 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 during the active season. 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 reasonably certain to occur, take is difficult to precisely quantify as numbers of ABB individuals because:

- 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 2014b).
- ABB are mobile.
- ABB abundance can vary substantially in response to variable climatic conditions across years (e.g., due to drought or extreme wet years) or days (e.g., warmer nights versus cooler nights).
- ABB presence within the footprint of soil disturbance is uncertain because the effective area for detection using traps (~500 acres) is larger than the patch size of the disturbed area.

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 (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 2021, including data collected in support of the R-Project from 2014 through 2021. 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 assumption is consistent with the SSA (USFWS 2019a), which characterized the vast majority of the habitat within the Permit Area as favorable (land-cover types with suitable soils and vegetation to support all or critical portions of the ABB life cycle) or conditional (land-cover types that can be favorable under some conditions and unsuitable under others). Based on this assumption, NPPD used only results from the historic sampling data (1996-2014) collected from outside the Permit Area and R-Project-specific surveys conducted by NPPD (2015-2021) where the traps were placed in high-quality habitat. Traps placed in high-quality habitat were defined as any trap that captured at least six ABB over a five-night trap period for an average of 1.2 ABB per trap night. ABB populations fluctuate annually based on climate factors including precipitation and temperature (USFWS 2019a). Incorporating numerous years of historic and current 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.

To ensure that the data used to calculate the take estimate only represent high-quality habitat, ABB survey data supplied by USFWS and by NPPD were screened to include only those traps with at least six unmarked beetles captured across a standardized five-night sampling effort. All survey points with less than a five-night sampling period were removed, surveys with a five-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 395 ABB survey points. This data set is likely composed almost exclusively of ABB surveys conducted within high-quality habitats in the Sandhills.

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 2019a). An additional screening criterion was also included that only considered surveys completed in August when ABB populations are at their highest due to the presence both teneral and senescent individuals (USFWS 2016c). This reduced the sample size from 395 survey points to 263. Because of the annual population fluctuation and the non-parametric distribution of ABB capture rates, the take estimate applies 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 0.116 ABB/acre. Note that the prior version of this HCP employed this same method to estimate the 99th percentile density; however, the dataset only included 167 survey points from survey data provided by USFWS, which concluded with the 2016 survey season. This resulted in a density of 0.13 ABB/acre in the prior version of this HCP. NPPD has completed extensive ABB survey efforts from 2016 through 2022, which increased the incorporated dataset to 263 survey points as described above. This inclusion of additional survey points that meet the screening criteria resulted in a new 99th percentile density of 0.116 ABB/acre.

Trapping completed within the Permit Area by NPPD from 2016 through 2020 has confirmed that ABB densities in the Permit Area rarely approach 0.116 ABB/acre for any single area, as would be expected when using the 99th percentile. A density of 0.116 ABB/acre was not documented on any one survey transect from 2016 through 2020 and would be unlikely throughout the Permit Area during completion of Covered Activities. The highest average density for any of the NPPD-surveyed transects occurred in 2016 on Highway 7, where the estimated ABB density was 0.046 ABB/acre. The highest density recorded in any one trap from 2016 through 2020 was in Trap #4 on the Highway 7 transect in 2016. This trap captured 41 individual ABB throughout the five-night survey, resulting in a density estimate of 0.091 ABB/acre. Table 5-4 presents the ABB density estimate for each transect surveyed in support of the R-Project from 2016 through 2020.[13] These surveys are more completely described in Section 3.2.1. NPPD and the USFWS realize that the method described above to estimate ABB density per acre is conservative, but such conservatism is appropriate when estimating impacts to listed species given the cyclical nature of ABB populations.

TABLE 5-4 R-PROJECT AMERICAN BURYING BEETLE DENSITY ESTIMATES: 2016 - 2020

SURVEY AREA	ESTIMATED ABB/ACRE DENSITY				
	2016	2017	2018	2019	2020
Hwy 83	0.0	0.0	0.0	0.0	0.0
Purdum	0.0004	0.0006	0.0	0.0002	0.0
Brewster	0.0283	0.0092	0.0142	0.0070	0.0116
Hwy 7	0.0460	0.0155	0.0085	0.0038	0.0038
Calamus River	0.0166	0.0017	0.0095	0.0035	0.0033
Gracie Creek Rd	0.0064	0.0051	0.0073	0.0044	0.0060
Hwy 11	0.0315	0.0164	0.0066	0.0028	0.0031
846 Rd	0.0155	0.0202	0.0037	0.0026	0.0071

[13] As noted in Section 3.2.1, ABB surveys conducted in 2021 focused on different areas than the surveys conducted from 2016 to 2020.

5.2.2 ABB Take Calculation

The ABB take calculation is based on the acres of direct habitat disturbance and the highest 1% of ABB density based on previous trapping efforts. These effects are captured under the Crushing and Desiccation of Individuals by Direct Habitat Disturbance subheading in Section 5.1. Other potential effects described in Section 5.1, including fragmentation of habitat, temporary disruption of behavior, and degradation of habitat from lighting, may impact ABB but would not do so in such a way that the impacts would rise to the level of take.

Construction of the R-Project would result in the temporary disturbance of approximately 1,249 acres of potential ABB habitat within the Permit Area. The USFWS's Species Status Assessment (USFWS 2019a) identified approximately 8.6 million acres of potential ABB habitat in the Sandhills. The entire Permit Area, recognized as the area where take may occur, is 671,423 acres. Jorgensen et al. (2014) states that areas with a probability of occurrence of 0.6 and higher are areas where ABB are likely to occur. The Permit Area includes 503,963 acres with a probability of occurrence greater than 0.6. Considering these large acreages, the amount of available habitat is not a limiting factor in the affected ABB populations. ABB must fly to find food, a mate, and a suitable carcass on soils conducive to burying and have been documented moving as far as 18 miles in a single night (USFWS 2019a). Given the amount of available habitat, the temporary loss of 1,249 acres would not significantly impair the ability of an individual ABB to breed, feed, or shelter until those areas are restored.

The prevalence of available habitat in the Permit Area, coupled with the movement capabilities of individual ABB, supports the conclusion that the temporary removal of habitat, habitat fragmentation, temporary disruption of behaviors, and degradation of habitat from lighting would not result in take. This conclusion is consistent with the USFWS's April 26, 2018 guidance on the trigger for an incidental take permit based on habitat modification. That guidance recognizes that, for take to occur from habitat modification, the modification of habitat (1) must be significant, (2) must significantly impair an essential behavior pattern of a listed species, and (3) must result in actual killing or injury of wildlife.

Covered Activities associated with construction will temporarily disturb an estimated 1,249.5 acres and will permanently disturb an additional 0.86 acre within the Permit Area. The R-Project would also include up to 19 acres of permanent disturbance from permanent access in the Permit Area; however, those acres would be a subset of temporary access and thus would not create additional disturbance or result in additional take.[14] Covered Activities associated with emergency repairs will temporarily disturb an estimated 250 acres within the Permit Area (Table 5-5). All of the acres within the Permit Area are assumed to be ABB habitat that supports the highest 1% of ABB density. When multiplied by 0.116 ABB/acre, Covered Activities associated with construction of the R-Project will account for an estimated take of 146 ABB. Covered activities associated with emergency repairs will account for an estimated take of 29 ABB during operation and maintenance of the R-Project. Total ABB take is 175 from the crushing and desiccation of individuals by direct habitat disturbance during construction and emergency repair of the R-Project over the 50-year permit duration.

As noted above, temporary access routes 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 permanent access and represent a permanent impact. No more than 19 acres of temporary access would be left in place following the completion of construction. Permanent access roads would not create any additional disturbance beyond that incorporated under temporary access. Permanent access roads would be used during emergency repair situations to the greatest extent feasible given the site-specific situation.

[14] Note, however, that the 19.86 acres of permanent disturbance are subject to a different mitigation ratio than the acres of temporary disturbance. See Section 6.2.2.

ABB larvae and eggs may be present in disturbance areas during the ABB breeding season (late June through August). Brood chambers typically contain 12 to 18 larvae and two adult ABB (USFWS 2019a). 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 0.116 ABB per acre was derived from survey efforts that occurred after the ABB breeding season and represents all ABB larvae that successfully emerged.

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

COVERED ACTIVITY	ESTIMATED DISTURBANCE (ACRES)	ESTIMATED ABB DENSITY PER ACRE	ABB TAKE
CONSTRUCTION – Temporary and Permanent			
Access			
Temporary Access[1]	387	0.116	45
ROW Preparation			
ROW Tree Clearing[2]	22	0.116	3
Temporary Work Areas			
Fly Yards/Assembly Areas	221	0.116	26
Construction Yards/Staging Areas	38.5	0.116	4
Pulling and Tensioning Sites	251	0.116	29
Temporary Structure Work Areas			
Lattice Tower	103	0.116	12
Steel Monopole	173	0.116	20
Construction Contingency			
Construction Contingency	40	0.116	5
Distribution Power Line Relocation			
Distribution Power Line Relocation	13.6	0.116	2
Well Relocation			
Well Relocation	0.4	0.116	0.052
Permanent Structure Foundations			
Lattice Tower	0.61	0.116	0.079
Steel Monopole	0.25	0.116	0.032
Construction Subtotal – Temporary and Permanent	1,250	--	146
OPERATION AND MAINTENANCE			
Emergency Repairs[3]	250	0.116	29
TOTAL	1,497	--	175

[1]Temporary access routes 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 permanent access and represent a permanent impact; however, no additional habitat would be disturbed, and no additional take would occur.
[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.

As noted in Section 1.1 and Table 5-2, NPPD completed certain construction activities on the R-Project when ITP #TE72710C-0 was in effect. Activities completed during that time that could potentially have had an impact on ABB include grading for the Thedford Substation; temporary disturbance of construction yards/staging areas, fly yards, and access; tree clearing; and distribution power-line relocations. Using the compliance monitoring methods outlined in Appendix H, these activities would have resulted in the estimated take of 0.23 ABB, which demonstrates that it is highly unlikely that any take of ABB occurred when ITP #TE72710C-0 was in effect.

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 incorporated to develop the data set 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 0.03 ABB/acre based on the same ABB survey data used to calculate take. 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 (0.116 ABB/acre) to a population size estimated from the median density (0.03 ABB/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 1.2 ABB for each trap night. The median density of 0.03 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.

Jurzenski et al. (2014) completed a model to predict the probability of occurrence for ABB throughout the Sandhills. This model was later updated and improved in Jorgensen et al. (2014). Jorgensen et al. (2014) recommends that ABB be considered 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 0.03 ABB/acre, it is estimated that 15,118 ABB may be present within the Permit Area in a year with a median ABB population. This estimate of 15,118 ABB falls within the Permit Area population estimates completed using mark/recapture calculations (see discussion below and Table 5-6).

The estimated take of 175 beetles over the life of the R-Project represents 1.1% of the estimated median ABB population occurring at any given time within the Permit Area. ABB populations are highly variable from year to year and area to area (USFWS 2019a). For instance, estimated ABB populations in the surveyed area alone (i.e., the total area surveyed as represented by a 0.5-mile trap radius for all traps) ranged from 1,017 in 2018, to 343 in 2019, and back up to 842 in 2020. Estimated ABB populations in the Permit Area ranged from 13,103 in 2018, 3,939 in 2019, and back up to 9,266 in 2020. Accordingly, the take of 175 ABB throughout the Permit Area over the 21- to 24-month construction period would not be discernable because the annual fluctuations in populations are much larger. Any gain or loss in annual population estimates could not be specifically attributed to take from the R-Project when such wide annual population fluctuations are considered.

This comparison is artificially inflated for the purposes of the individual take comparison by using a higher density to estimate take than is used to estimate the population. A simpler comparison can be made using the acres of habitat with a probability of occurrence greater than or equal to 60% and the acres of disturbance from the R-Project. Disturbance of 1,497 acres of ABB habitat (Table 5-4) represents approximately 0.3% of the 503,963 acres with a greater than or equal to 60% probability of occurrence in the Permit Area.

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 146 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 29 ABB estimated to be taken by emergency repairs would be spread over the remaining life of the permit.

The USFWS's 2019 SSA for ABB (USFWS 2019a) identified 8,633,685 acres of the Sandhills Analysis Area as either favorable or conditional habitat. Using the simplified comparison of acres disturbed versus available acres of habitat, the disturbance of 1,497 acres of ABB habitat (Table 5-5) represents approximately 0.017% of favorable or conditional habitat available to ABB in the Sandhills Analysis Area.

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 Schnabel method for mark/recapture analysis. These surveys were completed over the same dates and same trap locations in August 2016 through 2020 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 within the Permit Area following the estimated take of ABB.

Using a mark/recapture population estimate derived from the 2016 through 2020 survey results, NPPD estimated ABB populations within the 39,500 acres surveyed each year (Table 5-6) (Schnabel 1938; Guy and Brown 2007). NPPD also estimated the ABB population within the Permit Area for each year surveyed (Table 5-6). 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 146 ABB during construction will be distributed over the Permit Area and range from 3.7% of the estimated Permit Area population in the lowest year (2019) to 0.9% of the estimated Permit Area population in the highest year (2016).

TABLE 5-6 ANNUAL ABB MARK/RECAPTURE POPULATION ESTIMATES

SURVEY YEAR	ESTIMATED ABB POPULATION – SURVEYED AREA	ESTIMATED ABB POPULATION – PERMIT AREA
2016	1,281	16,125
2017	714	9,071
2018	1,017	13,103
2019	343	3,939
2020	842	9,266

Comparison of individuals taken to the estimated annual populations and acres disturbed to acres of available habitat indicate that NPPD's take will have little impact on the population as a whole and no impact on its long-term persistence. While ABB will not have use of temporarily disturbed habitat until restoration is complete, the abundance of available habitat, coupled with the ability of ABB to travel long distances, leads to the conclusion that this temporary loss of habitat will not significantly impair ABB's breeding, feeding, or sheltering. 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: Complete Covered Activities in a manner that causes no more than the requested take of 175 ABB over the 50-year permit term.
    - Objective 1: Monitor ABB populations within the Permit Area to detect if populations rise above 0.116 ABB per acre.
- Goal 2: Maintain or restore ABB habitat within the Permit Area to minimize short-term and long-term effects to habitat in the Permit Area.
    - Objective 2a: During Project construction and operation, ensure permanent disturbance of ABB habitat does not exceed 20 acres from R-Project Covered Activities (Table 5-1).
    - Objective 2b: During Project construction, ensure temporary disturbance of ABB habitat does not exceed 1,249 acres from R-Project Covered Activities (Table 5-1).
    - Objective 2c: 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 3: Protect habitat that supports individuals of the Sandhills ABB population.
    - Objective 3a: Protect, in perpetuity, an amount of occupied ABB habitat based on mitigation ratios described in Section 6.2.2.
    - Objective 3b: Manage protected ABB habitat to ensure breeding, feeding, and sheltering needs of ABB are met, as described in Appendix F.

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.

- Consideration of ABB during route selection.

- Avoidance of sub-irrigated wet meadows and mesic grasslands.
- Use of existing roads and two-tracks for access.
- Use of temporary improvements for access.
- Siting temporary work areas in areas unsuitable for ABB use.
- Use of helical pier foundations in Sandhills.
- Helicopter construction.
- Winter construction.
- Conducting limited nighttime construction during periods when ABB are active.
- Using downshielded and low-temperature LED lighting.
- Restoration of ABB habitat.
- Worker Environmental Awareness Program.

Consideration of ABB During Route Selection

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 Jorgensen et al. (2014) and Jurzenski et al. (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). Through the application of this minimization measure, ABB densities within the footprint of project-related ground disturbance are expected to be lower than the highest-density areas identified by Jorgensen et al. (2014) and Jurzenski et al. (2014).

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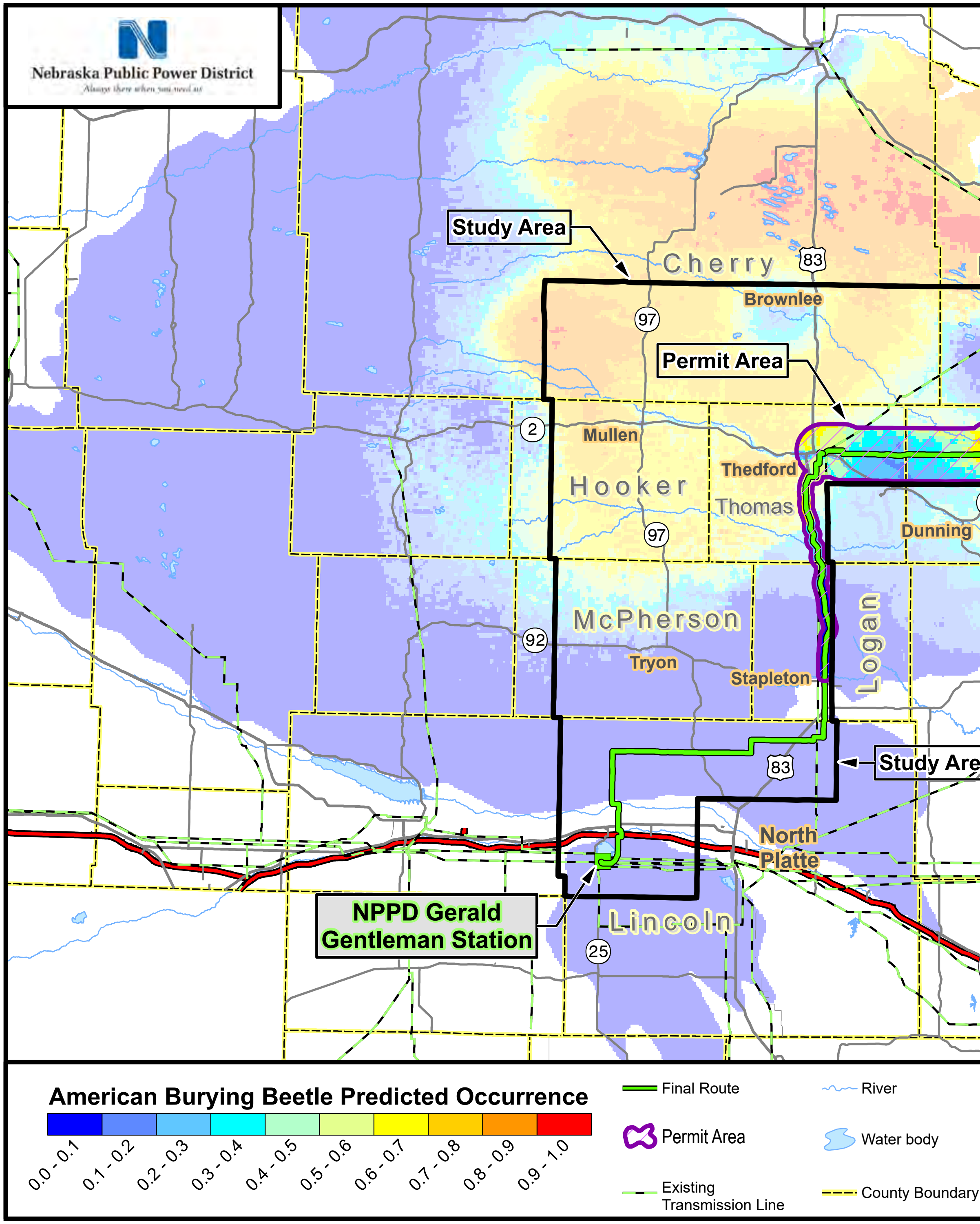

NPPD's 345kV Transmission Line Project

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 (Bedick et al. 2006; Panella 2013). Wet meadows and edges of wetlands are considered some of the most likely ABB habitat (USFWS 2014b). 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 the highest-quality 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 2010 and 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 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 (POWER 2016c). 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. Through the application of this minimization measure to construct in areas that present less-favorable ABB habitat, the number of ABB present in areas of project-related ground disturbance is expected to be lower than in wet habitats.

Use of Existing Roads for Access

To minimize ground disturbance, the R-Project will use existing roads 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. Through the application of this avoidance measure, construction of new access roads is not needed; thus, total acres of ABB habitat impacted will be reduced.

Use of Temporary Improvements for Access

Temporary access 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 387 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. Through the application of this minimization measure, impacts to ABB habitat are temporary, which reduces the permanent loss of ABB habitat.

Overland Access

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. Overland access with no improvement will be used in areas with suitable terrain to avoid soil disturbance. While overland access may result in the take of ABB via crushing, it will not require improvements (blading or fill), and vehicles will drive over vegetation rather than remove it, thus retaining ABB habitat. Overland access will use existing two-tracks where available. Through the application of this minimization measure, the acres that will be bladed or filled at the time of construction will be reduced, which minimizes the severity of impacts to 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). Through the application of this avoidance measure, construction of temporary work sites will not impact ABB habitat; thus, total acres of ABB habitat impacted will be reduced at the time of construction.

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.
Sources: USFWS 2018a, 2019a

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. Through the application of this minimization measure, temporary disturbance for structure work areas is reduced by 75% using helical piers. The reduced work areas needed for helical pier foundations will avoid impacts to approximately 254 acres of potential ABB habitat.

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 heavy equipment, such as large cranes, at lattice tower locations, reducing the need for access improvements. With the application of this minimization measure, disturbance areas will be reduced because large equipment such as cranes will not need to access each structure. Additionally, structure work areas will be reduced because the structure is assembled off-site and flown to its final location.

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). Frost depths averaged 20 to 30 centimeters in this study. 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. With the application of this minimization measure, 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.

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 areas are representative of the survey transects that routinely captured ABB from 2016 through 2020. 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, downshield, low-temperature 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. With the application of this minimization measure, fewer ABB may be attracted to nighttime work, potentially reducing impacts to individual ABB.

Downshield, Low-Temperature 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. Downshielded, low-temperature lighting will be installed in these instances to prevent attracting ABB to the substation. With the application of this minimization measure, fewer ABB may be attracted to nighttime work, potentially reducing impacts to individual ABB.

Application of Herbicides during Daytime Hours

All application of herbicide treatments for noxious weeds will be completed during the daytime. This avoidance measure 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 2b (Section 6.4). Disturbed areas will be stabilized either through use of physical methods (e.g., matting, jute blankets) or vegetative cover. To meet Biological Objective 2b, NPPD has prepared a Restoration Management Plan (Appendix E). The primary goal of restoration is to implement the proper measures to provide the best chance for disturbed areas to return to the condition they were in prior to construction, or as close as possible thereto, as demonstrated by achieving a basal cover of at least as 80% of adjacent monitoring plots. If initial restoration efforts are unsuccessful in meeting Biological Objective 2b, adaptive management described in Section 6.5.1 will be implemented to continue restoration efforts until Biological Objective 2b is met. Restoration of temporary disturbance areas will reduce long-term disturbance to ABB habitat by approximately 1,249 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.

The guide to restoration of prairies and wetlands published by Prairie Plains Resource Institute and NGPC states that restoration plantings may take three to five years to become well established. Warm-season grasses and other perennials are typically dominant in years three through five of restoration efforts (Steinauer et al. 2003). The University of Nebraska – Lincoln Extension indicates that warm-season grasses may take two or more years to establish an adequate stand for livestock forage (Anderson 2007). NPPD estimates that, for the R-Project, restoration of vegetation cover will be achieved in an average of five years after restoration actions. Five years represents 10% of the life of the Project. Please note that five years represents the estimated average to achieving restoration goals, as some areas may meet the goals sooner and others may take longer.

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 Environmental 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 in 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. Application of this avoidance and minimization measure will help ensure the other measures listed above are correctly implemented, thus ensuring acres of disturbance and take of ABB do not surpass the permitted amounts.

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 be achieved in an average of five years based on published guidance for Nebraska (Anderson 2007; Steinauer et al. 2003). This average represents 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	1,249.5	3:1	10%	374.9
Permanent impact	19.86	3:1	--	59.58
Temporary emergency repairs impact[2]	250	3:1	10%	75
TOTAL	--	--	--	509.83

[1]Five years or 10% of the Project life.
[2]250 acres represents 20% of the construction subtotal within the Permit Area.

As noted in Section 5.2.2, NPPD completed activities under ITP #TE72710C-0 in 2019 and 2020, including the foundation work on the Thedford Substation, and portions of necessary tree clearing, distribution line moves, and establishment of material delivery yards and fly yards (Table 6-3). Although NPPD believes no ABB take occurred as a result of those activities, mitigation acres for those activities have been secured by the purchased mitigation lands.

TABLE 6-3 R-PROJECT MITIGATION FOR COMPLETED DISTURBANCE

TYPE OF IMPACT	AFFECTED ACRES	MITIGATION RATIO (CONSERVED:AFFECTED)	TEMPORARY IMPACT TIMESCALE[1]	MITIGATION ACRES REQUIRED
Temporary construction impact	26.77	3:1	10%	8.03
Permanent impact	13.07	3:1	--	39.21
TOTAL	--	--	--	47.24

Based on the affected acres and mitigation ratios in Table 6-2 and Table 6-3, conserving 557.07 acres of suitable ABB habitat would mitigate the impacts of permitted take from the R-Project. NPPD has purchased 594 acres of mitigation lands 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 five 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, has developed a management plan for the mitigation parcel that addresses 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. This mitigation parcel management plan is provided in Appendix F.

To ensure restoration is successful, NPPD has established 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. 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 that NPPD fully implements avoidance, minimization, and mitigation measures described in the HCP and ITP. A Compliance Monitoring Plan is included in Appendix G. A separate plan to monitor ABB populations in the Permit Area is included in Appendix H.

Annual ABB population compliance monitoring will be conducted each August at the same 79 trap locations originally established for the August 2016 survey and surveyed continuously 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 potentially exceeds that estimated in the HCP and ITP. See Appendix H 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 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 C.F.R. §§ 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 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. NPPD will design a final Access Plan for the R-Project that delineates where construction areas will be accessed. Environmental compliance monitors will ensure that the Access Plan is followed by construction personnel.

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.

Effectiveness monitoring as described above and in the Restoration Management Plan will ensure temporarily disturbed areas are returned to ABB habitat and could be used by the species for breeding, feeding, and sheltering. The assumption of this HCP and the take estimate described in Section 5.2 is that the Permit Area currently provides suitable habitat for ABB. Therefore, when vegetation is restored to the temporary disturbance acres, they will once again provide suitable habitat. Additionally, it is assumed the restored areas will provide suitable ABB habitat because they would no longer fall in the categories of unsuitable habitat described in the current ABB survey protocol (USFWS 2018a) and in the ABB SSA (USFWS 2019a).

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 6-4.

TABLE 6-4 PERFORMANCE STANDARDS

BIOLOGICAL OBJECTIVE	PERFORMANCE STANDARD
Objective 1: Monitor ABB populations within the Permit Area to detect if populations rise above 0.116 ABB per acre.	Compliance monitoring will document the annual ABB population estimate within the Permit Area. Biological Objective 1 will be met if and when the monitored population estimates remain below 0.116 ABB per acre.
Objective 2a: During Project construction and operation, ensure permanent disturbance of ABB habitat does not exceed 20 acres from R-Project Covered Activities (Table 5-1)	Compliance monitoring will document the extent of permanent disturbance areas within ABB habitat and will quantify disturbed areas that do not present habitat for ABB. Biological Objective 2a will be met if and when permanent disturbance is less than 20 acres from R-Project Covered Activities (Table 5-1).
Objective 2b: During Project construction, ensure temporary disturbance of ABB habitat does not exceed 1,249 acres from R-Project Covered Activities (Table 5-1).	Compliance monitoring will document the extent of temporary disturbance areas within ABB habitat and will quantify disturbed areas that do not present habitat for ABB. Biological Objective 2b will be met if and when temporary disturbance from construction is less than or equal to 1,249 acres (Table 5-1).

BIOLOGICAL OBJECTIVE	PERFORMANCE STANDARD
Objective 2c: Within five years post-construction, establish native, non-invasive 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 2c 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, invasive, 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 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 3a: Protect, in perpetuity, an amount of occupied ABB habitat based on mitigation ratios described in Section 6.2.2.	Biological Objective 3a will be met when NPPD has established conservation lands providing occupied ABB habitat equal to the mitigation ratios described in Section 6.2.2.
Objective 3b: Manage protected ABB habitat to ensure breeding, feeding, and sheltering needs of ABB are met, as described in Appendix F.	Biological Objective 3b will be met when NPPD manages the established conservation lands to continually support ABB populations as described in Appendix F.

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

NPPD will apply adaptive management at any time as necessary to establish the 80% coverage objective described in Table 6-4. The need for restoration adaptive management will be determined based on results of restoration monitoring described in Section 6.3.2 and in the Restoration Management Plan. 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 6-4 within five years if the Sandhills experience prolonged drought following restoration efforts. Restoration adaptive management may occur at any time following the initial restoration efforts based on the results of restoration monitoring.
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 results 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 have been incorporated into the management plan for the mitigation property secured by NPPD. Adaptive management of mitigation property incorporates the four adaptive management steps identified above. 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 are included in Appendix F.

6.6 Reporting

By March 31 of each year that the ITP is in effect, NPPD will submit an annual report to the USFWS and NGPC that addresses the previous calendar year. Annual reports will include:

- Brief summary or list of Covered Activities accomplished during the reporting year, including construction activities and emergency repairs.
- Temporary and permanent construction disturbance impacts (i.e., number of acres disturbed by Covered Activities) incurred that year.
    - If Compliance Monitoring (Section 6.3.1) indicates that total acres of temporary or permanent disturbance described in Table 5-5 may be exceeded, USFWS and NGPC will be notified immediately.
- 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.
- 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 permit 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 C.F.R. §§ 17.22(b)(5) and 17.32(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 C.F.R. § 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. The mitigation agreed to in this HCP would continue to benefit the species after a potential delisting, because the mitigation is provided 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 could choose to relinquish the ITP or to continue to implement the HCP as agreed upon. Even if it decides to relinquish the ITP, NPPD would continue restoration activities until all restoration goals are met.

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 avoidance 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. A wildfire could also occur as a result of natural or other anthropogenic causes. 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). Potential effects to ABB as a result of climate change were discussed at length in the SSA (USFWS 2019a). 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 and NGPC 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 and NGPC 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 presence within the project area but outside of the Permit Area, then NPPD will implement take-avoidance measures in those areas. If implementation of such take-avoidance areas is infeasible, NPPD will coordinate with USFWS to revise the HCP and 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 250 acres within the Permit Area, NPPD will coordinate with the USFWS and NGPC 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. NPPD has purchased 594 acres of mitigation, which is more than is required to offset anticipated disturbance. USFWS and NGPC would examine whether the excess 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 and NGPC 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 C.F.R. § 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 and NGPC 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. The USFWS and NGPC must be consulted on all proposed amendments. Amendment procedures are described below.

Administrative changes may be required to the HCP that will not require additional public notice. 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. These changes would be documented in writing between NPPD and the USFWS but would not require formal amendment application or additional public review.

Amendments that are beneficial or not significantly different from those described in this HCP; do not meaningfully increase or change impacts to the species, their habitats, and the environment beyond those analyzed in the HCP, EIS, and Biological Opinion; and do not increase the level of take beyond that authorized by the ITP would also not require additional public review. These amendments must be approved in writing by the USFWS and NPPD before they may be implemented and would become effective on the date of the joint written approval or when the amended ITP is signed. NGPC will be notified of any amendments.

An amendment that modifies the Covered Activities described in the HCP such that they may affect the impact analysis or conservation strategy of the HCP or affect other environmental resources or other aspects of the human environment in a manner not already analyzed must undergo the same formal review process as the original HCP and ITP, including appropriate NEPA analysis, a Federal Register notice, and an intra-USFWS Section 7 consultation. For example, an amendment to increase the take allowance of the ITP or to add a covered species would require further analysis and public input. These amendments may require additional or modified minimization measures, mitigation measures, or monitoring protocols or some combination thereof.

The HCP and ITP may be amended upon written notification to the 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, the documented language change in the ITP might be all that would be required.

NPPD or the USFWS may propose these amendments by providing written notice to the other party. Such notice shall satisfy the provisions of 50 C.F.R. § 13.23 as well as include a description of the proposed 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 an amendment to the HCP, the USFWS may approve or disapprove such amendment or require that the amendment undergo further public review and analysis. The USFWS will provide NPPD with a written explanation for its decision. When the USFWS proposes an 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 C.F.R. § 13.23.

If possible, the need for an 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.

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, copying NGPC, 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 C.F.R. § 13.22). The provisions of 50 C.F.R. § 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% 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 2022, the amount NPPD collected from sales and other operating revenues totaled $1,196,972,000.

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 Notices to Construct for approved projects needed within the four-year financial commitment horizon.

The R-Project, as an SPP “Notice to Construct” 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 ROW 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, responses to changed circumstances, 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.

To ensure restoration is successful, NPPD has established 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. The funds in the Escrow Account will not be disbursed if NPPD is actively implementing restoration activities including adaptive management. For a full description of the Escrow Account, see Section 6.2.2.

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 United States 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 [C.F.R.] §§ 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, bundled, 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 C.F.R. §§ 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 C.F.R. §§ 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) or because the original listing was in error (e.g., because the listed entity did not meet the statutory definition of a species).

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 Habitat Conservation Plan (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 USFWS 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 C.F.R. § 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 C.F.R. § 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.

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 C.F.R. § 1508.1(s)).

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. §§ 4321–4347).

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. ROW 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 or similar taking prohibitions for threatened wildlife species (50 C.F.R. § 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(19) of the Endangered Species Act, 16 U.S.C. § 1532(19), "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 69,000 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

December 7, 2023

NEBRASKA PUBLIC POWER DISTRICT

R-Project Transmission Line

Whooping Crane: Potentially Suitable Habitat Assessment

PROJECT NUMBER:
128143
PROJECT CONTACT:
Ben Bainbridge
EMAIL:
Ben.bainbridge@powereng.com
PHONE:
208-788-0391

POWER ENGINEERS

Whooping Crane: Potentially Suitable Habitat Assessment

PREPARED FOR: *NEBRASKA PUBLIC POWER DISTRICT*

PREPARED BY: *BEN BAINBRIDGE*
208-788-0391
BEN.BAINBRIDGE@POWERENG.COM

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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

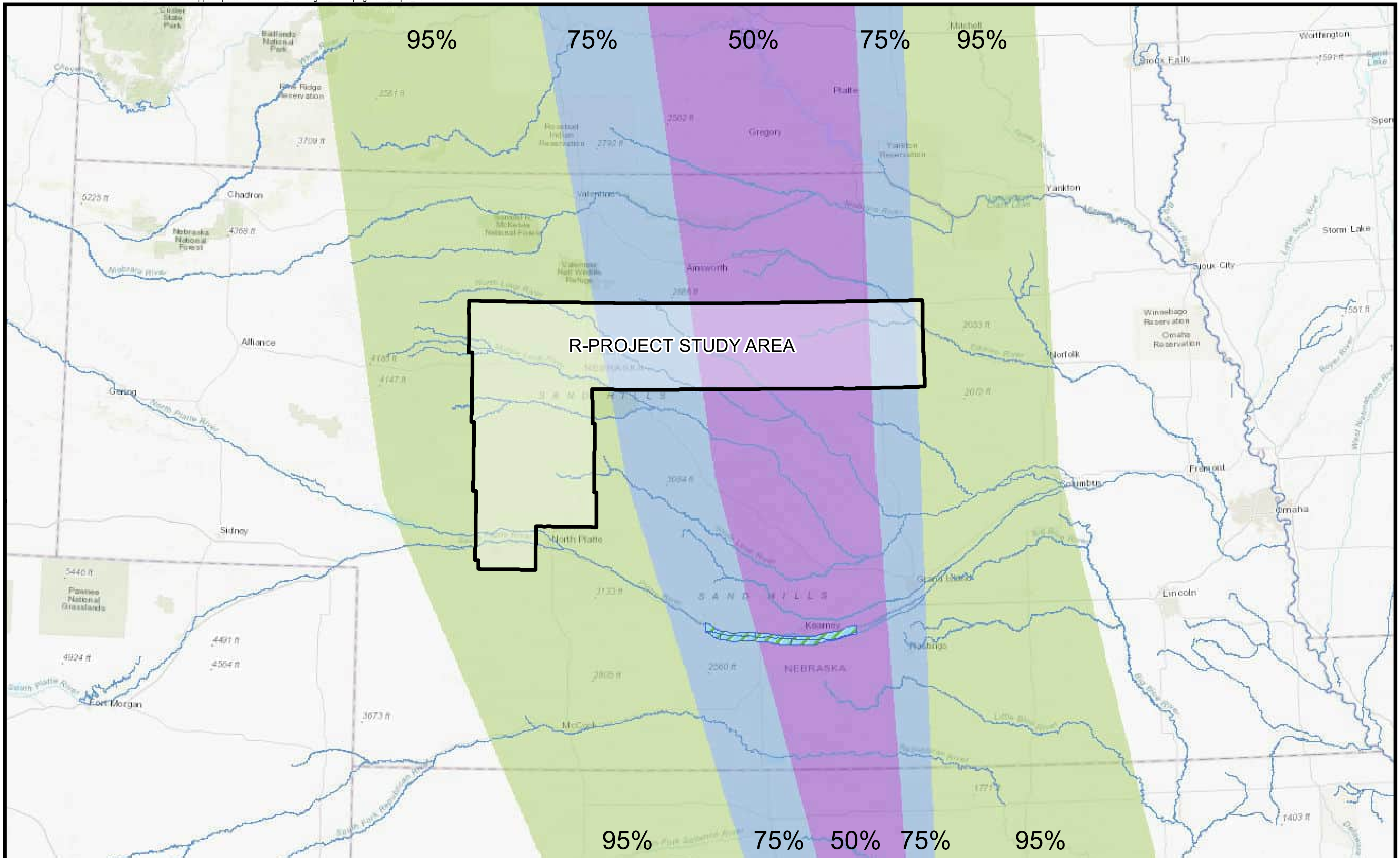
1.0 INTRODUCTION

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 226-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 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 sighting corridors were updated in 2018 using current opportunistic sightings and locations of 58 satellite-tracked whooping cranes. Figure 1 depicts where the R-Project area falls within the migration 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.

Date: 1/13/2022 Path: W:\128143_NPPD_SPP\DD\GIS\Apps\Reports\HCP\202201_HCP\Fig3-4_WhoopingCrane_95pct_20220113.mxd



% OF CONFIRMED SIGHTINGS

50% 75% 95%

Whooping Crane Designated Critical Habitat

River or Major Steam

NPPD's 345kV 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, Pearse et al. 2020).

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. Surveys completed in the 2022 - 2023 wintering period estimate the whooping crane population at 536 whooping cranes (443 to 644, 95% confidence interval) (USFWS 2023). 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; in the 2022 - 2023 survey period, it is estimated that an additional 14 whooping cranes were beyond the primary survey area (USFWS 2023).

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 226 miles long) (Figure 2). This corridor will subsequently be referred to as the "Whooping Crane Study Corridor."

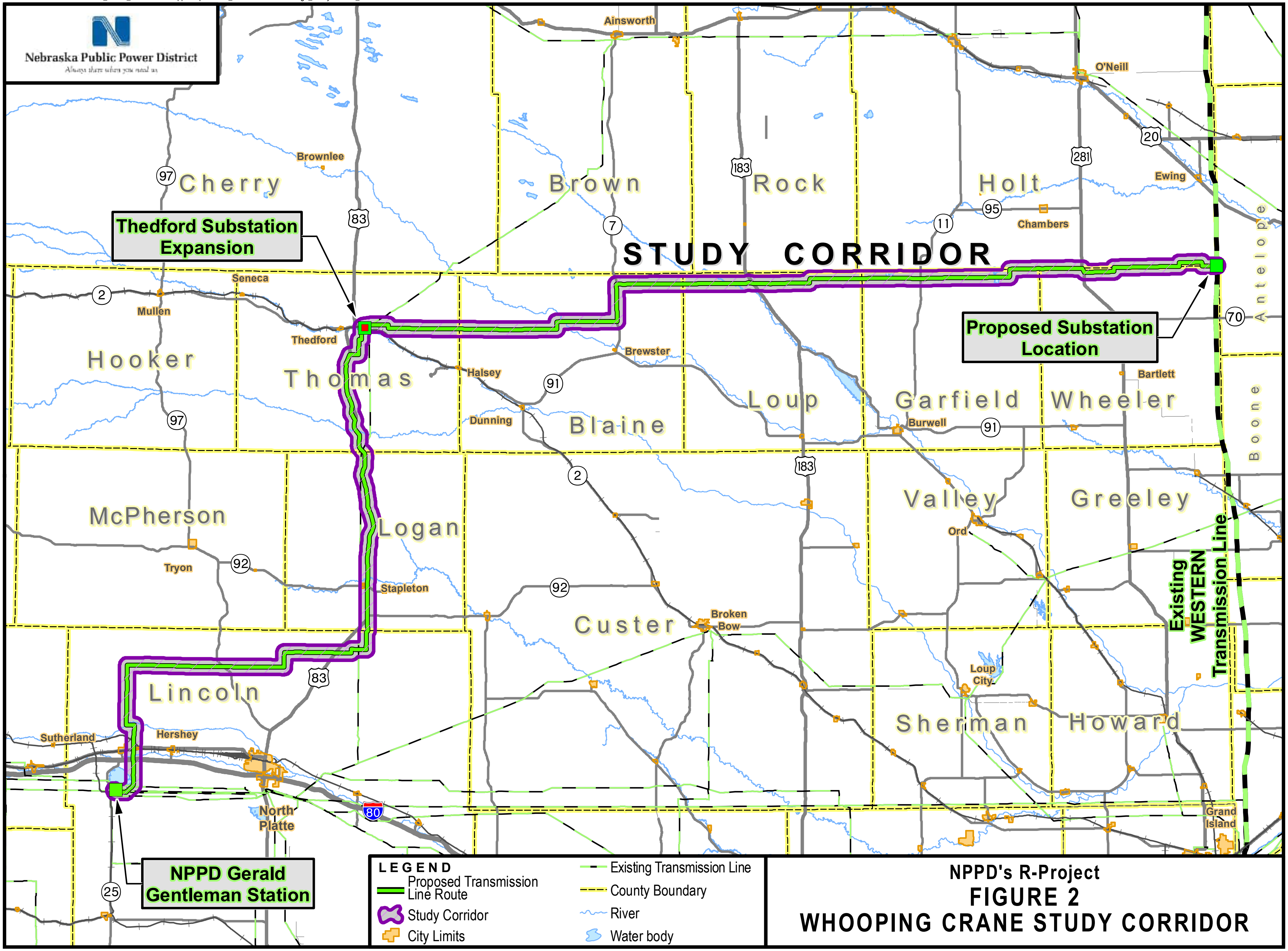
4.2 Potentially Suitable Habitat Components

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 has identified 124 miles of the R-Project in close proximity to whooping crane potentially suitable habitat. The R-Project will comply with the Region 6 Guidance by marking all portions of the transmission line within one mile of potentially suitable habitat (124 miles). However, the R-Project will go one step further in the avoidance and minimization of whooping crane impacts and mark all 226 miles of the completed transmission line. To comply with the Region 6 Guidance, NPPD will place bird flight diverters on 124 miles of existing power lines in the migration corridor.

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APPENDIX B R-PROJECT WHOOPING CRANE SURVEY PROTOCOL

Whooping Crane Fact Sheet

Whooping Cranes in Flight

Foraging Whooping Cranes

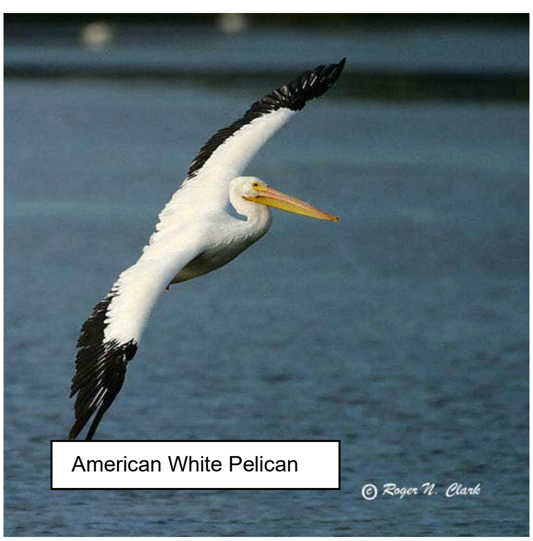
Adult with juvenile

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 the tallest bird in North America and one of the rarest birds in the world. 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. (International Recovery Plan, Whooping Crane *Grus americana*; Third revision, 2007).

Whooping Crane Survey Protocol

Whooping Cranes can be disturbed by sight (human figures, equipment within sight) and sound (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 6 – April 29
- Fall Migration – October 9 – November 15
- When construction activities are occurring, surveys should be conducted daily during these two time frames.

Time of Survey:

- Survey project each day within one hour of start of workday, with at least one survey done no later than 10 am. Record start and stop time.
- Survey area within 0.5 miles [*Not a sufficient distance if this protocol were to be used during operation of a wind farm*] 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:

- Do not start work. Contact the Commission[1] or the U.S. Fish and Wildlife Service[2] (Service) for further instruction.
- Stop work if seen at times other than the morning survey, and contact the Commission and the Service, as above .
- Work can begin or resume if birds move off and are greater than 0.5 miles from the construction/activity area; record sighting, bird departure time, and work start time on survey form. **[***This bullet may apply to construction of simple, linear, projects, but it's insufficient protection from operating wind farms.*]

[1] Nebraska Game and Parks Commission Point of Contact:
Melissa Marinovich, Assistant Division Administrator, (402) 471-5422
OR
Joel Jorgensen, Nongame Bird Program Manager, (402) 471-5440

[2] U.S. Fish and Wildlife Service, Nebraska Field Office Point of Contact:
Matt Rabbe, Fish & Wildlife Biologist, (308) 379-5562
OR
Mark Porath, Nebraska Ecological Services Project Leader, (308) 216-2077

APPENDIX C 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?)

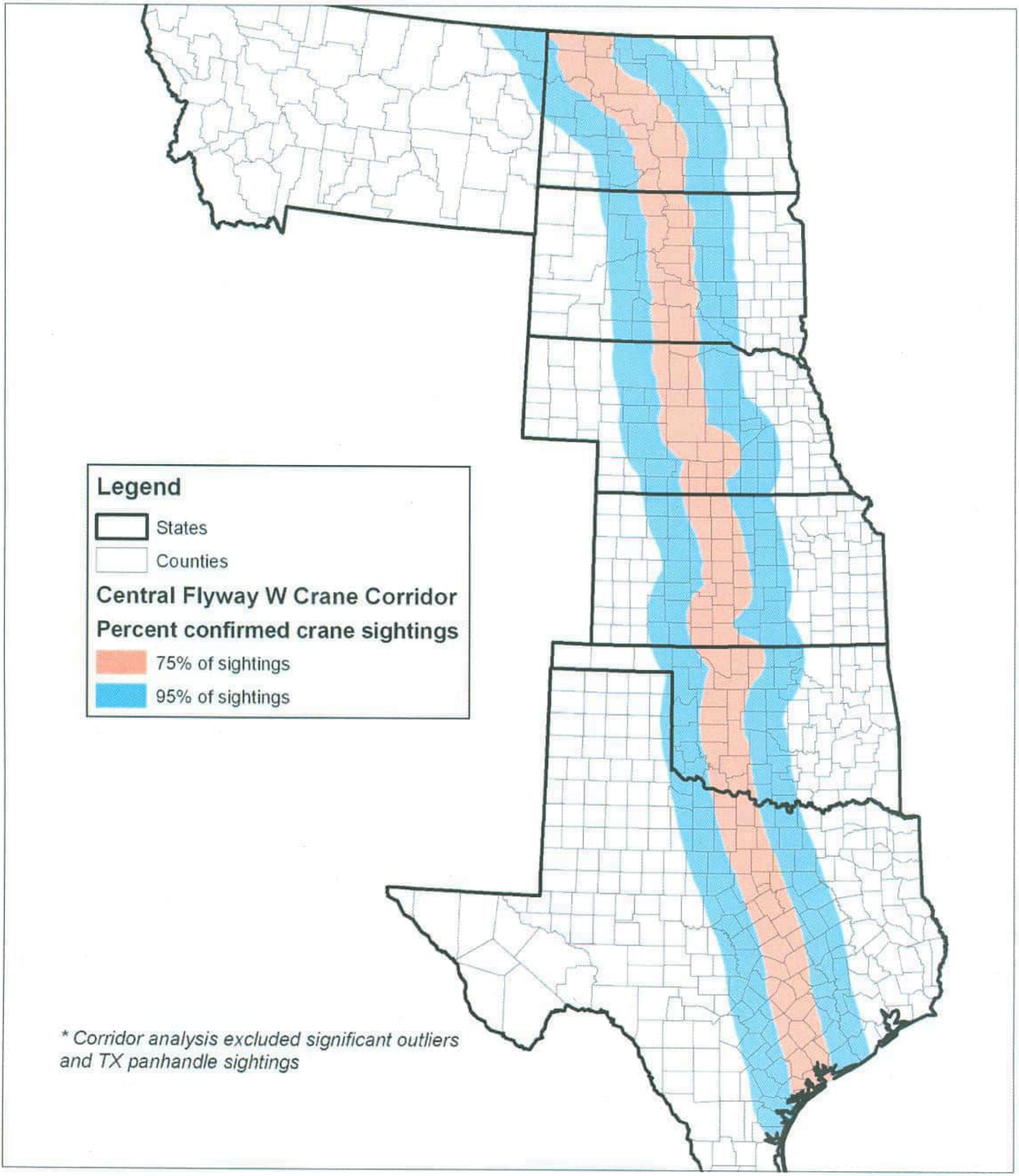
---

[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
Grand Island, NE
Current to: 2008
Basemap (Date): U.S. Counties
Meridian:
File:

Miles
0 70 140 280 420 560

N
W E
S

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APPENDIX D WHOOPING CRANE RISK ANALYSIS REVIEW

June 24, 2025

NEBRASKA PUBLIC POWER DISTRICT

R-Project

Whooping Crane Risk Analysis Review

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Whooping Crane Risk Analysis Review

PREPARED FOR: NEBRASKA PUBLIC POWER DISTRICT

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TABLE OF CONTENTS

TABLES:

ATTACHMENTS:

ACRONYMS AND ABBREVIATIONS

%	percent
APLIC	Avian Power Line Interaction Committee
DOJ	Department of Justice
HCP	Habitat Conservation Plan
kV	Kilovolt
NPPD	Nebraska Public Power District
NWR	National Wildlife Refuge
RCK	Reasonably Certain Knowledge
USFWS	United States Fish and Wildlife Service
WEST	Western EcoSystems Technology, Inc.

1.0 INTRODUCTION

As stated in the R-Project Habitat Conservation Plan (HCP), Nebraska Public Power District (NPPD) examined three separate analyses to evaluate the likelihood of a whooping crane take from collision with the R-Project. A summary of these analyses is included in Section 4.1.2 of the HCP. Expanded descriptions of the methods, variables, and assumptions applied for each analysis are provided below.

Note that the 2018 analysis (Section 2.0) was not updated for this effort and is provided as a summary of previous whooping crane risk analyses. The 2018 analysis was not updated for the current HCP because it begins with total known whooping crane mortalities reported by Stehn and Haralson-Strobel (2014), and that document has not been updated with a more recent publication that uses the same or similar methodology for counting and reporting total whooping crane mortalities.

NPPD has updated the "Reasonably Certain Knowledge" analysis originally prepared by the U.S. Fish and Wildlife Service (USFWS) (Section 3.0) with the most recent information regarding whooping crane mortalities that occurred during migration. NPPD also engaged Western EcoSystems Technology, Inc. (WEST) to develop a different approach to analyzing the whooping crane risk, which also used the most recent information available regarding whooping crane migration mortalities. A summary of all known or assumed whooping crane power-line mortalities that occurred during migration is provided in Table 1.

Previously, whooping crane mortality during migration was communicated and tracked in a number of separate publications (Stehn and Wassenich 2008; Stehn and Haralson-Strobel 2014; Stehn and Haralson-Strobel 2016; Pearse et al. 2019; Harrell and Bidwell 2020), news and government reports (U.S. Department of Justice 2013; Godfrey 2022), necropsy reports from the USFWS (USFWS 2023), and general word of mouth from avian biologists in the field. Brightwell et al (in press) worked with representatives from the USFWS and the United States Geologic Survey (USGS) to compile an accurate list of confirmed and suspected mortality of fledged whooping cranes. Such confirmed and suspected mortalities that occurred during whooping crane migration in the United States are presented in Table 1.

TABLE 1 KNOWN OR ASSUMED WHOOPING CRANE MIGRATION MORTALITY IN THE UNITED STATES

YEAR	DATE	MIGRATION PERIOD	LOCATION	AGE[1]	RECOVERED	REPORTED CAUSE OF DEATH	CLASSIFIED CAUSE OF DEATH	COMMENTS/SOURCE
KNOWN POWER-LINE COLLISIONS								
1956	May	Spring migration	Lampass City, Texas	SA	Yes	Power line	Power line (transmission)	Transmission line, broken wing tip
1965	Nov	Fall migration	Rawlins County, Kansas	SA	Yes	Power line	Power line (distribution)	Distribution (3 wire)
1967	Apr	Spring migration	Russell County, Kansas	A	Unknown	Power line	Power line (distribution)	Distribution (3 wire)
1982	Oct	Fall migration	Oglesby, Texas	A	Yes	Power line	Power line (distribution)	Distribution (4 wire, <8 m)
1984	Oct	Fall migration	Linton, North Dakota	A	Yes	Power line	Power line (unknown type)	Male with multiple fractures in wing, captured but later died Jan 1985, aspergillosis, and partial paralysis from running into captive fence during handling
1989	Oct	Fall migration	Stratton, Nebraska	SA	Yes	Power line	Power line (distribution)	Distribution (12 kv);[2] flew into 2-wire transmission line, found dead
2002	Apr	Spring migration	De Leon, Texas	A	Yes	Power line	Power line (distribution)	Distribution[2] power-line strike
2020	23 Apr	Spring migration	Mountrail County, North Dakota	Juv	Yes	Power line	Power line (transmission)	Radio telemetry, appeared to have struck a transmission line the night of 20 April 2020
KNOWN POSSIBLE POWER-LINE COLLISION								
1952	Oct	Fall migration	Sharon, Kansas	A	Yes	Unknown	Possible power line	Had dislocated wing, died in route to San Antonio Zoo
2024	Nov	Fall migration	Emmons County, North Dakota	Juv	Unknown	Unknown	Possible power line	Potential distribution power line strike[2]

YEAR	DATE	MIGRATION PERIOD	LOCATION	AGE[1]	RECOVERED	REPORTED CAUSE OF DEATH	CLASSIFIED CAUSE OF DEATH	COMMENTS/SOURCE
KNOWN NON-POWER-LINE MORTALITY								
1955	Fall	Fall migration	Sioux Falls, South Dakota	A	Unknown	Shot	Non-power line	Snow goose hunter
1982	Jun	Spring migration	Minton, South Dakota	Unknown	Yes	Aircraft	Non-power line	Feathers identified on military tanker aircraft
1991	Apr	Spring migration	Bend, Texas	A	Yes	Shot	Non-power line	Shot
2003	Nov	Fall migration	Dallas, Texas	A	Yes	Shot	Non-power line	Shot
2004	Nov	Fall migration	Quivira NWR, Kansas	SA	Yes	Shot	Non-power line	Had a leg amputated, died in captivity 9 Nov
2004	Nov	Fall migration	Quivira NWR, Kansas	SA	Yes	Shot	Non-power line	Second bird had a fractured humerus repaired, died due to complications mid-Nov
2005	Dec	Fall migration	Missouri	Juv	Yes	Bacterium	Non-power line	Bacterium obstructing the larynx
2007	7 Apr	Spring migration	North Dakota	A	Yes	Collision	Non-power line	Collision with a blunt object; sighting database states "died in flight, fell to ground"
2011	8 Nov	Fall migration	Kansas	Juv	Yes	Unknown	Non-power line	No necropsy was attempted, no direct or indirect evidence of power line collision
2012	Apr	Spring migration	Hand County, South Dakota	A	Unknown	Shot	Non-power line	Shot by a hunter near Miller, SD
2013	8 Apr	Spring migration	South Dakota	A	Yes	Predation	Non-power line	Predation
2021	Dec	Fall migration	Kiowa County, Oklahoma	A	Yes	Shot	Non-power line	Discovered by hunters near Tom Sneed Lake; died in transport to veterinary clinic
2021	Dec	Fall migration	Kiowa County, Oklahoma	A	Yes	Shot	Non-power line	Evidence discovered while investigating the location of the original injured crane
2021	Dec	Fall migration	Kiowa County, Oklahoma	A	Yes	Shot	Non-power line	Evidence discovered while investigating the location of the original injured crane

YEAR	DATE	MIGRATION PERIOD	LOCATION	AGE[1]	RECOVERED	REPORTED CAUSE OF DEATH	CLASSIFIED CAUSE OF DEATH	COMMENTS/SOURCE
2021	Dec	Fall migration	Kiowa County, Oklahoma	A	Yes	Shot	Non-power line	Evidence discovered while investigating the location of the original injured crane
2022	Apr	Spring migration	South Dakota	A	Yes	Trap	Non-power line	Bird caught in a muskrat trap.
2022	Nov	Fall migration	South Dakota	A	Yes	Infected Transmitter	Non-power line	GPS transmitter cause infection in leg. Bird died in South Dakota during fall migration.
2023	Nov	Fall migration	Howard County, Nebraska	A	Yes	Trauma	Non-power line	Cause of death reported as trauma not related to a power line.
ASSUMED MORTALITIES								
1957	Oct	Fall migration	Ketchum, Oklahoma	A	No	Trauma	Possible power line	Crippled bird seen, then was lost from sight
1998	Nov	Fall migration	Quivira National Wildlife Refuge (NWR), Kansas	A	No	Broken leg	Possible power line	Last seen with broken leg; mate appeared at Aransas NWR without her
2004	Nov	Fall migration	Quivira NWR, Kansas	SA	No	Shot	Non-power line	Shot at, red spot seen on breast, not captured, stayed in area and was last observed in Dec; assumed mortality
2012	23 Nov	Fall migration	Nebraska	Juv	No	N/A	Non-power line	Mortality suspected, not confirmed; no direct or indirect evidence of power line collision

[1] A = Adult, Juv = Juvenile, SA = Subadult.
[2] The 2024 North Dakota fall migration mortality was reported after Brightwell et al (in press) was completed

2.0 2018 ANALYSIS

In the 2018 Analysis, NPPD first considered the 10 whooping crane power line mortalities that were known at that time to have occurred within the Aransas-Wood Buffalo population since 1956, 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.

NPPD estimated in 2018 that there were approximately 326,000 miles of power lines (transmission and distribution) within the migration corridor in the United States. Out of these 326,000 miles, approximately 34,000 miles were transmission lines, and 292,000 were distribution lines. For the 2018 Analysis, transmission lines were defined as those power lines with a voltage greater than or equal to 115 kilovolts (kV).

According to Stehn and Haralson-Strobel (2014), the total mortality in the Aransas-Wood Buffalo population between 1950 and 2010 was 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 2009). Thus, in the 2018 Analysis, the number of mortalities that occurred during migration was 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.[1] Out of the 50 recovered carcasses known at the time of 2018 Analysis, 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 could be attributed to transmission lines. Applying this ratio to the 93 estimated mortalities during migration, it was estimated approximately four whooping cranes (rounded up from 3.3) collided with transmission lines in the migratory corridor in the United States and Canada between 1956 and 2016.[2] Although only 80% of the known power line collisions occurred in the United States (8 out of the 10), NPPD assumed all four estimated collisions with transmission lines occurred in the United States. This equated to 0.067 crane collisions with transmission lines per year (estimated four collisions over the 60-year period from 1956 to 2016).

[1] 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 United States and Canada since 1956, 0.05 crane collisions with transmission lines per year, a risk of 0.00000147 crane per mile per year, a risk of 0.00033 cranes per year for the R-Project, and 0.017 cranes per the 50-year project life.

[2] Although the data set in Stehn and Haralson-Strobel (2014) was from 1950 to 2010, the first reported collision with a transmission line occurred in 1956, and no additional whooping crane collision with a power line occurred between 2010 and the 2018 Analysis. NPPD conservatively used a 60-year period to estimate the annual crane-transmission line collision rate, even though it could have used the period from 1950 to 2018, which would have reduced the per-mile risk per year.

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 115 kV and above transmission line within the United States portion of the Aransas-Wood Buffalo population migratory corridor. 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 crane per mile per year (0.067 cranes per year divided by 34,000).

In the 2018 Analysis, NPPD recognized 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 used the entire 34,000 miles of 115 kV and above transmission line, rather than a subset of transmission lines in areas with whooping crane habitat. 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 a National Wetland Inventory wetland. Nearly all miles of transmission line within the whooping crane migratory corridor are within one mile of a National Wetland Inventory wetland. Wetlands were not screened for habitat suitability during this high-level analysis.

For the R-Project as proposed in 2018, 225 miles of new transmission line would be constructed in the Aransas-Wood Buffalo population migratory corridor.[3] Applying methodology from above (using all 34,000 miles of 115 kV and above transmission line) to the 225-mile R-Project would equate to a risk of 0.00044 crane per year (225 x 0.00000197) or 0.022 crane 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 Avian Power Line Interaction Committee (APLIC) (2012).

Because NPPD recognizes that not all transmission lines present a collision hazard to whooping cranes, the 2018 Analysis was also run assuming that only 50% and 10% of the transmission lines in the whooping crane migratory corridor present a collision hazard to whooping cranes.[4] 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

[3] Note that, at the time of the 2018 Analysis, the R-Project was proposed to be 225 miles. The current estimated length of the R-Project is 226 miles. However, the addition of one mile of transmission line would not affect the calculated outcome of the 2018 Analysis.
[4] Considering the amount of suitable habitat in the whooping crane migratory corridor, it is highly unlikely that 90% of existing transmission lines pose no collision risk.

- 0.0000197*225*50 = 0.22 estimated collisions with the R-Project in 50-year period

3.0 REASONABLY CERTAIN KNOWLEDGE ANALYSIS

In order to address the scarcity of whooping crane collision data, numerous risk analyses proposed by various parties, and differing assumptions, the USFWS developed the "Reasonably Certain Knowledge" (RCK) analysis in 2018, which identified data that were reasonably certain and other best available information, to analyze the risk of whooping crane collision for the R-Project. The 2018 RCK analysis concluded that, even if bird flight diverters were only 15% effective, there would be less than a 50% chance of at least one whooping crane striking the R-Project over its 50-year life. The 2018 RCK analysis was included in the document *A Review and Critique of Risk Assessments Considered by the United States Fish and Wildlife Service Regarding the Collision Risk for Whooping Cranes with NPPD's R-Project* (USFWS 2019).

NPPD has updated the 2018 RCK analysis with current (as of January 2025) whooping crane information that has been recorded since the original was developed in 2018. Additionally, the RCK analysis was updated to reflect population estimates in the Traylor-Holzer (2018) Population Viability Analysis (PVA). A summary of the PVA Updated RCK analysis is provided below. Note that previous iterations of the RCK analysis used a static annual population estimate of 1,500 whooping cranes for each year of the R-Project's estimated 50-year life span which was the mean of the population calculated by assuming a 4% growth rate over 50 years. The USFWS requested inclusion of the PCA into the RCK analysis to determine annual population sizes over the 50 year lifespan of the R-Project.

The PVA Updated RCK analysis takes into account the following variables relating to the Aransas-Wood Buffalo whooping crane population to provide an estimated annual and mortality from the R-Project:

- Population estimate from the Traylor-Holzer (2018) Population Viability Analysis (PVA).
- Estimated annual migration mortality in the United States from all causes: 0.9483%
- Estimated proportion of migration mortality that results from power lines: 37.5%
- Number of identified power-line mortality: 9 individuals
- Number of known and assumed power-line mortality (includes unidentified trauma): 12 individuals
- Estimated proportion of the power-line mortality during migration that may occur in Nebraska: 8.33%
- Estimated proportion of powerline strikes that occur on transmission lines: 25%

<u>Population input:</u> The PVA Updated RCK analysis uses the Traylor-Holzer (2018) PVA. Population estimates vary each year under the PVA but range from an estimate of 550 whooping cranes in 2023 to 2,783 whooping cranes in the year 2072 (50 years later).

<u>Estimated annual migration mortality in the United States</u>: The annual post-fledge mortality rate is 10.9%, with 17.4% of those mortalities coming during migration (Kuyt 1992; Pearse et al. 2018). Approximately 50% of the time spent during whooping crane migration is in the United States (Pearse et al. 2020). Using these reasonably certain metrics, 0.9483% of the Aransas-Wood Buffalo population dies each year during migration in the United States (10.9% x 17.4% x 50% = 0.9483%).

<u>Estimated proportion of migration mortality that results from power lines</u>: There have been 32 known or assumed whooping crane mortalities in the United States during migration from 1952 through the spring

2025 (Table 1). Of these 32 instances, nine were identified as powerline strikes, and an additional three were not specifically identified as powerline strikes but exhibited injuries that could have been due to collision with a power line. The Updated RCK analysis assumes that all three are line strikes for a total of 12 assumed power-line mortalities during migration. Accordingly, approximately 37.5% of all known migration mortalities may be attributed to power lines (12/32=0.375 or 37.5%).

<u>Estimated proportion of the power-line mortality during migration that may occur in Nebraska</u>: The Updated RCK analysis includes all known and assumed power line mortality (n=12), including those with injuries consistent with power-line collision, when estimating this parameter. The USFWS's original 2018 analysis used only those mortalities confirmed as a power-line mortality (n=8). This difference is one of interpretation, rather than new data, to remain consistent with the 37.5% of all known migration mortalities attributed to power lines as calculated above. Of the 12 known and assumed mortalities attributed to power-line collision in this analysis, one was documented in Nebraska (Stehn and Haralson-Strobel 2014; M. Rabbe, personal communication, email March 20, 2023) (1 / 12 = 0.0833 or 8.33%). Transmission lines (69 kV and higher) make up approximately 11% of all power lines throughout the whooping crane migratory corridor, but transmission lines may pose a higher collision risk than distribution lines.[5] The PVA Updated RCK analysis assumes that one of the three mortalities attributed to power-line strikes (but of an unknown line type) was the result of a transmission line. This results in three transmission line strikes during migration (two documented and one assumed), resulting in 25% of collisions occurring on a transmission line (3/12=0.25 or 25%).

<u>Results</u>: Because the R-Project would add 226 miles of transmission line in Nebraska, all of which are within the whooping crane migratory corridor, the R-Project would increase the length of transmission for collision in Nebraska by 4.7% (S&P Global 2021).[6] Under the PVA Updated RCK analysis, the variables described above (annual migration mortality, estimated proportion of migration mortality from power lines and transmission lines, estimated proportion of migration mortality in Nebraska, and the resulting percentage increase in transmission lines from the R-Project) are multiplied by each year's population estimate from the PVA. When considered over the 50-year life of the transmission line, the PVA Updated RCK analysis predicts that the R-Project may result in 0.3722 whooping crane collisions throughout the expected life of the project. 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 (2012).

<u>Line Marking</u>: NPPD has committed to mark and maintain all 226 miles of the R-Project according to APLIC Guidelines (APLIC 2012), which goes beyond the Region 6 Guidance (see HCP Section 4.1.2). 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 construction standard is based upon available information on the effectiveness of marker types, durability of markers, and the engineering constraints of the line.

Effectiveness of line marking devices intended to reduce avian collision varies based on local conditions and habitats but typically ranges from 50% to 80%. The Region 6 Guidance recognizes a 50% to 80%

[5] In the 2018 Analysis, transmission lines included lines that were 115 kV or higher. However, upon further investigation, NPPD determined that transmission lines include lines that are 69 kV or higher. For instance, the NERC Reliability Standards define transmission line to include those carrying "relatively high voltages varying from 69 kV up to 765 kV." *See* Glossary of Terms Used in NERC Reliability Standards, updated January 7, 2025, available at https://www.nerc.com/pa/Stand/Pages/USRelStand.aspx. SPP includes 69 kV lines in the 70,025 miles of transmission lines in its territory. *See* https://www.spp.org/Documents/31587/SPP101%20-%20An%20Introduction%20to%20SPP%20-%20All%20Slides%20PRINT.pdf. And the U.S. Energy Information Administration includes lines of 69 kV to 765 kV in its database of transmission lines. https://www.eia.gov/tools/faqs/faq.php?id=567&t=3. Thus, for the Updated RCK, transmission lines are defined to include lines of 69 kV or greater.

[6] There are currently 4,800 miles of 69 kV and above transmission line in Nebraska portion of the whooping crane migratory corridor (S&P Global 2021).

effectiveness in line marking. The effectiveness of marking is the subject of many studies, with most relevant studies referenced in APLIC (2012). Publications cited in APLIC (2012) studied some form of spiral bird flight diverters and recorded 60% to 80% reductions in mortalities and collision (see APLIC (2012) Table 6.8).

In addition to updating the RCK analysis with the PVA, the RCK analysis was also re-run with population estimated from the 2022-2023 Whooping Crane Survey Report, which included a population estimate of 550 cranes, and a 4.34% long-term population growth rate. Based on those inputs, the estimated whooping crane population would be 5,010 whooping cranes at 50 years with a total of 0.375 predicted whooping crane collisions. Note the total of 0.375 predicted whooping crane collisions does not include risk reduction as a result of line marking

4.0 WEST ANALYSIS

In addition to updating the 2018 RCK model, NPPD contracted WEST to examine steps in the RCK analyses that were identified as not being reasonably certain. The result was a risk assessment that is similar to the RCK analyses but is simplified and can be applied to any transmission line within the 95% migratory corridor (not just those in Nebraska). The WEST analysis retains all the reasonably certain variables of the RCK analyses. However, unlike the RCK analyses the WEST analysis uses only known and documented mortalities (n=28), whereas the RCK analyses use known and assumed mortalities (n=32). Additionally, the WEST analysis uses mortality data specific to transmission lines when calculating collision rates. Unknown trauma mortalities that could have been due to a power line collision was proportionally assigned as transmission collision (see attached report). This approach eliminates using distribution line strike data to estimate transmission line strikes. The WEST analysis also eliminates the need to consider a collision-risk differential between distribution and transmission lines, thereby eliminating the uncertainty associated with the estimated miles of distribution line.

<u>Estimated annual migration mortality rate</u>: Under the WEST analysis, the annual mortality percentage during migration in the United States is calculated the same as the Updated RCK analysis (10.9% x 17.4% x 50% = 0.9483%).

<u>Known and attributed transmission-line mortalities</u>: The WEST analysis uses the 28 total known mortalities during migration (Table 1). Two of those mortalities were identified as transmission-line collisions, and six were identified as distribution-line collisions. Mortalities that could possibly be attributed to transmission lines include one strike on an unidentified power line and one where the cause of the mortality was unknown but involved some form of trauma. To account for the unknown trauma and the collision on an unidentified power line, the WEST analysis line proportionally adjusted the input of transmission line mortalities to account for the possibility that a portion of the mortalities with unknown causes were due to collisions with transmission lines. This proportionally adjusted figure was 2.462 whooping crane mortalities attributed to transmission lines.

<u>Estimated annual migration mortality rate attributable to transmission-line strikes</u>: WEST then used the proportionally adjusted whooping crane mortalities attributed to transmission-line strikes to determine an annual migration mortality rate attributable to transmission-line strikes of 0.0008337 cranes. It did so by multiplying the annual migration mortality rate (0.009483) by the proportion of known migration mortalities attributed to transmission lines [(2.462/28) x 0.009483 = 0.0008337].

<u>Estimated R-Project annual mortality rate</u>: WEST proportionally applied annual migration mortality rate for transmission lines (0.0008337) to the 226 miles of R-Project in relation to all 46,851 miles

transmission lines in the whooping crane migratory corridor (226/46,851 = 0.0048) to determine an R-Project-specific annual mortality rate of 0.000004021 (0.0.0008337 x 0.0048 = 0.000004021).

Overall R-Project estimate: If the whooping crane population remained steady at the most recent estimate of 536 over the 50-year life of the R-Project, the estimated total mortality based on the project-specific mortality rate would be 0.108 (0.000004021 x 536 x 50). However, the potential for population growth must be taken into account. Similar to the PVA Updated RCK analysis, the WEST analysis also uses population estimates from the PVA (Traylor-Holzer 2018). When the annual estimated mortality specific to the R-Project is applied to the population model, the WEST analysis predicts the R-Project may result in 0.351 whooping crane collisions throughout the expected life of the project. This estimate does not take into account any level of risk reduction from marking the R-Project with bird flight diverters.

5.0 UNCERTAINTY

The USFWS recognized the uncertainty associated with attempting to predict collision with a single transmission project, and peer review concurred with that conclusion (USFWS 2019). Limited number of documented collisions, large temporal and spatial scales over which the data are distributed, increasing miles of power line and whooping crane populations over time, and the relative importance of collisions as a source of mortality all create areas of uncertainty. Despite this uncertainty, data are available to evaluate risk, as is demonstrated in the PVA Updated RCK and WEST approaches. While NPPD has updated previous analyses with new information where feasible, it is also important to keep in mind that uncertainty remains and the fact that assumptions about the available data must be made. The following is a discussion regarding the differences in outcome of the Updated RCK and WEST approaches if different assumptions are applied about certain aspects of the published data.

One source of uncertainty is known mortality (i.e., recovered carcasses) versus assumed mortality (i.e., an observed injured bird that was assumed a mortality). Currently, the Updated RCK approach includes all known and assumed mortality is included in the analysis. However, if all assumed mortality is removed and only recovered birds are used, the estimated take in the PVA Updated RCK analysis is 0.3873, compared to 0.3722 when those birds are included in the analysis. Conversely, if all assumed mortalities are included in the WEST analysis, the outcome is 0.31 whooping crane mortalities over the life of the Project.

A second source of uncertainty is if the mortality occurred at a transmission line or a distribution line. Misclassification can again have a large effect on the results of both the Updated RCK and WEST approaches to take. Currently, there are two estimated transmission line mortalities during migration. One individual bird was marked with a satellite tracker and hit a marked transmission line in North Dakota after being flushed at night (USFWS 2020). The other is a collision in Texas in 1956 identified as a transmission line in Stehn and Wassenich (2008); however, in Stehn and Haralson-Strobel (2014), the same individual is identified as a power-line collision, not a transmission-line collision. An older reference lists the injury to this bird as being the result hitting a high wire (McNulty 1966), which at the time could have been a distribution line, transmission line, or even a telephone line. While there is likely no way to ascertain exactly what the bird struck in 1956, the impacts of it being misclassified on the outcomes of the existing take calculation approaches can be calculated.

Any approach to estimating take on the R-Project must rely on a data set that, over 66 years, has nine confirmed power-line mortality collisions and three unknown traumas, two of which are assumed mortalities where the whooping crane was never recovered. Of those 11 individuals, only one is known to have hit a transmission line for certain, and one is assumed to have done so based on a publication that is 52 years after the incident. Because available publications (Stehn and Wassenich 2008 and Stehn and

Haralson-Strobel 2014) are not consistent in all aspects on the same data, certain assumptions on use of those data must be made, and changing those assumptions can have large impacts on the outcome.

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ATTACHMENT 1 R-PROJECT WHOOPING CRANE RISK EVALUATION MODEL UPDATE FOR EVALUATING POTENTIAL IMPACTS TO WHOOPING CRANES

R-Project Whooping Crane Risk Evaluation Model Update for Assessing Potential Impacts to Whooping Cranes

January 17, 2021 (Revised April 15, 2025)

Western EcoSystems Technology, Inc.

Environmental & Statistical Consultants
415 W. 17th Street. Suite 200
Cheyenne, Wyoming 82001

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1.0 BACKGROUND

Nebraska Public Power District (NPPD) has proposed a 226-mile, 345-kilovolt (kV) electric transmission line in Lincoln, Logan, Thomas, Blaine, Loup, Garfield, Wheeler, and Holt counties, Nebraska, referred to herein as the R-Project or the Project. Because the R-Project occurs in the range of the federally threatened American burying beetle and Project activities may potentially lead to take of this species, NPPD sought an incidental take permit under the Endangered Species Act from the US Fish and Wildlife Service (USFWS). As part of that permitting process, USFWS and NPPD also evaluated the potential for incidental take of the whooping crane (*Grus americana*). USFWS analyzed the potential for take using a "Reasonably Certain Knowledge" (USFWS-RCK) approach (USFWS 2018), which reviewed reasonable and best available environmental parameters and data. NPPD engaged Western EcoSystems Technology, Inc. (WEST) to review available data and provide an update to the USFWS-RCK approach for the Project.[1]

The whooping crane was federally listed as endangered in the US in 1967 (32 Federal Register 4001, USFWS 1967) and was designated as endangered in Canada in 1978 (Committee on the Status of Endangered Wildlife in Canada 2000). There are currently four wild whooping crane populations, but only one is naturally occurring and self-sustaining (Urbanek and Lewis 2020): the Aransas/Wood Buffalo whooping crane population (AWBP), which migrates between Aransas National Wildlife Refuge on the Texas coast, where it winters, and the Wood Buffalo National Park, along the boundary between Alberta and Northwest Territories, where it nests. Since 1941, the AWBP has increased from 15 birds (Allen 1952) to over 535 (Butler et al. 2023). Migration for the AWBP occurs from March through May in the spring and September through November in the fall (Pearse et al. 2020). It is only during migration that the Project may pose a risk to the AWBP.

2.0 INTRODUCTION

This effort to review data and update the USFWS-RCK model has two principal objectives, as described below.

Objective 1: Where possible and appropriate, revise the USFWS-RCK approach to estimating potential whooping crane take on the R-Project to incorporate the following updates.

- Based on the latest boundaries of the whooping crane migration corridor that NPPD received from the USFWS, all 226 miles of the R-Project are in the 95% whooping crane migratory corridor.

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[1] Note that NPPD has undertaken a separate effort to update the USFWS-RCK approach with new information. WEST's analysis differs from NPPD's update in that it revises certain aspects of the USFWS-RCK approach rather than just updating the information used therein.

- Four suspected mortalities (during the fall seasons of 1957, 1988, 1998, and 2004 wherein no carcasses were recovered) were removed from analyses.
- One new known whooping crane migration power line-strike mortality occurred in North Dakota in spring 2020 (Table 2).
- For consistency with prior USFWS modeling (USFWS 2019a, 2019b) and industry standards,[2] define transmission power lines as those lines that are 69 kV and above.

Objective 2: Address uncertainties and discrepancies in documentation of the process used in model development.

Many of the existing efforts to evaluate the collision risk associated with the R-Project have noted the lack of data and the uncertainty associated with what data are available (USFWS 2018). Therefore, this Objective includes describing the reasoning behind selection of data inputs and the modeling process in terms that allow the reader to understand the construction and application of the model with respect to development of the collision-based take prediction values. Relevant decision points and options, and the rationale behind selection of the options used in the model are provided below, so that conclusions drawn from the model outcomes are fully documented and supported in text. WEST did not attempt to rectify discrepancies in existing published information and just documented how those data are used.

3.0 UPDATE TO USFWS-RCK APPROACH TO ESTIMATE WHOOPING CRANE TAKE AND DOCUMENTATION OF DECISION PROCESS USED IN MAKING UPDATE

3.1 Model Overview

The USFWS-RCK model utilized “reasonably certain” information on annual AWBP mortality rates during migration, combined with historic AWBP known-source mortality data, to calculate an expected number of collisions with transmission lines in the US AWBP migratory corridor. Additionally, the USFWS-RCK model produced a Project-specific estimate for the expected number of collisions, which was assumed to be directly proportional to the increase in length of transmission lines in Nebraska due to Project development. This report describes the USFWS-

[2] The North American Electric Reliability Corporation (NERC) Reliability Standards define transmission lines to include those carrying “relatively high voltages varying from 69 kV up to 765 kV”. *See* Glossary of Terms Used in NERC Reliability Standards, updated June 28, 2021, available at https://www.nerc.com/pa/Stand/Pages/USRelStand.aspx. The U.S. Energy Information Administration includes lines of 69 kV to 765 kV in its database of transmission lines. https://www.eia.gov/tools/faqs/faq.php?id=567&t=3. The Southwest Power Pool includes 69 kV lines in the 70,025 miles of transmission lines in its territory. See https://www.spp.org/Documents/31587/SPP101%20-%20An%20Introduction%20to%20SPP%20-%20All%20Slides%20PRINT.pdf. And the Occupational Health and Safety Administration indicates that transmission system voltages are typically from 69 kV up to 765 kV, while distribution systems typically operate in a voltage range of 4 kV to 46 kV. *See* https://www.osha.gov/etools/electric-power/generation-transmission-distribution/transmission-distribution.

RCK model, WEST's revisions to the model formulation, and updates to input parameter values in more detail below.

3.2 Annual US Migration Mortality

WEST estimated the proportion of the post-fledging AWBP whooping cranes that die during migration in the US using the formula originally specified in the USFWS-RCK model:

$$m = \alpha \times \beta \times \lambda$$

where m is the proportion of post-fledging AWBP mortality during migration in the United States, α is the average total annual AWBP post-fledging mortality, β is proportion of annual post-fledging mortality that occurs during migration, and λ is the proportion of migration days spent in the US. USFWS (2018) estimated an average total annual AWBP post-fledging mortality rate (α) of 0.109 and that the proportion of post-fledging mortality that occurs during migration (β) is 0.174. WEST directly incorporated these values into the R-Project mortality prediction model.

USFWS (2018) estimated a value of 0.55 for λ (proportion of migration days in the US). However, based on our literature search, the percent of whooping crane migration days spent in the US is between 42% and 50% (Appendix A). WEST used 50% (0.50) as a conservative value (i.e., tending towards overestimate; Table 1). Based on these inputs, the resulting estimate for the proportion of annual post-fledging mortality during migration in the United States (m) is 9.483×10^{-3} (0.9%; $0.109 \times 0.174 \times 0.500 = 0.009483$), meaning less than 1% of post-fledging AWBP whooping cranes are estimated to die during migration per year.

Table 1. Model Input Parameters and Values

Symbol	Value	Description
α	0.109	Average total annual post-fledging Aransas-Wood Buffalo (AWBP) mortality
β	0.174	Proportion of annual post-fledging mortality occurring during migration
λ	0.500	Proportion of migration days in US
$d_{nonline}$	18[a]	Documented mortality (non-power line)
$d_{distline}$	5	Documented mortality (distribution line)
$d_{transline}$	2	Documented mortality (transmission line)
$d_{unkline}$	1	Documented mortality (unknown line type)
$d_{possline}$	2	Documented mortality (possible power line)
L_{total}	46,851	Miles of transmission lines in US AWBP corridor
L_{proj}	226	Miles of R-project transmission lines in the AWBP corridor

Table 1. Model Input Parameters and Values

Symbol	Value	Description

[a] 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 US Fish and Wildlife Service (USFWS). Data were provided to NPPD as a courtesy for its use. The USFWS 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.

While mortality during migration is known to occur within both the US and Canadian portions of the AWBP migration corridor, the number of miles of transmission line occurring within Canada is not currently available to include in the model. Therefore, the analysis was restricted to mortality occurring within the US.

3.3 Transmission Mortality

The USFWS-RCK model utilized data on documented mortality (Stehn and Haralson-Strobel 2014) to estimate the proportion of migration mortalities resulting from collisions with transmission and distribution power lines, as well as the proportion of collisions that occurred in Nebraska. While this approach was used to estimate a Nebraska-specific collision rate for transmission lines, WEST posits that there are not enough sufficiently documented mortality data from the US portion of the AWBP migration corridor (N = 28 publicly reported mortalities between 1952 and 2024; Table 2) to determine the accuracy of this estimate. To minimize the potential for erroneous assumptions based on limited data, WEST implements an approach that calculates an average proportion of mortality for transmission lines in the US and used it to extrapolate the predicted mortality rate at the Project.

Brightwell et al. (2023) reviewed the known-source mortality data (see Table 2) utilized in the USFWS-RCK model as well as information sources that post-date development of the USFWS-RCK model to evaluate and accurately attribute whooping crane mortalities to transmission-line strikes.

Evaluating these sources, Brightwell et al. (2023) found that there have been 28 documented mortalities (d_{tot}) during migration in the US from 1952 through December 2024 (Table 2). Of these mortalities, 18 were not attributed to power lines ($d_{nonline}$), 5 were attributed to distribution lines ($d_{distline}$), 2 were attributed to transmission lines ($d_{transline}$), 1 was attributed to a power line of unknown type ($d_{unkline}$), and 2 were identified as mortalities with trauma of unknown origin that could potentially be the result of power line collisions ($d_{possline}$) (Table 1). The death of the individual that was attributed to a collision with a power line of an unknown type power line($d_{unkline}$) was a whooping crane that was injured in North Dakota in 1984 and died in captivity in 1985; this mortality is assumed here to have resulted from an initial power line strike. Because power lines are specifically identified as a cause of mortality and are easily identified as a potential source of trauma (Table 2), WEST assumes that, for whooping crane fatalities attributed to trauma, there was a reason that trauma was not classified as a result of power line collision. WEST does, however, recognize and agree with the USFWS (2019) that cause of death of migrating whooping cranes may in some instances be inaccurately or incompletely reported. Therefore, WEST adjusted the number of documented transmission line mortalities to account for the possibility that a portion of the mortalities with unknown causes were due to collisions with transmission lines as follows.

First, WEST calculated the proportion of known-cause mortality attributed to power lines (p_{line}):

$$p_{line} = \frac{k_{line}}{k_{line} + d_{nonline}}$$

where k_{line} is the sum of known-cause mortality attributed to all power line types:

$$k_{line} = d_{distline} + d_{transline} + d_{unkline}$$

Using these formulas, k_{line} equals 8 (5 + 2 + 1), so p_{line} equals 0.308 (8/[8+18]).

Additionally, WEST calculated the proportion of known power line mortalities that were attributed to transmission lines ($p_{transline}$) as the ratio:

$$p_{transline} = d_{transline}/(d_{transline} + d_{distline})$$

Using this formula, $p_{transline}$ equals 0.286 or (2/[2+5]). With these proportions, WEST calculated an adjusted number of transmission-line mortalities (adj_{trans}), which accounts for mortalities that had unknown line types or were otherwise possible collisions with power lines:

$$adj_{trans} = d_{transline} + (d_{unkline} * p_{transline}) + (d_{possline} * p_{line} * p_{transline})$$

From these calculations, WEST estimated the adjusted number of transmission-line mortalities (adj_{trans}) as 2.462 (2 + [1 × 0.286] + [2 × 0.308 × 0.286]). Thus, WEST assumes a total of 2.462 out of 28 documented mortalities (d_{tot}) were caused by transmission lines. WEST then calculated the proportion of post-fledging mortality during migration for transmission lines in the United States (m_{trans}) as:

$$m_{trans} = m * \frac{ceiling(adj_{trans})}{d_{tot}}$$

Our estimate for m_{trans} was then 8.337×10^{-4} (0.009483 × [2.462/28]). Using the most recent population estimate of 536 individuals (Butler et al. 2023) this equates to approximately 0.447 mortalities per year due to collisions with transmission lines in the US portion of the AWBP corridor.

Table 2. Known whooping crane mortality in the US during the migration seasons

Year	Date	Migration Period	Location[a]	Age[b]	Reported Cause of Death	Classified Cause of Death	Comments
1952	Oct	Fall	Sharon, KS	A	Unknown	Possible power line	Had dislocated wing, died in route to San Antonio Zoo[c].
1955	Fall	Fall	Sioux Falls, SD	A	Shot	Non-power line	Shot by snow goose (*Anser caerulescens*) hunter[c,d].
1956	May	Spring	Lampasas Co., TX	SA	Power line	Power line (transmission)	Transmission line[e]; broken wing tip[c].
1965	Nov	Fall	Rawlins City, KS	SA	Power line	Power line (distribution)	Collision with distribution (3-wire) line[c,e].
1967	Apr	Spring	Russell Co., KS	A	Power line	Power line (distribution)	Collision with distribution (3-wire) line[e].
1982	Jun	Spring	Minot, ND	Unknown	Aircraft	Non-power line	Feathers identified on military tanker aircraft. Hit while taking off[c].
1982	Oct	Fall	Oglesby, TX	A	Power line	Power line (distribution)	Collision with distribution (4-wire, <8 meters) line[c,e].
1985	Jan	Fall	Linton, ND	A	Power line	Power line (unknown type)	Male with multiple fractures in wing was captured in Oct 1984 but later died in Jan 1985 from complications due to collision with power line during fall migration. Male also had aspergillosis and partial paralysis from running into captive fence during handling[c].
1989	Oct	Fall	Stratton, NE	SA	Power line	Power line (distribution)	Collision with distribution (12-kilovolt); flew into 2-wire distribution line, found dead[c,e].
1991	Apr	Spring	Bend, TX	A	Shot	Non-power line	Shot[c].
2002	Apr	Spring	De Leon, TX	A	Power line	Power line (distribution)	Distribution[e] power line strike[c]; found under power line[f].
2003	Nov	Fall	Dallas, TX	A	Shot	Non-power line	Shot[c].
2004	Nov	Fall	Quivira NWR, KS	SA	Shot	Non-power line	Leg amputated; died due to complications in captivity 9 Nov[c].
2004	Nov	Fall	Quivira NWR, KS	SA	Shot	Non-power line	Fractured humerus repaired; died due to complications mid-Nov[c].
2005	Dec	Fall	MO	Juv	Disease	Non-power line	Bacterium was obstructing the larynx[c].
2007	7 Apr	Spring	ND	A	Unknown	Non-power line	Collision with a blunt object[c]. The whooping crane public sightings database[f] states "…died mid-air and fell to ground, possible broken neck. Nearest power line was too far away".

Table 2. Known whooping crane mortality in the US during the migration seasons

Year	Date	Migration Period	Location[a]	Age[b]	Reported Cause of Death	Classified Cause of Death	Comments
2011	8 Nov	Fall	Ransom, KS	Juv	Unknown	Non-power line	Bird C19[g]. No necropsy was attempted; no direct or indirect evidence of power line collision[f].
2012	Apr	Spring	Miller, SD	A	Shot	Non-power line	Shot by an individual near Miller, SD[h].
2013	8 Apr	Spring	Miller, SD	A	Predation	Non-power line	Bird A01[g]. Predation.
2020	22 Apr	Spring	Mountrail Co., ND	Juv	Power line	Power line (transmission)	Bird 18E[f]. Carcass was found beneath a transmission line. Radio telemetry indicates death occurred at approximately 01:30.
2021	5 Nov	Fall	Kiowa Co., OK	A	Shot	Non-power line	Discovered by hunters near Tom Sneed Lake; died in transport to veterinary clinic[i,j].
2021	5 Nov	Fall	Kiowa Co., OK	A	Shot	Non-power line	Bird 14G[i,j].
2021	5 Nov	Fall	Kiowa Co., OK	A	Shot	Non-power line	Evidence discovered while investigating the location of radioed crane (Bird 14G) that was also shot in the area [i,j].
2021	5 Nov	Fall	Kiowa Co., OK	A	Shot	Non-power line	Evidence discovered while investigating the location of radioed crane (Bird 14G) that was also shot in the area[i,j].
2022	Apr	Spring	SD	A	Trap	Non-power line	Possible cause of death indicated it to be from being caught in a muskrat (*Ondatra zibethicus*) trap[k].
2022	18 Nov	Fall	Clark, SD	A	Leg injury/exposure	Non-power line	Bird 5H[k]. Leg-mounted transmitter became iced during severe winter conditions resulting in leg injury.
2023	Nov	Fall	Elba, NE	A	Trauma	Non-power line	Carcass discovered 4 Nov[f]. Trauma of unknown origin. Distance from power lines indicated that collision was unlikely to be cause of trauma.
2024	29 Nov	Fall	Napoleon, ND	Juv	Trauma/predation	Possible power line	Bird 1L. Leg trauma of unknown origin led to abandonment by parents, poor body condition, and predation by coyotes[k,l].

[a] Co. = County, NWR = National Wildlife Refuge
[b] A = Adult, Juv = Juvenile, SA = Subadult
[c] Stehn and Haralson-Strobel 2014
[d] McNulty 1966
[e] Stehn and Wassenich 2008
[f] Nebraska Ecological Services Field Office, U.S. Fish and Wildlife Service (unpublished data)
[g] Pearse et al. 2019
[h] US Department of Justice 2013
[i] Godfrey 2022
[j] US Department of Justice 2023
[k] National Fish and Wildlife Forensics Laboratory, U.S. Fish and Wildlife Service (unpublished data)
[l] Aaron Pearse, USGS, pers. comm. February 12, 2026

3.4 Project-specific Mortality

The power line mortality described in the USFWS-RCK model (USFWS 2018) included data from whooping cranes that collided with distribution (4-kV to 46-kV lines) as well as transmission lines (69kV to 765kV lines). Because the R-Project is a transmission line, WEST removed distribution lines from consideration as distribution lines present a different risk profile. Following the formulation of the USFWS-RCK model, WEST calculated a Project-specific mortality proportion based on the proportional increase in transmission line miles associated with the Project:

$$m_{proj} = m_{trans} * \frac{L_{proj}}{L_{total}}$$

where m_{proj} is the proportion of post-fledging mortality occurring at the Project, L_{proj} is the number of transmission line miles within the 95% confidence band of the migration corridor associated with the Project (226 miles) , and L_{total} is the total number of transmission line miles in the US AWBP migration corridor. Based on Platts Electric Transmission Lines 2021 data filtered to show operational 69 kV and higher, there are 46,851 miles of transmission lines within the US AWBP 95% migration corridor (A. Ames pers. comm., Sept. 15, 2021; S&P Global 2021). Using these values, WEST estimates the proportion of post-fledging mortality occurring at the Project (m_{proj}) is 4.021 × 10^{-6} (Table 3; 0.0008337 * [226/46,851]), which equates to approximately 0.002 crane mortality per year ([4.021 × 10^{-6}] × 536) for a population of 536 cranes. Consistent with the USFWS-RCK model, WEST assumes this proportion of mortality (m_{proj}) is representative of unmarked transmission lines.

Table 3. Model Estimates

Symbol	Name	Value	Description
m	US migration mortality proportion	9.483 × 10^{-3}	Proportion of AWBP post-fledging mortality during migration in the US
m_{trans}	Transmission line mortality proportion	8.337 × 10^{-4}	Proportion of AWBP post-fledging mortality during migration in the US at transmission lines
m_{proj}	Project mortality proportion	4.021 × 10^{-6}	Proportion of Project-specific mortality with unmarked lines
N_t	Population size	-	AWBP size in in year t
F_t	Project Fatalities	-	Fatalities at the Project in year t

3.5 Future Projection

The USFWS-RCK model projected a cumulative take number for the Project assuming a 4% growth rate (Wilson et al., 2016). However, USFWS recognized that extrinsic factors such as limited wintering-ground capacity could slow population growth. The USFWS-RCK model used an average population size of 1500 individuals to calculate the cumulative take prediction, which provides the same result as calculating take using an increasing population size over time.

WEST reviewed the literature regarding AWBP growth rates (Butler et al., 2013; Wilson et al., 2016; Wilson and Bidwell, 2021) and determined the population viability analysis conducted by Traylor-Holzer (2019) likely provides a more accurate prediction of future population growth than does a 4% annual growth rate (Wilson et al., 2016). To evaluate performance of the Traylor-Holzer model to date, WEST compared predictions from the model to population estimates produced by the USFWS for years 2017-2022. In all years, the Traylor-Holzer model predictions fell within the 95% CI of the estimated population and generally within 20 whooping cranes (range: 4 to 36 whooping cranes) of the USFWS mean estimated population based on empirical survey data (Figure 1). Compared to a constant 4% annual population growth rate used in the USFWS-RCK model to estimate whooping crane population size, the Traylor-Holzer model results in a smaller population size estimate over the 50-year period. For example, for an estimated population of 664 in 2026, assuming a 4% annual growth rate, produces an estimated 4,719 whooping cranes in 2075; the Traylor-Holzer estimate for 2075 starting from the same 2024 population size is 2,578 whooping cranes.

Dr. Traylor-Holzer, Senior Program Officer, International Union for Conservation of Nature Species Survival Commission Conservation Planning Specialist Group and author of the *Population Viability Analysis (PVA) Report for the species meta-population of whooping cranes (Grus americana;* Traylor-Holzer 2019) provided WEST a spreadsheet (without underlying data) with a 100-year projection for the annual population size for the AWBP. These population estimates represent counts in the wintering grounds just after fall migration and, therefore, approximate winter counts. These estimates may present a slight overestimation of the total population, as the estimates do not include mortality that may have occurred between fall migration and the winter population counts that occur in any given year.

Whooping crane population projections are cyclic due to the model assuming an 11-year solar cycle and associated impacts (Butler et al., 2017). Documented patterns of AWBP fluctuations in recruitment and population growth suggest that weather conditions on the breeding grounds and during fall migration may influence juvenile mortality (Boyce et al., 2005; Wilson et al., 2016; Butler et al., 2017); however, the underlying mechanism behind these recruitment changes is currently unknown. Traylor-Holzer (2019) identifies other factors that may contribute to uncertainty in the population estimate, especially those that may lead to a lower population growth, such as lower recruitment related to increasing atmospheric carbon dioxide levels and potential of increased mortality with increased anthropogenic threats during migration. Therefore, the input parameter value used herein by WEST may be considered conservative (tending toward overestimation rather than underestimation of take).

It is uncertain if the model was initiated at the optimal point in this cycle to match the actual phase of the 11-year solar cycle in the wild (K. Traylor-Holzer, pers. comm. April 9, 2020). Given the relatively stable winter count data collected since 2017, it is possible or even likely that the model should be shifted a few years in relation to the phase of the cycle in recruitment and population growth, but WEST expects the impact of this uncertainty to have little effect on the 50-year predictions.

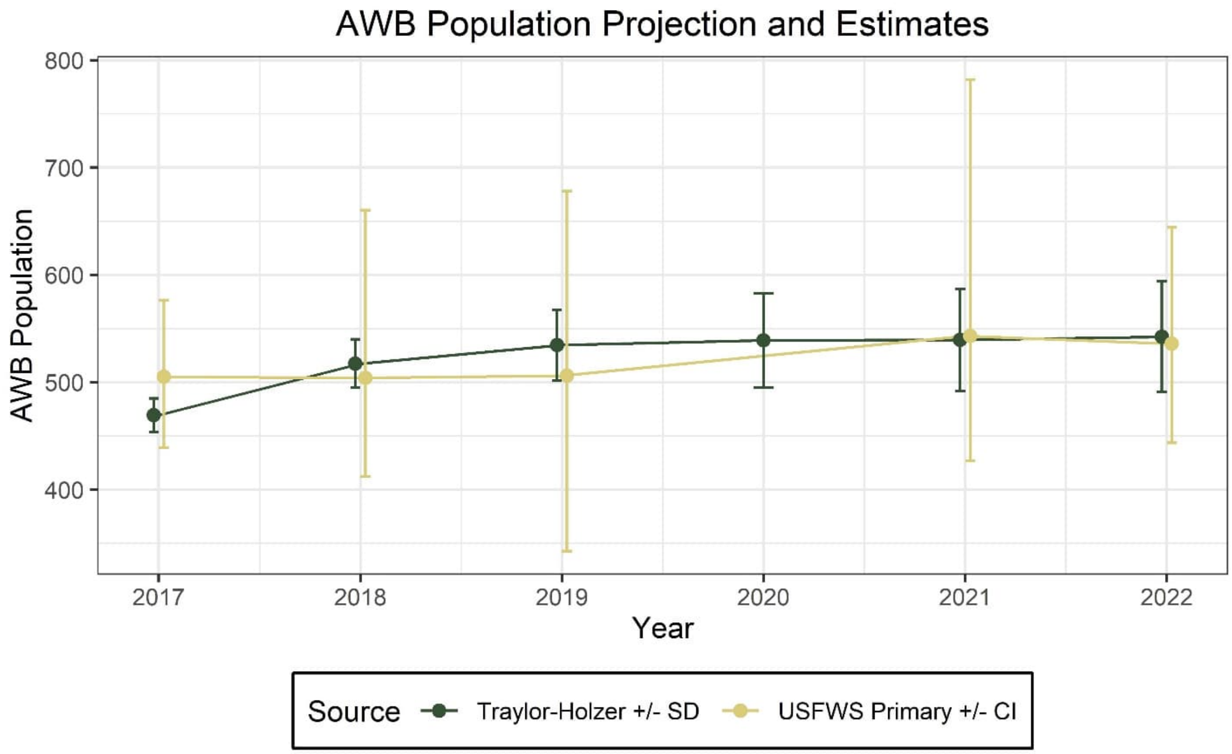

Figure 1. Comparison of the Aransas Wood-Buffalo (AWB) whooping crane population projections and estimates from wintering-ground population surveys. Projections (in green) are from Traylor-Holzer (2019), and error bars represent standard deviations around the projected population mean. Population estimates (in yellow) are from the USFWS population estimates for the primary winter survey area with error bars indicating a 95% confidence interval.

WEST applied the Traylor-Holzer (2019) population projections and Project-specific proportion of mortality (defined above) to estimate annual take at the Project over a 50-year period from 2026 to 2075:

$$F_t = N_t * m_{proj}$$

where F_t is the estimated number of fatalities at the Project in year (*t*), and N_t is the projected population size in year (*t*). Over the 50-year period, WEST estimates a total take of 0.351 whooping cranes (Figure 2). As noted above, this estimate does not take into account any risk reduction from the use of bird flight diverters.

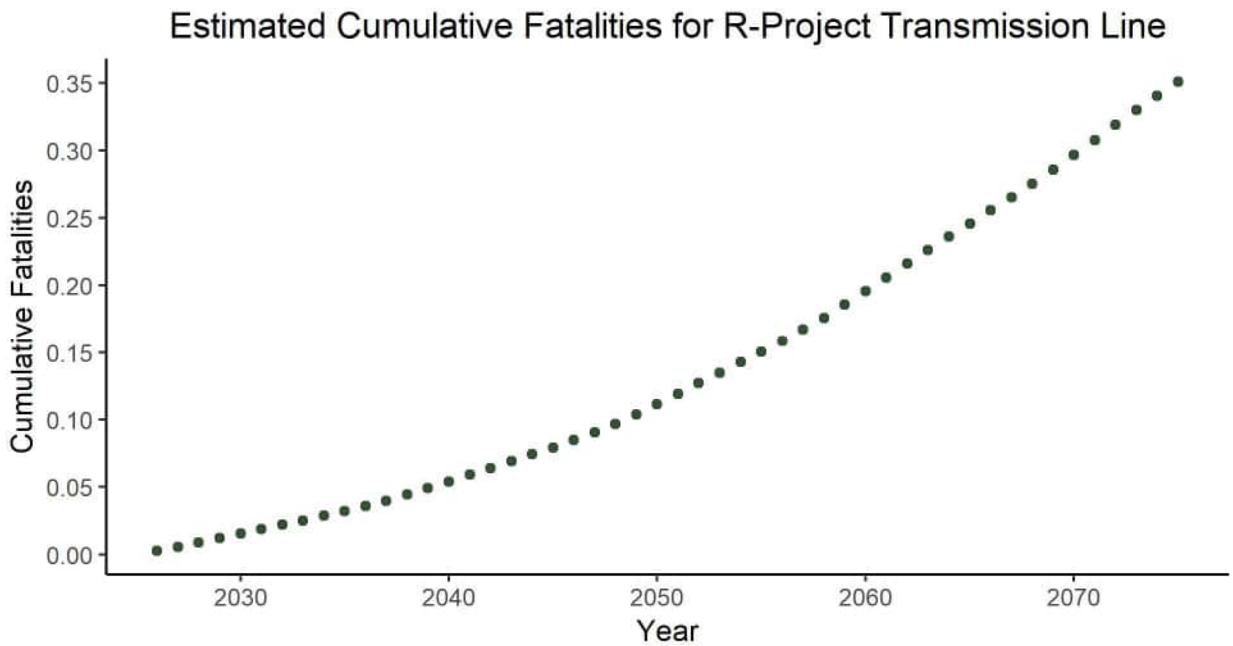

Figure 2. Projected collision fatalities of whooping cranes over the 50-year R-Project life span for transmission lines that are not marked with bird flight diverters.

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Appendix A: Percent of Whooping Crane Migration Days in US

Pearse et al. (2020) (Appendix A1, A2) provides support for the conclusion that 50% of migration days for the Aransas-Wood Buffalo whooping crane population are in the US.

- Whooping cranes spent about 50.1% of total annual migration (spring + fall) in Zones 5 and 6, which are exclusively in Canada
- Whooping cranes spent 21.0% of total annual migration (spring + fall) in Zone 4, and some of Zone 4 (about 20%) is in Canada

Baasch et al. (2019) demonstrates that the use of 50% is conservative, as the data in that report suggest that only 42% of the migration days are in the US.

- Platte River Recovery Implementation Program unpublished data (reported in Baasch et al. 2019) identified the average number of days telemetry-marked whooping crane individuals spent within the US portion of the migration corridor during spring 2013 – fall 2015
    - o Fall migration = 10.5 days
    - o Spring migration = 20.5 days
    - o Average total migration days spent in US = 31.0 days
- 31 days in US (Baasch et al. 2019)/74 days migration (Pearse et al. 2020) = 41.9% of migration days in US.

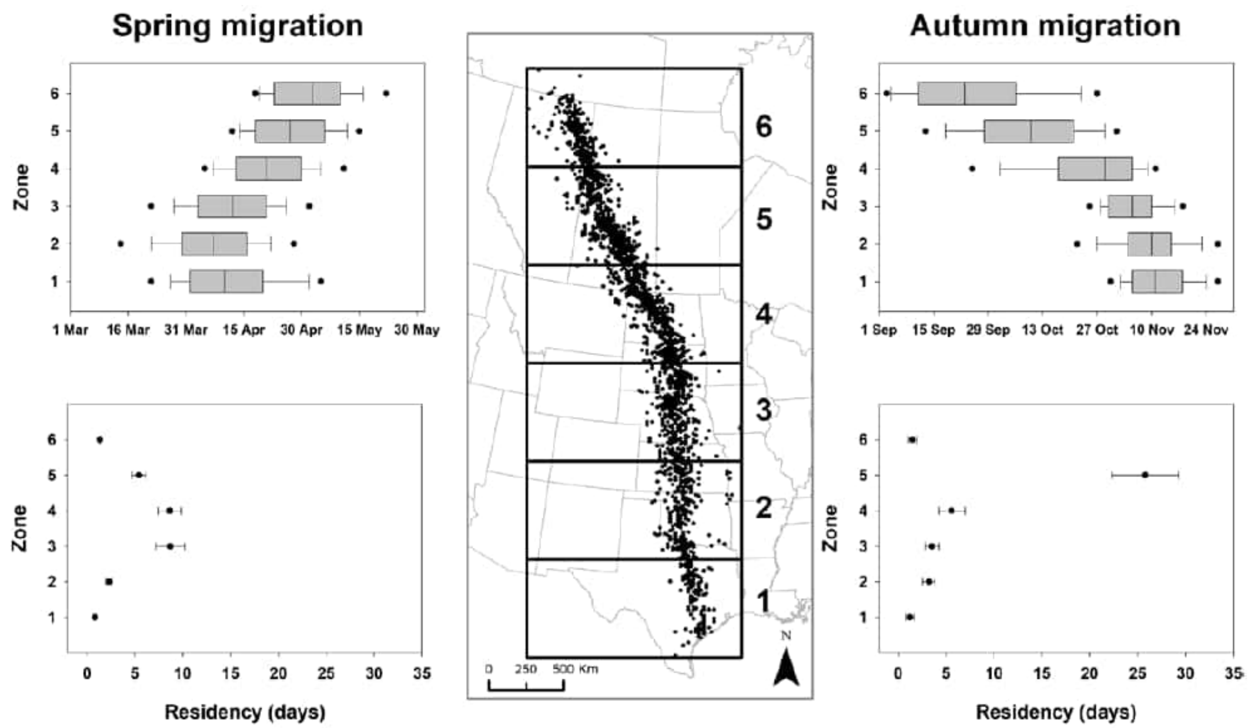
Appendix A1. Data from Pearse et al. 2020.

	Spring Migration (days)	Fall Migration (days)	Total Migration (Spring + Fall) (days)
Migration time (avg)	29	45	74
Time in Zone 6 (CAN)	*~1.5*	*~1.4*	*~2.9*
Time in Zone 5 (CAN)	5.4	25.8	31.2
Time in Zone 4 (CAN/US)	8.7	5.6	14.3
Time in Zone 3 (US)**	8.7	*~3.5*	*~12.2*
Time in Zone 2 (US)	*~2.4*	*~3.1*	*~5.5*
Time in Zone 1 (US)	0.8	1.2	2.0
Total migration days (sum in zone 1-6)	27.5 (95% of reported migration time avg [29 days])	40.5 (90% of reported migration time avg [45 days])	68.0 (92% of reported migration time avg [74 days]))
Total days exclusively in CAN	~6.9 (25.1%)	27.2 (67.1%)	~50.1%
Total Zone 4 (CAN/US)	8.7 (31.6%)	5.6 (13.7%)	21.0%
Total days exclusively in US	~11.9 (43.3%)	7.8 (19.2%)	~28.9%

avg = average; CAN = Canada; ~ = about.

* Italicized days were estimated from the graphs in Appendix A2 below.

** The Project is located in Zone 3.



Appendix A2. Data from Pearse et al. 2020.

APPENDIX A LITERATURE CITED

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APPENDIX E RESTORATION MANAGEMENT PLAN

April 29, 2022

NEBRASKA PUBLIC POWER DISTRICT

R-Project

Restoration Management Plan

Restoration Management Plan

PREPARED FOR: *NEBRASKA PUBLIC POWER DISTRICT*
PREPARED BY: *BEN BAINBRIDGE*
208-788-0391
BEN.BAINBRIDGE@POWERENG.COM

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ACRONYMS AND ABBREVIATIONS

ABB	American burying beetle
APHIS	Animal and Plant Health Inspection Service
BMP(s)	best management practice(s)
CFR	Code of Federal Regulations
ft^2	square foot
GPS	global positioning system
HCP	Habitat Conservation Plan
ITP	Incidental Take Permit
kV	kilovolt
MLRA	Major Land Resource Area
NDA	Nebraska Department of Agriculture
NGPC	Nebraska Game and Parks Commission
NPPD	Nebraska Public Power District
NRCS	Natural Resources Conservation Service
Plan	Restoration Management Plan
PLS	pure live seed
ROW	right-of-way
R-Project	Gerald Gentleman Station to Holt County 345 kV Transmission Project
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTV	utility task vehicle
WEAP	Worker Environmental Awareness Program
Western	Western Area Power Administration

1.0 INTRODUCTION

1.1 Purpose

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 (Western) Fort Thompson to Grand Island 345 kV transmission line (Figure 1). The approximate length of the transmission line is 226 miles. This includes a large portion of the Nebraska Sandhills that is home to the federally endangered American burying beetle (*Nicrophorus americanus*; ABB). NPPD has prepared a Habitat Conservation Plan (HCP) to support the application of an Incidental Take Permit (ITP) for this species.

The purpose of this Restoration Management Plan (Plan) is to describe the methods and activities that will be executed to restore temporary disturbances to grasslands in the Sandhills potentially disturbed by construction of the R-Project, including habitat that supports ABB. This Plan is applicable to temporary disturbances from construction activities and temporary disturbances that may be caused by emergency repair activities. Potential disturbances to croplands are not included as part of this Plan. NPPD will use their standard restoration practices in cropland. In an effort to reduce long-term impacts to the landscape, NPPD will restore grasslands temporarily disturbed by construction activities. This Plan details the restoration methods, monitoring, and project design features, committed to by NPPD for all areas temporarily disturbed by the R-Project.

Future landowner input is an important part of this Plan 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.

1.1.1 Restoration Zones

Zone 1 is defined as the R-Project HCP Permit Area where all disturbance activities that may impact ABB will be in compliance with the federal Endangered Species Act through an ITP. Funding for the successful restoration of ABB habitat in Zone 1 will be assured by an Escrow Account. Because the Escrow Account is to assure funding for the successful restoration of ABB habitat, it is only applicable to the Permit Area as depicted in Figure 1.

Zone 2 is defined as all disturbance activities outside the R-Project HCP Permit Area. NPPD understands the concern over restoration, and unless requested otherwise by the landowner, NPPD will employ the same restoration methodologies and monitoring as within Zone 1. However, there is no regulatory nexus and accompanying compliance requirement in Zone 2.

Approximately 160 miles of the R-Project fall within Zone 1, while approximately 66 miles fall within Zone 2.

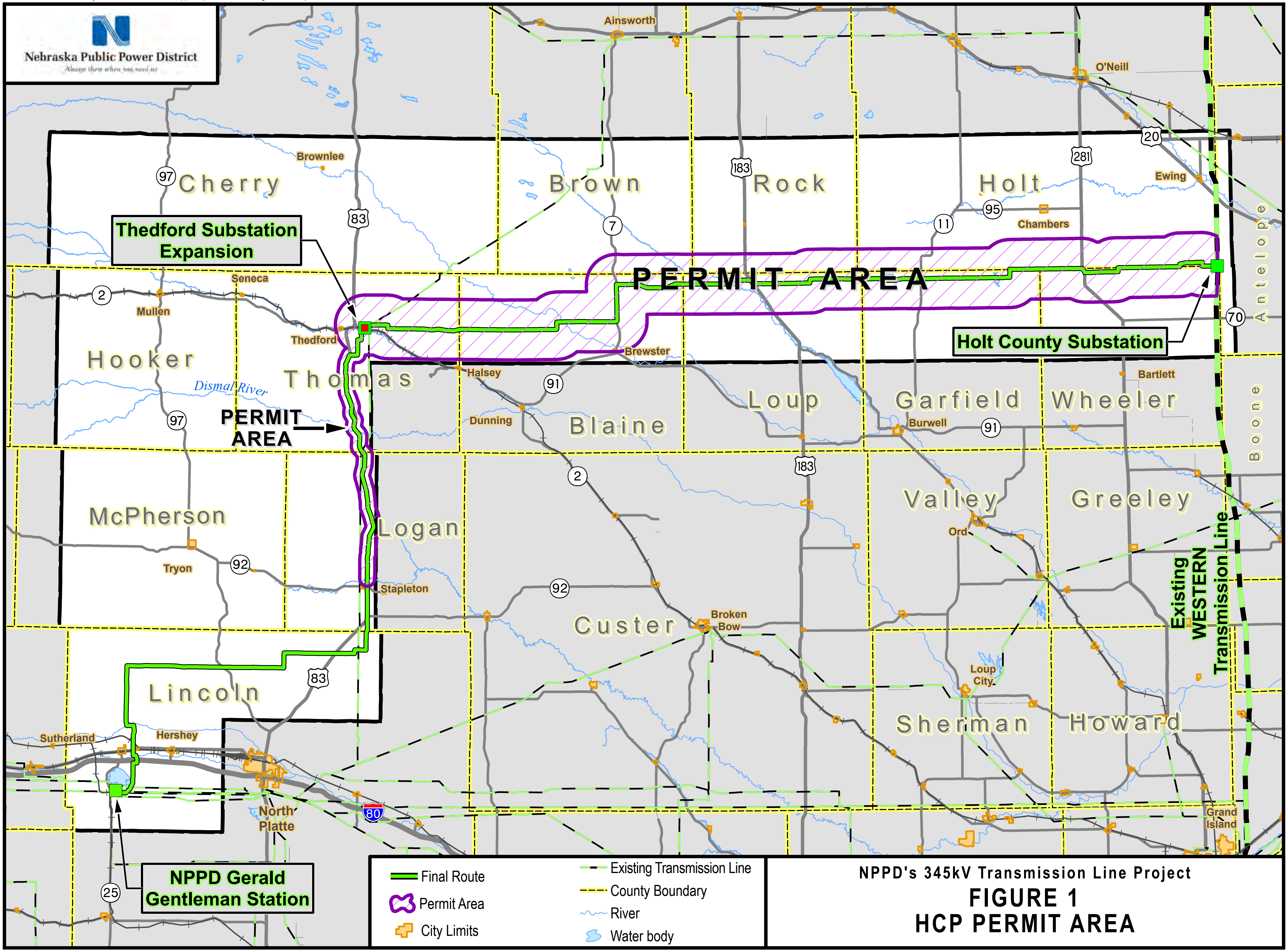
1.2 Timeline

An Escrow Agreement will be in place prior to the initiation of construction activities in Zone 1. Restoration efforts as detailed in this Plan will begin after construction activities are completed in an area. Revegetation will be implemented during late fall or early spring (October 15 to May 15) when weather and soil conditions permit. Erosion control will be implemented if revegetation is not implemented within one week after construction activities are completed in an area. This Plan assumes all restoration, in both zones, will meet the restoration success criteria (Section 4.2) within five years post construction. If the restoration success criteria are not met within the five-year period, adaptive management will be initiated and restoration efforts will continue. At no point in Zone 1 will NPPD cease restoration efforts if restoration success criteria have not been met. Restoration efforts in Zone 2 will only cease when the success criteria have been met, or NPPD and the landowner agree to a different criteria.

1.3 Plan Updates

This Plan may be revised periodically based on updates to the noxious weed list, feedback from adaptive management, additional or new information provided by Natural Resource Conservation Service (NRCS) personnel, and the involvement of the selected construction contractor and landowners.

Date: 1/19/2023 Path: G:\Projects\128143_NPPD_SPP\Apps\Reports\HCP\HCP_Figures_2022.aprx



NPPD's 345kV Transmission Line Project

FIGURE 1

HCP PERMIT AREA

2.0 TEMPORARY DISTURBANCE ACTIVITIES

Construction activities that may cause temporary disturbance are summarized in Table 1. These activities will occur along the entire R-Project and will require restoration efforts as described in this Plan. Temporary improvements such as culverts or temporary fill will be removed following completion of construction activities.

TABLE 1 TEMPORARY DISTURBANCE ACTIVITIES

ACTIVITY	SUMMARY	ACRES WITHIN PERMIT AREA (ZONE 1)	ACRES OUTSIDE PERMIT AREA (ZONE 2)
CONSTRUCTION			
Access			
Temporary access routes	Temporary access routes include improvements such as blading, and placement of fill material on geofabric where required.	387	140
Right-of-Way (ROW) Preparation			
ROW tree clearing	Complete removal of trees and tall brush.	22	20.1
Temporary Work Areas			
Fly yards/Assembly areas	Base location for helicopter construction and lattice tower assembly. Will require a graded pad with gravel, geotextile with gravel overlaid, or protective ground matting.	221	58
Construction yard/Staging areas[1]	Base location for staging construction materials and construction offices. Will require a graded pad with gravel or geotextile with gravel overlaid.	50	58
Pulling and Tensioning sites	Area used by heavy equipment to pull and tension the transmission line conductor, overhead shield wire, and fiber-optic shield wire.	251	108
Temporary Structure Work Areas			
Lattice tower	100-foot x 100-foot work area at each lattice tower. Includes installation of helical pier foundations and leg extension erection.	103	34
Steel monopole	200-foot x 200-foot work area at each steel monopole. Includes installation of poured	173	89

ACTIVITY	SUMMARY	ACRES WITHIN PERMIT AREA (ZONE 1)	ACRES OUTSIDE PERMIT AREA (ZONE 2)
	concrete foundation and structure assembly and erection.		
Construction Contingency			
Construction contingency	Additional disturbances that may be necessary and cannot be predicted at this time.	40	**0**
Distribution Power Line Relocation			
Distribution power line relocation	Relocation of existing distribution power lines that would interfere with the R-Project.	13.6	0
Well Relocation			
Well relocation	Relocation of existing irrigation wells that would interfere with the R-Project.	0.4	0
CONSTRUCTION SUBTOTAL		**1,261**	**507.1**
Operation and Maintenance			
Emergency Repairs[2]	Repairs necessary for continued safe operation of transmission line. Estimated at 20% of construction subtotal.	**250**	**101**
TOTAL		**1,511**	**608.1**

[1] Includes 11.5 acres disturbance area currently in place from the 2019 start of R-Project construction.
[2] Disturbance from emergency repairs is estimated at 20% of the remaining construction subtotal for temporary disturbance as calculated in the HCP. Disturbed areas would be restored if conditions require restoration efforts.

3.0 RESTORATION

3.1 Grassland Types in Disturbance Areas

Grassland that will be disturbed by construction activities includes mesic grassland and wet meadows, and semi-arid Sandhills. These are the habitat types that are included under this Restoration Management Plan. Habitat in Zone 1 is a mix of mesic grassland and wet meadows, semi-arid Sandhills, and trees. The presence of mesic grassland and wet meadow habitat increases from west to east across Zone 1. Grasslands in Zone 2 are typically much drier and consist mostly of semi-arid Sandhills and trees along the North Platte River and South Platte River. In areas with trees, the trees will be removed and the land cover type converted to grassland during the restoration process.

Mesic grassland and wet meadows – The mesic grassland and wet meadows land cover type corresponds to parts of the valley wetlands vegetation type identified by LANDFIRE data (USGS 2013). Mesic grassland and wet meadows are those that have areas of elevated soil moisture. Mesic grassland and wet meadows typically have sandy to fine sandy loam soils and occur in the intergrade between wetlands and uplands. Associated species commonly include switchgrass (*Panicum virgatum*), big bluestem (*Andropogon gerardii*), Indiangrass (*Sorgastrum nutans*), sedges (*Carex* spp.), spikerushes (*Eleocharis* spp.), prairie cordgrass (*Spartina pectinata)*, false indigo-bush (*Amorpha fruticosa*), leadplant (*Amorpha canescens*), and sandbar willow (*Salix exigua* spp. *interior*) (Kaul et al. 2006; NatureServe 2009; Schneider et al. 2011).

Some mesic grassland and wet meadows areas may fall within the parameters of wetlands under the jurisdiction of the United States Army Corps of Engineers (USACE). Areas identified as jurisdictional wetlands will not require restoration of vegetation cover since no clearing, grading, or fill is proposed in these areas. Temporary matting and other typical wetland best management practices (BMPs) will be used when crossing or working in jurisdictional wetlands and removed upon completion.

Semi-arid Sandhills – Semi-arid Sandhills with minimal soil moisture corresponds to the dune prairie and shrubland vegetation type identified by LANDFIRE data (USGS 2013). The sandy soils are highly permeable and susceptible to wind erosion, which creates wind-sculpted features such as blowouts and sand draws (NatureServe 2009). The dune prairie and shrubland vegetation type consists 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*). Shrublands may include sand cherry (*Prunus pumila* var. *besseyi*), leadplant, and yucca (*Yucca glauca*). Common forbs that may be present are stiff sunflower (*Helianthus pauciflorus*), bush morning glory (*Ipomoea leptophylla*), gilia (*Gilia* spp.), annual wild-buckwheat (*Eriogonum annuum*), and gayfeather (*Liatris* spp.) (NatureServe 2009; Schneider et al. 2011).

Trees – Trees include shelterbelts and riparian areas that correspond to the floodplain vegetation type identified by LANDFIRE data (USGS 2013). Sandy to dense clay soils are primarily alluvial and typically sustain flooding every five to 25 years. Dominant trees and shrubs that may occur include Plains cottonwood (*Populus deltoids* ssp. *monilifera*), peach-leaf willow (*Salix amygdaloides*), and sandbar willow. Tallgrass species grow underneath the trees and may include switchgrass and big bluestem (Kaul et al. 2006; NatureServe 2009; Schneider et al. 2011).

3.2 Soil Management

Soil management includes soil compaction relief, seedbed preparation, fertilization, and erosion protection after temporary disturbances occur. Areas affected by temporary disturbances will hereafter be defined as "restoration areas." No earthwork will occur in rivers, stream channels, or any other wetlands under the jurisdiction of USACE without the proper federal and state permits. Matting and other typical wetland BMPs will be used when crossing or working in wetlands.

3.2.1 Soil Compaction Relief

If needed, soil compaction relief will be implemented upon the completion of temporary disturbance and when weather and soil conditions permit. Ripping, discing, and/or deep chiseling will be conducted only as needed to relieve soil compaction to, as nearly as possible, the condition in which it was found prior to the start of construction. Alleviation of compaction will be performed during suitable weather conditions and should not be performed under extremely wet or other soil conditions that may adversely affect future production capacity of the land. Soil compaction relief may be done in conjunction with seedbed preparation below, if appropriate.

3.2.2 Seedbed Preparation

Prior to seeding, the seedbed may be loosened to a minimum depth of two inches by discing, harrowing, or other tillage methods. Existing weeds shall be destroyed and incorporated into the soil during seedbed preparation. Ruts and gullies will be filled so the seedbed is continuous. The desired seedbed should be free of large clods, firm, smooth, and weed free.

3.2.3 Fertilization

Sandhills soils generally have little topsoil and disturbance may result in exposed mineral soil, which lacks soil microbes needed for grass establishment. Fertilization will be applied uniformly if necessary to facilitate grass establishment and may include nutrients such as potassium, phosphorus, sulfur, and micronutrients. The local NRCS office will be consulted to determine the proper fertilizer formula and application rates based on the land use and soil type. Soils tests may be conducted as needed to determine site-specific nutrient deficiencies.

3.2.4 Erosion Protection

Erosion control will be managed to achieve erosion that is equal to or less than the surrounding undisturbed area so that water naturally infiltrates into the soil and gullying, headcutting, slumping, and deep or excessive filling is not observed. Erosion protection measures at each restoration area shall be implemented by mulching or straw matting if the grade is greater than three percent (3%) and either of the following conditions is met:

- Temporary disturbance activities are complete, and revegetation will not occur for more than one week; or
- Revegetation is complete.

Mulch will be mature, native grass hay, threshed grain straw, or hay. Hay and straw must be inspected to ensure that it is free of noxious weed seed. Hay harvested late in the season from Conservation Reserve Program plantings of warm-season prairie grasses would be excellent mulching material and will be used if available. Additional options for acquiring native hay and straw include, but are not limited to, purchasing certified hay or straw, specifying that hay or straw be from sources located in the Sandhills, contracting with local landowners for hay from native meadows, and utilizing hay from local areas restored in the past with native grasses. Mulch shall be applied at a planned rate of approximately 2.0 tons/acre; however, actual rates may vary from site to site depending on variations in local conditions. Weather permitting, mulch will be applied within 48 hours of seeding, with a mulch blowing or spreading machine that will obtain uniform coverage. Mulch can be hand spread on steep slopes where machinery cannot be operated.

Mulch shall be properly anchored to the soil by using a crimping machine weighted sufficiently to push the mulch into the soil. Steep slopes where mulch is applied by hand can be anchored by placing small piles of soil at three-foot intervals over the mulch. Straw or mulch matting that is used for erosion control over seeded areas shall have photodegradable mesh and biodegradable pins to hold matting in place. Metal pins are not allowed. Hydroseeding provides another option for carrying seed and mulch.

3.3 Revegetation

Revegetation procedures described below include seeding dates, seeding methods, seeding rates, seed mixes, and protection of restoration areas. At a minimum, the established plant community will consist of species included in the seed mix and/or desirable species occurring in the surrounding natural vegetation.

3.3.1 Seeding Dates

Revegetation of the restoration areas will be implemented during late fall or early spring (October 15 to May 15) after soil management is complete and weather and soil conditions permit. Seeding will be avoided when the soil is wet or frozen. To avoid “winter kill,” fall seeding will not occur until soil temperature has cooled sufficiently so that germination is delayed until spring.

3.3.2 Seeding Methods

On areas accessible to drilling, a grass drill will be used that is equipped for handling “fluffy” seed (appropriate agitator and meters) and has depth control of seed placement from 0.25 to 0.75 inch. Some types of grass drills that may be used include grassland drills, grassland inter-seedeers, hydraulic seeders, and no-till grass drills. The grass drill will be pulled by a utility task vehicle (UTV) or tractor for broadcast seeding operations in most areas. On steep slopes not accessible to field equipment, hand seedbed preparation and seeding followed by raking is an acceptable practice. On smaller areas where drilling is not practical, hand seedbed preparation and hand broadcast seeding followed by raking is an acceptable practice. Appropriate hydro-seeding methods may also be applied to distribute seed.

3.3.3 Seeding Rate

The seeding rate is based on classifying the areas to be seeded as a “critical area seeding,” which doubles the seeding rate normally used for good field conditions. Seed mix application rates will be on a pure live seed (PLS) basis. This is expressed in PLS pounds per acre and is based on planting a predetermined number of live seeds per square foot (ft^2) to achieve a specific plant density. The seeding rate for drilled seeding is 60 PLS/ft^2. The seeding rate for broadcast seeding is double that of drilled seeding, or 120 PLS/ft^2.

3.3.4 Seed Mixes

Seed mixes will be certified noxious-weed free, include species adapted to the restoration site, and be consistent with the vegetation of the area to be restored. Landowner input will be considered. Native species and varieties will be used except in the case of sterile annual companion crops used for quickly establishing cover where there are erosion concerns. There will generally be a minimum of six grass species and 60 percent sod-forming grass species in each seed mixture. Increasing species diversity in seed mixes tends to provide better results, and sod-forming grasses are better for long-term soil stabilization. Bunchgrasses establish much faster than sod-forming grasses, which may take several years to establish. Quick establishment of perennial cover will be enhanced as appropriate by including bunch grasses such as little bluestem to the seed mixture.

Restoration areas included in this plan occur in NRCS-designated Major Land Resource Area (MLRA) 65E – Eastern Sandhills. Table 2 provides details for an example seed mix for semi-arid Sandhills in MLRA 65E. Table 3 provides details for an example seed mix for mesic grasslands and wet meadows in MLRA 65E. Areas where trees are removed will be revegetated with the seed mixes in Tables 2 and 3 that are appropriate for the surrounding area. In some instances, sterile, annual grasses such as a triticale (e.g., QuickGuard) or wheat hybrid (e.g., ReGreen) may be included in the seed mix to help establish a quick stand for erosion control. The cover crop species and application rates to be used will be determined through consultation with the local NRCS office.

TABLE 2 NEBRASKA EASTERN SANDHILLS (MLRA 65E) SEED MIX, SEMI-ARID SANDHILLS RESTORATION AREAS

SPECIES NAME	SEEDING RATE IN LBS/AC @ 20 PLS/FT²	MINIMUM (%)	MAXIMUM (%)	EXAMPLE SEED MIX (DRILLED)	
				LBS/AC PLS	GRASSES (%)
Sand bluestem *Andropogon hallii*	7.7	20	40	5.8	25
Blue grama *Bouteloua gracilis*	1.1	0	10	0.3	10
Prairie sandreed *Calamovilfa longifolia*	3.2	15	25	1.9	20
Sand lovegrass *Eragrostis trichodes*	0.7	5	15	0.2	8
Green needlegrass *Nassella viridula*	4.8	0	5	0.3	2
Switchgrass *Panicum virgatum*	2.2	5	15	0.7	10
Western wheatgrass *Pascopyrum smithii*	7.9	0	5	1.2	5
Little bluestem *Schizachyrium scoparium*	3.4	15	25	1.5	15
Indiangrass *Sorghastrum nutans*	5.0	5	15	0.8	5
Other native perennials	-	0	5	-	-
TOTAL	-	-	-	12.6 lbs/ac 60.0 PLS/ft²	100% (60% sod-forming)

Sources: Stubbendieck 2005, NRCS 2009.

TABLE 3 NEBRASKA EASTERN SANDHILLS (MLRA 65E) SEED MIX, MESIC GRASSLAND AND WET MEADOW RESTORATION AREAS

SPECIES NAME	SEEDING RATE IN LBS/AC @ 20 PLS/FT2	MINIMUM (%)	MAXIMUM (%)	EXAMPLE SEED MIX (DRILLED)	
				LBS/AC PLS	GRASSES (%)
Big bluestem *Andropogon gerardii*	5.3	30	40	5.6	35
Canada wildrye *Elymus canadensis*	7.6	0	5	1.1	5
Virginia wildrye *Elymus virginicus*	11.9	0	10	-	-
Switchgrass *Panicum virgatum*	2.2	5	20	0.7	10
Western wheatgrass *Pascopyrum smithii*	7.9	0	5	1.2	5
Little bluestem *Schizachyrium scoparium*	3.4	10	20	1.5	15
Indiangrass *Sorghastrum nutans*	5.0	15	30	3.0	20
Prairie cordgrass *Spartina pectinata*	8.3	0	15	2.5	10
Other native perennials	-	0	5	-	-
TOTAL	-	-	-	15.6 lbs/ac 60.0 PLS/ft²	100% (80% sod-forming)

Sources: Stubbendieck 2005, NRCS 2009.

3.3.5 Restoration Area Protection

Protection from grazing and trampling is generally desirable during the first growing season to allow establishment of the new seedlings. However, implementation of this practice is highly variable because of grazing demands and management practices of each individual landowner. Some of the options for restoration area protection that may be used are described below. Landowner input will be considered.

1. Use of temporary fencing may be necessary in grazed areas to prevent livestock disturbance until such time that vegetation is adequately restored. If temporary fencing is utilized, fencing will be accomplished by installing single-wire electric fence and providing a solar fence charger. For small areas of seeding, this is not practical, so temporary fencing may encompass a larger area that includes several smaller areas. NPPD is responsible for all restoration area protection, which may include NPPD completing installation, maintenance, and removal, as appropriate, of temporary fencing or contracting with landowners for installation, maintenance, and removal of temporary fencing.
2. When newly seeded areas are within a pasture unit that is part of a several pasture rotation system, the pasture that contains the new seeding could be deferred until after the growing season, thus accomplishing a growing season deferment for the newly seeded areas. This would nullify the necessity to erect fencing as suggested under item #1.
3. NPPD may reimburse landowners for forage loss of restoration areas during the first growing season after losses have occurred, and additional years as needed for successful establishment of restoration areas. Forage loss will be calculated using the following variables: pasture productivity, class of animal, time (years), and the going rate for pasture lease per animal unit.

4.0 MONITORING

4.1 Effectiveness Monitoring

Effectiveness monitoring of restoration efforts will include visual assessment and photographs where soil disturbance has occurred, along with sampling basal cover at 45 paired disturbance and reference plots (total of 90 plots) each year. Thirty of the paired disturbance and reference plots (60 total plots) occur in Zone 1, while 15 of the paired plots (30 total plots) occur in Zone 2. However, NPPD will conduct the same monitoring measures for all plots regardless of location. The same paired disturbance and reference plots will be sampled each year until success criteria are achieved. Disturbance plots will be stratified by the grassland types described above so that the number of plots is representative of the number of structures within these habitats, with a minimum of five plots for each type. Effectiveness monitoring will be conducted during late summer for five consecutive years following restoration, unless success criteria are achieved earlier.

Disturbance plots will be established at randomly selected structures at the beginning of effectiveness monitoring, which will be repeated annually until performance standards are met. 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 right-of-way (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 a sub-meter global positioning system (GPS) unit at the 0- and 15-meter marks, a meter stick will be laid on the ground perpendicular to the tape. The number of centimeters 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. The sub-meter GPS points will ensure that the tape starts and ends at the same location each year during monitoring. Before measuring basal vegetation each year, 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.

4.2 Performance Standards

Restoration areas must develop a trend of vegetative cover diversity and species dominance that is similar to the naturally occurring plant communities in adjacent reference plots. Restoration areas will be successfully restored if a self-sustaining, diverse, native (or otherwise approved) plant community appropriate to the surrounding landscape is established on the site. At a minimum, the established plant community will consist of species included in the seed mix and/or desirable species occurring in the surrounding natural vegetation. Restoration of permanent vegetative cover will be determined successful when the basal cover is at least 80 percent of the basal cover of the adjacent reference plot.

Erosion of the disturbed area will be equal to or less than the surrounding area and erosion control will be sufficient so that water naturally infiltrates into the soil and gullying, headcutting, slumping, and deep or excessive filling is not observed.

The site will be free of noxious weeds, unless the weeds were present at the site prior to construction or are present in surrounding areas. Noxious weeds do not count towards the 80 percent standard, though other non-native plant species may count towards the 80 percent standard if they are representative of the immediate area (species occur in a similar proportion in the nearest reference plot and/or adjacent areas in the same pasture), as approved. See Section 5.0 for a discussion of noxious weeds.

Once an area has met the performance standards, the restoration area will be considered restored and monitoring efforts will not be repeated at that plot. If performance standards are not met within the five-year monitoring period, adaptive management measures, as described in Section 4.4, will be implemented and monitoring will be extended until the standards are met. At no point prior to successful restoration will NPPD cease restoration efforts in Zone 1. In Zone 2, NPPD and the landowner may agree to different performance standards in Zone 2.

4.3 Effectiveness Monitoring Reporting

A formal Effectiveness Monitoring Report will be submitted to USFWS only for Zone 1, because that is the area of the project under USFWS jurisdiction through the ITP. The annual report will be prepared following each late-summer monitoring session, which will include results from the effectiveness monitoring 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 and post-construction restoration effectiveness monitoring will be extended until the standards are met. Any data collected for Zone 2 will be kept by NPPD to document restoration success.

4.4 Restoration Adaptive Management

Formal restoration adaptive management described below is only applicable to Zone 1, because that is the area of the project under USFWS jurisdiction through the ITP. However, NPPD will continue to work with landowners to ensure the success of restoration in Zone 2 should the efforts not meet the performance standards described above. Adaptive management may be implemented during the course of vegetation restoration if, after five years, restoration has not met the 80 percent coverage objective described in Section 4.2. As described earlier, funding to complete adaptive management and ensure the successful restoration of Zone 1 will be assured by an Escrow Account. The Escrow Account will not be applied in Zone 2. NPPD and the landowner may agree to different adaptive management steps or measures than those described here to ensure successful restoration in Zone 2. The following presents a breakdown of the four adaptive management steps and how they may be applied to restoration efforts.

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 Section 4.2 within five years if the Sandhills experience prolonged drought during 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 will be incorporated into the R-Project restoration. 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 4.1 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 will be applied. Results of effectiveness monitoring in Zone 1 will be included in the annual reports to the USFWS as described in Section 4.3. NPPD will coordinate with USFWS, should the results of effectiveness monitoring indicate that alternative management strategies are necessary. Results of any effectiveness monitoring in Zone 2 will be kept by NPPD.

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).

5.0 NOXIOUS WEEDS

The restoration areas will be managed to be free of noxious weeds, unless the weeds were present at the site prior to construction or are present in surrounding areas. The following section describes the noxious weed species that are known to the Sandhills and measures that will be implemented to prevent weed infestations.

5.1 Noxious Weed Species

Noxious weed species are regulated federally by Animal and Plant Health Inspection Service (7 Code of Federal Regulations [CFR] Part 360; APHIS 2010) and at the state level under the Noxious Weed Control Act by the Nebraska Department of Agriculture (NDA; Neb. Rev. Stat. §§ 2-945.01 to 2-968). Noxious weeds are legally defined in a given jurisdictional entity for prioritizing weed prevention and control efforts to those species that are considered to have the greatest negative economic and ecological impacts. Species included on these lists are nearly always non-native and have demonstrated invasive characteristics. Table 4 lists all noxious weed species for the Sandhills. Negative impacts from noxious weeds include habitat degradation of native prairies, wetland, and riparian habitats; decreased crop and livestock production; and land devaluation and associated tax revenue loss. Nebraska's Noxious Weed Control Act delegates to the NDA and Nebraska's counties the authority to require landowners to effectively control noxious weeds on their lands.

TABLE 4 NOXIOUS WEEDS IN THE R-PROJECT COUNTIES

COMMON NAME[1]	SCIENTIFIC NAME[1]	STATUS[1]	COUNTY OCCURRENCE IN THE PERMIT AREA[2]
Musk thistle	*Carduus nutans*	State Noxious	Blaine, Brown, Garfield, Holt, Lincoln, Logan, Loup, Rock, Wheeler (Roeth et al. 2003)
Diffuse knapweed	*Centaurea diffusa*	State Noxious	Brown, Holt, Rock, Wheeler (Gaussoin et al. 2010)
Spotted knapweed	*Centaurea stoebe* ssp. *micranthos*	State Noxious	Brown, Holt, Rock, Wheeler (Gaussoin et al. 2010)
Canada thistle	*Cirsium arvense*	State Noxious	All counties except Blaine (Wilson 2009)
Bull thistle	*Cirsium vulgare*	County Noxious – Rock	Blaine, Loup, Wheeler
Houndstongue	*Cynoglossum officinale*	State Watch List (Category 2)	Holt
Leafy spurge	*Euphorbia esula*	State Noxious	All counties (Sandell and Knezevic 2001)
Japanese knotweed (cultivars and hybrids)	*Fallopia japonica* and hybrids	State Noxious	Garfield (NWCA 2012)
Broadleaf pepperwort/ Perennial pepperweed	*Lepidiem latifolium*	State Watch List (Category 2)	Lincoln
Purple loosestrife (cultivars and hybrids)	*Lythrum salicaria*	State Noxious	Brown, Holt, Lincoln, and Rock (Knezevic 2003)
Eurasian water-milfoil	*Myriophyllum spicatum*	State Watch List (Category 2)	Wheeler
Eurasian common reed (Phragmites)	*Phragmites australis* ssp. *australis*	State Noxious	Blaine, Brown, Garfield, Holt, Lincoln, Rock, Thomas, Wheeler (Knezevic et al. 2008)
Sulphur cinquefoil	*Potentilla recta*	State Watch List (Category 2)	Blaine, Brown, Garfield, Holt, Wheeler

COMMON NAME[1]	SCIENTIFIC NAME[1]	STATUS[1]	COUNTY OCCURRENCE IN THE PERMIT AREA[2]
Saltcedar	*Tamarix ramosissima* and hybrids	State Noxious	Lincoln, Rock (Wilson and Knezevic 2006)

Sources:
[1]APHIS 2010 (no federal noxious species occur in R-Project counties); NDA 2014.
[2] Kaul et al. 2006 in addition to any citations listed.

5.2 Preventative Measures

NPPD recognizes that prevention is the most effective approach to noxious-weed management. The following preventive measures will be implemented where practicable to minimize the spread of noxious weeds:

- Inspect material sources (e.g., soil stockpiles, mulches) and ensure that they are free of visible noxious weeds before use and transport. Treat weed-infested sources to eradicate plant parts, and strip and stockpile contaminated material before any use of pit material.
- Prevent weed establishment by minimizing driving through noxious-weed-infested areas when the spread of seeds or propagules is most likely.
- Before construction activities start, identify sites where construction vehicles, temporary wetland matting, and equipment can be cleaned. Site cleaning stations in construction yard/staging areas in noxious weed-free designated areas at least 100 feet from streams and wetlands. Place barriers where needed around each cleaning station to prevent migration of wastewater and/or sediments into water bodies.
- At cleaning sites, use a high-pressured washer or air compressor to clean construction vehicles, temporary matting, and equipment if they have been in known areas containing noxious weeds before entering and leaving the ROW. Clean construction vehicles and equipment when entering each county for the first time.
- Collect material resulting from vehicle and temporary matting cleaning and dispose of at an approved landfill if doing so is determined to be necessary and appropriate.
- Engage landowners regarding any concerns over noxious weeds.
- Inspect, remove, and properly dispose of weed seed and plant parts found on workers' clothing and equipment.

6.0 HERBICIDE USE

Herbicides will be used to control noxious weeds in restoration areas until criteria for restoration of vegetative cover in disturbed areas are met. Once vegetative cover has been successfully restored in disturbed areas, responsibility for on-going control of noxious weeds on the land, including land within the ROW, reverts back to the landowner. The following sections describe landowner notification, noxious-weed treatment, stump treatment, herbicide application and handling (applies to both noxious-weed and stump treatment), herbicide spills and cleanup, and herbicide-use reporting.

6.1 Noxious Weed Treatment

NPPD will conduct herbicide treatments on all noxious weeds listed in Table 4 until criteria for restoration of vegetative cover in disturbed areas are met. Restricted use herbicides would be approved by USFWS and Nebraska Game and Parks Commission (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. Special attention would be given to state-designated noxious weeds (versus county-listed noxious and state–watch-list noxious weeds). Where there is a pre-existing high occurrence of noxious weeds in or adjacent to the R-Project, NPPD will control noxious weeds within areas disturbed by the project until criteria for restoration of vegetative cover are met. NPPD will not control weeds beyond that required for project-specific restoration efforts. Once vegetative cover has been successfully restored in restoration areas, responsibility for on-going control of noxious weeds on the land becomes the responsibility of the landowner.

NPPD would consult with the USFWS and NGPC in situations where herbicide treatment may not be an appropriate option (e.g., near known special-status species locations). Alternative treatments (e.g., biological controls, mechanical treatments) may be implemented if recommended by the appropriate agency and agreed by the landowner where herbicide treatment is not an option. Timing of treatment for noxious weeds would vary depending on species targeted, and multiple treatments may be required in a given year to effectively treat all noxious weeds.

6.2 Stump Treatment

NPPD’s intent is to establish and maintain a ROW that is primarily grass and low-growing herbaceous plants with little or no woody growth (excluding cultivated land). Tree and vegetation control for the R-Project will be maintained for the entire ROW (generally 100 feet on each side of center line) (clearance width). Trees located off the clearance width that upon falling would come within 15 feet of the line conductor’s worst case sag position, i.e., danger trees, will also be removed under this specification.

All tree stumps cut for ROW and danger tree clearing will be treated with herbicides to prevent regrowth. Vegetation control shall be accomplished by cutting all woody growth and applying herbicide(s) to the stumps to prevent re-growth. Woody vegetation that is less than eight feet in height does not have to be cut but can be treated with herbicide(s) and left in place. Herbicide treatment will consist of spraying or painting the cut surfaces of freshly cut stumps or stubs in accordance with the manufacturer’s recommendations. The cambium area next to the bark is the most vital area to chemically treat. Painting or spraying should be performed the same day that brush and tree cutting removal work is completed, but in no event later than the manufacturer’s recommendations.

6.3 Herbicide Application and Handling

Herbicide application and handling procedures follow numerous federal and state regulations. The following measures for herbicide application and handling will be required for all herbicide treatments:

- All herbicide label instructions (http://www.cdms.net/Label-Database) will be followed for all herbicide applications.

- NPPD will notify landowners by mail of pending herbicide application on their property. Follow-up landowner notification(s) either in person or by phone will be conducted at least 72 hours prior to working on private property. All landowner notifications will be documented as described in *Herbicide Use Reporting* below. If livestock is in the area or will be in the area, the landowner will be notified and their permission obtained before herbicide treatment is started.

- Only Nebraska Certified Pesticide Applicators will be used for herbicide application. All herbicide applicator personnel shall go through the HCP Worker Environmental Awareness Program (WEAP) and receive training on the requirements of NPPD's Transmission Vegetation Management Program and Imminent Threat Communication Process before any treatments are conducted. See Section 6.2.1 of the HCP for a description of the WEAP.

- Copies of Material Safety Data Sheets for materials to be used on the jobsite will be available at the jobsite. Employees will be provided with adequate training as to the hazards associated with materials used on the jobsite and protection measures as specified in 29 CFR Part 1910.1200.

- Herbicide application and handling will avoid surface waters. In areas requiring herbicide treatment in the vicinity of surface waters, only herbicides approved for aquatic use will be used.

- When applying herbicides near waters of the State of Nebraska, the *Endangered and Threatened Species Standard Procedures for General NPDES Permit Number NEP 100000 for Pesticide Applications To, Over, or Near Waters of the State of Nebraska* will be used.

- Application of herbicide treatment during cold months when the ground may be continuously frozen or during periods when marsh or low ground cover may be or is about to be flooded will be delayed until conditions will allow adequate herbicide penetration to the roots in accordance with the manufacturer's recommendations.

- Safety equipment suitable to the hazards involved and confirming to the safety regulations on the project will be used when applicable.

- Weather and wind conditions in the area and the location of other vegetation (e.g., special status plants, cropland) in the area near or adjacent to the treatment site will be identified before applying herbicides. Herbicides will be applied in a manner that prevents drift or runoff so that no damage is done to other vegetation or listed species in any areas adjacent to or in the vicinity of the treatments.

- Herbicides that could drift should be applied using a large droplet size in order to minimize drift. Nozzles with higher rated flows and use of the lowest recommended spray pressure for a nozzle will produce larger droplets.

- Landowner-planted trees and shrubs within the clearance width that have been approved to stay will not be damaged.

- Equipment will be cleaned and rinsed in an area where the rinse water will not enter water bodies (lakes, ponds, rivers, streams, etc.) or contaminate groundwater.

- NPPD will comply with all applicable federal, state, and local laws and regulations concerning the use storage, proper labeling, transportation, and disposal of hazardous materials. These substances include but are not limited to insecticides, herbicides, fungicides, rodenticides, petroleum products, wood preservatives, and solvents.

- Herbicide 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 within the Permit Area because individuals would be underground when herbicides are applied.

6.4 Herbicide Spills and Cleanup

The following measures will be followed in the event of an herbicide spill. Additional details regarding spills and cleanup will be provided in the Spill Prevention and Response Plan. The R-Project-specific Spill Prevention and Response Plan will be developed by the selected construction contractor.

- NPPD will report to all appropriate landowners or agencies immediately if there are any herbicide spills, unplanned non-target herbicide applications, unusual occurrences of drift, unforeseen effects on wildlife or other resources, or any other situation that may affect public welfare. Herbicide clean-up and disposal is the responsibility of NPPD and will comply with all federal, state, and county requirements.

- All herbicide applicators will keep a spill kit in their vehicle. At a minimum the following items are suggested: shovel, 10 pounds of absorbent material (cat litter, soil, sawdust, or absorbent clay), large polyethylene bags with ties, safety goggles, rubber gloves, protective overalls, rubber boots, five-gallon pail, respirator and cartridges suited to the composition of the herbicide(s), dust pan, shop brush, portable eyewash, blank labels, first aid kit, apron, soap, water, and phone numbers of appropriate emergency personnel and CHEMTREC.

6.5 Herbicide Use Reporting

Herbicide use reporting will be conducted daily for each application of herbicide treatment, as follows:

- NPPD’s Form K142 – Pesticide Use Report will be completed for each application of herbicide treatment.

- NPPD's Form N159 – Vegetation Management Contractor's Daily Report shall be completed on a daily basis until criteria for restoration of vegetative cover in disturbed areas are met. All landowner notifications shall be documented in Form N159.

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APPENDIX F NPPD ABB MITIGATION PARCEL MANAGEMENT PLAN

January 29, 2025

NEBRASKA PUBLIC POWER DISTRICT

R-Project

R-Project Mitigation Parcel Management Plan Revised and Updated Plan Supporting Habitat for the American Burying Beetle (Nicrophorus americanus)

PROJECT NUMBER:
128143

PROJECT CONTACT:
Ben Bainbridge
EMAIL
ben.bainbridge@powereng.com
PHONE:
208-788-0391

POWER ENGINEERS

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R-Project Mitigation Parcel Management Plan

PREPARED FOR: NEBRASKA PUBLIC POWER DISTRICT
PREPARED BY: BEN BAINBRIDGE
208-788-0391
BEN.BAINBRIDGE@POWERENG.COM

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ACRONYMS AND ABBREVIATIONS

ABB	American burying beetle
HCP	Habitat Conservation Plan
ITP	Incidental Take Permit
Mitigation Plan	Mitigation Parcel Management Plan
NGPC	Nebraska Game and Parks Commission
NPPD	Nebraska Public Power District
Property	NPPD's mitigation land
R-Project	345,000 volt transmission line from NPPD's Gerald Gentleman Station Substation near Sutherland to an expansion of NPPD's existing substation east of Thedford
SSA	Species Status Assessment
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service

1.0 INTRODUCTION AND PROJECT BACKGROUND

Nebraska Public Power District (NPPD) plans to construct a 345,000 volt transmission line from NPPD's Gerald Gentleman Station Substation near Sutherland to an expansion of NPPD's existing substation east of Thedford (R-Project). The new line will then proceed east and connect to the Holt County Substation sited in Holt County at the intersection of Holt, Antelope, and Wheeler Counties, Nebraska (Figure 1).

The R-Project is an approximately 226-mile-long line that will 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 grasslands and wet meadows where the American burying beetle (*Nicrophorus americanus*) (ABB) is known to occur.

It has been determined that incidental take of ABB is likely to occur in connection with certain activities associated with construction and emergency repair of the R-Project. Consequently, NPPD decided to apply to the United States Fish and Wildlife Service (USFWS) for an Endangered Species Act Section 10(a)(1)(B) Incidental Take Permit (ITP). This application and corresponding preparation of a Habitat Conservation Plan (HCP) in coordination with the USFWS and Nebraska Game and Parks Commission (NGPC) were voluntary steps that have been undertaken by NPPD to obtain authorization for incidental take resulting from otherwise lawful construction and emergency repair of the R-Project within the Permit Area.

The USFWS issued ITP #TE72710C-0 for the R-Project and associated substations to NPPD on June 12, 2019. Subsequent litigation challenged the USFWS's action in federal district court, arguing that the USFWS's decision to issue the ITP violated the Endangered Species Act, the National Environmental Policy Act, and the National Historic Preservation Act.

Between June 12, 2019, and June 17, 2020, NPPD completed certain construction activities under ITP #TE72710C-0. Total activities included 13 acres of permanent disturbance at the Thedford Substation and 0.07 acre of permanent disturbance associated with distribution line relocations. There were also 26.77 acres of temporary disturbance. In compliance with the HCP associated with ITP #TE72710C-0, a total of 47.24 acres of mitigation are required to offset these activities. Further information on temporary and permanent disturbance associated with Project progress to date, as well as future disturbance totals and associated mitigation measures, can be found in Section 5.1 of the HCP.

On June 17, 2020, the federal district court issued its opinion, which rejected some of petitioners' claims and agreed with others. Oregon-California Trails Ass'n v. Walsh, 467 F. Supp. 3d 1007 (D. Colo. 2020). The court vacated ITP #TE72710C-0 and remanded the matter to the USFWS for further proceedings consistent with its order. NPPD revised the HCP to include updates to the original HCP in response to new information and minor changes to the Project. The revised HCP will support NPPD's resubmitted ITP application for the R-Project. Based on the revised HCP, 509.83 acres of mitigation property will be required in addition to the 47.42 acres identified above.

In 2019, NPPD purchased in fee title 594 acres of native sandhills prairie lands to offset the impacts of all anticipated ABB take. That mitigation land (referred to herein as the "Property") remains in place and is the subject of this Mitigation Parcel Management Plan (Management Plan).

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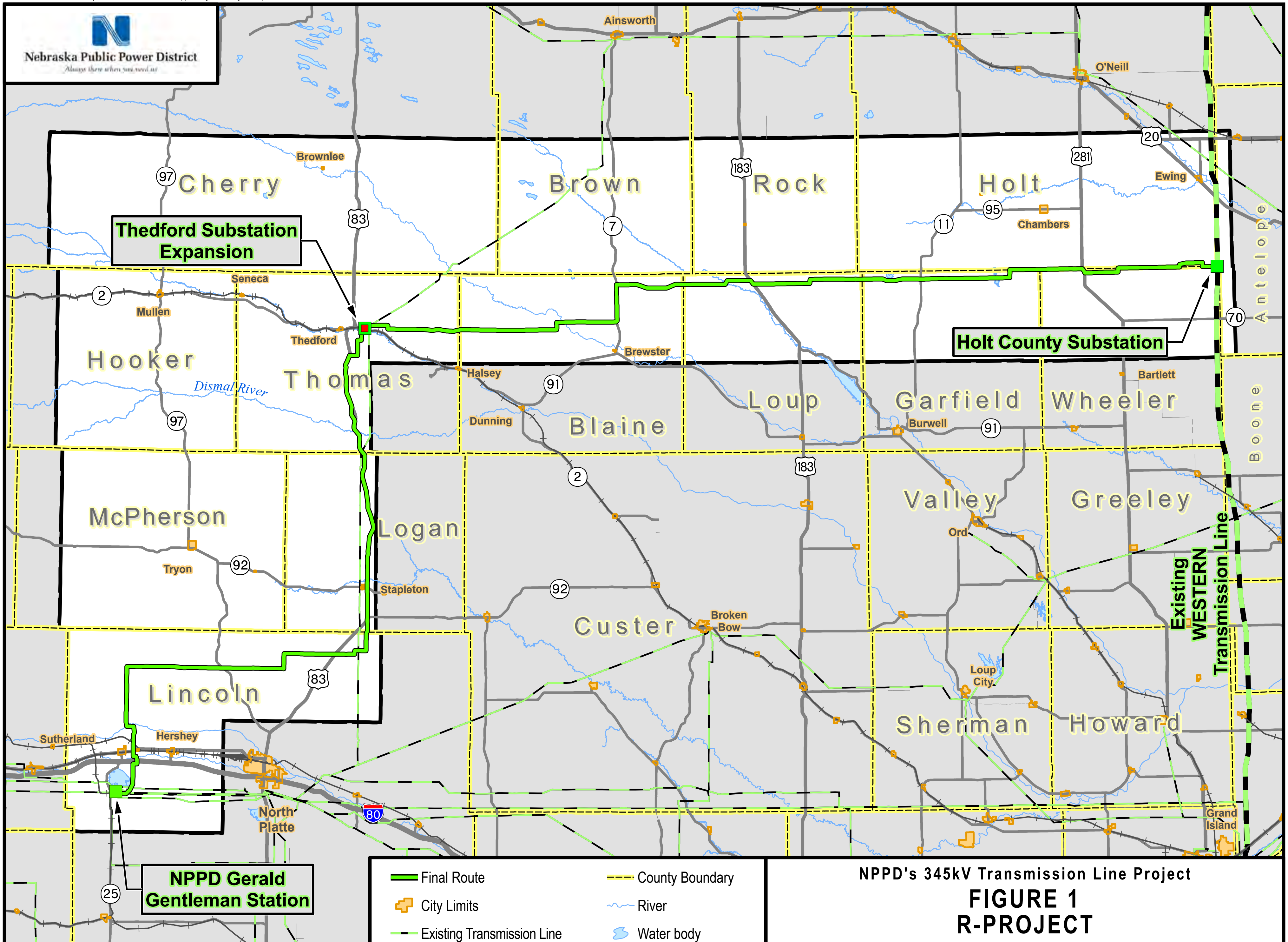


NPPD's 345kV Transmission Line Project

FIGURE 1

R-PROJECT

2.0 MITIGATION PROPERTY DESCRIPTION

Given the known distributions of ABBs in the varied ecoregions of Nebraska, Oklahoma, and Rhode Island, it is apparent that ABBs do not have specific habitat requirements that are consistent across its entire known range and that ABBs have a wider niche than many other similar species (Jurzenski 2012). ABB is considered a habitat generalist in terms of vegetation where it is found (USFWS 2019). However, soil moisture is an important component of suitable habitat and ultimately populations are likely limited by carrion of a suitable size for reproduction (USFWS 2019). According to the ABB Rangewide Survey Guidance dated May 8, 2018, the USFWS believes that areas considered unfavorable for use by ABB include permanent wetlands; land that is regularly tilled; developed lands that have lost their surficial soils, topsoil component, leaf litter, or vegetation; stockpiled soil without vegetation; and urban areas with maintained lawns or impervious surfaces, and mowed areas where vegetation height is typically 8.0 inches or less (USFWS 2018).

No critical habitat has been designated for the ABB by the USFWS. The ABB Species Status Assessment acknowledges that identifying the specific habitat requirements of ABBs has been difficult because of the species' unusual life history, ecology, and it is highly mobile and potentially attracted to baited traps used for survey purposes (USFWS 2019).

The 2019 American Burying Beetle Species Status Assessment (SSA) states, "The ABB needs properly functioning ecosystems that contain suitable soils sufficient to support diverse vegetative communities that sustain appropriate wildlife populations such that suitable carrion to facilitate reproduction is available" (USFWS 2019). Based on that assertion from the ABB SSA, this management plan assumes that healthy rangelands, managed in such a way as to encourage a healthy grassland communities, support ABB habitat and individuals. The significant correlations between numbers of trapped ABB and the corresponding biomass of vertebrate animals observed by Holloway and Schnell (1997) also suggest that a healthy, diverse grassland ecosystem that is capable of producing and supporting a diversity of vertebrate species is key in providing quality ABB habitat. Also of note, Schnell and Hiott (2005), as referenced in the SSA, found that all of the areas with the highest ABB catch rates were in grasslands or open forest with a grass component, which is indicative of the importance of healthy grasslands to the support of ABB populations.

In the majority of the Nebraska Sandhills, the dominant native ecosystem consists of grasslands, including vegetated sand dunes interspersed with wet meadows fed by the Ogallala Aquifer, which provides a water table at or near the surface for discharge into a vast array of wetlands even during drought (LaGrange 2005). The presence of a shallow water table allows for drought resiliency for native grasses and other prairie plants as well as a reliable source of moisture that can keep ABB from desiccating during periods of otherwise inhospitable conditions.

Healthy native grassland communities in the Nebraska Sandhills are typically represented in dune areas by sand bluestem (*Andropogon hallii*), prairie sandreed (*Calamovilfa longifolia*), little bluestem (*Schizachyrium scoparium*), and hairy grama (*Bouteloua hirsuta*), along with various annual and perennial forb species (Kaul et al. 2006; Schneider et al. 2011). Wet meadows are dominated by sedges (*Carex* spp.), spike-rushes (*Eleocharis* spp.), prairie cordgrass (*Spartina pectinate*), switchgrass (*Panicum virgatum*), and various wet-meadow forb species (Schneider et al. 2011).

In September 2019, NPPD purchased 594 acres of native prairie in Blaine County, Nebraska to preserve as habitat for the ABB to mitigate the impacts of taking ABB associated with the R-Project transmission line. The entirety of the Property is native sandhills prairie with soil moisture profiles that range from saturated (wetlands) to xeric dune tops (Figure 2). This heterogeneity provides a diverse vegetative community and ensures the Property will provide suitable soil moisture profiles for ABB through a variety of weather and climatic conditions as well as a range of conditions for numerous native vertebrate species. Aerial imagery in Figure 3 shows the Property in wet conditions noted in 2010. Aerial imagery in Figure 4 shows the Property during dry conditions in 2016. While there are small areas of long-term standing water visible on aerial imagery, these are not considered permanent water bodies and are not categorized as such in United States Department of Agriculture, Natural Resources Conservation Service ecological site descriptions (USDA 2023). No standing water was present in August 2022. Soil moisture levels fluctuate across the parcel in response to changes in groundwater elevation and precipitation levels. In dry years the wetland areas provide ABB with a source of suitable mesic habitat; in excessively wet areas the upland locations provide refuge for ABB from inundated lowlands.

This parcel was selected as suitable mitigation land in part due to its location within an area of high ABB density and the degraded condition of the Property at the time of acquisition along with the potential to restore to a more typical climax community condition. During multiple site visits between March 2018 and November 2019, while the Property was under the previous grazing management, nearly all of the Property was found to have vegetation less than eight inches tall due to grazing. Areas with vegetation maintained at less than eight inches are not considered to be suitable habitat for ABB (USFWS 2014). Informal pedestrian surveys through the site under the previous grazing regime showed a trend away from climax community as indicated by the prevalence of species such as Kentucky bluegrass (*Poa pratense*) and black medic (*Medicago lupulina*) in wet meadow portions of the parcel. Grazing levels on the parcel remained consistent with pre-purchase levels through the end of the 2020 grazing season. Beginning in 2021, NPPD removed all grazing activities from the Property. Figure 5 depicts the area when grazed and following a year with no grazing.

The site is native sandhills prairie. Complete plant species composition on the Property was unknown at the time of site visits and was unable to be determined due to the level of grazing. Grasses that were able to be identified appeared to be dominated by native plants that are common in the Sandhills ecoregion. However, a change in species composition away from native species and toward a Kentucky bluegrass state was noted, likely due to extensive season-long grazing regimes. Both the biomass production and species composition will be targeted for improvement by prescriptive management actions. Because the land retains characteristics of unbroken prairie and has many native plant species, there is no plan to disturb the site, including the re-planting of native plant species.

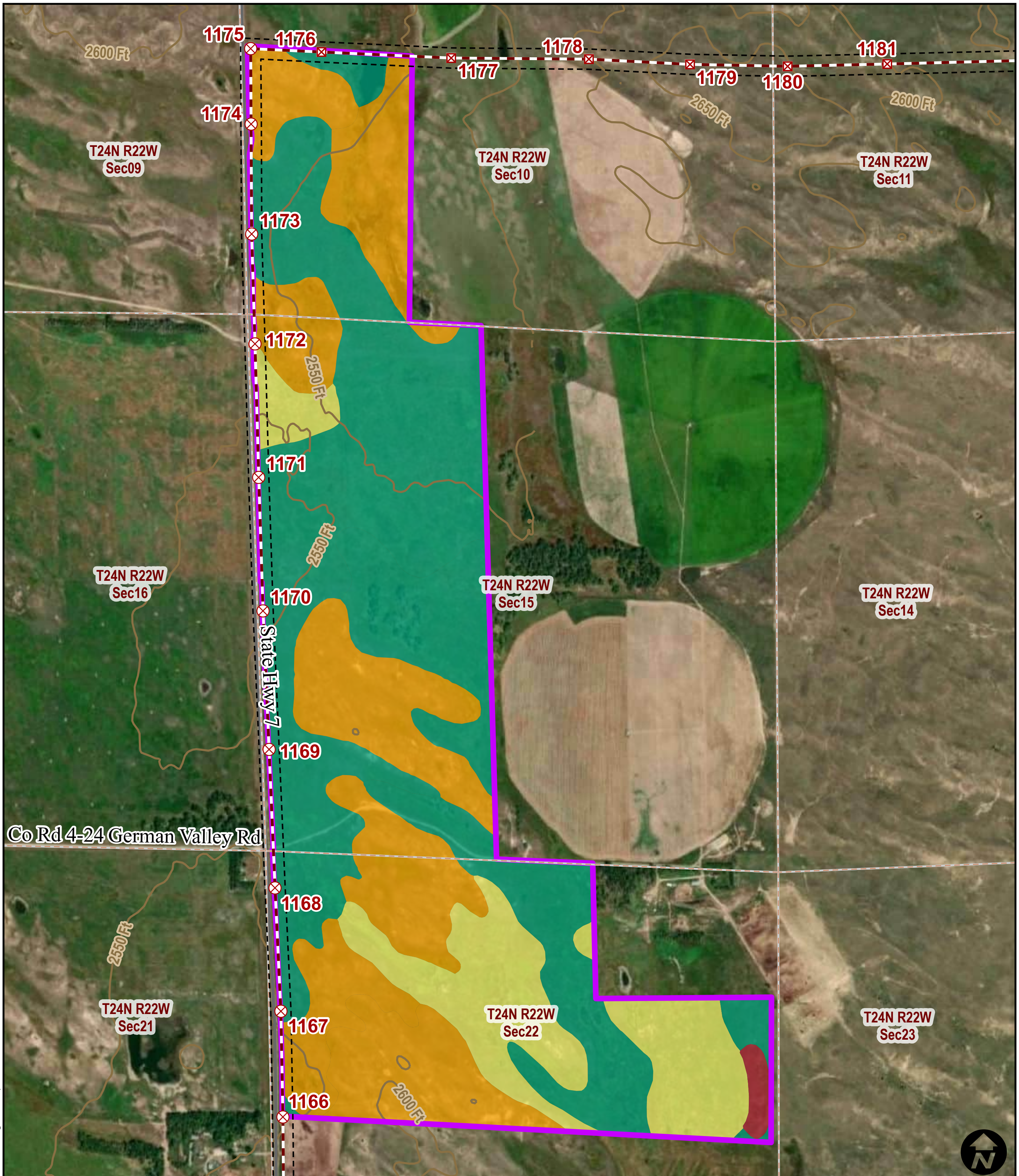
In addition to the wetland and grassland species, there are groves of deciduous trees on the Property consisting mostly of cottonwoods interspersed with a few cedar trees.

Water levels at this site are influenced by groundwater, with no flowing stream entering or exiting the Property; therefore, active management of water levels to affect the gross soil moisture on the Property is not an available option. However, passive loss of soil moisture is expected to be reduced as ground cover and aboveground biomass increase.

As part of the ABB survey associated with calculating take for the R-Project, NPPD has surveyed from three miles south of the Property to one mile north of the Property during all years from 2016 through 2024 (Figure 6). NPPD will continue this survey until completion of the construction of the R-Project and for at least five years post construction. Survey results for these traps are summarized in Table 1. ABB abundance as determined by survey results has varied by greater than an order of magnitude in the eight years of survey.

TABLE 1 HIGHWAY 7 SURVEY RESULTS AS INDIVIDUAL ABB CAPTURES

	2016	2017	2018	2019	2020	2021	2022	2023	2024
HWY 7 Trap 1	11	6	11	0	2	15	18	15	6
HWY 7 Trap 2	33	10	4	5	5	10	7	13	3
HWY 7 Trap 3	11	3	0	2	1	5	0	8	1
HWY 7 Trap 4	41	14	4	5	0	6	5	12	2
HWY 7 Trap 5	13	11	6	0	1	8	12	12	2
HWY 7 Trap 6	7	2	2	0	1	6	3	9	1
HWY 7 Trap 7	2	3	0	0	2	9	14	5	7
	118	**49**	**27**	**12**	**12**	**59**	**59**	**74**	**22**



Blain County, NE
T24N R22W Sec10, 15, 22

Project Components

- Habitat Mitigation Area
- Lattice Tower
- Steel Monopole
- Transmission Centerline
- ROW

Ecological Site Description

- Choppy Sands High P.Z. 22-25
- Sands High P.Z. 22-25
- Sandy Lowland
- Subirrigated

Reference

- Section line
- Contour - 50 feet

NPPD's R-Project

FIGURE 2:
MITIGATION PROPERTY
ECOLOGICAL SITE DESCRIPTION

0 500 1,000 1,500 2,000 2,500 Feet

Nebraska Public Power District

POWER ENGINEERS

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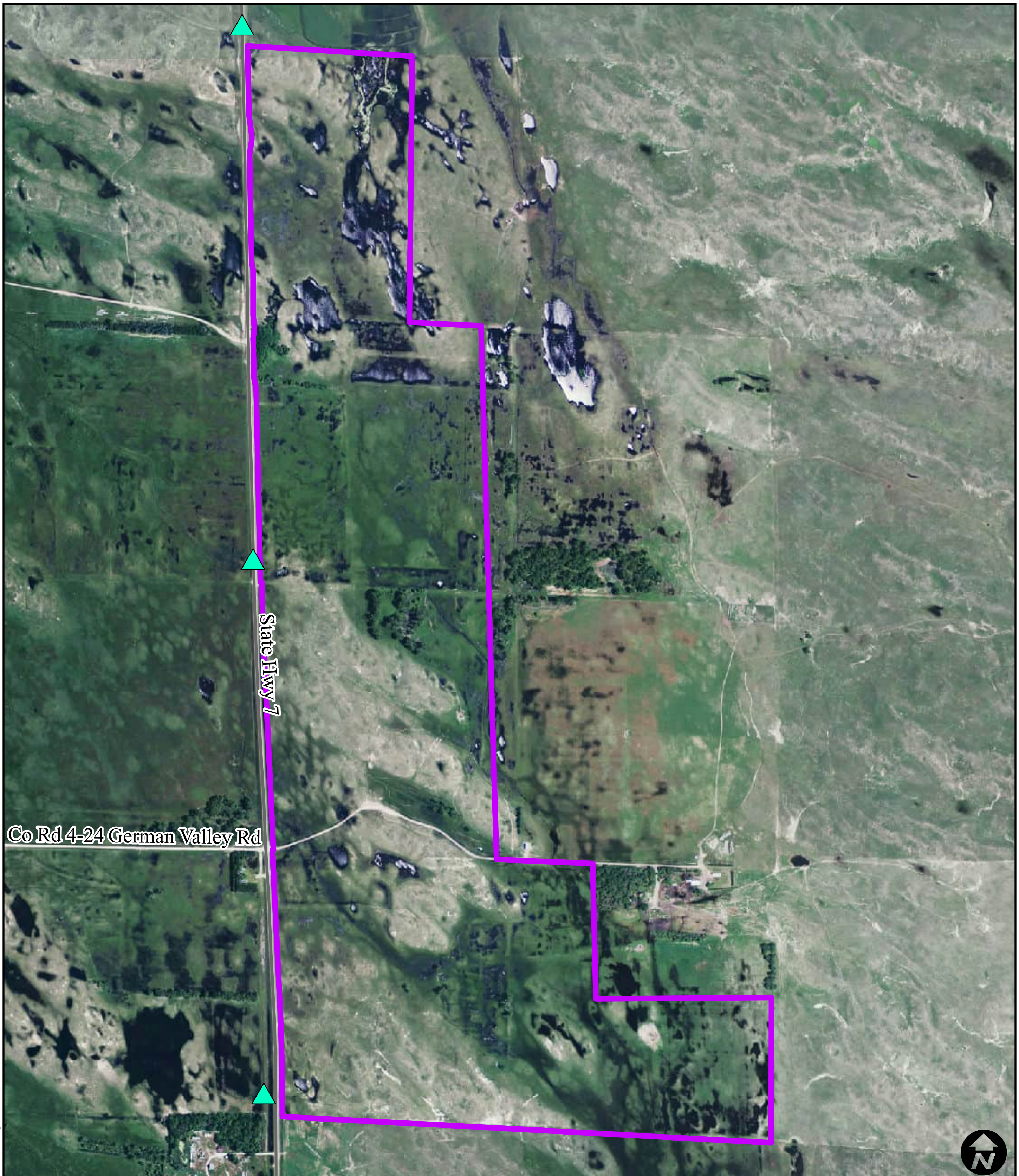

Blain County, NE
T24N R22W Sec10, 15, 22

Habitat Mitigation Area

ABB Trap Present 2017

NPPD's R-Project

FIGURE 3:
WET CONDITIONS (2010)

0 500 1,000 1,500 2,000 2,500 Feet

Nebraska Public Power District

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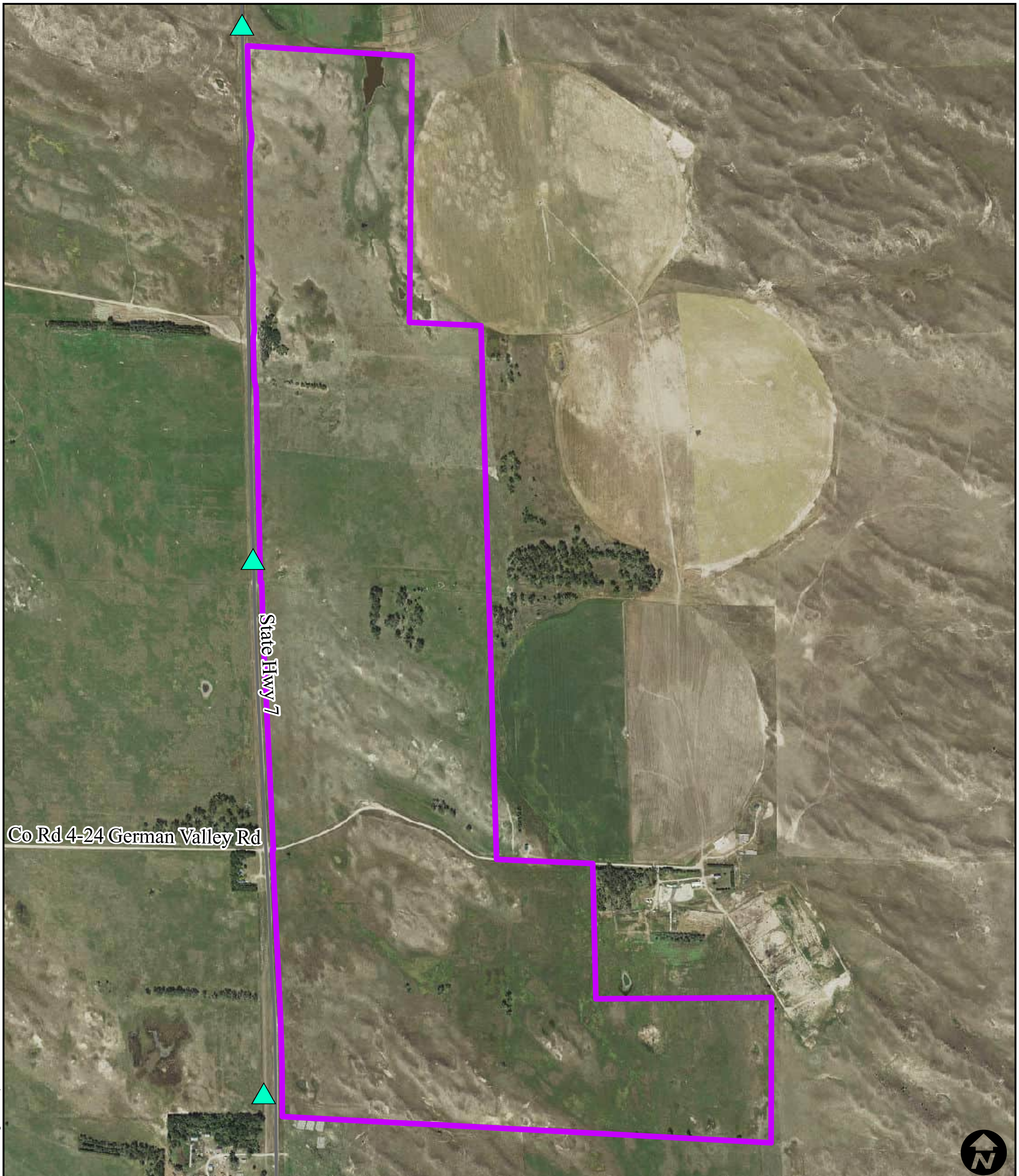

Blain County, NE
T24N R22W Sec10, 15, 22

Habitat Mitigation Area

ABB Trap Present 2017

NPPD's R-Project

FIGURE 4:
DRY CONDITIONS (2016)

0 500 1,000 1,500 2,000 2,500 Feet

Nebraska Public Power District

POWER ENGINEERS

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3.0 PURPOSE AND GOAL

The HCP includes goals and objectives for the benefit of ABB. The HCP Goals and Objectives pertinent to this Management Plan include the following (note that this Management Plan is HCP Appendix F):

- Goal 3: Protect habitat that supports individuals of the Sandhills ABB population.
    - Objective 3a: Protect, in perpetuity, an amount of occupied ABB habitat based on mitigation ratios described in Section 6.2.2.
    - Objective 3b: Manage protected ABB habitat to ensure breeding, feeding, and sheltering needs of ABB are met, as described in Appendix F.

The purpose of this Management Plan is to provide direction and guidance for the management of the Property with a native grassland plant community that provides habitat for ABB in order to meet HCP Goal 3 and Objectives 3a and 3b.

The goal of this Management Plan is to create conditions on the Property that are trending toward the climax plant community for the individual ecological sites present (i.e., a functioning ecosystem). As noted in the SSA, functioning ecosystems such as healthy grassland offer increased habitat quality for vertebrate wildlife species on the Property as well as conditions that are currently understood to support the Sandhills ABB population (USFWS 2019).

4.0 OBJECTIVES

The objectives of this Management Plan are the measurable steps that will be taken to achieve the goal of a grassland community managed as healthy grasslands for the benefit of the ABB. The focus of the objectives is the use of tools that result in healthy native prairie that is understood to provide ABB habitat:

1. Determine the baseline condition of grassland resources.
    a. Action: Use established methods to document state of grassland. A Rangeland Health Assessment was completed to document the condition of the native plant community on the Property in summer of 2023.
        i. Response Measurement: Provide survey, inventory, and/or monitoring results in annual reporting documents.
2. Establish long-term monitoring sites with geo-referenced photographs for each monitoring site.
    a. Action: Complete annual data collection and photo documentation at established monitoring sites to record changes in site conditions over time.
        i. Response Measurement: Provide site data, photo documentation, and interpretation of results in annual reporting documents.
3. Develop and implement an annual or multiannual management plan using tools described in Section 5 that encourages grassland habitat development toward climax plant community.
    a. Action: Identify and implement annual or multi-annual management actions (Section 5)
        i. Response Measurement: Perform annual range health assessment monitoring protocol; include results and identified trends in annual reporting documents.
4. Diminish direct and indirect impacts that reduce the conservation value of the mitigation Property as prudent.
    a. Action: Perform a Strength, Weakness, Opportunities, and Stress analysis of management activities annually prior to implementation of annual management plan to identify potential direct or indirect impacts to ABB that could result from management activities.

            i. Response Measurement: Include results of Strength, Weakness, Opportunities, and Stress analysis as well as any observed unintended consequences of management actions in annual reporting documents so they can be used to inform future adaptive management decisions.

5. Examine the relationship between management actions and ABB population density in and around the Property.
    a. Action: Implement five years of consistent ABB monitoring completed during the August survey window on Highway 7 in and around the Property. See Section 6.0 for a full description of ABB monitoring.
        i. Response Measurement: Compare results of vegetation, photographic, and ABB population monitoring in relation to one another to evaluate the effectiveness and potential correlation to management actions, with the goal of achieving desired habitat conditions and expected ABB population responses. Results may be applied to Adaptive Management (Section 7.0).
6. Use adaptive management practices to establish management actions for the following year.
    a. Action: Develop annual report detailing results of monitoring efforts and assessments of effectiveness of management actions, and any proposed changes to such management.
        i. Response Measurement: Include annual meeting notes and adaptive management decision in annual reporting documents.

FIGURE 5 MONITORING POINT JULY 7, 2020 VS. JUNE 25, 2021

5.0 MANAGEMENT ACTIVITIES

Management of the Property will focus on achieving Objective 3. The management activities described below should be considered as tools in a toolbox. Any of these activities could be detrimental if done at the wrong time or under the wrong conditions. Native prairie ecosystems are dynamic environments that require alternating periods of grass species stimulation and rest to promote the maximum amount of species diversity and ecosystem function, thereby providing maximum support for ABB in the area. Excessive plant litter is a sign of underutilization of grasses, under-stimulation of grasses and soil biology, and stagnation of grassland species, which begins a trend away from proper functioning of the rangeland.

5.1 Cross-Fencing

Cross-fencing is the addition of interior fencing to divide a property into smaller management units. Cross-fencing by itself is not considered a management activity. However, it provides the base infrastructure that is needed to implement certain grazing strategies. For example, an area that has been treated with a prescribed burn should be excluded from grazing pressure for at least one growing season. Alternatively, cross-fencing allows for the proper concentration of cattle in certain areas to achieve successful twice-over rotational grazing. Cross-fencing can be done through several methods ranging from light-duty, temporary electric fencing to more permanent wood-post and barbed wire installation. Fencing types would be selected based on the identified management needs.

5.2 Full Rest

Full rest includes the removal of all grazing and management activities from a property. As the Property has had a history of continuous, season-long grazing to the extent that little to no vegetation over 8.0 inches high remained and species composition was becoming altered, complete removal of cattle from the Property for a period of time, or a rest period for the Property, may be a prudent approach. During a rest period biomass is allowed to accumulate, and plants are able to replenish root reserves and become better established and resilient to external pressures, leading to healthy grassland communities that support increased ABB populations (USFWS 2019). Excessive rest can result in an over-accumulation of litter and eventual stagnation of the grass plants. However, intentional rest is a good strategy for naturally combating the stresses of overgrazing.

5.3 Grazing

Grazing includes the active management of livestock to remove plant biomass and stimulate new plant growth. Due to the timing of NPPD’s purchase of the Property in 2019, it was agreed that the previous landowner could use the Property for grazing purposes in 2020. The previous grazing regime that had been in place for several years resulted in vegetation height maintained consistently below 8.0 inches, which likely reduced the value as ABB habitat. Because of the past grazing impacts, all grazing was deferred in 2021 and 2022 to increase surface biomass.

Native prairie has adapted over centuries to thrive under proper levels of ungulate grazing. Certain types of desired changes in vegetation can best be effectuated by closely monitored grazing prescriptions. While grazing is prevalent throughout the Sandhills, the impacts of prescribed grazing on ABB or certain aspects of their habitat such as food sources is not well understood. The suite of grazing prescriptions is vast, but they all rely on the components of stocking density, grazing duration, and timing of grazing to achieve desired results. Due to the complexity of grazing management strategies, a discussion of potential grazing approaches is included as Attachment A.

Strategic use of grazing as a management strategy has the potential to stimulate native grass plants and help move the plant community closer to a climax community which, as previously noted, can reasonably be assumed to support a corresponding population of vertebrate wildlife that can serve as a food source for the ABB.

5.4 Haying

Haying is a management action that can leave standing residual cover in excess of 8.0 inches while removing excessive standing plant material that can cause stagnation of a grassland if allowed to remain in place for an extended period of time. Haying may be considered for use in conjunction with other management actions in specific circumstances. Excess buildup of standing dead plant material can have a detrimental effect on native prairies, and thereby reduce the ability of the habitat to support peak ABB numbers. Removing this excess of standing dead plant material promotes new growth, resulting in healthier grassland communities that support ABB populations (USFWS 2019). Timing of haying activities would be set in coordination with USFWS and NGPC to avoid effects to ABB and consider other sensitive resources in the area, including nesting migratory birds, and western prairie fringed orchid (*Platanthera praeclara*). Haying as a management practice is not expected to be used routinely since removing biomass from the field in which it was grown can deplete soil fertility and reduce litter and ground cover over time.

5.5 Controlled Burns

Controlled burning removes standing dead and excessive plant litter and provides a nutrient release that can stimulate prairie grassland species, resulting in healthier grassland communities that support ABB populations (USFWS 2019). A burn also aids in the control of undesirable tree species such as eastern red cedar. However, the effects of burning on ABB, which will lead to exposure of bare soil that could result in loss of soil moisture, are not known at this time. Controlled burns are not a widely accepted practice in the Sandhills, and landowners indicated to NPPD during R-Project public meetings that fire is a major landowner concern. Therefore, while controlled burns are included as a potential management practice, they are not expected to be conducted routinely. Similar to haying, the timing of controlled burns would be set in coordination with USFWS and NGPC to avoid effects to ABB and consider other sensitive resources in the area, including nesting migratory birds, and western prairie fringed orchid (*Platanthera praeclara*).

5.6 Undesirable Plant Control

Undesirable plant species may include general invasive plants, state-listed noxious weeds, or woody plants such as eastern red cedar. Invasive plants will be assessed for the level of detriment they may cause to the general health of the surrounding native prairie. Most general invasive plants can be managed by improving rangeland health so that the desirable native plants can out-compete the invasives. In cases where general invasive plants pose a threat to the native prairie, a more comprehensive control strategy may be implemented in coordination with USFWS and NGPC.

State-listed noxious weeds, if present, must be controlled consistent with state law. As with general invasive plants, noxious weeds will be assessed for the threat they pose to the surrounding native prairie, and an adaptive approach using an appropriate combination of cultural, mechanical, chemical, or biological control will be used in coordination with USFWS and NGPC.

Eastern red cedar will be removed from the Property using a combination of methods that can include mechanical, chemical, or the use of controlled burn. All cedar control should occur outside the ABB active period of May 1 to October 1. NPPD will commence cedar control within two years of ITP issuance, with additional cedar control to be performed every five to 10 years after the initial control efforts as deemed necessary during monitoring.

5.7 Prohibited Activities

The purpose of the Property is to provide ABB habitat that is safeguarded in perpetuity. Because the Property currently supports a native plant community that is likely to support ABB presence, activities that could detrimentally affect suitability for ABB will be prohibited. Any activity on or use of the Property inconsistent with this Management Plan is prohibited. Without limiting the generality of the foregoing, the following activities are expressly prohibited:

1. The construction or fabrication of any residential, commercial, recreational, or industrial facility on the Property, or any other structure not specifically discussed in this Management Plan or otherwise approved in advance by the USFWS
2. Surface mining or quarrying of soil, sand, or other minerals
3. Erection of commercial, institutional, or other similar types of signage
4. Alteration of the surface or general topography of the Property, or covering surfaces with impervious material
5. Any dumping or accumulation of any kind of trash, ashes, refuse, waste, bio-solids, or hazardous waste on the Property or any placement of bulk soil on the Property that would be inconsistent with this Management Plan
6. Erection of electrical generating wind turbines or solar arrays
7. Construction or continued maintenance of confined animal feeding lots or operations
8. Installation of recreational facilities, resort structures, golf courses, sports fields, or other public or commercial facilities; however, passive recreational uses may be carried out on the Property by NPPD or its invitees, so long as those uses do not conflict with the Management Plan
9. Selling or transferring any easement, right-of-way, or other encumbrance on the Property to a third party, other than as approved in advance by the USFWS and NGPC

6.0 MONITORING AND REPORTING

6.1 ABB Monitoring

ABB must fly to find food and can travel long distances in a single night with the possibility of being attracted to bait during survey efforts (USFWS 2019). Existing information indicates most movement during surveys is less than 0.8 kilometers (km); however, the accuracy of that distance in regards to natural movements outside of survey efforts is unknown (USFWS 2019). Due to the shape of the Property no point within the Property lies more than 0.6 km mile from the Property boundary. Since ABB are known to travel distances far exceeding 0.6 km in a single night, it would not be possible to attribute changes in ABB abundance or occurrence determined through survey efforts solely to the management of the mitigation Property. Variables outside the control of NPPD such as adjacent lands management, rain events, drought, or others could all play a role in ABB abundance and occurrence. Therefore, ABB trapping results are intentionally not tied to any Management Plan Objectives defined in Section 4.

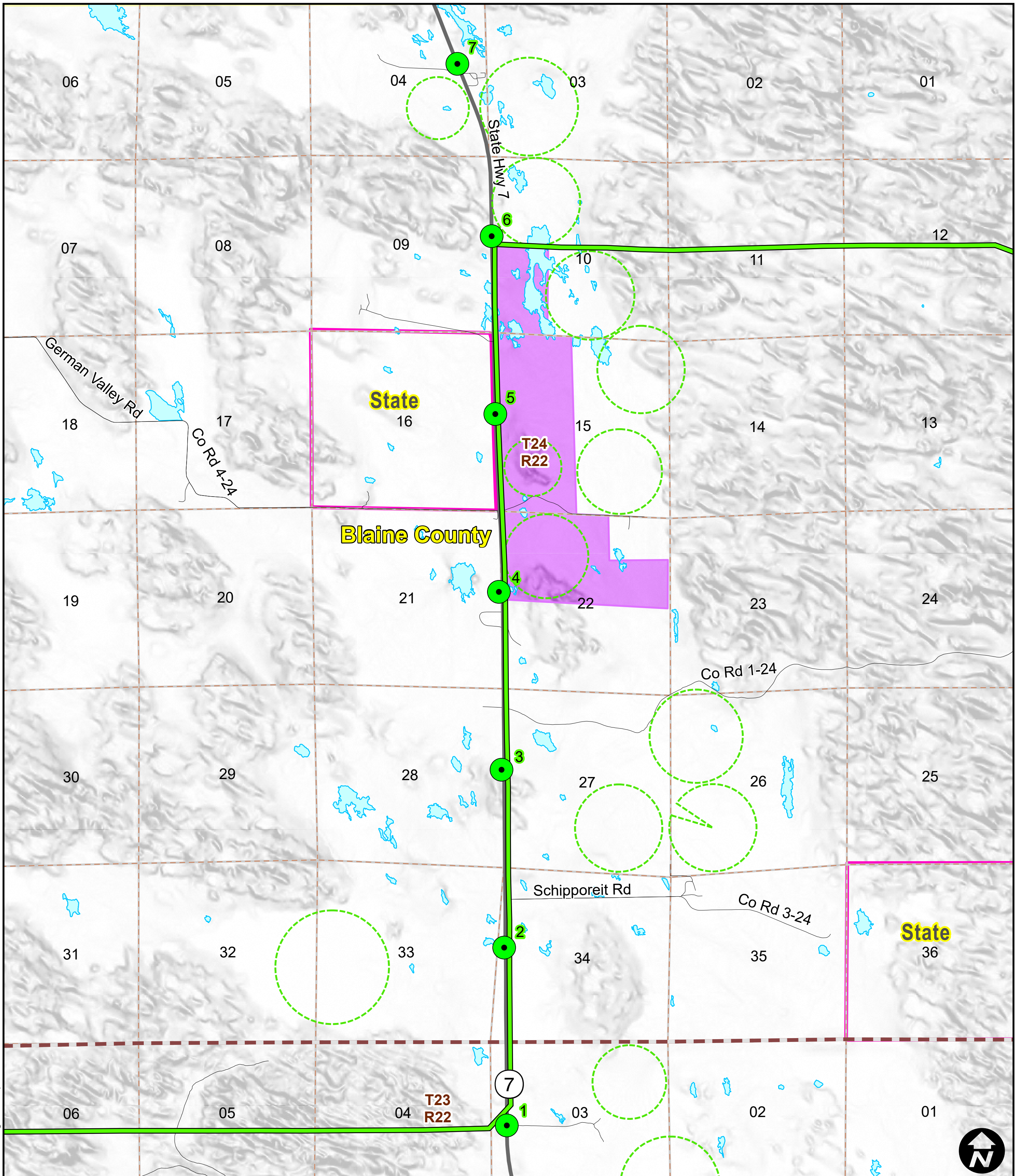
Repeated ABB surveys at the same locations along the entirety of the R-Project in the years 2016 through 2020 showed that ABB abundance varies significantly (Tables 2 and 3) in response to weather or other landscape-scale ecological drivers that cannot be addressed in a management plan. This is consistent with what was observed in the more immediate vicinity of the mitigation ground also (Table 1). The continuation of monitoring near the mitigation plan will provide data that can be evaluated by the FWS, NGPC and NPPD that may shed light on the localized effects on ABB due to management activities on the Property. NPPD will continue to monitor the seven ABB traps along Highway 7 (Figure 6) that were part of the original take monitoring protocol using the same five-night effort in the August survey window. The trapping effort along Highway 7 will continue for five years after completion of R-Project construction, at which time the USFWS, NGPC, and NPPD will confer on the need to continue or suspend the annual ABB trapping effort.

TABLE 2 INDIVIDUAL ABB CAPTURES

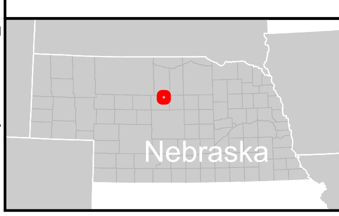
	Individual ABB				
Survey Transect	**2016**	**2017**	**2018**	**2019**	**2020**
Highway 83	0	0	0	0	0
Purdum	2	3	0	1	0
Brewster	99	46	77	38	62
Highway 7	118	49	27	12	12
Calamus	63	8	43	16	15
Gracie Creek Road	23	23	33	20	27
Highway 11	122	74	30	13	14
846 Road	64	91	17	12	33
Total	**491**	**294**	**227**	**112**	**163**

TABLE 3 ABB POPULATION ESTIMATES

Survey Year	Lower 95% ABB Population Estimate	ABB Population Estimate	Upper 95% ABB Population Estimate
2016	1,073	1,281	1,589
2017	695	714	736
2018	987	1,017	1,049
2019	231	233	235
2020	806	842	881



Blain County, NE
Mitigation Parcel:
T24N R22W Sec10, 15, 22



#
ABB Trap Location
Project Centerline
ABB Mitigation Parcel
7
State Highway
Local Road
Township
Section
Irrigated Agriculture
Special Managment Area
WAter body

NPPD's R-Project

FIGURE 6:
ABB TRAP LOCATIONS

0 0.5 1 1.5 Miles

Nebraska Public Power District

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6.2 Site Inventory and Monitoring

An initial Rangeland Health Assessment and corresponding vegetative inventory was performed on the Property during the summer of 2023 at a time when most native cool- and warm-season grasses are near maturation, likely late June to late July depending on weather conditions.

The purpose of gathering baseline data is to determine with reasonable certainty the current status of the Property as habitat for ABB (Objective 1) and the likely trajectory of habitat changes under the application of various management activities (Objectives 2, 3, and 4). While the Property is located within known ABB habitat and occupied areas, it is likely that the suitability of the parcel as ABB habitat prior to purchase was compromised. The known history of the Property includes several years under continuous, season-long cattle grazing. While the Property has historically remained native rangeland, the observed intensity of grazing activities prior to the acquisition of the Property resulted in consistent periods of time with less than 8.0 inches of vegetative ground cover. Species composition changes away from the historic climax plant community have also been generally observed.

The baseline inventory of the Property included mapping of all existing infrastructure—including fences, wells, water sources, shelterbelts—and an assessment of the historic grazing patterns as indicated by plant community. The last year that cattle were present on the site was 2020, so the condition of the Property has already improved since NPPD acquired it; however, changes to species composition away from the reference plant community will likely remain visible for an extended period of time.

In addition to documenting physical structures, hydrological features, rangeland ecological sites, and other variables were identified. A full Rangeland Health Assessment was done to evaluate the function of the existing prairie communities. The following evaluations were completed with the inventory:

- Sample sites were established at locations that are representative of the average conditions for each rangeland ecological site found on the Property. The reference community for each site is called the Historic Climax Plant Community. Under certain conditions, such as non-use or heavy grazing, the plant community deviates from Historic Climax Plant Community in predictable patterns. If such deviations are noted within ecological sites during the initial baseline inventory, then additional sampling locations will be added to the monitoring design to document changes resulting from management activities. Following the inventory, a minimum of four and a maximum of 12 sample sites were identified.

- Using a soil probe, soil at each sample location was examined for depth of topsoil or organic layer and the presence of soil biological activity, such as earthworms and rhizosphere, which can be good indicators of rangeland health. Vegetation species and percent foliar cover were tallied to determine the similarity index of the community. A Range Health Assessment form was completed for each sample site. This measure provides information about how the present ecological function of the site compares to the reference state’s potential. There are multiple steps that document factors such as presence of and resistance to erosion, functional and structural groups, litter cover and depth, and overall plant vigor, among others.

- During the initial inventory, current-year aboveground biomass production data was collected by clipping and weighing air-dried plant material. The growth curve of dominant species was also factored in; resulting biomass weight was adjusted as appropriate based on the time of year the sample was collected and the relative proportion of cool- or warm-season species present. Determining production data aids in assessing the level of historical impact to the rangeland, inform the appropriate stocking rates of grazing animals should they be integrated as a management tool, and help to measure changes and trends that arise in response to management activities.

- In addition to the quantitative measurements obtained through the range inventory process described above, qualitative photo documentation was performed at established monitoring and sampling points.

Following the baseline range inventory in Summer 2023, an annual monitoring program will be implemented to document site conditions and response to management activities. Annual monitoring will consist of collecting the same ecological data as the baseline inventory at the sampling locations, with the exception of the clipping data. Repeatedly clipping vegetation at the exact location can reduce productivity over time and artificially lower annual production estimates when compared to nearby locations. Therefore, no clipping will occur following the original baseline inventory.

For annual monitoring visits, the predicted biomass indicated for the ecological site within Natural Resources Conservation Service Nebraska Vegetative Zone 3 will be used; an appropriate factor to account for annual rainfall and overall range condition will be applied to ensure conservative estimation of stocking rates. Biomass clipping will be completed every five years to ensure that current conditions are objectively being reflected in monitoring data.

NPPD also established six photo points on the Property in the spring of 2020. Pictures at the photo points will be taken at least twice per year (growing season and non-growing season) until deemed no longer necessary. These photo points will provide additional photo documentation of changes to the site.

Annual monitoring will also include a qualitative assessment of the private lands surrounding the Property. This will include an assessment of landcover via an estimated percent of cropland vs native habitat and any changes that occurred within the previous year. The qualitative assessment will be completed from public roads and will only apply to private lands within one mile of the Property.

7.0 ADAPTIVE MANAGEMENT

Adaptive management is a framework for resource conservation that promotes iterative learning-based decision making. (Williams 2011). Management of the Property will follow the four steps of adaptive management: 1) identify uncertainties, 2) develop alternative management strategies, 3) capture sufficient data to evaluate management actions, and 4) use information to establish management actions for the following year. Based on the available data on ABB presence, it is reasonably certain that the Property will continue to provide habitat for ABB under a variety of conditions.

1. Identify Uncertainties

There are several constraints that limit adaptive management within the Property. One of the primary limitations is that ABB surveys are conducted using baited traps. Assumptions regarding effective survey area, percentage of the available population captured, where each unique capture originated from, and the ability to recapture those individuals who may have fed in the trap the night before are based on limited information. While the assumptions listed above may be broad, what is known is that ABB are attracted to a trap from some distance away. Therefore, it is difficult to subdivide the Property into experimental treatments that will allow for independent monitoring and certainty of ABB response to management because any responses from surveys have likely drawn in ABB from off the Property. Additional factors that result in uncertainty around management outcomes include:

- Variability in timing, magnitude, and duration at which management activities are available for consideration.
- The ability of ABB to travel long distances.
- NPPD has no means to control certain factors that impact the Property, such as environmental variability.
- NPPD lacks control over use of surrounding lands.

2. Develop alternative management strategies

Alternative management strategies may include any of the actions described in Section 5.0 above.

3. Capture sufficient data to evaluate management actions

In years when ABB monitoring is conducted, NPPD, USFWS, and NGPC will cooperatively evaluate ABB survey results in conjunction with the management practices implemented in that year and years prior to determine correlative information, if any, pertaining to vegetation management and grazing actions.

4. Use information to establish management actions for the following year

Following issuance of the ITP, NPPD will, in conjunction with the USFWS and NGPC, review all available information from ABB capture data, the baseline rangeland inventory data, ground photography, and annual site visits to determine the suitability of the objectives for the upcoming growing season. A prescribed grazing plan that is compatible with the year's objectives will be implemented; it is anticipated that in some years full rest from grazing will be warranted.

Once the final ABB monitoring season is complete, NPPD, USFWS, and NGPC will:

- Meet to revisit the Management Plan's objectives and management actions,
- Assess the overall adequacy of grazing, haying, and cedar control plans as implemented, along with any potential adjustments needed to each, and
- Identify the level of agency coordination for subsequent years.

8.0 MODIFICATIONS TO THE MANAGEMENT PLAN

It is recognized that plan objectives and/or management actions may change through time based on monitoring results presented at coordination meetings or based on new scientific information. Changes to this plan, including additions, deletions, or modifications to objectives or management actions, would require concurrence from the NPPD, USFWS, and NGPC prior to implementation.

Representatives from NPPD, USFWS, and NGPC will conduct an annual site visit to assess conditions of the mitigation Property and to determine if management actions are achieving the desired land cover and habitat improvements necessary to provide enhanced ABB habitat. This site visit will occur in late fall to early winter so that results from the current-year ABB survey as well as vegetation monitoring results can be available to site visitors. Ideally the site visit will occur during the ABB inactive season, or after October 1, and will help to inform adaptive management strategy decisions for the Property.

The protection of this Property as habitat for ABB is expected to continue in perpetuity. Any termination of management activities would have to be adequately supported by scientific data and only upon unanimous consent of NPPD, USFWS, and NGPC.

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APPENDIX A APPLIED GRAZING MANAGEMENT STRATEGIES

Applied Grazing Management Strategies

Continuous Season-Long Grazing

Continuous, season-long grazing is a way of grazing that simply entails placing cattle onto a pasture and leaving them until the end of the growing season. This situation can result in repeated re-grazing of new growth over parts of the pasture and over-maturation of vegetation in other areas. This pattern is known as spot grazing. If stocking density is high, this type of grazing will result in widespread overgrazing and short vegetation across the entirety of the pasture.

Continuous, season-long grazing done under low stocking density results in areas of heavily overgrazed grasses interspersed with stagnant, underutilized areas. Over a continued period of use of this grazing method, the overgrazed areas experience transition of the community away from the historic climax plant community or "reference state." The underutilized areas are characterized by standing dead plant material that become undesirable for grazing due to high lignin content and poor digestibility. Lack of grazing stimulation can cause a reduction of plant vigor and the individual grass plant crowns to regress, resulting in increasing amounts of bare soil between the plants. These bare areas are then ripe for colonization by opportunistic or invasive species such as eastern red cedar.

Although a continuous, season-long grazing strategy is typically shunned by range conservationists, under certain conditions it has been shown to result in increased heterogeneity of plant structure and a slight (although statistically significant) increase in grassland bird species diversity (Ranellucci et. al, 2012). Because continuous, season-long grazing typically results in less uniform use of pastures, areas of open, heavily used areas become interspersed with areas of over-mature grasses, thus adding to diversity of vegetation structure.

High-Density, Short-Duration Grazing (Cell Grazing)

High-density, short-duration grazing is sometimes referred to as cell grazing or boom/bust grazing. It is characterized by the placement of a very high density of livestock in a restricted area for a limited amount of time. This is followed by an extended rest period during which the plants are allowed to recover and regrow. In addition to consumption of aboveground plant material, hoof action also tramples remaining vegetation and litter into contact with the ground. The trampling of litter along with the addition of urine and dung can help to jumpstart soil biology and encourage the microbial breakdown of the litter.

While in some areas of high annual rain fall and extreme productivity, this strategy is used as an entire grazing system, in drier environments such as the Nebraska Sandhills this grazing method is more often used as a tool in limited circumstances to address specific issues. One example in which cell grazing is appropriate is if there is an overload of standing dead vegetation and litter that is inhibiting new plant growth and haying is not an option. Cell grazing can also be an effective method to combat certain invasive vegetation or to reduce shrubby plants such as buckbrush that are indicative of extended periods of non-use.

Twice-over Rotational Grazing

Twice-over Rotation (TOR) is a grazing strategy that focuses on the natural growth curve of the native plant and aims to extend the length in which the plant is in a vegetative state and thus prolong the growth period. TOR involves a two-stage grazing season in which the first stage stimulates native perennial grass plants during the initial vegetative growth stage, and then a second grazing session completes the "harvest" of a portion of the plant's total production in a second graze.

Most native perennial grasses in the Great Plains region are facultative mycorrhizal-obligate species. There is a close relationship between the grasses and soil biological entities such as mycorrhizal fungi, bacteria, and other microorganisms. During the first pass through of a TOR system, the plants are grazed at only 25 to 30% of their current biomass, which translates to approximately one-third of the total grazing allotment. This light graze does not adversely affect the root structure and serves to stimulate the release of sugars from the plant root. This sugar release excites the soil organisms and provides "fuel" for enhanced biological soil respiration. One of the end products of this respiration is an increase in mineral nitrogen, which helps to boost the plant's vegetative growth in response to the partial defoliation.

After a 45-day rest period, grazing animals pass through the pastures a second time, this time consuming the remaining two-thirds of the grazing allotment. One side effect of the increased vigor in healthy soil is a regrowth of up to 140% of the initial plant defoliation amount and an increase in the number of vegetative fall tillers. More fall tillers translate into an expansion of the crown of the grass plant.

TOR grazing prescriptions are beneficial when the goal is to stimulate the native grass plants to increase aboveground biomass and overall ground cover. TOR also capitalizes on perennial grass species' inherent relationship with soil biology to increase the health and vigor of native plant species so they can outcompete non-native or invasive plant species.

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APPENDIX G COMPLIANCE MONITORING PLAN

February 3, 2023

NEBRASKA PUBLIC POWER DISTRICT

R-Project Habitat Conservation Plan

Final Compliance Monitoring Plan

Final Compliance Monitoring Plan

PREPARED FOR: *NEBRASKA PUBLIC POWER DISTRICT*
PREPARED BY: *BEN BANBRIDGE*
208-788-0391
BEN.BANBRIDGE@POWERENG.COM

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ACRONYMS AND ABBREVIATIONS

ABB	American burying beetle
BGEPA	Bald and Golden Eagle Protection Act
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
USFWS	United States Fish and Wildlife Service
WEAP	Worker Environmental 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 226 miles. This includes a large portion of the Nebraska Sandhills that is home to the federally threatened 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 the roles and responsibilities of the U.S. Fish and Wildlife Service (USFWS), NPPD, construction contractors, and the compliance team; provide a concise review of applicable avoidance and minimization measures; establish necessary reporting to be completed by the compliance team; and establish levels of compliance. 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 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 USFWS R-Project-specific website, and is not included in this CMP.

1.4 Plan Updates

This CMP may be revised periodically based on updates to species avoidance and minimization measures, new information, and the involvement of the selected construction contractor. Any updates or changes to this CMP will be reviewed with the USFWS and the Nebraska Game and Parks Commission (NGPC) prior to being implemented to ensure compliance with the R-Project HCP and ITP.

2.0 ROLES AND RESPONSIBILITIES

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 will designate a contact that NPPD will report any compliance issues to and provide with an annual report. The USFWS designated contact may ask for an update on activities associated with compliance at any time.

2.2 Nebraska Game and Parks Commission

The 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

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.

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 it as appropriate;[1] 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

[1] As noted in Section 1.4, any updates or changes to this CMP will be reviewed with USFWS and NGPC prior to being implemented to ensure compliance with the R-Project HCP and ITP.

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

NPPD 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.

7.0 SPECIES-SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES AND MONITORING REQUIREMENTS

7.1 American Burying Beetle

The ABB (*Nicrophorus americanus*) is listed as threatened under the ESA and is protected as a threatened 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 1,249 acres of habitat may be temporarily disturbed and a total of 19.86 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 (8.0 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.
Sources: USFWS 2018, 2019a[2]

[2] U.S. Fish and Wildlife Service (USFWS). 2018a. American burying beetle (*Nicrophorus americanus*) Range-wide Presence/Absence Survey Guidance. May 2018. U.S. Fish and Wildlife Service (USFWS). 2019a. Species Status Assessment Report for the American Burying Beetle (*Nicrophorus americanus*). February 2019.

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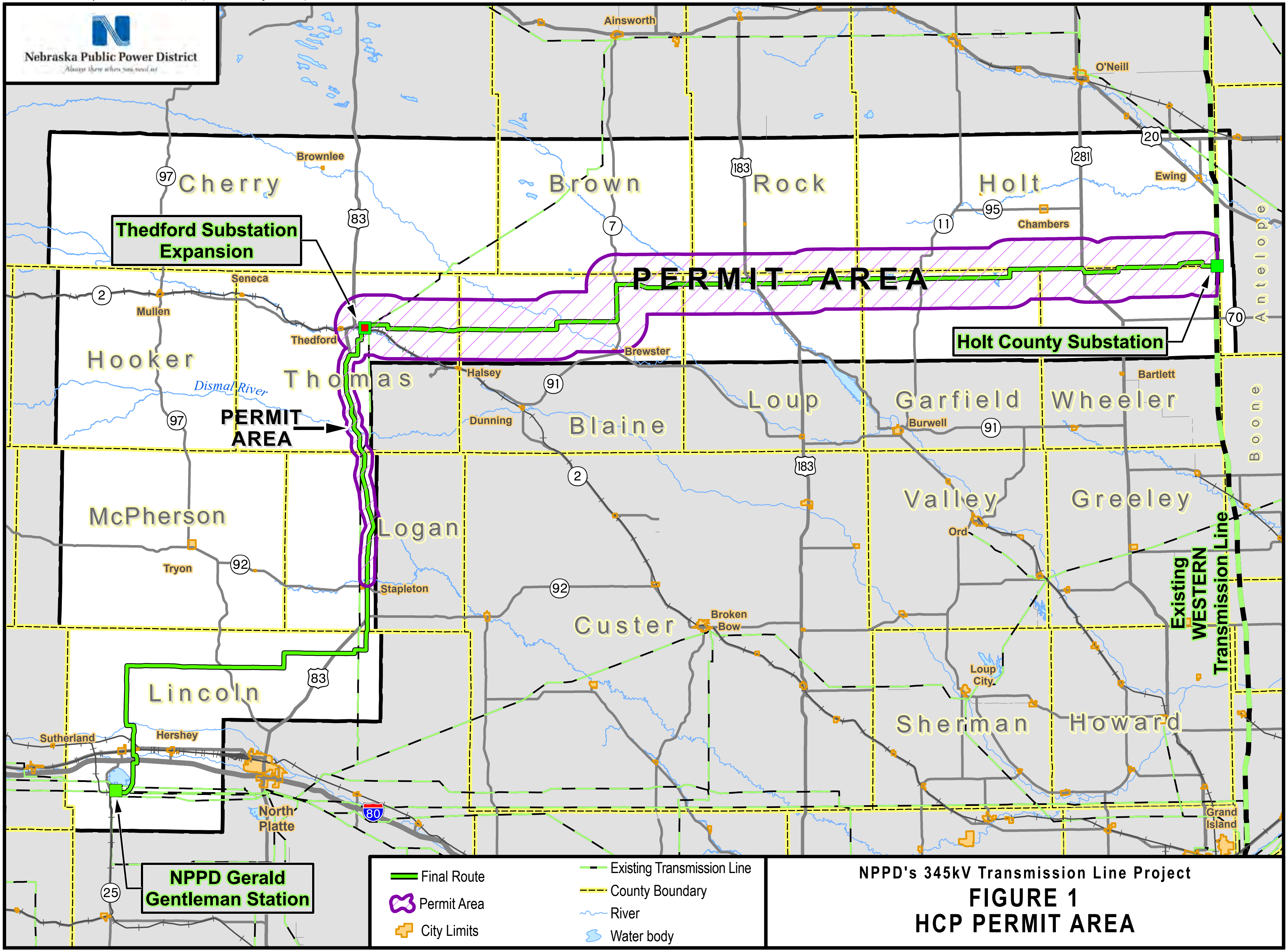

NPPD's 345kV Transmission Line Project

FIGURE 1
HCP PERMIT AREA

The following list of measures/practices will be used to avoid and minimize impacts on ABB (additional details are contained in the HCP):

- Avoidance of wet meadows and mesic grasslands.
- Helicopter use for erecting lattice structures, stringing sock line, and mobilizing certain equipment.
- 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.
- Non-active season construction in specified areas.
- Siting of disturbance areas on previously disturbed lands or unsuitable habitat to the extent practicable.
- Downshielded and low-temperature LED lighting at substations and temporary work areas, if necessary.
- Limited nighttime construction during periods when ABB are active.
- Daytime application of herbicides in noxious weed areas to avoid ABB active periods.

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 6 – April 29; fall: October 9 – November 15). 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 USFWS and 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 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.

7.4 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is protected by BGEPA and MBTA. Bald eagle nest surveys completed in 2014 and 2020 identified three 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.

7.5 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.

7.6 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.

7.7 Northern Long-Eared Bat

The northern long-eared bat (*Myotis septentrionalis*) is listed as endangered 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 during the pup season (June 1 – July 31).

7.8 Tricolored Bat

The tricolored bat (*Perimyotis subflavus*) is proposed to be listed as endangered under the ESA. Should the listing of endangered be finalized, the species would also be listed as endangered under NESCA. Because tricolored bats use trees as maternity roosts, no tree clearing will be permitted during the pup season (June 1 – July 31).

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.[3]

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 described in the R-Project's Stormwater Pollution Prevention Plan will be implemented to control erosion and sediment runoff from construction areas that could impact waters that are inhabited by Topeka shiners.

[3] Should the Blanding's turtle be listed as threatened or endangered prior to construction of the R-Project, construction monitors would not capture and remove Blanding's turtles from disturbance areas. The individual would not be disturbed, and construction activities would halt until the turtle has moved out of the path of construction.

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.

Best management practices described in the R-Project's Stormwater Pollution Prevention Plan 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 H ANNUAL ABB SURVEY PLAN

April 29, 2022

NEBRASKA PUBLIC POWER DISTRICT

R-Project

Annual ABB Survey Plan

PROJECT NUMBER:
128143

PROJECT CONTACT:
Ben Bainbridge
EMAIL:
ben.bainbridge@powereng.com
PHONE:
208-788-0391

POWER ENGINEERS

ABB Survey Plan

PREPARED FOR: NEBRASKA PUBLIC POWER DISTRICT
PREPARED BY: BEN BAINBRIDGE
208-788-0391
BEN.BAINBRIDGE@POWERENG.COM

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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 Holt County Substation (Figure 1). Referred to as the R-Project, the approximately 226-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 threatened insect. The purpose of this ABB Survey Plan 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% (1,499 acres) of the Permit Area will actually be disturbed.

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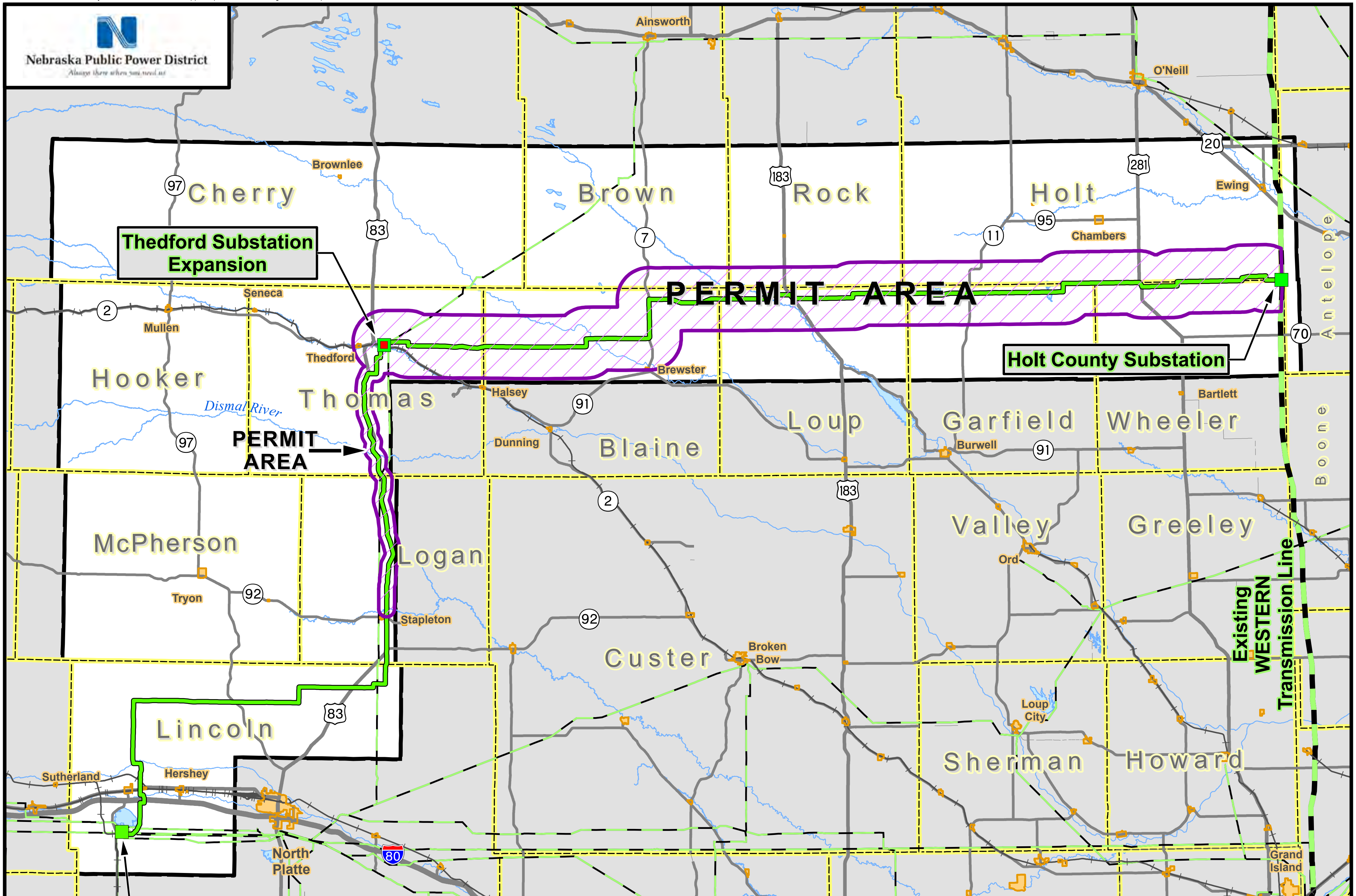


NPPD's 345kV Transmission Line Project

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 and NPPD's R-Project surveys from 2016 through 2020. The 99th percentile density estimate from this historic sampling data was 0.116 ABB/acre and resulted in a take estimate of 175 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. 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 August 1 – 6 from 2016 through 2020. 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 2016 through 2020 surveys.

3.2 Survey Method

Surveys described in this plan will follow the *USFWS American Burying Beetle (Nicrophorus americanus) Range-wide Presence/Absence Survey Guidance (May 2018)* (USFWS 2018) (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.

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. Additional baits may be added throughout the survey depending on the rate of decay and consumption by other species of burying beetles.

3.2.3 ABB Processing and Marking Patterns

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	Lower Left
4	Upper 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 2018). Using this method, NPPD identified 79 trap locations spread throughout the Permit Area (Figure 3) along publicly accessible roads.

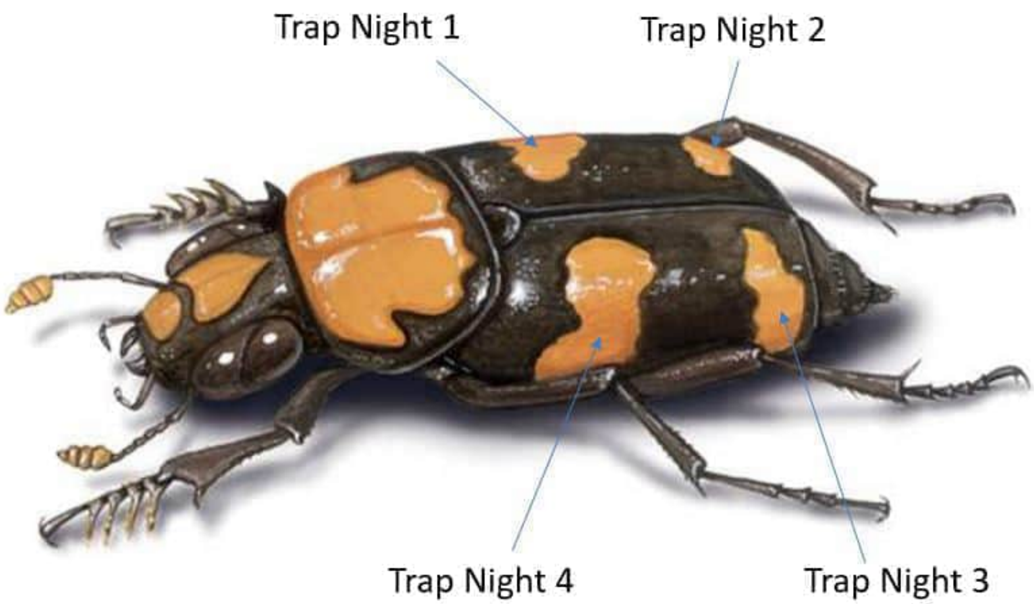
General trap locations include the following areas: Highway 83, Purdum Road, Brewster, Highway 7, Calamus River, Gracie Creek Road, Highway 11/844 Road, and 846 Road.

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 from August 2016 through 2020. Surveys at these specific trap locations will be repeated annually each August starting the first year of construction 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 by habitat along the proposed traps. Traps occur in a variety of habitats including dry sandy dune grasslands and low wet meadows.

[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.

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 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:

   (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 146 ABB issued in the HCP/ITP for the construction phase of the R-Project.

The USFWS 2018 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 December 31 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 AMERICAN BURYING BEETLE (NICROPHORUS AMERICANUS) RANGE-WIDE PRESENCE/ABSENCE SURVEY GUIDANCE (MAY 2018)

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Division of Ecological Services

American Burying Beetle (*Nicrophorus americanus*)
Range-wide Presence/Absence Survey Guidance

May 2018

INTRODUCTION

This document provides guidance for designing and conducting live-trapping presence/absence surveys for the endangered American burying beetle *(Nicrophorus americanus*; ABB). This guidance replaces any previous U.S. Fish and Wildlife Service (Service) recommended ABB survey guidance. Presence/absence surveys may only be conducted by individuals possessing a valid Federal Fish & Wildlife Permit (Recovery Permit) for scientific research and recovery of the ABB, as defined under section 10(a)(1)(A) of the Endangered Species Act (ESA). Section 10(a)(1)(A) permits require all other necessary permits (*e.g.*, state, county, tribal) be obtained for the federal recovery permit to be valid. Surveyors should contact respective state resource agencies to determine if other guidelines apply and if any state permits are required. Additional permits and/or authorizations may also be required for surveying on lands managed by federal, state, or tribal agencies.

Other Federal and/or State Requirements

Section 10(a)(1)(A) (Research and Recovery) permits require possession of any other necessary permits (*e.g.*, state, county, tribal) for the federal permit to be valid. Surveyors should contact respective state resource agencies 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 agencies.

Responsibility lies with the surveyor to ensure surveys are conducted in accordance with this protocol and trapping efforts cover all potential ABB habitats within a project area. For surveys to be considered valid, surveyors must adhere to the protocols outlined within this document. If upon review of a proposed project package for which survey documentation is submitted and the Service determines a survey to be invalid, the package will be returned to the project proponent as incomplete. The package should be resubmitted to the Service once a valid survey is obtained. Project proponents should contact the Ecological Services Field Office in their state, or utilize that office’s guidance, when assuming presence of ABBs within their project area. Refer to Appendix J for contact information specific to each Ecological Services Field Office.

This guidance is based on the most current scientific information available and is consistent with current knowledge of ABB movement patterns. The guidance will be updated as new information becomes available. Please contact the appropriate State Ecological Services Field Office for any updates to this guidance prior to the initiation of ABB surveys each year. To ensure you have the most recent version, go to: ***http://www.fws.gov/southwest/es/oklahoma/ABB_Add_Info.htm.***

Definitions

Biological timeframes:

Active period - the time of year when ABBs have emerged from overwintering and are actively seeking carcasses for feeding, and breeding.

Inactive period - the time of year when ABBs are below ground, overwintering and are not actively seeking carcasses for feeding and/or breeding.

Brood-rearing period – the time of year during the active period when ABBs are underground raising their young.

Survey timeframes:

Survey period – nightly trapping timeframe between 9 p.m. and 4 a.m.

Active season - the time of year during the ABB active period when surveys should be conducted to be considered valid.

Early season - the early trapping season is the time when ABBs are actively seeking carcasses, but before the young-of-year have emerged. In southern portion of the ABB range, the early season begins according to established weather criteria, and ends July 28. (See SEASONAL PARAMETERS, p. 3.)

Late season - the late trapping season is the time when most ABBs have completed brood-rearing and the young-of-year have likely emerged. In the southern portion of the ABB range, the late season begins July 29 and ends according to established weather criteria. (See SEASONAL PARAMETERS, p. 3.)

Valid survey a survey conducted during the most recent active season that meets all weather parameters, siting criteria, suitable habitat conditions and ensures all components of this guidance have been met.

This guidance addresses both the Southern and Northern portions of the currently occupied ABB range in the Midwest. States included in the Southern portion of the range include Arkansas, Kansas, Missouri, Oklahoma, and Texas. States included in the Northern portion of the range include Nebraska and South Dakota. The American burying beetle is also found in New England (Block and Nantucket Islands). Please contact the New England Ecological Services Field Office for survey guidance in Massachusetts and Rhode Island.

Trap sites should be located within the center of the area of interest, and within suitable habitat. All suitable habitat that could be impacted within a proposed project area should be surveyed. Because of the life history of the ABB, surveys are valid for only a short period of time, and are dependent on weather conditions within the area of interest, and whether they occur within the Northern or Southern portion of the occupied range. Therefore some of following guidance components are separated out between Northern and Southern portions of the occupied range for better understanding of these differences in trapping protocols. Additionally, old surveys from previous years will be considered invalid for purposes of determining occupancy of an area once the new active season has commenced.

AREAS UNFAVORABLE FOR ABB

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 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 soils, 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, vegetation typical of saturated soils, and/or wetland hydrology).
6. Pasture or grassland that has been maintained at a height of 8 inches (20 cm) or less through frequent mowing, grazing, or herbicide application.

NOTES: In both the Northern and Southern areas, locations adjacent to wetlands and/or riparian areas (such as sub-irrigated wet meadows) could be suitable for the ABB, as these areas may be important to ABBs seeking moist soils during dry conditions. In lab conditions, American burying beetles have been shown to seek out the moistest soils available (Hoback 2008).

SEASONAL PARAMETERS

Time of Year for Surveys

A valid survey must occur during the ABB active season and conform to all required weather parameters, as identified in this guidance. Surveyors should collect the necessary temperature information from data loggers and/or the weather station closest to the survey site (see more information in the *Reporting Procedures* section below) before making a decision to deploy traps.

<u>Northern portions of ABB range – Nebraska and South Dakota</u>

In the Northern range, the Service considers the ABB active season to begin following five consecutive nights when temperatures at midnight are 55^{o} Fahrenheit (F)/12.7^{o} Celsius (C), or greater. Surveys should not be conducted during the average brood-rearing period (July 1-August 7) when most ABBs are underground and trapping results are more likely to produce false negative results. Alternatively, ABB survey results collected during the average brood rearing period may be accepted if control traps reveal teneral beetles are above ground before August 7 (control traps are explained further below.) Teneral beetles are beetles that have newly emerged from the pupal case. For results to be accepted, however, the surveyor will need to document that the ABB active season began earlier in May than normal due to an early summer.

> *Control Traps (Northern Portion Only)* - A positive control trap must be used in association with ABB surveys in the Northern portions of the ABB range. A positive control establishes that conditions were appropriate in a given geographic area and that ABBs were active during the time frame 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, during

trapping, but not after the trapping time frame. Positive control trapping should be done in areas with a recent history of populations documented through regular research or survey work. Contact the appropriate State Ecological Services Field Office to determine if a positive control is required.

Surveys may continue in the Northern range until the midnight temperature falls below 55° F (12.7° C) for three consecutive nights.

Surveyors are encouraged to contact the appropriate State Ecological Services Field Office prior to conducting any ABB surveys to determine the locations and circumstances in which surveys are necessary and any site specific survey recommendations.

<u>Southern portions of ABB range – Arkansas, Kansas, Missouri, Oklahoma, Texas</u>

In the Southern range, the Service considers the ABB active season to begin following five consecutive nights of minimum nightly temperatures at 60° F (15.5° C), or greater (Bedick 1997, Kozol 1991, Service 1991). Surveys may continue in the Southern range until the third night following August 31 on which the minimum temperature falls below 60° F (15.5° C).

Breeding activity in the ABB tends to be asynchronous in the Southern portion of the range where brood rearing is not as temporally constrained by weather conditions (*i.e.*, longer, more variable active season). For this reason, surveys in the Southern portions of the range may be conducted at any time during the ABB active season without necessary avoidance of the brood-rearing period, or implementing a control trap as required in Nebraska and South Dakota.

Timeframe Survey Results are Considered Valid

American burying beetle density is cyclical and thus, can vary annually, but also can vary within the same active season. Additionally, other circumstances (*e.g.*, flooding, drought) can alter ABB density beyond that expected due to normal population fluctuation. As a result, in both the Southern and Northern portions of the ABB's range, surveys performed later in the active season have documented ABB presence in areas where earlier active season surveys were negative, and vice-versa. Additionally, Northern population emergence and brood-rearing are synchronized while in the Southern populations they are not. Surveys conducted after the summer brood rearing period when tenerals have completed emergence more accurately represent the presence or absence of teneral ABBs prior to overwintering. Owing to these differences, some timing adjustments to trapping protocols between the Northern and Southern areas is required. Some surveys conducted for ABBs are valid only for the active season when the survey was completed, while others are valid until the end of that active season.

<u>Northern portions of ABB range – Nebraska and South Dakota</u>

In the Northern portion of the range, all survey results are considered valid until the start of the next spring active season. This provides for obtaining a valid survey that can inform occupancy of an area during the ABB's overwintering inactive period.

<u>Southern portion of ABB range – Arkansas, Kansas, Missouri, Oklahoma, Texas</u>

In the Southern portion of the range, surveys completed through July 28 of the current year are valid through the end of that active season. Surveys completed after July 28 will be valid until the start of the next spring active season.

Following metamorphosis from larva to adult, teneral beetles will typically emerge from underground in mid- through late-summer. However, in Oklahoma teneral emergence has been documented as early as late spring (May). The timing of emergence varies based on latitude and weather conditions.. Teneral beetles typically will overwinter as adults and comprise the breeding population the following spring and summer (Kozol 1990). American burying beetles usually live only for one year and all overwintering ABBs are believed to be that summer's brood.

Positive Results within an Active Season

For both the Northern and Southern areas, when there are multiple valid surveys within the same effective area (see Trap and Spacing Placement below) and during the same active season (See Time of Year for Surveys, p. 3), positive survey results (presence of an ABB) take precedence over negative survey results. Within the Southern portion of the ABB range, a positive survey takes precedence within the active season, but because early season surveys (before or on July 28th) expire at the end of the active season, the results of late season surveys (conducted after July 28th) will have precedence from the end of that active season until the beginning of the next active season.

For example in the Southern range, if a survey is performed with positive results before July 28th (early season) and another is performed after July 28th (late season) with negative results, the positive survey would determine presence within the area of interest until the end of the active season. The late season surveys would be considered valid only during the following inactive period and until the beginning of the next active season.

TRAP DESIGN

General

The Service prefers surveyors to use a 5-gallon (18.92-liter) bucket-style trap when conducting ABB presence/absence surveys. Traps must, have smooth sides, and be free of any texture or ridges that may allow ABBs to climb out of the trap. Each trap consists of a bucket with 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 buried as a pitfall trap, as described below. Above-ground bucket traps are typically used when soil is rocky and is difficult to dig. However above-ground traps also may be used in areas where rocky soils are not prevalent. Check with the appropriate State Ecological Services Field Office for guidance on the use of above-ground bucket traps versus below-ground pitfall traps for ABB surveys.

Above-ground Bucket Trap

See Appendix C (Leasure *et al*. 2012) for instructions, materials, figures and schematics of a typical above-ground bucket trap. Above-ground buckets must be **light in color** to help moderate high temperatures. When selecting a funnel for the trap, the small end of the funnel MUST be large enough to allow the largest ABBs to fall through into the bucket (approximately 2.16 in (55 mm in diameter). If the opening in the small end of the funnel is not large enough, you may need to cut it off to make the hole larger (Figure 2). Surveyors should drill additional 1/8 inch (3.2 mm) diameter holes around the top edge of the bucket (Figure 2) to allow air circulation through the bucket.

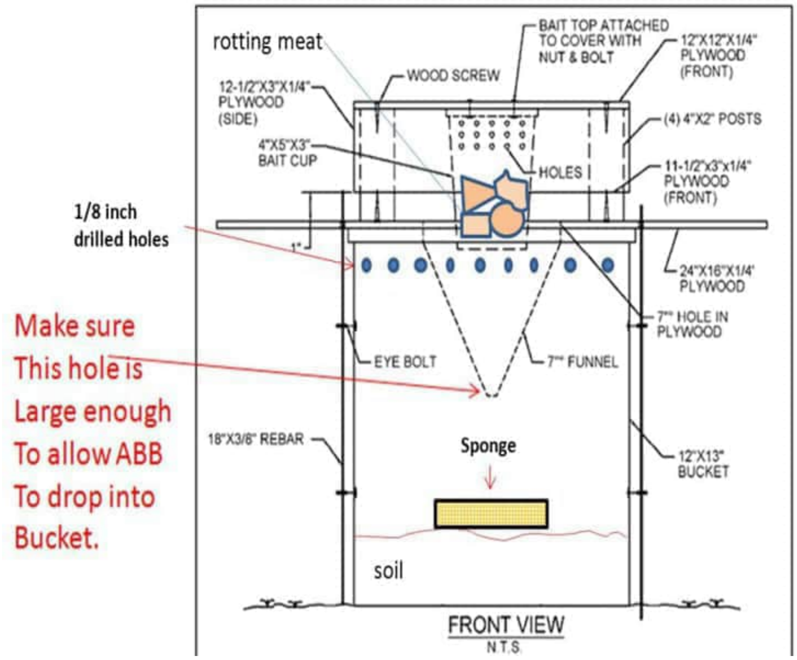


Figure 2. Modified form of above-ground bucket trap (pictured) from Leasure *et al*. (2012) using soil and sponge in the bottom of the bucket. This design allows beetles to find refuge from other congeners, provides moisture to reduce the risk of desiccation, and reduces stress to ABBs.

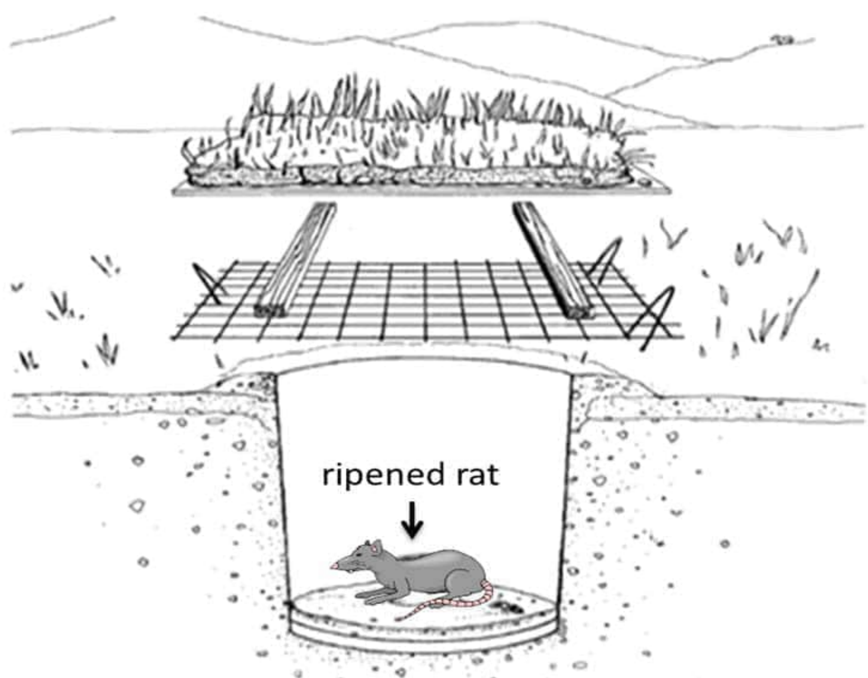
Pitfall Bucket Trap

The pitfall bucket trap design follows Bedick *et al*. (2004), although refinements and modifications have been made to the trap design to provide for better performance and safety, such as allowing ABB access to bait within the trap to decrease competition and provide moisture for captured beetles. Holes allowing air circulation do not need to be provided for pitfall traps. Pitfall bucket color is inconsequential because traps will be under-ground.

A schematic of the improved design is pictured in Figure 3. The following is a general list of items needed to build these pitfall traps.

Materials

1. Two 5-gallon (18.92 liter) buckets with a diameter of 11.2 in (28.5 cm) or greater
2. Piece of plywood at least 4 in (10.2 cm) wider than diameter of bucket
3. Piece of wire mesh or hardware cloth (1 in (≥ 2.5 cm) mesh size) to allow ABB to enter but still exclude scavengers
4. Four garden staples or stakes
5. Two 1-in by 1-in (2.5 cm by 2.5 cm) wooden strips large enough to hold the cover off the bucket
6. Shovel or ground auger



Pitfall trap design (Bedick et al. 2004). Place ripened carrion on top of soil in bottom of bucket.

Figure 3. Pitfall trap design typically used when soil is sand or loamy and can be easily dug (based on Bedick *et al*. 2004)

Dig a hole approximately the size the bucket. Place the bucket in the hole then place the second bucket inside of the first bucket. The rim of the bucket should be 2-3 inches (5-8 cm) 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, flooding the bucket, and drowning ABBs or other insects. Place approximately 2-3 inches (5-8 cm) of moist soil in the bottom of the inside bucket to give trapped carrion beetles room to burrow into the soil to avoid competitors, high temperatures, and low moisture levels.

If using a pitfall 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 3. Place the wire mesh over the buckets and secure in place with the garden staples or stakes to help exclude vertebrate scavengers. The piece of wire mesh should allow ABBs access to the trap, but prevent larger animals from accessing the bait.

Lay the 1-in x 1-in wooden strips over the wire mesh and place a hard cover on top of the wooden strips.

Place additional weight (plug of sod from bucket excavation, soil, rocks, etc.) on top of the trap cover to reduce bait loss to vertebrate scavengers and to prevent wind or small animals from dislodging the cover, as depicted in Figure 3.

TRAP DEPLOYMENT

A cover is necessary to deter scavenger access to the trap, prevent rainfall from entering the trap, and provide shade to captured insects to inhibit desiccation. The cover should be rigid, light in color, weighted or secured to the trap or ground. Covers over pitfall traps should be raised off the trap about 1 to 2 inches to allow ABBs to crawl into the trap and to allow the scent of the bait to better permeate the air.

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 rights-of-way—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.

<u>Minimum Survey Effort (Temporal Scale)</u>

To accurately determine presence/absence of ABBs, surveyors should set traps for a minimum of **five consecutive nights.** Surveys conducted over five consecutive nights will reduce the potential for false negatives (Bedick *et al*. 2004, Hoback 2011 unpublished, Butler *et al*. 2012). Additional trapping effort may be required if weather conditions, disturbed traps, or missing bait invalidate survey results. See "Weather Requirements" section below for additional information about timing of surveys with invalid nights.

Weather Requirements or Disturbed Traps/bait

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:

1. Nighttime temperature during the survey period falls below 55º F (12.7º C) in the Northern portion of range (based on midnight temperature), or below 60º F (15.5 C) in the Southern portion of the range (based on minimum temperature),
2. 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.,
3. Precipitation exceeds 0.5 inches between 9:00 p.m. and 4:00 a.m., or
4. Surveys are interrupted by 3 consecutive nights of unsuitable weather conditions, disturbed traps, or a combination of both.

Minimum survey effort shall include five consecutive nights of suitable weather conditions and undisturbed traps. Surveyors should collect the necessary precipitation, temperature, humidity, and wind information from the closest weather station to the survey site (see more information in the *Reporting Procedures* section below). If unsuitable weather conditions or disturbed traps 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 valid nights of sampling, unless surveys are interrupted by three or more <u>cumulative</u> nights of unsuitable weather, disturbed traps, or a combination of both.

Record which survey nights did not meet trapping requirements on the "*ABB Survey Data Collection Form*" (Appendix A) and the total number of nights with unsuitable weather conditions, and/or disturbed traps on the "*ABB Survey Summary Report*" (Appendix B). For submissions to the Oklahoma Ecological Services Field Office only, record this data in the "*EEC Workbook*." The *EEC Workbook* contains all required documents in an easy to use Excel workbook format rather than having separate documents to submit. The "*EEC Workbook*" also reduces the size of email load and reduces times for Service personnel to verify and culminate survey information. Surveys with over 10 transects will require the use of multiple workbooks.

Trap Spacing and Placement

The effective survey radius for each trap is 0.5 miles (0.8 km). Therefore, surveyors should space traps no more than 1.0 miles (1.6 km) apart to achieve adequate survey results. The Service determined this effective survey radius based on ABB mobility, size, recorded movement distances, and the distance from which ABBs can detect carrion. Surveyors should place traps generally along the upwind edge of the survey area. In general, low elevation, mesic meadows with a thick layer of vegetation litter are more conducive to ABB capture than dry, elevated areas. Surveyors should place traps along the upwind edge of the survey area at the highest elevation possible to ensure the scent plume permeates the area of interest. Do not place traps in depressions that may hold water if rain occurs. Traps should not be placed in locations susceptible to disturbance or destruction (*i.e.*, cattle trails, areas where livestock congregate, etc.).

Exercise good judgement when placing traps. For example, do not place traps near ranch houses to reduce the risk of a dog digging up the bucket to access the bait. Avoid placing traps near stock tanks as ranchers have expressed concern about cattle avoiding watering because they detect decomposing bait.

To most accurately represent the area of interest and void bias towards one habitat type over another, traps should be placed as close as possible to the interest area's center. If traps cannot be placed near the center, justification should be provided in the Notes section of the Survey Data Collection Forms and submitted with survey summary.

Baiting and Checking Traps

Any type of carrion is suitable for use as bait, as long as it is proportional in size to the trap and produces a pungent odor 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 5 days, or until adequately aged to produce a sufficiently robust odor. Bait will ripen faster in hotter temperatures. Take care to not fill the container or bag completely full. This will to allow for expansion as gas is produced as the bait ripens.

The Service recommends placing bait on top of soil in the bottom of the pitfall bucket traps with whole carcasses, hair/feathers intact. Surveyors may use ripened previously frozen, 9.7-13.2 ounce (275-374 gram) laboratory rats (*Rattus norvegicus*) as bait (available from pet stores and online dealers). Rats are preferred, but if rats are not available, bait items of comparable size and structure may be used. Additionally, if using the above-ground 5-gallon bucket, surveyors should utilize the bait cup attached to the lid to ensure the pungent odor of carrion is effectively dispersed. This bait need not be a whole carcass and may consist of aged pieces with neither skin nor hair.

Setting and baiting traps consists of:

1. Wash all buckets with bleach and thoroughly rinse with water prior to each survey effort.
2. Secure the bucket in or on the ground.

3. Place approximately 1-2 in (2.5 to 5.1 cm) 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 for ABB presence.
4. 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 providing soil moisture.
5. If you are using a pitfall trap, place the carcass on top of the soil in the bottom of the trap. If the 5-gallon above-ground bucket trap is used, surveyors must place bait in a perforated bait cup attached to the lid and may place additional bait in the bottom on top of the soil layer.
6. When checking traps, care must be taken to ensure no ABB remain inside the bait (*e.g*., whole carcass), especially if the bait is removed from the trap. During trapping efforts, surveyors must replace any bait that has dried out, is full of maggots, and/or no longer emits a pungent odor, with new, prepared bait. Do not leave discarded or old bait at or near the current trapping area. 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.
7. Secure the tops of the traps to ensure predators do not have access to the contents of the bucket.
8. All traps must be in place and baited by dusk each night.

Exposure to full sunlight and temperatures over 77º F (25º C) even for a few hours, can result in mortality (Kozol 1990, Service 1991, Kozol 1992). Traps must be checked no later than **10:00 a.m. daily in the Southern portion** of the range and by **12 p.m. in the Northern portion** of the range to minimize any temperature-related mortality. On days of extreme heat, checking traps prior to these times may be necessary to avoid 77º F even in the Northern portion of the range. Delay in checking ABB traps exposes captured 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.
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. All ABBs held for observation should be placed in ventilated containers and kept out of direct sun in a cool, shaded location. Process any dead ABBs as described below under "*Accidental Death of ABBs.*"

Ant Colonies

Surveyors should survey area for presence of ant colonies to ensure traps are not placed within 23 ft

(7 m) of any ant colonies. If ants are in a trap, the surveyor should relocate the trap at least 23 ft away.

Trap site reclamation

Once the survey is complete, always backfill the hole that was excavated for the bucket trap and remove any marking placed to indicate the presence of a trap (*i.e*., any and all flagging). Return the trapping area to the state that you found it to avoid concerns by the public.

PROCESSING CAPTURES

Identification and processing of *Nicrophorus* Species

Components of a completed survey package may vary between field offices, but, at a minimum, will include the daily field data sheets, the electronic summary sheet, and weather data. The State Ecological Services Field Office may require photographs of each ABB captured if deemed necessary and feasible, as is the case in Oklahoma. This is not the case in Nebraska where carrion beetles are so abundant that photographing each individual is not feasible Only complete survey packages will be accepted. The Service prefers information submitted via electronic media. If the "*ABB Survey Data Collection Form*" (Appendix A) is sent by U.S. mail, then all accompanying information, including the accompanying "*ABB Survey Summary Report*" (Appendix B) must also be submitted by U.S. mail at this time so all data and summaries are received together in the respective field offices. This can be accomplished by mailing a compact disk, thumb drive or similar media containing the required information.

For surveys in Oklahoma, the Oklahoma Ecological Services Field Office prefers the use of the automated "*EEC Workbook*" for data collection and submission of ABB surveys. The "*EEC Workbook*" is available on the ABB webpage at http://www.fws.gov/southwest/es/oklahoma/ABB_Add_Info.htm. This workbook captures the daily survey data, and automatically transfers the pertinent data to the Survey Summary Report that is also found within the workbook. Weather data, pictures, and any other trapping data can then be added to various tabs within the same workbook for submission. If more than 10 traps (transects) are deployed in a single survey project, additional *EEC Workbooks* with sequential trap numbers should be created for each 10-trap workbook, with all workbooks being submitted 30 days after survey completion.

Surveyors must identify and record all Silphidae species captured. Appendix D provides descriptions of the *Nicrophorus* species and Appendix E provides a dichotomous key. These appendices also are available from the ABB webpage mentioned previously.

Processing ABBs includes collecting data on gender determination, age determination, pronotal width (if required by State field office), marking (if authorized,) and data recording of all captured ABBs. Surveyors must record all information on the "*ABB Survey Data Collection Form*" (Appendix A) For submissions to the Oklahoma office this information will be recorded within the "*EEC Workbook.*" Check with your State Ecological Services Office for which forms are required in your area.

Photographs, if required, should have the highest resolution possible. Photos of ABB should show the ABB on top of grid paper, inside a transparent container, such as a Petri dish. Photos should be taken from directly above the subject, and the size (gauge) of the grid should be indicated (*e.g.* ¼ inch, 10mm, etc.). Add photos in a separate tab to the "*EEC Workbook,*" and submit as part of the complete survey package. Photographic images taken in the field on a piece of reference grid paper can be analyzed using freeware such as ImageJ (http://imagej.nih.gov/ij/) as long as the gauge-size of the grid is specified.

American burying beetles are sensitive to prolonged heat exposure. Surveyors must 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 and store the containers in an ice cooler until processing commences. The plastic containers should be stored 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, as indicated on issued permits. Morphometric measurements of individuals, such as pronotal width, can be measured using a caliper or via photographic images.

American burying beetles are to be released near (within 609 m/2000 ft) the trap site where captured, but at least 10 ft (3 m) away from foot traffic near the site, and a minimum of 500 ft (152 m) from any vehicle path to avoid trampling or crushing. To release ABBs, surveyors may 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 inches thick.

Age Determination

Any ABBs 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 adults). Surveyors can distinguish newly emerged ABBs from older ABBs by their softer bodies, more shiny appearance, and a pronotum that appears more orange (less red) and lighter in hue (Figure 4). If soft-bodied teneral beetles are identified during surveying, make a note in the comments area on the "*ABB Survey Data Collection Form*" (Appendix A) and include with the "*ABB Survey Summary Report*" (Appendix B) or in the "*EEC Workbook*." Older ABBs have a red rather than orange pronotum, are deeper in hue, are often missing body parts (especially legs or antennae), and mandibles appear more worn at the tip. Surveyors must record the ages of ABBs as old, young, or unknown, on all data forms. It is important to consider the time of year when assessing age. More mature ABBs will emerge earlier in the active season while there may be higher numbers of younger ABBs captured later.

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 4). Surveyors must record ABB gender on the "*ABB Survey Data Collection Form*" or record all within the "*EEC Workbook*."

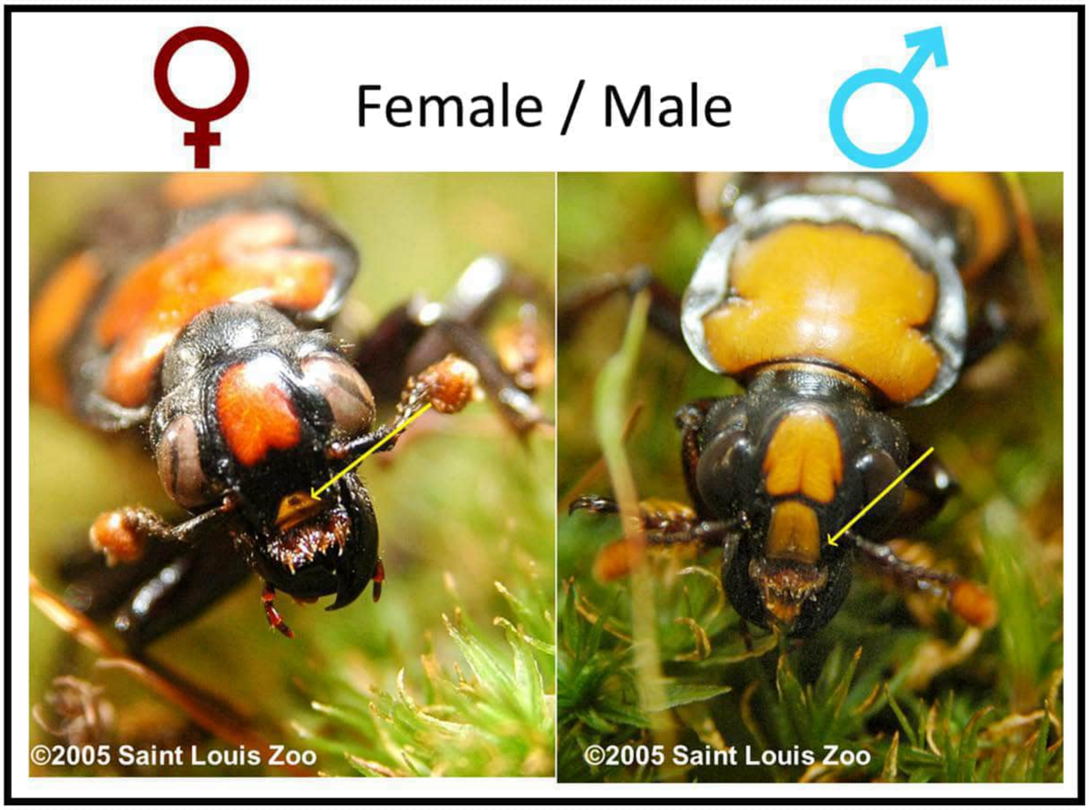


Figure 4. Distinguishing female from male ABB, and old from new cohorts. Color variations are not indicative of male vs female, but can be seen within the species. The female (left) is darker in hue and appears more red - consistent with an older adult's senescent coloring. The male (right) is lighter in hue and appears more orange - consistent with characteristics of a teneral adult.

REPORTING PROCEDURES

Surveyors should collect the necessary precipitation, temperature, humidity, 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). 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). If uncertain regarding acceptable weather stations, contact your state field office. Local temperatures during the survey should 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); or record all within the "*EEC Workbook.*"

Location Data

Surveyors should document the GPS location (decimal degrees, NAD 83,) legal description of each trap, and note the general habitat characteristics of the trap site. Habitat notes whether the area is disturbed or native, woodland or grassland, and then note any other component of the landscape with potential to affect the trapability of ABB within the survey radius.

Additional Information

For those who train others in their organization to survey for ABB, the trainer will need to indicate on each of the daily data forms who was in attendance. This creates a record of how long they were in the field, whether or not an ABB was captured, and if the trainee was present for placement, recovery of the traps and trap site reclamation. The comment/notes line on the daily data sheets is for extraneous information such as this. Add any relevant information to this line. (*e.g.*, field hands attending, any conditions that could have impacted your survey, weather anomalies, invasive species, the presence of cattle, etc.).

Survey 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 State 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 State Ecological Services Field Office and to *abbcontact@fws.gov* for every survey conducted (even if no ABBs were captured). Survey reports may also be required in association with state permits and should be submitted to the appropriate state agencies by the surveyor. Surveyors should submit Appendix B in Excel format only. Surveyors may submit the "*ABB Survey Data Collection Forms*" either electronically or by mail, however, mailed forms will also need to be submitted in an electronic format. When submitting the data forms, combine all forms into a single pdf file. If sending survey information by U.S. mail, all information will be contained within one submission cover. Electronic forms and information should be placed onto a compact disk, for mailing. 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 made. The Oklahoma Ecological Services Field Office requires the use of the automated "*EEC Workbook*" for survey submissions. The "*EEC Workbook*" contains all required documents in an easy to use excel workbook format rather than having separate documents to submit. The "*EEC Workbook*" also reduces the size of email load and reduces times for Service personnel to verify and culminate survey information. Surveys with over 10 transects will require the use of multiple workbooks.

Permittees must submit the results of their ABB surveys within 30 days of survey conclusion. This information is also submitted during the required end of year research and recovery permit reports [ESA section 10(a)(1)(A)] The Service reserves the right to request surveyors provide ABB survey results at any time. It is the project proponent's and surveyor's responsibility to ensure surveys are conducted in accordance with this protocol and the effective traps' radii cover all potential ABB habitats within a project area. The Service will, periodically check submitted surveys for accuracy and review all surveys that are part of a submitted Project Review Package (as part of section 7 consultation or technical assistance process).

Specific data entry criteria are necessary to maintain functionality of the Service's ABB GIS spatially explicit database. Surveyor adherence to these input rules is of great importance in allowing the public access to the beetle occurrence database in a timely manner.

1. All names (*e.g.*, companies, months, locations, soil types, plant species, and persons) should be spelled out with no abbreviations (*e.g.*, May instead of 5, Joe Smith instead of J. Smith) and no punctuation (*e.g.*, Joe L Smith instead of Joe L. Smith).

2. Latitude and longitude should be reported in decimal degrees (NAD 83). Longitude should have a negative sign preceding the number. Do not enter the directional component ("N" or "W") within the cell.

3. Township-Range-section will be numbers only. Do **not** enter "T", "R", or "S" in the cell. **Do** enter directional components (*i.e.* N, S, E, W.)

Each survey should be named according to the project's name for which the surveys are performed 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 query, if questions arise, or if the survey is for a specific project.

1. Specify the project proponent and the project name in the ABB survey report and any other correspondence submitted to the Service (*e.g*., Acme Company, XYZ pipeline).

2. Entitle each email submission with the name of the project (*e.g.*, Acme oil well 14).

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 calendar days of the mortality to the State Ecological Services Field Office and ***abbcontact@fws.gov***. Surveyors should refer to their section 10(a)(1)(A) research and recovery permit to ensure other requirements related to notification have been met. Surveyors must submit the hardcopy "*ABB Accidental Death Form*" with their annual permittee 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) or 70% Isopropyl rather than preserving as dried specimens. Specimens, once 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 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 (quarter section minimum), and latitude/longitude coordinates (decimal degrees; NAD 83).

Contact your State Ecological Services Field Office for recommendations as to which facility or facilities would accept specimens. Surveyors should deliver dead specimens, along with a hardcopy of the "*ABB Accidental Death Form*" (Appendix F) to the State Ecological Services Field Office or a Service-approved facility.

Protocols and Forms

All guidances and forms (including the ABB survey guidance appendices listed below) are located on the Oklahoma Ecological Services Field Office's website at ***http://www.fws.gov/southwest/es/Oklahoma/ABB_Add_Info.htm***.

CONCLUSION

The Service appreciates continued compliance with this protocol and associated reporting. Surveyor reports enable the Service to monitor the status of the ABB. In addition, these surveys provide necessary information for companies to avoid impacts to ABBs from project implementation. Additionally, maintaining a survey database provides data to be utilized by the public during project planning.

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ABB Survey Guidance Appendices

Appendix A — ABB Survey Data Collection Form Survey Guidance
Appendix B — ABB Survey Summary Report Survey Guidance
Appendix C — Leasure *et al*. 2012
Appendix D — Description of *Nicrophorus* Species
Appendix E — Dichotomous Key
Appendix F — ABB Accidental Death Form
Appendix G — Carrion Types for Attracting ABBs
Appendix H — ABB Summary Report Entry Guidance
Appendix I — EEC Workbook - ABB Data Forms May 2017 (Excel)
Appendix J — Contact Information - Ecological Services Field Offices

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
Purdum – 1	42.030158	-100.320611
Purdum – 2	42.023102	-100.308301
Purdum – 3	42.009245	-100.304069
Purdum – 4	41.998349	-100.292329
Purdum – 5	41.988050	-100.282427
Purdum – 6	41.973710	-100.283719
Purdum - 7	41.959919	-100.278327
Purdum – 8	41.946801	-100.277565
Purdum – 9	41.951965	-100.295632
Purdum – 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

TRAP	LATITUDE[1]	LONGITUDE[1]
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
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