DRAFT

Environmental Assessment for Proposed Habitat Conservation Plan and Incidental Take Permit

Alliant Energy
Interstate Power and Light Company and Wisconsin Power and Light Company
Wind Portfolio
Iowa and Minnesota

U.S. Fish and Wildlife Service
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June 2024

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Abbreviations

Alliant	Alliant Energy
Applicant	Alliant Energy
BGEPA	Bald and Golden Eagle Protection Act
BO	Biological Opinion
Btu	British thermal unit
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DARC	Detection and Active Response Curtailment
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act of 1973, as amended
EPA	U.S. Environmental Protection Agency
F	Fahrenheit
GHGs	Greenhouse gas emissions
HCP	Habitat Conservation Plan
IDALS	Iowa Department of Agriculture and Land Stewardship
IDNR	Iowa Department of Natural Resources
IEC	Illinois Environmental Council
ITP	Incidental Take Permit
MBTA	Migratory Bird Treaty Act
MDNR	Minnesota Department of Natural Resources
m/s	Meters per second
MW	Megawatts
NEPA	National Environmental Policy Act
OCRU	Ozark-Central Recovery Unit
PM	Particulate Matter
RPS	Renewable Portfolio Standard
SSM	Scattered Staggered Monitoring
SGCN	Species of Greatest Conservation Need
USEIA	U.S. Energy Information Administration
USFWS	U.S. Fish and Wildlife Service

1.0 PROJECT OVERVIEW, BACKGROUND, PURPOSE, AND NEED

1.1 INTRODUCTION

This Environmental Assessment (EA) has been prepared by the United States Fish and Wildlife Service (Service or USFWS) pursuant to the National Environmental Policy Act (NEPA) 42 U.S.C. § 4321 *et seq*. The EA evaluates the effects of issuing an Incidental Take Permit (ITP) pursuant to section 10(a)(1)(B) of the federal Endangered Species Act of 1973, as amended (ESA), 16 U.S.C. § 1531 *et seq.* for activities associated with eleven Alliant Energy (Alliant or Applicant) wind energy facilities (individually Project, collectively Projects or Alliant Projects) (see Section 1.3 for more details). Under section 10(a)(2)(A) of the ESA, any application for an ITP must include a conservation plan that details, among other things, the impacts of the take and the steps taken to minimize and mitigate such impacts.

The Projects are owned and operated by Interstate Power and Light Company and Wisconsin Power and Light Company, subsidiaries of Alliant. The eleven Projects are located across Iowa and Minnesota. One Project, English Farms, is located in an area that supports the federally endangered Indiana bat *(Myotis sodalis*) during the spring and fall migratory periods. All Projects are located in areas that support the federally endangered northern long-eared bat (*Myotis septentrionalis*), the non-listed little brown bat (*Myotis lucifugus*) and the non-listed tricolored bat (*Perimyotis subflavus*) during the spring and fall migratory periods. Additionally, certain Projects also support the northern long-eared bat, little brown bat, and/or tricolored bat in the summer (see Table 3.2 in the HCP for a summary of which species are likely present in the summer at which Projects). The Applicant has decided to request take coverage for these species (referred to as "covered species" throughout) in their ITP.

The Service received an application on February 21, 2024 for an ITP from the Applicant. As part of this application, the Applicant has developed a Habitat Conservation Plan (HCP) to ensure that impacts to the covered species are minimized and mitigated to the maximum extent practicable in accordance with the requirements of section 10 of the ESA. The ITP, if issued, would authorize the incidental take of these species during the operations and implementation of mitigation measures for the Projects for a term of 30 years. The Service has prepared this EA to inform the public of the Proposed Action, the effects of the Proposed Action, and its alternatives, as well as to seek information from the public and to use information collected and analyzed to ensure that information regarding environmental impacts is available to federal decision-makers before a decision is made on the ITP application.

The ESA and its implementing regulations prohibit the take of any fish or wildlife that is designated as a threatened species or endangered species under section 4 of the ESA (federally listed species) without prior approval pursuant to either section 7 or section 10(a)(1)(B) of the ESA. The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." (16 U.S.C. § 1532(19)). Pursuant to the Code of Federal Regulations (CFR), "incidental taking" means "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" (50 CFR 17.3). "Harm" is defined in the CFR as "an act which actually kills or injures [federally listed] wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures [federally listed] wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR 17.3). "Harass" means "an intentional or negligent act or omission which creates the likelihood of injury to [federally listed] wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR 17.3).

Issuance of a section 10 ITP constitutes a discretionary federal action by the Service and is thus subject to NEPA, which requires federal agencies to assess the effects of their actions on the human environment by preparing an EA or an Environmental Impact Statement (EIS) to document the potential effects of the federal action (42 U.S.C. § 4332). Accordingly, the Service has prepared this EA to evaluate the potential impacts associated with issuance of an ITP and implementation of the HCP and to evaluate alternatives. Two alternatives to the Proposed Action Alternative are also considered in this Draft Environmental Assessment (DEA). They are a No Action Alternative and a More Restrictive Alternative (see Section 2.2, below). The consequences of these alternatives on various resources are discussed in this DEA.

1.2 PROPOSED FEDERAL ACTION

The Proposed Action is issuance of an ITP by the Service pursuant to the provisions of section 10(a)(1)(B) of the ESA, which will authorize the incidental take of the covered species resulting from the operations and implementation of mitigation measures for the Projects. Under section 10 of the ESA, applicants may be authorized, through issuance of an ITP, to conduct activities that may result in take of listed species, as long as the take is incidental to, and not the purpose of, otherwise lawful activities. The purpose of the section 10(a)(1)(B) permit is to ensure that any incidental taking that might occur will be minimized and mitigated to the maximum extent practicable and will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. The Applicant is seeking a 30-year permit term to implement their HCP. At the end of the 30-year term, the Applicant may apply for a new ITP or for an ITP renewal (see Chapter 8.5 of the HCP).

The submission of the ESA section 10(a)(1)(B) permit application requires the development of a HCP designed to ensure that the taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild, while allowing for any limited, incidental take of the species that might occur during the operation of the Projects. The implementing regulations for section 10(a)(1)(B) of the ESA, as provided at 50 CFR 17.22, specify the requirements and issuance criteria for obtaining an ITP. The Applicant has prepared an HCP to support their permit application.

The Service will analyze the impacts of the proposed Covered Activities (see Section 1.3.2) on all elements of the natural and human environment that could be affected, including other wildlife species that occur within the Permit Area. The Permit Area is defined by the combination of each Project boundary that includes all leased lands associated with the Projects where Covered Activities may occur (Figure 1-1). Consistent with Service guidance, we will also consider, among other things, the effectiveness of the action alternatives in reducing impacts to migratory birds and other bat species.

1.3 ALLIANT WIND ENERGY PROJECTS

Alliant's wind fleet in Iowa and Minnesota consists of nine existing wind energy facilities with seven projects located in the northwestern two-thirds of Iowa, one in southern Minnesota, and one in southeastern Iowa (Figure 1). Two additional facilities are planned with one located in southern Minnesota and one in north-central Iowa. The Projects are summarized in _Ref146290231 and further descriptions of the Projects can be found in Sections 2.1 and 3.1 of the Applicant's HCP.

Table 1-1. Summary of covered projects within Alliant's existing wind energy portfolio in the states of Iowa and Minnesota

Project Name	County (State)	Year Operational	Number of Turbines	Turbine Size (MW)	Total Project Size (MW)	Manufacturer's Cut-in Speed (m/s)	Overlapping Species Ranges
Bent Tree	Freeborn (MN)	2011	122	1.65	201	3.5	MYSE, PESU, MYLU
English Farms	Poweshiek (IA)	2019	69	2.3/2.5	171	3.0	MYSE, MYSO, PESU, MYLU
Franklin County	Franklin (IA)	2012	60	1.65	99	3.5	MYSE, PESU, MYLU
Golden Plains	Kossuth/ Winnebago (IA)	2020	82	2.3/2.5	200	3.0	MYSE, PESU, MYLU
Kossuth	Kossuth (IA)	2020	56	2.3/2.8	150	3.0	MYSE, PESU, MYLU
Richland	Sac (IA)	2020	53	2.3/2.5	130	3.0	MYSE, PESU, MYLU
Upland Prairie	Dickinson/ Clay (IA)	2019	121	2.3/2.5	300	3.0	MYSE, PESU, MYLU
Whispering Willow East	Franklin (IA)	2009	121	1.65	200	3.5	MYSE, PESU, MYLU
Whispering Willow North	Franklin (IA)	2020	81	2.3/2.5	200	3.0	MYSE, PESU, MYLU
Bent Tree North	Freeborn (MN)	Anticipated 2026	30	TBD	150	TBD	MYSE, PESU, MYLU
Whispering Willow South	Franklin (IA)	Anticipated 2027	68	TBD	300	TBD	MYSE, PESU, MYLU
		Total	**765**	**1.65–2.8**	**1,651**	**3.0-3.5**	**n/a**

Legend
MYSO: Indiana bat *(Myotis sodalis*)
MYSE: northern long-eared bat (*Myotis septentrionalis*)
MYLU: little brown bat (*Myotis lucifugus*)
PESU: tricolored bat (*Perimyotis subflavus*)

All operational Projects (aside from English Farms) are currently operating with feathering under manufacturer's cut-in speed. English Farms, the only Project within the range of the Indiana bat, has been operating under a take-avoidance strategy except for research activities covered under the Department of Energy's bat research grant program and associated incidental take authorization. Post-construction monitoring conducted in conjunction with this research discovered one Indiana bat fatality (on September 4, 2020). This fatality occurred at a control turbine that was feathered below manufacturer's cut-in speed. Additionally, the research documented fatalities of other non-listed bats, including one little brown bat and four tricolored bats. At least one year of post-construction monitoring has occurred at each Project.

The only other Project with documented take of the covered species is Golden Plains where two little brown bats were found on July 31, 2020. Results of the post-construction monitoring at the Alliant Projects are further discussed in Section 3.6. We assume that the two projects slated to come online during the Permit Term will operate with feathering below manufacturer's cut-in speed during the entire bat active season (March 15 to November 15).

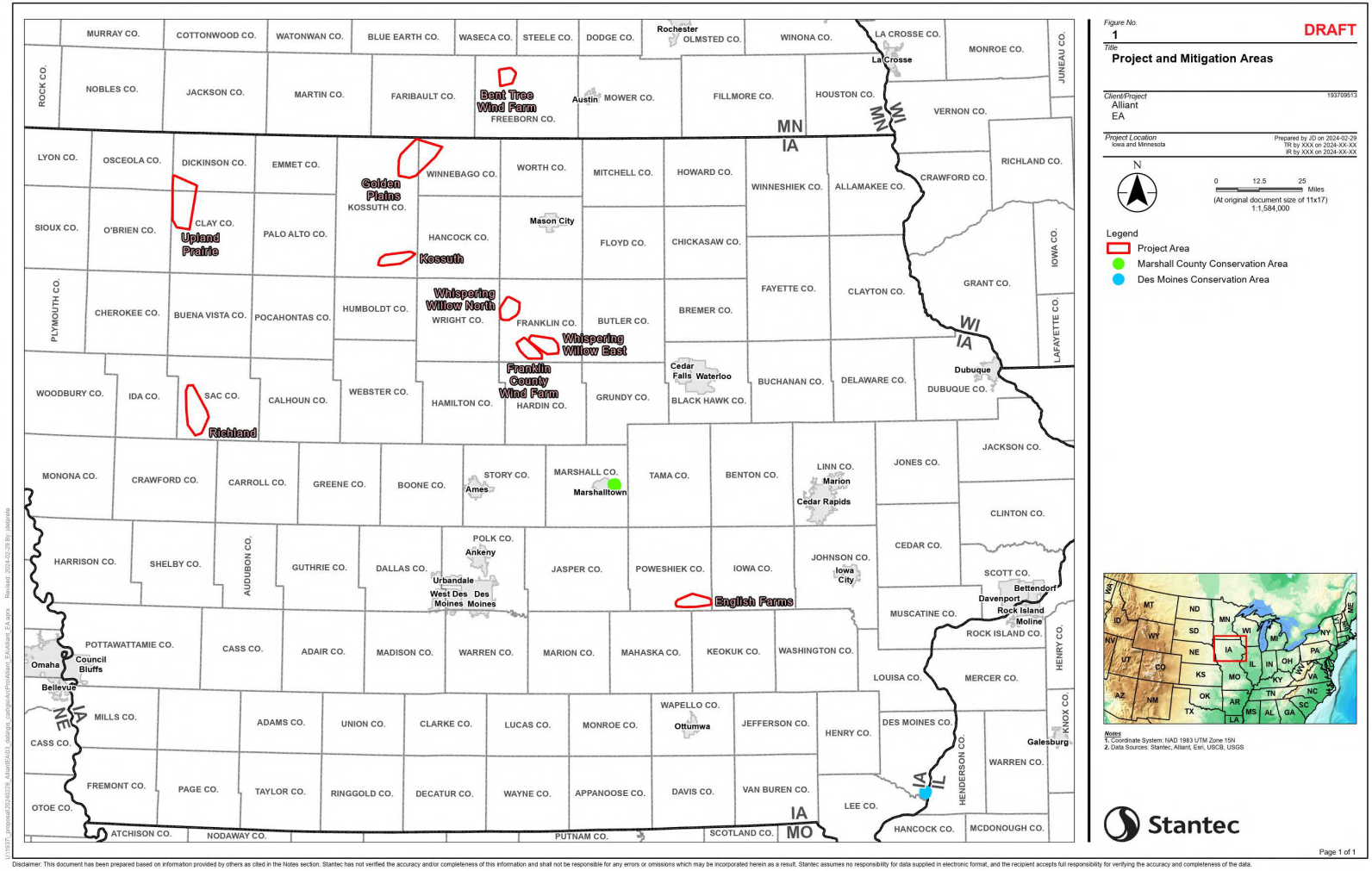

Figure 1. Project and Mitigation Areas

1.3.1 Life of the Projects and Permit Duration

Alliant is seeking a 30-year ITP for the covered species. The 30-year permit term is anticipated to cover the remaining operational life of the Alliant Projects. Some Projects may meet the end of their operational life during the permit term. Should Alliant repower any covered Projects during the permit term, Alliant and the Service would discuss any revised take estimates and changes to the HCP, if required, as outlined in the HCP Changed Circumstances Section 8.2.7.

1.3.2 Covered Activities and Scope

The proposed action is issuance of an ITP by the Service pursuant to the provisions of section 10(a)(1)(B) of the ESA, which would authorize the incidental take of the covered species resulting from the operation of the Projects. The covered activities associated with the proposed action are the operation of the Projects, the refurbishing of the Bent Tree, Franklin County, and Whispering Willow East Projects, and the mitigation associated with the implementation of the HCP.

The Service does not authorize the siting, construction, refurbishing, repowering, or operations of wind energy facilities. Rather, an ITP from the Service provides an applicant with incidental take coverage for listed species under the ESA for lawful activities. The only activity where take of listed bat species is likely to occur is Project operations, for which the Applicant has requested take coverage. As required by the NEPA, this EA will evaluate the effects on the human environment resulting from the issuance of the permit and the implementation of the associated HCP. Specifically, this EA evaluates the effects of the change in operations of the Projects as a result of the issuance of the ITP and implementation of the HCP, as well as alternatives to the issuance of the ITP in conjunction with the currently proposed HCP.

1.3.3 Covered Species

The Applicant has requested take coverage for the federally endangered Indiana bat and federally threatened northern long-eared bat as well as the non-listed little brown bat and non-listed tricolored bat (covered species).

The Indiana bat was listed as endangered throughout its geographic range by the Service in 1967 (32 Federal Register [FR] 4001). An Indiana Bat Recovery Plan was first developed and signed on October 14, 1983 (USFWS 1983). An agency draft of the Revised Recovery Plan was released in March 1999 (USFWS 1999). The Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision was made available for public comment on April 16, 2007 (72 FR 19015-19016) (USFWS 2007). Critical habitat, consisting of 11 caves and 2 mines, has been designated for the Indiana bat (41 FR 41914). No critical habitat occurs within the Project areas. The nearest known extant winter hibernaculum is Sodalis Nature Preserve (Priority 1) in Hannibal, Missouri, located approximately 138 miles (222 kilometers) south of the nearest Project area and the nearest known designated critical habitat is Blackball Mine in LaSalle County, Illinois, located approximately 169 miles (272 kilometers) east of the nearest Project area. The Indiana bat is state-listed as endangered in Iowa. The Indiana bat does not occur in Minnesota. Causes of Indiana bat population declines have been attributed to habitat loss and degradation and white-nose syndrome (WNS) (USFWS 2007, 2019b).

The northern long-eared bat was originally listed as threatened under the ESA with a 4(d) rule on January 14, 2016 (81 FR 1900–1922). The designation of critical habitat was determined to be not-prudent (81 FR 24707). The 4(d) rule exempted prohibitions for most incidental take of northern long-eared bats, including take associated with the operation of a wind farm. However, in 2020, the threatened listing for the northern long-eared bat was ruled to be unlawful and, in March 2021, a federal judge ordered the

Service to determine whether the northern long-eared bat warrants listing as an endangered species under the ESA by December 2022. On November 30, 2022, the Service published a final rule reclassifying the northern long-eared bat as an endangered species and removing the species-specific 4(d) rule, effective March 31, 2023 (87 FR 73488 [2022]). The Service upheld their not-prudent determination for critical habitat for the northern long-eared bat when the species was uplisted. Additionally, a Species Status Assessment was completed in 2022. This report concluded that northern long-eared bat populations are predicted to decline, primarily due to WNS. Habitat loss, wind energy development, and climate change are also recognized as population stressors (USFWS 2022b). The northern long-eared bat is not state-listed in Iowa but is a species of special concern in Minnesota.

The little brown bat is not a federally listed, proposed, or candidate species, but is currently under a Discretionary Status Review on the *National Listing Workplan* (USFWS 2023b). The Service anticipates determining if a protective status should be designated in 2024 (USFWS 2023b). Currently, no Federal critical habitat, conservation plans, or recovery plans exist for this species. The little brown bat is not state-listed in Iowa but is a species of special concern in Minnesota. While there are no population data available for Iowa, in Illinois, a state-level Species Status Assessment was completed for the species in 2022 which documented an 85% decrease in median little brown bat call activity between 2009 and 2020 and a 96% decline in the wintering population at Blackball mine in LaSalle County between 2013 and 2021, indicating little brown bat populations are declining in the state (Kath 2022). The primary cause for decline is attributed to WNS (Kath 2022). This trend has been observed across the Midwest (Straw et al. 2022; Kurta and Smith 2020; Cheng et al. 2021; Pettit and O'Keefe 2017)

The Service proposed to list the tricolored bat as endangered under the ESA on September 14, 2022 (87 FR 56381 [2022]), after completing a Species Status Assessment in response to a June 2016 petition to list the species under the ESA (Center for Biological Diversity and Defenders of Wildlife 2016). The Species Status Assessment for the tricolored bat concluded the species has declined and will continue to decline due to WNS, wind energy-related mortality, habitat loss, and climate change (USFWS 2021). Currently, no federally designated critical habitat, conservation plans, or recovery plans exist for this species. In addition, the tricolored bat is not state-listed in Iowa but is a species of special concern in Minnesota.

1.4 PURPOSE AND NEED FOR THE PROPOSED ACTION

Section 9 of the ESA prohibits the "take" of any fish or wildlife species listed under the ESA as endangered (16 U.S.C. 1538). Under Federal regulation, take of fish or wildlife species listed as threatened is also prohibited unless otherwise specifically authorized by regulation (50 CFR 17.31). The 1982 amendments to the ESA established a provision in section 10 that allows for "incidental take" of endangered and threatened species or wildlife by non-Federal entities (16 U.S.C. 1539).

Under section 10 of the ESA, the Secretary of the Interior may, where appropriate, authorize the taking of federally listed fish or wildlife if such taking occurs incidentally to otherwise legal activities. The Service was charged with regulating the incidental taking of listed species under its jurisdiction, and section 10 of the ESA specifically directs the Service to issue an ITP to non-Federal entities for incidental take of endangered and threatened species when the criteria in section 10(a)(2)(B) are satisfied by the applicant. Once we receive an application for an ITP, we need to review the application to determine if it meets issuance criteria. We also need to ensure that issuance of the ITP and implementation of the HCP complies with other applicable Federal laws and regulations.

The need for the Proposed Action (i.e., issuance of an ITP) is also based on the finding of one dead Indiana bat at the English Farms facility in 2020. These findings occurred during research activities at the

English Farms Project, and the taking of the Indiana bat was authorized by the Service under section 7 of the ESA. Other bat fatalities, including little brown bat and tricolored bat, have also occurred at the Projects. Wind turbines present a potential source of bat mortality, and risk of take to the covered species is expected to continue throughout future operation of the Projects.

The Service's purpose in considering the proposed action is to fulfill our authority under the ESA, and section 10(a)(1)(B). More specifically, the Service's purpose for the proposed action is to respond to an application requesting an ITP for the incidental take of the federally endangered Indiana bat, federally threatened northern long-eared bat, the non-listed little brown bat, and the non-listed tricolored bat, pursuant to the ESA section 10(a)(1)(B) and its implementing regulations and policies. The permit decision should ensure that the issuance of the ITP and the implementation of the HCP provide for the long-term conservation of the covered species and their ecosystems in the Permit Area. The permit decision should also ensure the Applicant will not appreciably reduce the likelihood of survival and recovery of the covered species in the wild, within the context of the ITP and associated HCP.

Per 40 CFR 1502.13, the Service must also incorporate the goals of the applicant in determining the purpose and need for the action. Therefore, as identified in Sections 1.2 and 5.1 of the HCP, the permit decision needs to also contribute to a) maximize the non-carbon emitting energy production, using reliable, low-cost wind, b) the long-term persistence of the covered species by developing mitigation projects that will support the survival and recovery of the covered species in the Permit Area, c) maintaining the integrity of the populations of the covered species in Iowa and Minnesota by minimizing mortality of the covered species in the Permit Area, and d) the scientific understanding of bat mortality at wind energy facilities.

1.5 DECISION TO BE MADE BY RESPONSIBLE OFFICIAL

The Service must decide whether to issue or deny the proposed ITP. The Service shall issue the ITP to the applicant if the issuance criteria and implementing regulations for the ESA and general permitting are met. The issuance criteria for an ITP are contained in section 10(a)(2)(B) of the ESA and the implementing regulations for the ESA (50 CFR 17.22(b)(2) and 17.32(b)(2) and 50 CFR 222.307(c)(2)). The Service may decide to issue a permit conditioned upon implementation of the HCP as submitted by the Applicant, or to issue a permit conditioned upon implementation of the HCP as submitted, together with other measures specified by the Service. We are required to deny the permit if these criteria are not satisfied. Alliant would serve as the permittee under the ITP (if issued) and is liable for all obligations assigned to them under the ITP and HCP.

1.6 REGULATORY AND POLICY BACKGROUND

This EA was developed in compliance with and consideration of the following guidance resources, laws, and regulations. The Council on Environmental Quality (CEQ) issued a final rule to update its NEPA implementing regulations, which went into effect on September 14, 2020. This EA is written to comply with these implementing regulations.

- Land-based Wind Energy Guidelines (LWEG)
    - The Service published the voluntary LWEG in 2012 to be used in conjunction with the appropriate regulatory tools in order to form the best practical approach for conservation of species of concern.
    - https://www.fws.gov/sites/default/files/documents/WEG_final.pdf

- NEPA
    - NEPA requires federal agencies to assess the environmental effects of their proposed actions prior to making decisions.
    - https://www.epa.gov/nepa/what-national-environmental-policy-act
- ESA
    - Federally listed threatened and endangered species and designated critical habitat are governed by the ESA and its implementing regulations (50 CFR parts 13 and 17).
    - The 1982 amendments to the ESA established a provision in section 10 that allows for "incidental take" of endangered and threatened species of wildlife by non-Federal entities (16 U.S.C. §1539).
    - https://www.fws.gov/library/collections/permits-native-endangered-and-threatened-species
    - The 2016 HCP Handbook provides comprehensive guidance to applicants on the ITP process.
    - https://www.fws.gov/sites/default/files/documents/habitat-conservation-planning-handbook-entire.pdf
- Migratory Bird Treaty Act of 1918 (MBTA)
    - The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations.
    - https://www.fws.gov/birds/policies-and-regulations/laws-legislations/migratory-bird-treaty-act.php
- Bald and Golden Eagle Protection Act of 1940 (BGEPA)
    - The BGEPA prohibits the take of a bald eagle (*Haliaeetus leucocephalus*) or golden eagle (*Aquila chrysaetos*).
    - On September 11, 2009, the Service published a final rule (Eagle Permit Rule) under the BGEPA authorizing limited issuance of permits to take bald eagles and golden eagles (74 FR 46836-46879). This rule was revised and finalized on December 16, 2016 (*Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests; Final Rule*) (81 FR 91494–91554). On September 30, 2022, the Service released proposed revisions to the eagle take permit program (87 FR 59598–59631). The final rule was published on February 12, 2024 creating a general permit option (89 FR 9920-9965).
    - https://www.fws.gov/program/eagle-management

  - On May 2, 2013, the Service announced the availability of the Eagle Conservation Plan Guidance: Module 1 – Land-based Wind Energy, Version 2
  - https://www.fws.gov/media/eagle-conservation-plan-guidance

- Iowa Endangered Plants and Wildlife Law (Code of Iowa, Chapter 481B)
  - It is unlawful to take, possess, transport, import, export, process, sell or offer for sale, buy or offer to buy, transport or receive for shipment, any species of fish, plants, or wildlife appearing on the Iowa List of endangered and threatened species.
  - https://www.legis.iowa.gov/docs/code/481B.pdf
- Minnesota's Endangered Species Statute (2022 Minnesota Statutes Chapter 84 Section 84.0895)
  - It is unlawful to take, import, transport, or sell any portion of an endangered species of wild animal or plant, or sell or possess with intent to sell an article made with any part of the skin, hide, or parts of an endangered species of wild animal or plant.
  - https://www.revisor.mn.gov/statutes/cite/84.0895

2.0 ALTERNATIVES

The NEPA requires that the environmental documents prepared for a proposed action discuss a range of alternatives. Therefore, this chapter describes the development of reasonable alternatives, alternatives eliminated from detailed study, and then alternatives explored and evaluated in the EA relevant to the Proposed Action (i.e., issuance of an ITP by the Service pursuant to the provisions of section 10(a)(1)(B) of the ESA).

Each alternative was evaluated for its ability to meet the purpose and need (see section 1.4), feasibility to implement, and environmental impacts. Only those alternatives that passed the screening process were selected for detailed analysis.

2.1 DEVELOPMENT OF ALTERNATIVES

The scope of reasonable alternatives is defined by the purpose and need for the action and guided by the goals and objectives of the acting agency. Reasonable alternatives include those that meet the purpose and need of the proposed action and are practical or feasible from both a technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the Applicant. Alternatives were developed to address the potential for take of the covered species during operation of the Projects, and as such, are primarily operational alternatives relating to the dates and times of operation and changes in cut-in speed (i.e., the wind speed at which turbines begin generating power and sending it to the grid). All curtailment studies to date show a generally consistent inverse relationship between cut-in speed (measured in meters per second (m/s)) and bat mortality (Table 2-1). Curtailment actions effective at reducing risk of collision for all bat species (including tree bats) are assumed to be equally effective for the covered species. Additionally, acoustic exposure (i.e., the subset of bat passes occurring when turbine rotors are spinning) measured at turbine nacelles has been positively correlated with bat mortality rates at multiple temporal scales (Peterson et al. 2021). Turbine related bat fatalities result from exposure to turbine operation, therefore, percent reductions in exposure at different cut-in speeds can be used as a

surrogate to determine the expected percent reduction in bat fatality rates at different cut-in speeds. Table 2-2 outlines the percent reduction in acoustic exposure at various cut-in speeds based on data collected from projects across the state of Iowa (unpublished data).

Table 2-1. Summary of publicly available curtailment studies on bats conducted to date in eastern North America[1].

Project	Year	State/Province[2]	Baseline Cut-in Speed (m/s)	Cut-in Speed (m/s)	Reduction in Bat Mortality	Average Reduction	Citation
Fowler Ridge	2011	Indiana	3.5	3.5	36%	36%	Good et al. 2012
Laurel Mountain	2011	West Virginia	3.5		35%		Stantec 2015
Summerview	2007	Alberta	4.0	4	57%	35%	Baerwald et al. 2009
Mount Storm	2010	West Virginia	4.0		No Significant Reduction		Young et al. 2011[3]
Mount Storm	2010	West Virginia	4.0		35%		Young et al. 2011[3]
Mount Storm	2011	West Virginia	4.0		12%		Young et al, 2012
Fowler Ridge	2011	Indiana	3.5	4.5	57%	62%	Good et al. 2012
Wolfe Island	2011	Ontario	4.0		48%		Stantec 2012
Anonymous	2010	Service Midwest Region[4]	3.5		47%		Arnett et al. 2013[5]
Laurel Mountain	2011	West Virginia	3.5		73%		Stantec 2015
Laurel Mountain	2012	West Virginia	3.5		71%		Stantec 2015
Raleigh Wind	Unk.	Ontario	3.5		77%		AWWI 2018
Casselman	2008	Pennsylvania	3.5	5	87%	51%	Arnett et al. 2011
Casselman	2009	Pennsylvania	3.5		68%		Arnett et al. 2011
Fowler Ridge	2010	Indiana	3.5		50%		Good et al. 2011[6]
Pinnacle	2012	West Virginia	3.0		47%		Hein et al. 2013[5]
Pinnacle	2013	West Virginia	3.0		54%		Hein et al. 2014
Kelley Creek	2018	Illinois	3.0		42.5%		Iskali et al. 2019
Criterion	2012	Maryland	4.0		62%		Young et al. 2013
Summerview	2007	Alberta	4.0	5.5	60%	66%	Baerwald et al. 2009
Fowler Ridge	2011	Indiana	4.0		73%		Good et al. 2012
Wolfe Island	2011	Ontario	4.0		60%		Stantec 2012
Anonymous	2010	Service Midwest Region[4]	3.5		72%		Arnett et al. 2013[5]

Project	Year	State/Province[2]	Baseline Cut-in Speed (m/s)	Cut-in Speed (m/s)	Reduction in Bat Mortality	Average Reduction	Citation
Spring Valley	2013	West Virginia	3.0		66%		BLM 2018
Sheffield	2009	Vermont	4.0	6	60%	62%	Arnett et al. 2013
Sheffield	2012	Vermont	4.0		63%		Martin et al. 2013
Casselman	2008	Pennsylvania		6.5	74%	77%	Arnett et al. 2011
Casselman	2009	Pennsylvania			76%		Arnett et al. 2011
Fowler Ridge	2010	Indiana			78%		Good et al. 2011[6]
Pinnacle	2013	West Virginia			75%		Hein et al. 2014
Beech Ridge	2012	West Virginia		6.9	73-89%	81%	Tidhar et al. 2013[7]

[1]Studies conducted in USFWS Region 8 (California and Nevada) were excluded due to the high proportion of Brazilian free-tailed bats (*Tadarida brasiliensis*), a species known to be active in higher wind speeds compared to the typical suite of species in Illinois. Due to this, the reductions in bat fatalities in Region 8 studies are likely lower than what would be seen in Illinois.
[2]USFWS Region 3 includes Minnesota, Iowa, Missouri, Illinois, Wisconsin, Indiana, Michigan, and Ohio.
[3]This study looked at curtailment for the first half of the night (47% reduction) versus the second half of the night (22% reduction). For this analysis, these values were averaged.
[4]The Service's Midwest Region (Region 3) includes Minnesota, Iowa, Missouri, Illinois, Wisconsin, Indiana, Michigan, and Ohio.
[5]These studies used modeled differences, not calculated reductions based on fatality estimates.
[6]These studies did not feather below cut-in speed.
[7]This study did not have control turbines, so this is the reduction from the West Virginia average (73%) and from the average in the Northeastern United States (89%).

Table 2-2. Percent reduction in acoustic exposure at various cut-in speeds based on acoustic data from projects across the state of Iowa (unpublished data)

Baseline Cut-in Speed (m/s)	Cut-in Speed (m/s)	Reduction in Acoustic Exposure
3.0	3.5	8.8%
	4.0	19.9%
	4.5	32.1%
	5.0	44.3%
	5.5	55.1%
	6.0	64.5%
	6.5	72.3%
	7.0	78.7%
	7.5	84.0%
	8.0	88.4%

Baseline Cut-in Speed (m/s)	Cut-in Speed (m/s)	Reduction in Acoustic Exposure
3.5	4.0	12.1%
	4.5	25.5%
	5.0	38.9%
3.5	5.5	50.8%
	6.0	61.0%
	6.5	69.6%
	7.0	76.6%
	7.5	82.4%
	8.0	87.2%

The alternatives do not address aspects of the Projects beyond operations, such as turbine siting or construction, because the USFWS does not have the authority to regulate the construction of wind projects and construction and siting activities are not identified as Covered Activities in the Applicant's HCP.

2.2 ALTERNATIVES RETAINED FOR DETAILED ANALYSIS

The alternatives retained for detailed analysis are described in detail in Sections 2.2.1 through 2.2.3 and summarized in Table 2-3below. All action alternatives under consideration implement feathering of turbines below certain cut-in speeds nightly during the entire bat active season from March 15 through November 15. Additionally, all action alternatives under consideration implement the Applicant's Bird and Bat Conservation Strategy (BBCS) for each individual Project. It is assumed that a BBCS would also be developed and implemented for each of the two new Projects.

Table 2-3. Summary of Alternatives

Alternative	Cut-in Speed[1]				Temp Threshold[3]	HCP Employed	BBCS Employed
	March 15 to March 31[2]	April 1 to July 14	July 15 to September 30	October 1 - November 15			
Alternative 1 (No Action)	Manufacturers[4]	6.0 m/s at turbines within 2.7 miles of TRI habitat; Manufacturers[4] at all other turbines	8.0 m/s	Manufacturers[4]	N/A	No	Yes
Alternative 2 (Proposed Action)[5]	Manufacturers[4]	Manufacturers[4]	5.0 m/s at English farms and Golden Plains; 4.0 m/s at Franklin County, Whispering Willow East, and Richland; Manufacturers[4] at Bent Tree, Kossuth, Upland Prairie, Whispering Willow North, Bent Tree North, and Whispering Willow South	Manufacturers[4]	50ºF	Yes	Yes
Alternative 3 (More Restrictive)	Manufacturers[4]	6.0 m/s at English farms; 5.0 m/s at all other projects		Manufacturers[4]	50ºF	Yes	Yes

[1]Turbine blades feathered below the cut-in speed from one-half hour before sunset to one-half hour after sunrise.
[2]Curtailment begins at the start of the bat active season.
[3]Cut-in speed would be raised from manufacturer's cut-in speed when temperatures are above the temperature threshold.
[4]Manufacturer's cut-in speed varies by Project. 3.0 m/s at English Farms, Golden Plains, Richland, Kossuth, Upland Prairie, and Whispering Willow North; 3.5 m/s at Franklin County, Whispering Willow East, and Bent Tree.
[5]The Proposed Action varies depending on the Alliant Project. Proposed protocols are outlined in Table 5.1 of the Applicant's HCP

2.2.1 Alternative 1: No-Action Alternative

At these Projects, the Service is currently assuming operational curtailment with the elevated cut-in speeds noted above and in Table 2-2 for the No-Action Alternative would be sufficient to ensure take of the covered species—Indiana bats, northern long-eared bats, little brown bats, and tricolored bats—is not reasonably certain to occur. We base this assumption on an analysis of wind speed and bat acoustic data (an indication of bat activity; unpublished data from Iowa and Illinois) and the likelihood that spring collision risk at the Projects would be lower than risk in the summer and fall. We also know that bat behavior during spring migration and the summer is different than in the fall, and likely results in a lower risk of turbine collisions. Bats that would be present in the Permit Area in spring are expected to be migrating to summer habitat. Bats from spring migration studies have migrated more slowly than in the fall and made periodic stops to forage on their way to their summer habitat (Roby et al. 2019). Therefore, we are assuming that bats are less likely to migrate at higher wind speeds during the spring, as this may be more energetically demanding after hibernation.

We also assume that summer risk is highest at turbines within 2.7 miles of suitable summer roosting and foraging habitat, as 2.7 miles is the maximum distance traveled from roosting areas to foraging grounds for reproductive (pregnant or lactating) adult female tricolored bats (USFWS 2021) and tricolored bats have the largest foraging distance of any of the covered species. Suitable summer roosting and foraging habitat was based on the tricolored bat suitable habitat model developed as part of the tricolored bat Resource Equivalency Analysis (REA) model (USFWS 2022c). This is a conservative estimate because it is likely that not all suitable habitat is occupied habitat.

We also assume that 6.0 m/s would be a sufficient cut-in speed for avoidance in the summer given a lower collision risk based on minimal suitable summer habitat near turbines (see Section 3.6.1), the low pre-construction bat acoustic activity detected in the summer (see Section 3.6.1.3), and the likelihood that summer behavior puts bats at a lower collision risk than fall migration behavior, as indicated by seasonal bat mortality studies (WEST 2021). In conclusion, while spring and summer risk is likely low, there is currently only limited Project-specific data available to indicate whether spring and summer bat mortalities could occur at the Projects. Therefore, including raised curtailment during the spring and summer is a conservative approach to ensure take of federally listed species is avoided.

As noted above, a high fall mortality risk to the covered species is more certain, with Indiana bat, little brown bat, and tricolored bat mortalities occurring at the Projects in fall. Based on an analysis of acoustic data from Iowa and Illinois, blanket curtailment below 8.0 m/s during fall migration, when covered species risk is expected to be highest, would avoid over 90% of tricolored bat and *Myotis* activity (unpublished data from Iowa and Illinois). Therefore, we believe that feathering turbines below 8.0 m/s during the fall migration would make take of the covered species not reasonably certain to occur.

Under the No-Action Alternative, an ITP would not be issued, and the Projects could voluntarily submit a request for a TAL. Because the Service considers the measures in a TAL unlikely to result in take of covered species at the Projects, Alliant would not obtain an ITP or implement an HCP. The BBCSs would be revised to reflect the avoidance and minimization measures necessary for a TAL over the long-term. This No Action Alternative is based on best available information at the time; however, Alliant would follow appropriate guidance for avoidance of take of the covered species as it becomes available.

2.2.2 Alternative 2: The Proposed Action

Under this alternative, the Service would issue an ITP to the Applicant for incidental take of Indiana, northern long-eared bats, little brown bats, and tricolored bats at the Projects based upon the Applicant's commitment to fully implement their proposed HCP and BBCSs.

The proposed HCP includes specific measures to minimize, mitigate, and monitor take of the covered species as a part of operation of the Projects, as described in the following sections.

2.2.2.1 Minimization Through Operations

The curtailment plan is explained in detail in Section 5.2.2 of the HCP for the Projects. The Applicant would minimize the potential take of Indiana, northern long-eared, tricolored, and little brown bats resulting from operations by adjusting turbine operational parameters. Projects were categorized based on their apparent level of risk (higher risk, moderate risk, and typical risk) based on project-specific mortality data, proximity to higher risk MidAmerican projects, and presence of and distance to suitable habitat.

Two of the nine Alliant Projects, English Farms and Golden Plains, were identified as having higher risk. Individual turbines at these two projects would be feathered below manufacturer's cut-in speed (3.0 m/s) from March 15 to July 15 and October 1 to November 15 from sunset to sunrise. Between July 15 and September 30 all turbines at these projects would be feathered below a wind speed of 5.0 m/s from sunset to sunrise and when ambient temperatures are above 50ºF based on a 10-minute rolling average. If temperatures are below 50ºF, the cut-in speed will be the manufacturer's cut-in speed (3.0 m/s).

Three of the nine Alliant Projects, Franklin County, Whispering Willow East, and Richland, were identified as having moderate risk. Individual turbines at these three projects would be feathered below manufacturer's cut-in speed (3.0 m/s at Richland and 3.5 m/s at the remaining two) from March 15 to July 15 and October 1 to November 15 from sunset to sunrise. Between July 15 and September 30 all turbines at these projects would be feathered below a wind speed of 4.0 m/s from sunset to sunrise and when ambient temperatures are above 50ºF based on a 10-minute rolling average. If temperatures are below 50ºF, the cut-in speed will be the manufacturer's cut-in speed (3.0 m/s).

The four remaining Alliant Projects, Bent Tree, Kossuth, Upland Prairie, and Whispering Willow North were identified as having typical risk. Individual turbines at these three projects would be feathered below manufacturer's cut-in speed (3.5 m/s at Bent Tree, 3.0 m/s at the other three) for the entire bat active season (March 15 through November 15) from sunset to sunrise.

2.2.2.2 Measures to Mitigate the Impact of Taking

The Applicant would purchase mitigation credits from the Two Rivers Conservation Bank in order to offset the impact of covered species take by protecting and restoring suitable roosting and foraging habitat for the covered species. Within one year of permit issuance, the Applicant would provide upfront mitigation via the Two Rivers Conservation Bank to cover 100% of the authorized take for Indiana bats, northern long-eared bats, and little brown bats and 28% of the authorized take for the tricolored bat (see section 5.3 of the HCP). Within 30 days of permit issuance, the Applicant would provide funding assurances that would cover the remaining cost to fully mitigate tricolored bat authorized take, if needed. A mitigation true-up would be paid to cover the true-up cost of mitigation (based on projected take levels) if triggered under adaptive management. The Applicant is considering four options for mitigation true-ups: use of a permittee-responsible mitigation project, purchase of credits from a conservation bank, contribution to an in-lieu fee mitigation fund, or a research project on WNS. The mitigation options are

intended to provide streamlined and expeditious means to offset take. The locations of the proposed Mitigation Area for upfront mitigation are in Des Moines County, Iowa and Marshall County, Iowa (Figure 1).

2.2.2.3 Monitoring and Adaptive Management

The Applicant has provided detailed monitoring and adaptive management plans in their HCP that would ensure the Projects meet their biological goals and objectives and do not exceed the permitted take amount (see Sections 5.4 and 5.5 of the HCP).

The Applicant's monitoring protocol would follow a Scattered Staggered Monitoring (SSM) framework. The SSM framework varies by Project with English Farms having a higher level of effort than all other Projects. At English Farms, the SSM framework includes bi-weekly road and pad searches out to 100 meters (328 feet) at approximately 40% of turbines. At all other Projects, the SSM framework includes bi-weekly road and pad searches out to 100 meters (328 feet) at approximately 20% of turbines at each individual Project. Of the 20% (40% at English Farms) of turbines being searched at each individual Project, a subset (25% to 30% of the 20%) will consist of uncleared full plots searched by dog and handler (or equivalent) teams every other year. Which 20% (40% at English Farms) of turbines are searched at each Project will be rotated annually so that all turbines at each Project would be searched at least once within a five-year period.

Fatality monitoring would be conducted from July 1 through October 15 to cover the period of highest bat fatalities observed across the Permit Area. This monitoring window may be shortened to September 30 if no covered species carcasses are found between October 1 and October 15 in the first five years of the permit term. The fatality monitoring protocol would be in place for the entire 30-year permit term.

Fatality monitoring data would be used to inform collision risk and trigger adaptive management for the Projects when needed. If fatality data indicates that the annual permitted take and/or projected future take could exceed the authorized take, over the short and/or long term, the Applicant would revise their operational plan under their adaptive management plan to reduce future fatalities and ensure the permitted take levels are not exceeded. Alliant has also identified other adaptive management measures that would be implemented as needed to ensure the biological goals and objectives of the HCP are being met and the permitted take levels are not exceeded (see Table 5.8 of the HCP for additional details).

2.2.3 Alternative 3: More Restrictive Alternative

Under Alternative 3, the Service would issue an ITP based on an HCP addressing the incidental take of the covered species expected from a modified cut-in speed operational protocol. The Applicant would be expected to implement a revised BBCS that will reflect measures in the HCP for the modified cut-in speed. Under this alternative, individual turbines at English Farms would be feathered below a wind speed of 6.0 m/s and individual turbines at all other Projects would be feather below a wind speed of 5.0 m/s from April 1 through September 30.

The HCP would outline a conservation program including mitigation, monitoring, and adaptive management requirements that meets ITP issuance criteria. It is assumed that monitoring and adaptive management program described in Section 2.2.2 would remain in place and that mitigation would be similar to that described in Section 2.2.2 but scaled to account for changes in the amount of take and resulting impacts to covered species and their habitats.

2.3 ALTERNATIVES ELIMINATED FROM DETAILED ANALYSIS

2.3.1 Implementation of New Technology Alternative

The Service considered alternatives that would include the implementation of new technology, such as deterrents, smart curtailment, and Detection and Active Response Curtailment (DARC). However, these alternatives were not carried forward for detailed analysis due to cost to implement, uncertainty in actual take reduction, complexity of implementation on large scale (i.e., across multiple projects), and reliability of components.

2.3.2 Six-Year Incidental Take Permit

The Service considered a short-term Permit for the Projects in order to gather more site-specific data on local bat populations to inform long-term management decisions (including operating parameters) at the Projects. Based on the site-specific data collected during the first six years of operations, the Applicant may then choose to use these data to develop a new HCP and pursue a separate, long-term ITP. However, there is pre-construction data for most Projects, at least one year of post-construction monitoring data at each Project, additional post-construction monitoring data at Projects that were considered higher risk (English Farms), and the availability of post-construction monitoring and data from the MidAmerican Projects in Iowa. Based on all of this available data, the Service determined that additional data collection prior to applying for a long-term ITP was unnecessary; therefore, this alternative was not carried forward for detailed analysis.

2.3.3 Additional Elevated Operational Adjustment Alternatives

The Service considered alternatives that included feathering turbines below other various wind speeds, including a variable smart curtailment regime, during any and all periods of covered species risk. These alternatives were eliminated from detailed consideration because the best available science does not support a substantial difference in fatality reductions when compared to the other alternatives carried forward for detailed analysis. By this we mean that the range of potential impacts to each species that would result from applying these cut-in speeds is captured among the alternatives analyzed in detail. In addition, site-specific exposure rates that would inform a smart curtailment regime are not currently available for the Projects.

2.3.4 Less Restrictive Alternative

The Less Restrictive Alternative would result in a higher take of Covered Species than the HCP Alternative. In this EA, we have chosen not to carry a high-take alternative forward for detailed analysis because it is unlikely and unreasonable that the Service would decide to issue a permit with fewer conservation measures and a higher take limit than the Applicant proposed.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 AFFECTED ENVIRONMENT

The affected environment is the area and its resources (i.e., biological, physical, socioeconomic) potentially impacted by the Proposed Action and Alternatives. The purpose of describing the affected environment in the sections below is to define the context in which the impacts would occur. To make an informed decision about which alternative to select, it is necessary to first understand which resources would be affected and to what extent. The affected environment sections of this document provide the basis for this understanding.

Relative to the Applicant's proposal, the affected environment includes those settings where any Covered Activities (operations, refurbishment, repowering, and mitigation) would occur. This includes the site of each individual Project (the Permit Area) and habitat Mitigation Area(s). The ITP would cover the Permit Area and all Covered Activities.

In defining potentially affected resources, we considered the potential impacts associated with the covered activities under the Proposed Action and the implementation of the HCP. Specifically, we analyzed the impacts of the operation of the turbines and mitigation actions as described in the HCP. Consistent with NEPA, we also considered alternatives to the Proposed Action involving the operation of the Projects, which is directly associated with the take of Indiana, northern long-eared, little brown, and tricolored bats.

Operations at the Projects and mitigation vary among the considered alternatives. With regard to implementation of any of the alternatives considered, bat resources are likely to experience the most pronounced impact and vary measurably among alternatives. Hence, our analysis is commensurate with the estimated impacts and focuses predominately on this resource. We recognize four other resource categories that may experience variable effects under the alternatives: vegetation, non-volant wildlife resources, avian resources, and air quality and climate. Thus, we also provide an analysis for these resources.

Project operations and implementation of mitigation under the alternatives are unlikely to have significant effects to geology and soils, surface and ground water, environmental justice, land use, visual resources, cultural resources, transportation, and communications. Most of the Projects are already built and operational, and assessment of the effects of construction of the two other Projects is outside the purview of this EA because the construction itself of the new projects is not expected to take listed species and therefore is not a covered activity in the HCP and ITP. Additionally, mitigation actions will only involve vegetation and habitat management on undeveloped and agricultural land. Therefore, the Applicant's proposed action and the alternatives in this EA are not anticipated to result in changes to these resources from their current condition. Hence, our review does not extend to include detailed analyses of these resources.

In summary, the following descriptions of resources are limited to those affected by the alternatives under consideration, described in Section 2.0. The alternatives under consideration include three scenarios in which the 765-turbine Alliant fleet could operate (i.e., three different operational adjustments associated with turbine cut-in speeds), along with the corresponding mitigation measures. Our detailed analysis is confined to the biological environment (vegetation; wildlife; avian; bats) and the physical environment (air quality and climate).

3.1.1 Overview of the NEPA Project Area

The Projects are dispersed across the northwestern two-thirds of Iowa, southern Minnesota, and southeastern Iowa, all within the Western Corn Belt Plains Environmental Protection Agency (EPA) Level III ecoregion. The NEPA Project area includes the leased land on which the turbines are built and covers approximately 283,623 acres (Figure 1). The setting includes primarily agricultural lands (i.e., cultivated crops and hay/pasture) interspersed with small patches of forest and developed land (Figure 2).

Land cover of the NEPA Project area is dominated by cultivated agriculture (primarily corn and soybeans) (91.6%), with small amounts of forest (0.6%; to include deciduous and mixed forest) found primarily at Whispering Willow East and Bent Tree. Major watersheds within which the Projects are located include the Minnesota (HUC ID 070200), Missouri-Little Sioux (HUC ID 102300), Iowa (HUC ID 070802) and Des Moines (HUC ID 071000). Approximately 0.5% of the NEPA Project area consists of wetlands (to include woody wetlands and emergent herbaceous wetlands) and approximately 0.1% consists of open water. In the larger context area of the State of Iowa, approximately 85% of the state consists of agricultural land, forested areas make up approximately 10%, and wetlands account for approximately 1% (IDNR 2015a). In Freeborn County, Minnesota approximately 86% of the County consists of agricultural land and farmsteads, forested areas make up approximately 4%, and wetlands account for approximately 0.6% (Minnesota IT Services, 1999).

The nine Projects total 1,651-MW across 765 wind turbine generators and include other associated project components (Section 1.3). The Projects are located on land leased from private landowners who continue their current uses of the agricultural lands. As a leaseholder, Alliant's rights are limited to those incorporated in the lease agreement to allow for safe and effective operation, maintenance, and decommissioning of the Projects. Alliant has no control over landowner activities on the properties in which the Projects are sited beyond what is specified in their lease provisions. Alliant used standard construction procedures, including best management practices, to minimize impacts to the existing environment and habitat, including siting wind turbines 1,000 feet or more from suitable bat foraging habitat at most Projects[1].

The Applicant is in the process of setting up a single-client conservation bank, the Two Rivers Conservation Bank, to mitigate the impact of take at the Projects. The Two Rivers Conservation Bank consists of two Applicant-owned properties, one in Des Moines County, Iowa and one in Marshall County, Iowa. The properties meet the habitat requirements of all four Covered Species and have sufficient acreage to provide enough mitigation credits to fully offset the authorized take of Indiana, northern long-eared, and little brown bats and offset 28% of the tricolored bat authorized take. To offset the remaining authorized take of the tricolored bat, the Applicant will implement mitigation true-ups throughout the 30-year permit term that allow mitigation to stay ahead of take of the tricolored bat.

3.2 ENVIRONMENTAL CONSEQUENCES

The environmental consequences sections analyze the environmental impacts of each of the three alternatives in Section 2.0 that were retained for detailed analysis (summarized in Table 2-3). The alternatives differ from each other with respect to operational adjustments and the amount of mitigation that would be implemented.

[1] Eleven turbines at Bent Tree and six turbines at Whispering Willow East are within 1,000 feet of suitable bat foraging habitat

In accordance with 40 CFR §§ 1502.16 and 1508.1, we analyzed direct, indirect, and cumulative impacts on the environment. The direct and indirect effects of each alternative (if applicable, some impacts are the same under all alternatives) are described in each resource section. Direct effects are those that are caused by the action (issuance of an ITP) and occur at the same time and place as the action. Indirect effects are those that are caused by the action (issuance of an ITP) but occur later in time or are further removed in place but still reasonably foreseeable. Long-term effects persist through the life of the Projects; short-term effects would be limited in time and duration. Cumulative effects are the effects on the environment resulting from the Proposed Federal Action added to the effects of other past, present, and reasonably foreseeable actions, as described further in Section 3.2.1.

The Service has initiated an intra-service Section 7 consultation/conference to determine if and how issuance or denial of the permit would affect federally listed, proposed, and candidate species. No designated or proposed critical habitat occurs in the Permit Area. Potential impacts are discussed in the pertinent resource sections. A final jeopardy analysis will be made through the USFWS Section 7 intra-agency consultation/conference process, which is ongoing as of the date of this document. The results of this process will be presented in the Final EA.

3.2.1 Cumulative Effects

Cumulative effects for the Projects are assessed over the 30-year permit term. Cumulative effects are also assessed at different spatial scales (Cumulative Analysis Areas) appropriate to each of the affected resources (see Environmental Consequences sections for each resource). The Cumulative Analysis Area for each resource was selected based on the NEPA Project area (i.e., Permit Area; see Section 3.1.1), the duration of the agency action, the type of planned actions that may impact the affected resources, and the scale at which effects on the resource can be meaningfully discussed.

Environmental trends and past, present, and reasonably foreseeable future actions in the analysis area were considered for their potential to contribute to cumulative effects in combination with the Projects. These include other wind energy development, other land development (industrial, residential, etc.), climate change, WNS, and conservation projects, as described further below. A cumulative impact analysis associated with these actions is provided in the Environmental Consequences section for each resource, as applicable.

3.2.1.1 Wind Energy Development

Iowa was the first state to enact its Renewable Portfolio Standard (RPS) in 1983. Iowa's RPS requires a minimum of 105 MW of energy to be generated from renewable energy resources by the two major utilities in the state, MidAmerican Energy Company (MEC) and Alliant Energy Interstate Power and Light (DSIRE 2020). An important organization in Iowa that ensures utilities provide safe, reasonably priced, and environmentally responsible services to all Iowans is the Iowa Utilities Board (DSIRE 2020). Iowa ranked second in the U.S. for wind electricity generation in 2022, powering approximately 62% of Iowa's net generation (USEIA 2023b). Projections put Iowa's onshore wind energy capacity in 2024 at 12,948 MW, with a maximum buildout of 16,668 MW over the next 30 years (Gagnon et al. 2023, National Renewable Energy Laboratory [NREL] 2023; Table 3-1). In 2007, Minnesota legislation modified the 2001 voluntary energy objective to create a mandatory RPS, which requires the state to have at least 25% of retail electricity sales be generated or procured using eligible renewable sources by 2025 (DSIRE 2023). Projections put Minnesota's onshore wind energy generation in 2024 at 5,518 MW and is projected increase to 23,502 MW by 2050 (Gagnon et al. 2023, NREL 2023; Table 3-1). Wind energy development within the Indiana bat's Ozark-Central Recovery Unit (OCRU; Arkansas, Illinois, Iowa, Missouri, and Oklahoma) has been steadily increasing, with projections totaling approximately 35,900

MW at the end of 2024 and 133,480 MW by the end of 2050 (Gagnon et al. 2023, NREL 2023; Table 3-1).

To estimate the cumulative impact from wind development within the analysis areas, we used the NREL Mid-case scenario with nascent technologies (i.e., retrofits of natural gas and coal plants) and assuming current energy policies (i.e., state-specific clean energy goals and federal production tax credits). While these estimates are likely less accurate over time and based largely on assumptions, these projections are the best available estimates to use to estimate cumulative wind buildout within the Cumulative Analysis Areas (Table 3-1). The NREL projections fluctuate over time and vary based on the region being assessed. To provide the most conservative estimate, the max buildout over the NREL projected timeframe (i.e., through 2050) was used as the assumed max projected increase by the end of the permit term.

Table 3-1. Installed and projected onshore wind energy development in the cumulative analysis areas defined for avian and bat species.

State	Projected Wind Capacity Start of Permit – 2024 (MW)	Projected Maximum Wind Capacity by 2050 (MW)
Iowa	12,948	16,668
Minnesota	5,518	23,502
Total Iowa and Minnesota (Cumulative Analysis Area for northern long-eared bat, little brown, tricolored bat, non-covered bats, avian resources)	**18,466**	**40,170**
Total OCRU[1] (Cumulative Analysis Area for Indiana Bat)	**35,900**	**133,480**

Data Source: Mid-case Scenario (Gagnon et al. 2023, NREL 2023)

MW = megawatt

Totals may not equal addends due to rounding.

1. The Ozark-Central Recovery Unit (OCRU) includes Arkansas, Illinois, Iowa, Missouri, and Oklahoma.

3.2.1.2 Other Land Development

According to the U.S. Census Bureau, the populations of the State of Iowa and Freeborn County, Minnesota were estimated at 3,046,355 and 31,255, respectively, in 2010 and 3,190,369 and 30,895, respectively, in 2020 (U.S. Census Bureau 2023). Projections for 2040 estimate that, compared to the 2020 population, the population of Iowa will increase to 3.5 million (+9%) (State Data Center 2010). Some Project counties are expected to increase (Clay County +3%, Dickinson County +11%, Poweshiek County of +5%), others are expected to decrease in population (Franklin County of -5%, Kossuth County of -1%, Sac County of -10%), and Winnebago County is expected to remain the same (0%) (State Data Center 2010). In Freeborn County, Minnesota population is expected to decline to 28,890 by 2040 (-7%; Minnesota State Demographic Center 2020). Population changes can be one indicator for land use changes that may affect wildlife habitat availability and/or suitability. Given some of the Projects are in counties that could experience a population increase, there is a greater potential for increased land development that could reduce the amount of wildlife habitat in the Cumulative Analysis Area.

Although land use development could occur, particularly in Clay, Dickinson, and Poweshiek Counties, there are no specific reasonably foreseeable actions identified at this time. Past and present actions are discussed as part of the affected environment.

3.2.1.3 Climate Change

Climate change presents a growing threat to North America's fish, wildlife, and plants, and their habitats; human-induced emissions cause large-scale shifts in weather patterns, spread of invasive species, and habitat loss (U.S. Department of the Interior 2021). These impacts could result in changes in migration patterns, population distributions, food availability, shifts in seasonal behaviors (e.g., hibernation and reproduction), and other potentially adverse species impacts.

3.2.1.4 White-nose Syndrome

WNS is the primary cause of bat population declines across the U.S. WNS is passed by bat to bat contact and grows on the nose and flesh of bats (White-nose Syndrome Response Team 2023). This disease causes bats to arouse from hibernation more frequently, which depletes fat reserves and may cause bats to starve to death. WNS can kill up to 100% of bats in a single colony during hibernation (U.S. Forest Service [USFS] and Bureau of Land Management [BLM] 2019). WNS has been detected in USFWS Region 3 for approximately 14 years; it was first detected in Missouri between 2009 and 2010 and confirmed in the remaining states between 2010 and 2016 (White-nose Syndrome Response Team 2023). As such, WNS has affected the bat populations likely to be affected by the Projects.

3.2.1.5 Conservation Projects

Priority actions for conservation and restoration in Iowa have been identified in the Iowa Department of Natural Resources' (IDNR) *Iowa Wildlife Action Plan*. Objectives include protection and enhancement of existing habitats that benefit species of greatest need (SGCN), development of new habitats for SGCN, and improving the status of aquatic SGCN (IDNR 2015b). The Iowa Department of Agriculture and Land Stewardship (IDALS) works to protect and restore watersheds. Two current projects include the Price Creek Watershed Project and the Fox River Water Quality Project. The Price Creek Watershed Project's overall goal is to improve water quality by implementing erosion control and to move livestock out of the Price Creek corridor (IDALS 2007). The Fox River Water Quality Project aims to improve water quality and reduce flooding through the use of stabilization structures and sediment control basins (IDALS 1999). One federal conservation project occurring in Iowa is the Huron Island Complex Project, which is located along the left descending bank of the Upper Mississippi River, approximately 20 miles upstream of Burlington, Iowa. The main objectives of this project are to manage for a diverse and dynamic pattern of habitats to support native biota, to manage for viable populations of native species within diverse plan and animal communities, and to manage to processes that shape a physically diverse and dynamic river floodplain system (USACE 2021).

Priority actions for conservation and restoration in Minnesota have been identified in the Minnesota Department of Natural Resources' (MDNR) *Wildlife Action Plan*. The plan takes a two-fold approach to the protection of wildlife through a habitat approach and species approach. The state's habitat approach focuses on prioritizing conservation of SGCN and other wildlife within a mapped Wildlife Action Network of quality terrestrial and aquatic habitats throughout the state (MDNR 2016). This will support biodiversity that already occurs in the network by protecting and maintaining large core areas of habitat as well as corridors that connect these areas. The species-based approach focuses on implementing conservation actions that address the causes of decline that are not fully addressed in the habitat approach (MDNR 2016). The Minnesota Board of Water and Soil Resources manages the One Watershed, One

Plan Program which was developed to create comprehensive watershed management plans. These goals of these plans are to address water quality, wetland enhancement and restoration, identification of priority areas for riparian zone management and buffers, protection and enhancement of fish and wildlife habitat, promotion of groundwater recharge, and restoration and protection of surface and groundwater storage and retention systems (BWSR 2023).

Additionally, bat conservation projects in USFWS Region 3 have been, and continue to be, conducted by entities such as state agencies, other wind energy developers, mining companies, and Bat Conservation International (BCI). For example, 20 bat HCPs for wind energy development projects that would involve bat habitat mitigation have been approved in USFWS Region 3.

3.3 VEGETATION

3.3.1 Affected Environment

Vegetation resources include all plants, including rare, threatened, and endangered plants. Vegetation in the Project areas is dominated by agricultural crops with less than 5% forest (deciduous forest and mixed forest), wetland (emergent herbaceous and woody), or shrub/shrub habitat and open water. Numerous rivers that run throughout the state of Iowa are within or near the Project areas and may function as bat foraging corridors. There are also rivers and waterbodies near or in the Bent Tree Project area in Minnesota. General landcover is described in Section 3.1.1 and shown on Figure 2. Vegetation in potential mitigation areas consists of existing forested habitat or agricultural cropland.

3.3.1.1 Threatened and Endangered Plant Species

Based on information from the IDNR Natural Areas Inventory and the MDNR Rare Species Guide, two federally listed plant species, the western prairie fringed orchid (*Platanthera praeclara*) and the prairie bush cover (*Lespedeza leptostachya*), have been recorded in four of the counties within which Projects are located (IDNR 2023; MDNR 2023a). Both species were recorded in Kossuth, Dickinson, and Clay Counties in Iowa. Only the western prairie fringed orchid has records from Freeborn County in Minnesota. Six state-endangered species have been recorded in three of the counties within which Projects are located. In Iowa, one state-endangered species was recorded in Winnebago County (bog bedstraw (*Galium labradoricum*)), and three were recorded in Dickson County (blue giant hyssop (*Agastache Foeniculum*), clustered broomrape (*Orobanche fasciculata*), and water marigold (*Megalodonta beckii*)). In Minnesota, the state- and federally-endangered western prairie fringed orchid and state-endangered Butternut (*Juglans cinerea*) have been recorded in Freeborn County, Minnesota. For full list of federal and state listed species for each county, refer to the Iowa Natural Areas Inventory[2] and Minnesota Conservation Explorer[3].

[2] https://programs.iowadnr.gov/naturalareasinventory/pages/Query.aspx
[3] https://mce.dnr.state.mn.us/

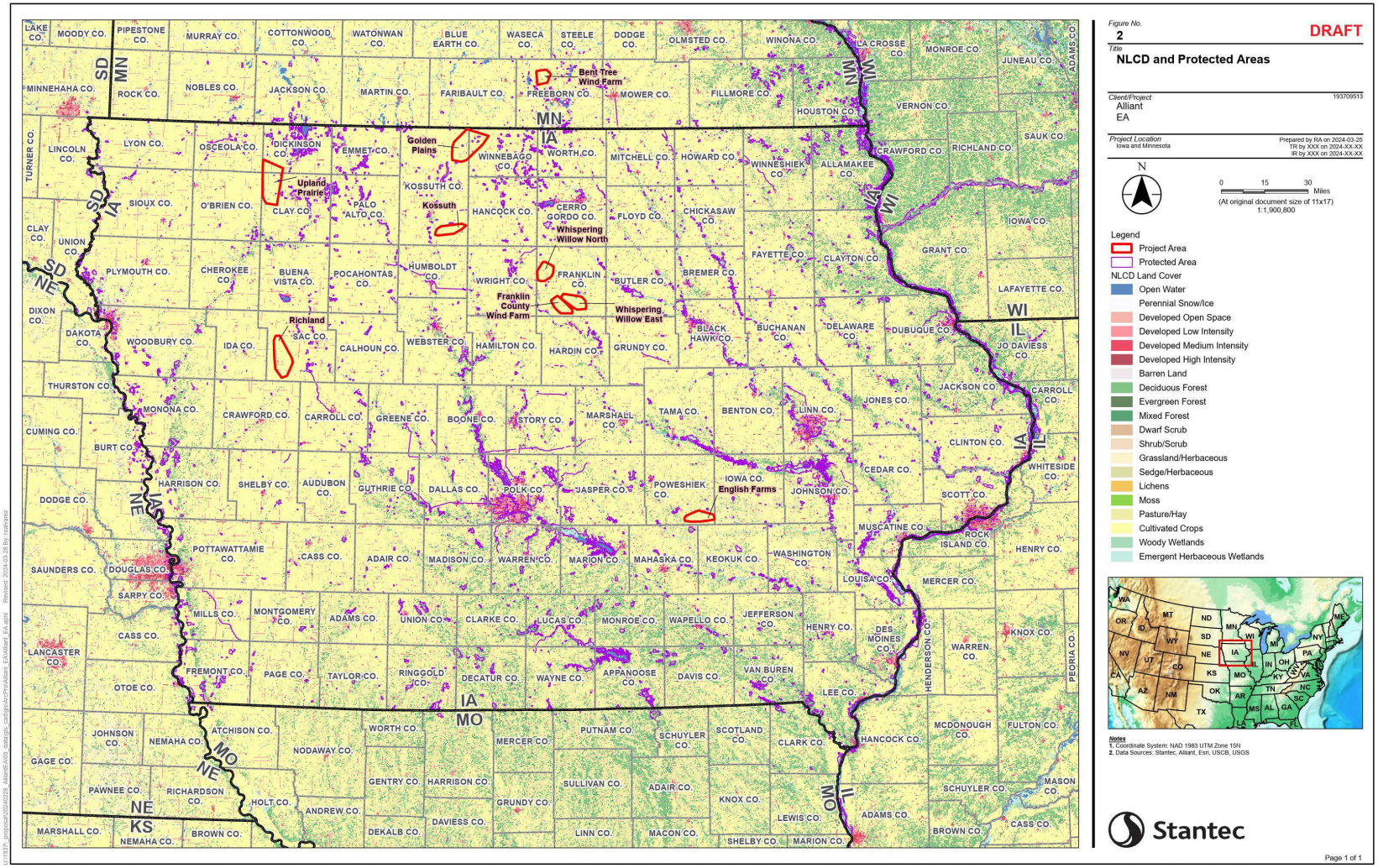

Figure 2. Land Cover and Protected Areas

3.3.2 Environmental Consequences

3.3.2.1 Impact Criteria

Federally listed plants are afforded protection under the ESA. State-listed plants are afforded protection under Iowa's Endangered Plants and Wildlife (Chapter 481B of the Code, 571 IAC Chapter 77.3) and Minnesota's Endangered and Threatened Species law (Minnesota Rules, Chapter 6134). Executive Order 13112 addresses federal coordination and response to the problems associated with invasive species. There are no specific federal or state regulations pertaining to unlisted plants that are relevant to the analysis for the Applicant's proposal. As per NEPA and CEQ guidelines, the human environment includes vegetation resources, and impacts to these resources can result in secondary effects to other resources.

Vegetation can be impacted at the individual, population, or community level. Major impacts to vegetation can occur when any of the following result:

- Naturally occurring population reduced in numbers below levels for maintaining viability at local or regional level;
- Substantial loss or degradation of soil stabilization services;
- Substantial loss or degradation of habitat for a rare, threatened, or endangered animal species; and
- Introduction of invasive species that results in substantial replacement of native species.

3.3.2.2 Direct and Indirect Effects to Vegetation Resources

Post-construction mortality monitoring on full plots is expected to be conducted by dog teams without plot clearing, unless otherwise triggered by adaptive management. If vegetation clearing on search plots does occur, under all action alternatives, clearing would be limited to previously disturbed areas that are currently actively cropped or hay/pasture areas. These areas are not expected to support state- or federally listed plant species. Therefore, no impacts to naturally occurring vegetation are expected, including to state- and federally listed species.

Mitigation activities under each action alternative would involve the protection and restoration of summer roosting and foraging habitat for the Covered Species (i.e., woodlands and open habitat) to offset take for the 30-year permit term. These areas would also be protected in perpetuity from development or changes in land use. Under the HCP Alternative, upfront mitigation would include the purchase of mitigation credits from the Two River Conservation Bank to cover 612.4 acres of summer roosting and foraging habitat to fully cover the authorized take of the Indiana bat, northern long-eared bat, and little brown bat over the Permit Term and offset the first five years of take of the tricolored bat take (see Table 5.4 of the HCP). Additional mitigation may be implemented under mitigation true-ups for the tricolored bat triggered by adaptive management (see Table 5.5 of the HCP). These mitigation true-ups could include protection and restoration of up to 1,416 additional acres of protected or restored summer roosting habitat or 1,176 additional acres of protected or restored open foraging habitat. While mitigation would be expected to be lower under the More Restrictive Alternative (due to lower take estimates), mitigation actions would have beneficial effects to vegetation and flora present in the mitigation area under any of the action alternatives.

3.3.2.3 Cumulative Effects to Vegetation

The Cumulative Analysis Area for vegetation includes the state of Iowa and Freeborn County, Minnesota. Adverse impacts to cropland are anticipated under any of the alternatives in the Permit Area. However, the protection of forested bat habitat and open foraging corridors in the Two Rivers Conservation Bank site by the Applicant, along with other bat conservation projects in Iowa and Minnesota, would have a cumulative beneficial effect on forest vegetation in the Cumulative Analysis Area.

Prior to European settlement, forested acres in Minnesota were estimated to be at 31.5 million (Miles and Kepler 2017). As of 2020, Minnesota has 17.7 million acres of forests making up 33% of its land cover (USDAFS 2021), up from 17.4 million acres in 2015 (Miles and Kepler 2017). The majority of Minnesota's forest resources are located in the northeast corner of the state, with forest resources dwindling as you travel south and west toward areas that were traditionally prairie and oak savannah (Miles and Kepler 2017). On average, there is a net gain of approximately 22,982 acres of forested land annually in Minnesota (USDAFS 2021). Similar information is not available for Freeborn County; however, as of 1999, Freeborn County consisted of 84.6% cultivated land with less than 6% grassland, 0.6% wetland, and 3.9% deciduous forest (Minnesota IT Services, 1999).

At the beginning of European settlements, Iowa was made up of approximately 85% prairies and treeless grasslands, with trees more commonly found in hilly areas in the southeast and along major rivers. Currently only about 0.1% of the original prairie remains (SHSI 2023). Most of the original land cover has been converted to agricultural land. Per Iowa's Wildlife Action Plan, agricultural land makes up 68% of land cover in the Western Corn Belt Plains ecoregion, with woodland comprising approximately 8% and wetlands approximately 2% (IDNR 2015a). Forested habitat in Iowa has decreased since 2012, from 3.1 million acres to 2.85 million acres (IDNR 2023). Approximately 24,103 acres of forested land is converted annually to non-forested land in Iowa (USDAFS 2022). Making space for more row cropping for agricultural purposes involves the clearing of trees along fencerows and has led to the decrease of small forests. It is noted that the Two Conservation Bank site was under threat of logging and other development activities prior to protection by the Applicant. It is reasonable to expect that these trends would continue to affect forested habitat similarly over the 30-year duration of the permit term.

Under the action alternatives, tree removal is not expected, and mitigation actions, including restoration and preservation of forested habitat, would provide a benefit to forested resources in the State. While beneficial, significant population-level effects on vegetation resources in the Permit Area are not expected as a result of the proposed mitigation. These areas would also be managed to promote the sustainability and integrity of the ecosystem using typical land stewardship practices, and therefore are not expected to negatively impact any federal or state listed species. It is not anticipated that forest habitat restoration or stewardship activities would have a significant effect on vegetation or local flora under any of the action alternatives considered, and mitigation would not occur under the No Action Alternative.

3.4 WILDLIFE RESOURCES

This section addresses non-volant (i.e., non-flying) wildlife; birds and bats are addressed in Sections 3.5 and 3.6, respectively. General wildlife includes common terrestrial and aquatic animals and rare, threatened, and endangered animals. Operations of the Projects and implementation of mitigation projects may affect wildlife resources.

3.4.1 Affected Environment

Based on the habitat available (Section 3.1.1), the majority of the terrestrial wildlife in the NEPA Project area are generalist species adapted to an agricultural environment. Limited habitat for aquatic species exists in the NEPA Project area. Wildlife present may include coyote (*Canis latrans*), white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), squirrels (*Sciurus* spp.), wild turkey (*Meleagris gallopavo*), and other commons mammals and birds. Creeks and drainages, although limited in the NEPA Project area, may be used by amphibians, fish, reptiles, and waterfowl.

Many of the Projects have turbines located within one mile of protected areas. Franklin County and Kossuth are the only Projects with no protected areas within one mile of a turbine while Golden Plans has the most at seven within one mile of turbines. Protected areas include Wildlife Management Areas, Wetland Reserve Program lands, County Parks, Conservation Reserve Enhancement Program lands, State Wildlife Management Area, and private conservation lands (see Figure 2). Appendix A includes figures of each project area and nearby protected areas.

3.4.1.1 Threatened and Endangered Species

Federally listed species are afforded protection under the ESA. Based on a review of the IDNR's Natural Areas Inventory and the MDNR's Rare Species Guide, seven federally listed wildlife species have been recorded in the Counties in which the Projects are located: the rusty patched bumble bee (*Bombus affinis*), Indiana bat, Topeka shiner (*Notropis topeka*), Powersheik skipperling (*Oarisma poesheik*), piping plover (*Charadrius melodus*), northern long-eared bat, and the Dakota skipper (*Hesperia dacotae*) (IDNR 2023; MDNR 2023a).

In Iowa, state-listed species are afforded protection under Iowa's endangered and threatened species law (Endangered Plants and Wildlife; Chapter 481B of the Code of Iowa) and in Minnesota state species are protected under Minnesota's Endangered Species Statute (Minnesota Rules, Chapter 6134). Based on a review of the IDNR's Natural Areas Inventory, thirty state-endangered or state-threatened wildlife species have been recorded in the Counties in which the Projects are located in Iowa. In Freeborn County, Minnesota, two state-listed species were recorded in Freeborn County which were the loggerhead shrike (*Lanius ludovicianus*) and Blanding's turtle (*Emydoidea blandingii*). For full list of federal and state listed species for each county, refer to the Iowa Natural Areas Inventory[4] and Minnesota Conservation Explorer[5].

3.4.2 Environmental Consequences

3.4.2.1 Impact Criteria

Major impacts to wildlife and aquatic resources are those that substantially affect a species' population (locally, regionally, or range-wide) or reduce its habitat quality or quantity. Examples of effects include disturbance, injury, mortality, and habitat alteration. Other effects include habitat loss or degradation over time or effects to resources used by wildlife in different life stages (i.e., alterations to surface water or alterations to plant composition). Another potential effect may be the creation of habitat such as edges and openings that favor a different mix of species and in some cases, increase predation pressure, thereby causing displacement or avoidance.

[4] https://programs.iowadnr.gov/naturalareasinventory/pages/Query.aspx
[5] https://mce.dnr.state.mn.us/

3.4.2.2 Direct and Indirect Effects to Wildlife Resources

Turbine operations under any alternative are not expected to affect aquatic or non-volant, terrestrial wildlife (i.e., non-flying), including threatened and endangered species. It is possible that some terrestrial animals already avoid the Project areas because of the presence of the Projects on the landscape, human activity associated with operation of the Projects, and agricultural work being done near turbines. However, common species, such as white-tailed deer, raccoon, and coyote, tend to become habituated to human activity and habitat modification. Conversely, wind facilities may attract terrestrial scavengers, such as raccoons and coyotes, to the area due to avian and bat fatalities providing a food source.

All alternatives would result in the same effects to non-volant wildlife from the ongoing operation and maintenance of the Projects. Impacts from turbine operations will be limited to species occurring within the rotor-swept zone of each turbine. Therefore, turbine operation is not expected to affect terrestrial or aquatic wildlife. Any impacts to species utilizing protected areas in proximity to the Projects are likely already realized as most of the projects are already built and operating and the two projects yet to be built will be built in close proximity to the existing projects.

If it occurs, clearing of full plots for post-construction mortality surveys would occur in actively cropped areas; therefore, no impacts to wildlife are expected as a result of clearing search plots for such surveys under any of the action alternatives. Post-construction mortality surveys would not result in any effects to aquatic wildlife resources because no aquatic resources are present under the turbines.

Mitigation activities would involve protection and restoration of summer foraging or roosting habitat for the Covered Species (i.e., woodlands), and therefore would benefit terrestrial and aquatic wildlife inhabiting these woodlands. However, it is not anticipated that these activities would have a significant effect on aquatic and terrestrial wildlife under any of the action alternatives considered. Mitigation would not occur under the No Action Alternative.

3.4.2.3 Cumulative Effects to Wildlife Resources

Wildlife is affected by land use patterns, habitat fragmentation, habitat degradation, invasive species, and lack of management. As population growth and development continues in the Project counties (see section 3.3.2.3, above), wildlife habitat may become more fragmented or unsuitable in portions of the County. Near and within nearby wildlife management areas, habitat management practices are likely to continue to preserve important values and associated elements of the protected areas. Impacts like those discussed in Section 3.3.2.3 would be similarly expected for wildlife.

3.5 AVIAN RESOURCES

Operational impacts to avian resources are expected under all of the alternatives, but these impacts are not expected to differ among the alternatives as there is currently no evidence that suggests varying turbine cut-in speeds affects birds either through disturbance/displacement or mortality. However, we anticipate public interest in impacts to birds and therefore summarize the potential effects of the Projects to avian resources, below.

Birds are highly mobile, and dispersal and migration are important aspects of their life strategies and survival. Birds will occur within and travel through the Project area and mitigation sites while flying to and from natural resources within the surrounding landscape and during migration. This analysis focuses on species of birds protected under the ESA, MBTA, BGEPA, Iowa's endangered and threatened species law, Minnesota's Endangered Species Statute, and USFWS Birds of Conservation Concern (BCC), but it

also considers species that are common to the Project area and region. Abundant species are expected to occur more frequently and are more likely to experience impacts from the Projects. This analysis considers site-specific habitat and land cover assessment information, site-specific pre-construction avian survey data, and post-construction mortality surveys.

3.5.1 Affected Environment

Avian species that occur in the Project areas are diverse and may include:

- Passerines (songbirds and corvids [crows and jays]);
- Nocturnal non-passerines (nightjars);
- Shorebirds;
- Waterbirds (waterfowl, loons, grebes);
- Game birds; and
- Raptors (falcons, eagles, hawks), vultures, and owls.

Habitat for birds is limited within the Project areas, as land cover is dominated by cultivated agriculture (86.3% - 95%). Hay/pasture account for 1% - 2.9% and barren land accounts for <0.1% - 0.2%). Natural habitats (deciduous forest, emergent herbaceous wetlands, herbaceous, open water, mixed forest, woody wetlands, and evergreen forest) account for 0.3% - 5% of each individual Project area: Bent Tree- 3.5%, English Farms- 2.1%, Franklin- 0.3%, Golden Plains- 1.1%, Kossuth- 0.6%, Richland- 0.6%, Upland Prairie- 3.1%, Whispering Willow East- 5%, and Whispering Willow North- 1%. See Appendix A in the HCP for detailed information on landcover in each Project area. While the exact Project Areas for the two new Projects (Bent Tree North and Whispering Willow South) are not known at this time, they will be in close proximity to existing Projects and will be sited in similar landscapes dominated by cultivated agriculture. Due to high levels of disturbance and lack of native vegetation, agricultural habitats are of restricted quality for birds. Cultivated agriculture is rarely used as nesting habitat by birds, although certain, disturbance-tolerant species may forage in crops. Agricultural fields may attract large flocks of birds, such as blackbirds and Canada geese (*Branta canadensis*), during the fall migration and winter seasons (Erickson et al. 2002). Unmowed grassland, mowed grassland, pasture, hayfields, savannah, and railroad right-of-way may provide nesting habitat for grassland and passerine birds. However, these habitats exist in only small amounts within the Project areas. Similarly, the Project areas contains only limited amounts of forested habitat (woodlot, shelterbelts). Forest fragments such as those found within some individual Project areas are typically not considered high-quality nesting habitat for birds due to their limited size and abundance of edge habitat, which is associated with higher incidence of nest predation and parasitism (Cavitt and Martin 2002). These small patches of forest habitat may receive higher levels of bird use during migration, as forest fragments often provide stopover habitat for migrating passerines and other birds (Packett and Dunning 2009).

3.5.1.1 Pre-construction and Post-construction Surveys

Wildlife use surveys were conducted at the existing Projects to assess wildlife usage in the Project area and predict project impacts, including fixed-point bird use surveys, raptor nest surveys, and post-construction mortality surveys. Any information pertaining to eagles will be addressed in the Eagle Conservation Plans for the Projects and their associated NEPA documents. Summaries of these surveys are provided per site below, based on the information summarized in each project's BBCS.

Bent Tree

Avian point-counts were conducted in suitable bird habitat within the Project area at 32 point-count sites between September and October 2008. A total of 128 5-minute surveys were conducted during which 48

species were identified. Unidentified blackbirds and non-native European starling (*Sturnus vulgaris*) comprised over 70% of the individuals observed (Alliant 2023a).

Standardized post-construction mortality surveys were conducted between July 1 to October 16, 2020, in which 10 birds, representing 9 identifiable species were found. The estimated fatality rate was 0.76 bird fatalities/MW/study period. No federal or state-listed threatened or endangered species were found during post-construction mortality surveys (Alliant 2023a).

Golden Plains

Avian point-count surveys were conducted from February 2016 through January 2018. During the first year (February 2016 through January 2017) 65 species were recorded (19,474 observations) with waterfowl comprising 93.2% of large birds observed and passerines comprising 78.2% of small birds observed (Alliant 2023c). No federally listed threatened or endangered species were recorded during the two years of avian use surveys; however, the state-endangered northern harrier (20 observations) and the state-endangered peregrine falcon (1 observation) were observed (Alliant 2023c). A ground-based raptor nest survey was conducted in 2016 during which 11 raptor nests were identified in or near the Project including two occupied nests (1 red-tailed hawk (*Buteo jamaicensis*) and 1 unidentified hawk nest) (Alliant 2023c). During aerial-based raptor nest surveys conducted in 2017, 53 raptor nests representing 2 species were detected. At least 13 occupied and active raptor nests were identified which included 1 bald eagle nest, 6 red-tailed hawk nests, 2 unknown owl species nests, and 4 unknown species nests (Alliant 2023c).

Standardized post-construction mortality surveys were conducted from July 1 to October 16, 2020, during which 21 bird fatalities were recorded, representing 12 identifiable species. The estimated bird fatality rate was 2.63 bird fatalities/MW/study period. No federal or state-listed threatened or endangered species were found during post-construction mortality surveys (Alliant 2023c).

Kossuth

Large bird use surveys were conducted from March 2016 through February 2017 and again from March 2018 through March 2019. During the first year of large bird surveys, 14 species were identified (570 observations) with waterfowl comprising 57.7% of all large bird observations (the snow goose (*Chen caerulescens*) accounted for most large bird observations), followed by red-tailed hawk (22.3% of large bird observations) (Alliant 2023d). During the second year of large bird surveys, 30 species were identified (3,644 observations) with waterfowl comprising 23.6% of all observations, followed by turkey vultures (*Cathartes aura*) (15.2% of large bird observations) (Alliant 2023d). No federally listed species were observed during the surveys; however, the state-endangered northern harrier was observed during both years of surveys (Year 1, 12 observations; Year 2, 34 observations) (Alliant 2023d). Additionally, one incidental observation of the Iowa state-endangered short-eared owl (*Asio flammeus*) was recorded during the second year of surveys (Alliant 2023d).

Small bird use surveys were conducted from March 2016 through November 2016. During this survey, 1,021 observations of small birds were recorded. Passerine species comprised 99.2% of all small bird observations. The most common passerine species was the Lapland longspur (*Calcarius lapponicus*; 279 observations) followed by the horned lark (*Eremophila alpestris*; 176 observations) and the red-winged blackbird (*Agelaius phoeniceus*; 118 observations). No federally or state-listed species were observed during the small bird surveys or incidentally (Alliant 2023d).

Aerial raptor nest surveys were conducted in March 2016, and March 2018. During the 2016 survey, seven occupied/active bald eagle nests and one unoccupied/inactive potential bald eagle nest were identified within the survey area. The closest nest to the Project was located 2.4 miles west of the Project

boundary. During the 2018 survey, 20 raptor nests representing 2 species (bald eagle and red-tailed hawk) were identified. Active nests included the eight bald eagle, or potential bald eagle, nests identified in 2016, one additional bald eagle nest, and one red-tailed hawk nest. The remaining nests (10 nests) were all inactive, non-eagle, raptor nests (Alliant 2023d).

Standardized post-construction mortality surveys were conducted from July 1 to October 14, 2020, during which eight individual birds, representing eight identifiable species were found. No federally or state-listed species were found during post-construction mortality surveys (Alliant 2023d). The estimated fatality rate was 0.65 bird fatalities/MW/study period (Alliant 2023d).

Richland

Large bird use surveys were conducted from January 15 to September 4, 2016 and again from March 2018 through February 2019 within an updated Project boundary. Due to an expansion of the Project boundary, additional surveys were conducted from July 23, 2019 to March 17, 2020. During the first survey period, 109 observations (88 within the plots and 21 outside the plots) of large birds were recorded consisting of 9 identified species. Gulls/terns were the most abundant, comprising 62.5% of all large bird observations, followed by vultures (17%) and diurnal raptors (9.1%). Overall bird use was 0.25 observation/800-m plot/survey event and the bird use was highest in spring followed by summer. The greatest use was by ring-billed gulls (*Larus delawarensis*) and turkey vultures. During the second survey period, 3,726 large birds (2,966 within the plots and 760 outside the plots) were recorded consisting of 31 species. Waterfowl were the most abundant, composing 63.5% of all large bird observations, followed by pigeons/doves (10.2%) (Alliant 2023e). Overall large bird use was 8.00 observations/800-m plot/survey event and the highest bird use was observed in the spring followed by fall. The greatest use was by mallards (*Anas platyrhynchos*) and greater white-fronted geese (*Anser albifrons*). During the third survey period, 2,543 large bird observations comprised of 28 identifiable species were recorded. Waterfowl were once again the dominant species group observed comprising 61.6% of all large bird observations. Overall bird use was 6.57 observations/800-m plot/survey event and the bird use was highest in winter followed by fall. No federally listed species were recorded in any year; however, the state-endangered northern harrier was observed in all years (Year 1, 2 observations; Year 2, 21 observations; Year 3, 14 observations; Alliant 2023e).

Small bird surveys were conducted from October 21, 2015 to September 5, 2016. During these surveys, 1,602 observations were recorded consisting of 27 species. Passerine species were the most abundant group observed, comprising 99.8% of all small bird observations. The other 0.2% consisted of two species of woodpeckers. The most common passerine species were the red-winged blackbird (299 observations), common grackle (*Quiscalus quiscula*; 200 observations), and European starling (199 observations). Overall bird use was 4.71 observations/100-m plot/survey event. Small bird use was greatest in the summer followed by fall. No federally or state-listed species were observed during these surveys; however, the state-endangered northern harrier (two observations) was observed incidentally to the surveys (Alliant 2023e).

Raptor nest surveys were conducted in March and April 2016. Four occupied nests were observed within 10 miles of the Project boundary, including two bald eagle nests and two red-tailed hawk nests (Alliant 2023e).

Standardized post-construction mortality surveys were conducted from July 2 to October 14, 2020, during which five individual birds, representing four identifiable species were found. No federally or state-listed species were found during post-construction mortality surveys (Alliant 2023e). The estimated fatality rate was 0.79 bird fatalities/MW/study period (Alliant 2023e).

Franklin County

Preliminary avian assessments conducted in September and October 2010 at 32 survey points recorded 38 species during the first survey and 35 species during the second survey. Common species during these surveys included American goldfinch (*Spinus tristis*), song sparrow (*Melospiza melodia*), blue jay (*Cyanocitta cristata*), American robin (*Turdus migratorius*), American crow (*Corvus brachyrhynchos*), and American kestrel (*Falco sparverius*). Common raptors included red-tailed hawk, American kestrel, and turkey vulture (Alliant 2023f).

Avian use point-count surveys were conducted at 32 points over 5 days through March, April, May, and June 2011. Seventy-two species were identified with the most common species being red-winged blackbird, American robin, brown-headed cowbird (*Molothrus ater*), song sparrow, and common grackle. No federally listed species were observed; however, one Iowa state-endangered northern harrier was observed (Alliant 2023f).

Standardized post-construction mortality surveys were conducted between April 14 and October 16, 2020. Seven individual birds representing five species were found. No federally or state-listed species were found during post-construction mortality surveys (Alliant 2023f). The estimated fatality rate was 1.06 bird fatalities/MW/study period (Alliant 2023f). One bald eagle was found incidentally in February of 2018 and reported to the Service.

Whispering Willow East

Prior to Fall 2008 surveys, preliminary avian assessments at fixed points within the Project area were conducted and reported red-winged blackbird, American goldfinch, song sparrow, barn swallow (*Hirundo rustica*), and mourning dove (*Zenaida macroura*) as the most common species. Common raptors included red-tailed hawk, American kestrel, and turkey vulture. No federal or state-listed species were observed (Alliant 2023f).

Avian use fixed-point counts were conducted on two dates in October and November 2008 and two dates in April and May 2009 at 34 points. In fall 2008, the most common species observed were red-winged blackbird, dark-eyed junco (*Junco hyemalis*), American crow, horned lark, and blue jay. Raptors observed included red-tailed hawk, sharp-shinned hawk (*Accipiter striatus*), and bald eagle (Alliant 2023g). In April 2009, 52 species were observed, and in May 2009 68 species were observed. The most common species in the spring were the red-winged blackbird, American robin, song sparrow, brown-headed cowbird, barn swallow, and killdeer (*Charadrius vociferus*). Five species of raptor were observed and included Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk, American kestrel, red-tailed hawk, and turkey vulture (Alliant 2023f). No federal or state-listed species were observed (Alliant 2023f).

Standardized post-construction mortality surveys were conducted from April 13 to October 16, 2020, during which 37 individual birds, representing 25 different species were found. No federally or state-listed species were found during post-construction mortality surveys (Alliant 2023f). Estimated fatality rates were 1.87 bird fatalities/MW/study period (Alliant 2023f).

Whispering Willow North

Small, large bird, and eagle avian use surveys were conducted between October 2016 and September 2018. Year 1 surveys (October 2016 – September 2017) were conducted at 45 survey points and Year 2 surveys (October 2017 – September 2018) were conducted at 42 survey points. During large bird surveys, 16,494 observations were made the first year (71 species) and 14,124 observations (74 species) the second year with waterfowl comprising most of the observations (60.9% and 71.65%, respectively). The most common species included greater white-fronted goose, snow goose, Lapland longspur, and mallard. Species richness was similar across all seasons but lower in the winter during both years. Avian use was

34.4 individuals/60 minutes/km^2 the first year and 14.4 individuals/60 minutes/km^2 the second year. Avian use was highest in the winter and lowest in the summer both years of survey. During the first year, 40 northern harrier observations were recorded across both small and large bird surveys and during the second year, 77 northern harrier observations were recorded across both small and large bird surveys (Alliant 2023g).

During small bird use surveys, 34,392 observations were made in the first year comprised of 116 species and 40,848 observations comprised of 118 species were made in the second year with passerines making up most of the observations (90.9% and 91.53%, respectively). The most common species included Lapland longspur, common grackle, red-winged blackbird, European starling, barn swallow and cliff swallow (*Petrochelidon pyrrhonota*). Overall avian use was 47.44 birds/10 minutes/ km^2 for the first year and 27.50 birds/10 minutes/ km^2 during the second year. Use was highest in the spring and lowest in summer both years. Species richness was similar across all seasons but lower in the winter for all surveys (Alliant 2023g).

Standardized post-construction mortality surveys were conducted from July 1 to October 16, 2020, in which 13 individual birds, representing 14 different species were found. No federally or state-listed species were found during post-construction mortality surveys (Alliant 2023g). Estimated fatality rates were 1.41 bird fatalities/MW/study period (Alliant 2023g).

Upland Prairie

Avian use surveys were conducted from December 2015 to May 2018. During large bird surveys, 3,600 observations (unknown number of species) were made in the first year and 9,422 observations (40 species) in the second year, with waterfowl comprising most of large bird observations (60.9% and 50.7%, respectively). Most of the waterfowl observations in the second year were of Canada goose (*Branta canadensis*), greater white-fronted goose, and gulls/terns. Mean large bird use was highest in the spring during the first year and in the fall in the second year. Large bird mean use was lowest in the winter during the first year and lowest in the summer during the second year. During the fall of Year 2, high use was largely attributed to gull/tern use (65.4%). Large bird species richness during the second year was highest in the spring and lowest in the winter. Raptors accounted for 2.2% of all bird observations in the fall, 2.0% in the winter, 1.5% in the summer and 0.5% in the spring during the first year. Fifteen observations of the state-endangered northern harrier were reported during the first year (Alliant 2023h).

During small bird surveys, 2,210 observations (unknown number of species) were made the first year and 3,578 observations (52 species) the second year. The most common species observed the first year included common grackle, European starling, and red-winged blackbird which collectively comprised 49% of all small bird observations. The most common species observed the second year included horned lark, cliff swallow, and red-winged blackbird which collectively comprised 50.7% of all small bird observations. Mean small bird use was highest in the spring during the first year and highest in the summer during the second year. Lowest mean use was in the winter the first year and in the fall the second. Average species richness was highest in the summer and lowest in the winter during the second year (Alliant 2023h).

Standardized post-construction mortality surveys were conducted from July 1 to October 17, 2020, during which seven individual birds, representing seven identifiable species were found. No federally or state-listed species were found during post-construction mortality surveys (Alliant 2023h). Estimated fatality rates were 0.35 bird fatalities/MW/study period (Alliant 2023h).

English Farms

Avian use surveys were conducted at 14 locations from September20, 2011 through November 8, 2011 (fall), from December 20, 2011 through February 14, 2012 (winter), from March 29, 2012 to May 8, 2012 (spring 2012), and March 27, 2013 through May 14, 2013 (spring 2013). During the fall migratory surveys, 737 birds, representing 24 species, were recorded with red-wing blackbird, American robin, and American goldfinch making up most of the total bird observations. During the winter surveys, 490 birds, representing 20 species, were recorded with one flock of Canada goose making up 300 of the observations (Alliant 2023b). During the spring 2012 surveys, 904 birds were observed, representing 33 species, of which, red-winged blackbird, American robin, and song sparrow were the most common (Alliant 2023b). During the spring 2013 surveys, 1,175 birds, representing 49 species, were recorded. The most common species were red-winged blackbird, Canada goose, and American robin (Alliant 2023b). No federal or state-listed species were found during any of the survey periods.

Raptor migration surveys were conducted in fall 2011 (same dates as avian use surveys), spring 2012 (same dates as avian use surveys), and spring 2013 (April 2013) (Alliant 2023b). During surveys, all raptors observed were recorded and a determination was made whether they were locals or migrants based on their flight behavior and direction. Migratory behavior was determined based on sustained flight direction, south in the fall and north in the spring. During the fall 2011 surveys four turkey vultures were observed for an overall passage rate of 0.14 raptor per survey hour and all were determined to be local based on flight patterns (Alliant 2023b). During the spring 2012 surveys, 11 raptors were observed, 10 of which were determined to be local based on flight patterns. Sightings included 3 local turkey vultures, 6 local red-tailed hawks, 1 local American kestrel, and 1 migrant sharp-shinned hawk (Alliant 2023b). This resulted in an overall passage rate of 0.40 raptor per survey hour and migratory passage rate of 0.04 raptor per survey hour. During the spring 2013 surveys, 31 birds representing 5 species were observed including 24 turkey vultures, 4 red-tailed hawks, 1 American kestrel, 1 migrant rough-legged hawk, and 1 state-endangered northern harrier. All 31 birds were classified as local birds based on their observed flight direction and behavior. It was concluded that the project is not within a concentrated raptor migratory corridor (Alliant 2023b). No federally listed species were observed; however, one state-endangered northern harrier was observed in the spring 2013 survey (Alliant 2023b).

Standardized post-construction mortality surveys for small birds were conducted from August 1 to October 15, 2019, August 5 to October 16, 2020, August 1 to October 17, 2021, August 1 to October 14, 2022, and August 1 to October 13, 2023. Note that the 2023 results were not available at the time of the drafting of this EA, but will be incorporated into the Final EA, when available. A total of 184 individual bird carcasses were found during standardized monitoring. During 2019, six individual birds, representing three species were found for an estimated fatality rate of 2.07 small bird fatalities/MW/study period (Alliant 2023b). During 2020, 111 individual birds representing 34 species were found for an estimated fatality rate of 3.59 small bird fatalities/MW/study period (Alliant 2023b). During 2021, 65 individual birds representing 29 species were found for an estimated fatality rate of 2.54 small bird fatalities/MW/study period (Alliant 2023b). During 2022 two individual birds representing two species were found for an estimated fatality rate of 0.19 small bird fatalities/MW/study period (Alliant 2023b). No federally or state-listed small bird species were found during any survey period (Alliant 2023b).

Standardized post-construction mortality monitoring for large birds was conducted from August 6, 2019 through July 24, 2020; August 5, 2020 through July 11, 2021; and August 10, 2021 through July 16, 2022. During the 2019-2020 surveys, one large bird carcass was found (*Buteo* spp.) (Alliant 2023b). The facility-wide fatality estimate for large birds was estimated to be less than or equal to two large birds/study period. During the 2020-2021 surveys, three large bird carcasses, one Canada goose and two red-tailed hawks, were found. The estimated fatality rate was 0.03 bird fatalities/MW/study period

(Alliant 2023b). During the 2021-2022 surveys, three large bird carcasses, two bald eagles and one red-tailed hawk, were found. The estimated fatality rate was 0.03 bird fatalities/MW/study period (Alliant 2023b).

3.5.1.2 Threatened and Endangered Avian Resources

Several federal and state-endangered or threatened bird species have known occurrences in the Project counties, including the piping plover, loggerhead shrike, barn owl (*Tyto alba*), northern harrier, short-eared owl, king rail (*Rallus elegans*), and Henslow's sparrow (*Centronyx henslowii*) (IDNR 2024). The only state-endangered or threatened bird species with known occurrences in Freeborn County, MN, where the Bent Tree Project is located, is the loggerhead shrike (MDNR 2023a). No piping plover, loggerhead shrike, barn owl, or king rail have been recorded in pre- or post-construction avian surveys thus far. The state-endangered northern harrier has been observed during avian surveys and incidentally at all Iowa sites except for Whispering Willow East; however, it has not been recorded as a fatality at any of the Projects. Northern harriers tend to fly below the rotor-swept area, thus it is unlikely that Project operations would adversely affect northern harrier populations. The Iowa-endangered short-eared owl was observed incidentally at the Kossuth Project and the Iowa-threatened Henslow's sparrow, was observed during avian use surveys at the Franklin County Project. The Exposure Index value, a measure of use in the rotor-swept zone, implies no detected exposure to turbine related collision for the Henslow's sparrow and negligible exposure risk (<0.01 individuals/10 minutes) for short-eared owls (TRC 2018a; TRC 2018c).

3.5.1.3 USFWS Birds of Conservation Concern

The Fish and Wildlife Conservation Act of 1980, as amended, (16 U.S.C. 2901, et seq.), mandates the Service 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" (16 U.S.C. 2912). The Service has identified those migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priorities as "birds of conservation concern" (BCC) species (USFWS 2008).

Golden Plains, English Farms, Kossuth, Richland, and Upland Prairie Wind Farms are located in the Eastern Tallgrass Prairie Bird Conservation Region (BCR; BCR 22). For this BCR, the Service has identified 25 species as BCC species. During avian use surveys at the Golden Plains Project, five BCC species were observed (red-headed woodpecker, dickcissel [*Spiza americana*], northern harrier, American white pelican, and bobolink [*Dolichonyx oryzivorus*]). One BCC species, the northern harrier, was observed at English Farms and Upland Prairie. Seven BCC species were observed at Kossuth (dickcissel, grasshopper sparrow (*Ammodramus savannarum*), red-headed woodpecker, short-eared owl, northern harrier, LeConte's sparrow (*Ammodramus leconteii*) and upland sandpiper (*Bartramia longicauda*)) and four BCC species were observed at Richland (dickcissel, northern harrier, red-headed woodpecker, and black tern (*Chlidonias niger*)).

Bent tree, Franklin County, Whispering Willow North, and Whispering Willow East are located in the Prairie Potholes Bird Conservation Region (BCR 11). The Service has identified 33 BCC species in this BCR. During avian use surveys, four BCC species were observed at Bent Tree (northern harrier, bobolink, American white pelican, and red-headed woodpecker). One BCC species was observed at the Franklin County Project (northern harrier). Eight BCC species were observed at Whispering Willow North (northern harrier, short-eared owl, Franklin's gull, Henslow's sparrow, red-headed woodpecker, rusty blackbird (*Euphagus carolinus*), American white pelican, and lesser yellowlegs (*Tringa flavipes*)).

3.5.2 Environmental Consequences

3.5.2.1 Impact Criteria

Birds can be affected at the individual and population-level. Impacts to avian resources would be considered major should implementation of an alternative result in any of the following a) naturally occurring population reduced in numbers below levels for maintaining viability at local or regional level; b) substantial loss or degradation of habitat for a rare, threatened, or endangered bird species; or c) substantial change in habitat conditions producing effects that cause naturally occurring populations to be reduced in numbers below levels for maintaining viability at local or regional levels.

3.5.2.2 Effects to Avian Resources

Operational impacts to avian resources are currently occurring and are expected to continue under all three of the alternatives being analyzed. Impacts on avian resources are not expected to differ among the alternatives because the only technique proven to minimize impacts to birds is turbine shutdown during high-risk periods triggered by real-time field observations and/or automated detectors (Marques et al. 2014). Therefore, for our analysis, we assume that feathering turbines during bat active periods would not affect avian resources, and as such, the operational impacts under each of the alternatives under consideration are identical. Typically, when impacts to a resource are the same under all alternatives, including the no-action alternative, an in-depth analysis of these impacts is not considered under NEPA. However, in order to be consistent with other wind energy NEPA documents in the Midwest, we are choosing to discuss impacts to avian resources.

Operational impacts of wind facilities on birds include varying degrees of displacement from the wind turbines and surrounding habitat and fatalities resulting from collisions with turbines, transmission lines, and other project-related structures (Winegrad 2004). Impacts to avian resources from mitigation lands include positive impacts from preservation, stewardship, and restoration of forested habitat, as discussed below.

Two categories of impacts (disturbance/displacement and fatalities) are each discussed in detail below. The alternatives vary only in nighttime operational adjustments (cut-in speed and associated timing; Table 2-3). The protocol (cut-in-speed) in which turbines are operated at night is not known to affect avian use in the vicinity of turbines (Marques et al. 2014). All alternatives include the implementation of each Project's BBCS, which outlines steps taken to minimize impacts to all bird species. Therefore, potential impacts from turbine operation are not expected to differ among the alternatives.

Disturbance/Displacement

Wind turbines may displace birds from an area due to the creation of edge habitat, introduction of vertical structures, and/or disturbances directly associated with turbine operation (e.g., noise, shadow flicker) (Leddy et al. 1999, Shaffer and Buhl 2016, Fernández-Bellon et al. 2019). Disturbance impacts are often complex, involving shifts in abundance, species composition, and behavioral patterns. The magnitude of these impacts varies across species, habitats, and regions. Limited data available indicate that avoidance impacts to birds generally extend 246 ft to 2,624 ft from a turbine, depending on the environment and the bird species affected (Strickland 2004). Studies by Shaffer and Johnson (2008) and Kerlinger (2002) have concluded that, in general, bird species that are more adapted to human disturbances or agricultural or edge habitat are less likely to exhibit avoidance behavior near turbines than other species.

Additional disturbance and displacement impacts to birds are expected due to construction of the Bent Tree North and Whispering Willow South Projects. Once built, and at the existing Projects, it is not anticipated that the operational protocols (i.e., cut-in speed adjustments) under any of the alternatives under consideration would either increase or decrease the level of disturbance or displacement for avian species in the vicinity of the Projects.

Turbine Related Fatality

Wind turbines pose risks to birds under all alternatives. Post-construction surveys at the Projects included standardized mortality monitoring, occurring generally in late summer and fall between July or August and October. Post-construction surveys at Franklin Wind Farm started as early as April. Across all Project sites, 299 avian carcasses were found during standardized searches, 7 at Upland Prairie, 13 at Whispering Willow North, 37 at Whispering Willow East, 7 at Franklin, 5 at Richland, 8 at Kossuth, 21 at Golden Plains, 10 at Bent Tree, and 191 at English Farms. English Farms conducted four years of bird and bat post-construction monitoring from 2019 to 2022, finding 6 individual birds in year 1, 111 birds in year 2, 65 birds in year 3, and 2 birds in year 4. In addition, English Farms conducted separate large bird mortality monitoring from 2019 to 2022, finding one large bird in year 1, three large birds in year 2, and three large birds in year 3. English Farms was the only project to conduct monthly large bird mortality monitoring.

Since most of the post-construction surveys were done in late summer and fall, seasonal (breeding and migration) comparisons of small and large bird fatalities at these wind farms could not be determined. Bird fatalities at other wind facilities, however, have been documented during both the breeding and migration seasons, but data suggest that the majority of fatalities at other wind energy facilities occur during the spring and fall migration periods (NRC 2007; Johnson et al. 2002).
Resident and migrating songbirds (passerines) represent the majority of fatalities at wind turbines nationwide (75%, excluding California; Erickson et al. 2001) and represented the majority of fatalities across Project sites during standardized post-construction monitoring (73.9%). No other bird group comprised over 5% of fatalities (diurnal raptors 3.4%, nightjars/nighthawks 0.3%, pigeons/doves 1.0%, cranes or rails 0.3%, falcons 0.3%, cuckoos 2.7%, pheasants 0.7%, owls 0.3%, waterfowl 0.3%, woodpeckers 1.0%, unidentified small birds 3.8%, unidentified large bird 2.1%) except for shorebirds which only consisted of killdeer (9.6%). Passerines have accounted for over 50% of avian fatalities at most wind facilities (Erickson et al. 2002). It is likely that birds taking off at dusk, landing at dawn, or traveling in low cloud or fog conditions (which lower the flight altitude of most migrants) are at the greatest risk of collision (Kerlinger 1995). Out of the 296 avian carcasses found during post-construction monitoring across Project sites, 9 were raptors fatalities (red-tailed hawk, bald eagle, great horned owl, peregrine falcon, turkey vulture, and an unidentified Buteo species).

Based on data from post-construction fatality surveys at the Projects, the avian fatality rates ranged from 0.03 to 3.59 birds/MW/study period or 0.88 to 6.34 birds/turbine/study period. Comparatively, the nationwide estimate of average avian fatalities rates ranges from 2.10 to 3.35 small birds/MW (Erickson et al. 2014). Smallwood (2013) estimated an all-bird fatality rate, including raptors, at 11.10 birds/MW in 2012. Using site-specific estimates of fatalities per turbine, an estimated 3,026 birds would be killed each year at the Alliant Projects under any of the alternatives under consideration (Table 3-2).

Table 3-2. Estimated avian fatalities by project.

Facility	Number of Turbines	Nameplate Capacity (MW)	Fatalities per MW	Fatalities per Turbine	Fatalities per Year	Fatalities over Permit Term
Bent Tree	122	201	0.76	1.26	154	4,620
English Farms[1]	69	171	3.62	8.90	614	18,420
Franklin County	60	99	1.06	1.75	105	3,150
Golden Plains	82	200	2.63	6.34	520	15,600
Kossuth	56	150	0.65	1.77	99	2,970
Richland	53	130	0.79	1.87	99	2,970
Upland Prairie	121	300	0.35	0.88	106	3,180
Whispering Willow East	121	200	1.87	3.09	374	11,220
Whispering Willow North	81	200	1.41	3.46	280	8,400
Bent Tree North[2]	~30	150	0.76	6.34	114	3,420
Whispering Willow South[3]	~68	300	1.87	3.09	561	16,830
Total	**~863**	**2,101**	**N/A**	**N/A**	**3,026**	**90,780**

[1] No all-bird fatality rate was calculated for English Farms so the small and large bird fatality rates were summed to get a conservative all-bird estimate. Because there were four years of monitoring at English Farms, the highest avian fatality rate observed across the four years of survey was used as a conservative estimate.

[2] Because this Project is not yet built and therefore does not have a calculated bird fatality rate, the fatality rate of the adjacent Bent Tree Project was used.

[3] Because this Project is not yet built and therefore does not have a calculated bird fatality rate, the higher of the estimates of the two other Whisper Willow projects was used as a conservative approach.

Killdeer and red-eyed vireo were the two most common species fatalities recorded. These species have estimated global populations of 1 million and 130 million, respectively (IUCN 2024; Partners in Flight

[PIF] 2020). The three rarest species observed were the red-headed woodpecker (a BCC species), Nelson's sparrow, and the peregrine falcon and have population estimates of 1.8 million, 1 million, and 340,000 individuals, respectively (PIF 2020). To assess the impact of fatalities on populations, the species with the highest estimated annual take and the species with the smallest population sizes were analyzed. The five most commonly found bird fatalities and the five species with the smallest global population sizes are listed in Table 3-3. The estimated annual fatalities by species were calculated using the total estimated avian fatality rate of 3,026 birds per year for the 11 Alliant Projects and then projected over the 30-year permit term. Based on these estimates, as well as published global population estimates (PIF 2020; IUCN, 2024), the estimated annual take by species for the 5 most commonly found species ranges from less than 0.001% to 0.029% of the global population size and from 0.003% to 0.873% of the global population size over the 30-year permit term.

Table 3-3. Estimated avian fatalities by species for the 5 most commonly found fatalities and the species with the smallest global population sizes, based on an annual fatality rate of 3,026 birds. BCR population estimates (Prairie Potholes [BCR11] and Eastern Tallgrass Prairie [BCR 22] combined) and global population estimates are also provided. Population estimates which are not available are denoted with n/a.

	Species	Percent of Fatalities	Annual Take Estimate	Take Estimate Over the Permit Term	Population Estimate within BCRs	Global Population Estimate	Source
Five Most Common Species	Killdeer	9.6%	291	8,730	n/a	1,000,000	IUCN (2024)
	Red-eyed Vireo	8.2%	250	7,500	2,590,000	130,000,000	PIF (2020)
	Golden-crowned Kinglet	6.2%	187	5,610	14,000[1]	140,000,000	PIF (2020)
	Cliff Swallow	5.8%	177	5,310	15,000,000	83,000,000	PIF (2020)
	Horned Lark	5.2%	156	4,680	23,600,000	140,000,000	PIF (2020)
Species With Smallest Population Sizes	Red-headed Woodpecker	0.3%	10	300	520,000	1,800,000	PIF (2020)
	Killdeer	See above	-	-	-	-	-
	Nelson's Sparrow	0.3%	10	300	400,000	1,000,000	PIF (2020)
	Black-billed Cuckoo	1.0%	31	930	133,000	880,000	PIF (2020)

	Species	Percent of Fatalities	Annual Take Estimate	Take Estimate Over the Permit Term	Population Estimate within BCRs	Global Population Estimate	Source
Five Most Common Species	Killdeer	9.6%	291	8,730	n/a	1,000,000	IUCN (2024)
	Red-eyed Vireo	8.2%	250	7,500	2,590,000	130,000,000	PIF (2020)
	Golden-crowned Kinglet	6.2%	187	5,610	14,000[1]	140,000,000	PIF (2020)
	Cliff Swallow	5.8%	177	5,310	15,000,000	83,000,000	PIF (2020)
	Horned Lark	5.2%	156	4,680	23,600,000	140,000,000	PIF (2020)
	Peregrine Falcon	0.3%	10	300	n/a	340,000	PIF (2020)

[1] This estimate is from BCR 11 only, as an estimate for BCR 22 is not available.

Using the data from each Project, the species with the highest annual fatality estimate(s), killdeer and red-eyed vireo, have an estimated take of up to 291 killdeer annually and up to 250 red-eyed vireo annually, based on an estimated 3,026 bird fatalities/year across the Projects and a species composition of 9.6% and 8.2 % of all fatalities, respectively. This represents 0.029% of the global killdeer population and 0.0002% of the global red-eyed vireo population annually. Among the species with the smallest global population, killdeer had the highest expected take followed by the black-billed cuckoo. It is difficult to quantify the potential impact to local killdeer populations because there is no BCR population size estimate for that species. While the IUCN (2024) reports that killdeer is of least concern as of 2016, it also reports that the overall population trend is decreasing with some populations remaining stable. The killdeer's extremely large range and lack of a rapid decline prevents the species from being considered as vulnerable (IUCN 2024). Frequent surveys at high-risk sites may be of use in understanding the extent of the project impact on this species. The take of the two bald eagles was not assessed in this analysis but will be analyzed in the EA for the Eagle Conservation Plan for the Projects.

The species with the smallest global population size, the peregrine falcon, has an estimated take of up to 8 individuals per year, which represents 0.002% of the global population. Based on the low impacts to populations, the take associated with the Projects is not expected to be significant.

Effects of Maintenance and Mitigation

Maintenance activities would be required to ensure the safety and operability of the Projects under all three alternatives being considered. Thus, maintenance impacts to birds would be the same for all alternatives.

The impacts on avian resources from noise, vibration, and/or increased human activity and traffic associated with maintenance activities would occur intermittently and over short periods of time in already disturbed areas. Impacts could include short-term avoidance of areas where maintenance activities are occurring and could occur during any time of year, since maintenance may occur year-round. While the potential exists for BCC species present in the area to be impacted, it is most likely to affect species

known to breed in the area, less likely to affect migrating individuals, and even less likely to affect rare/vagrant species. In total, the BCC species observed at all Project sites during the avian use and post-construction surveys included the dickcissel, red-headed woodpecker, northern harrier (Iowa-endangered), American white pelican, bobolink, grasshopper sparrow, short-eared owl (Iowa-endangered), LeConte's sparrow, upland sandpiper, black tern, Franklin's gull, Henslow's sparrow (Minnesota-endangered; Iowa-threatened), and the lesser yellowlegs. Because maintenance activities are temporary, would occur intermittently over short periods of time, and are not expected to result in bird mortality, population-level impacts from maintenance activities are not expected to occur. Additionally, post-construction mortality surveys to be conducted under any of the action alternatives would result in additional human activity and traffic at the Project sites, though the impacts of these activities on avian resources are not expected to differ greatly from the current conditions associated with the operation and maintenance of the operating facilities. Limited vegetation clearing would occur as part of routine maintenance activities under any of the alternatives under consideration, with some additional vegetation clearing necessary for post-construction mortality surveys under any of the action alternatives. However, the impacts of vegetation clearing on avian resources would be minor, as the activities would occur only in areas already cleared or disturbed.

No mitigation would occur under the No Action Alternative, as no take of the covered species is expected. Therefore, no ITP would be needed, and no HCP would be prepared. Avian species would therefore not receive the habitat conservation benefits expected under the action alternatives.

Under the two action alternatives, mitigation would be implemented (see Section 2.2) for the covered species, but no specific mitigation is proposed for avian resources. Forest birds would receive the habitat enhancement and protection benefits inherently associated with the bat summer roosting and foraging habitat protection mitigation proposed under the HCP. The protection and/or restoration of 612.4 acres of forested habitat up front and up to an additional 1,416 acres of protected or restored summer roosting habitat or 1,176 acres of protected or restored open foraging habitat would increase nesting and foraging opportunities for those avian species using the mitigation lands. It is assumed that every acre of forested habitat protected would also provide an acre of habitat for forest bird species whose ranges overlap with the mitigation site.

3.5.2.3 Cumulative Effects to Avian Resources

For the purposes of this EA, the analysis area for avian resources is the Service's Region 3. The effects analysis uses a 30-year timeframe based on the requested duration of the ITP. The selected spatial and temporal scales provide a reasonable assessment of past, present, and reasonably foreseeable future effects, which include wind energy development, habitat loss, and climate change.

Wind Energy Development

Wind energy is one of many potential sources of mortality of birds. Wind turbines account for less than 1% of the overall estimated annual avian fatality documented in the United States (Table 3-4) (Loss et al. 2015). The considerable expansion of wind energy production in the U.S. from 60,720 MW in 2013 (USDOE 2015) to at least 144,950 MW in 2023 (Hoen et al. 2018; revised 2023) and the implementation of new mitigation strategies at wind farms may influence annual collision estimates and trends. The American Wind Wildlife Institute (AWWI) maintains the American Wind Wildlife Information Center (AWWIC) database which contains both public and confidential post-construction monitoring data from across the US. In the Prairie biome, where the Projects are located, all bird fatality rates ranged from 0.07 bird/MW/year to 12.5 birds/MW/year, with an average of 1.83 birds/MW/year, which is the same as the US average (AWWI 2020). Extrapolating this out to the installed US wind capacity in the US of 144,950

MW results in an estimated average of 265,259 bird collision fatalities/year across the US, although others have estimated bird collision fatalities at over 500,000/year (Smallwood 2013; Merriman 2021).

By 2050, wind energy development is projected to grow to 709,817 MW across the continental United States (Gagnon et al. 2023, NREL 2023). As of 2023, wind facilities have an operating capacity of 144,950 MW in the U.S. (12,428 MW capacity in Iowa and 4,537.5 MW in Minnesota), which has tripled over the last decade (ACP 2023a, Minnesota Department of Commerce 2023). Wind energy is currently a low source of bird mortality compared to other anthropogenic sources; but, as wind development continues to rapidly increase, avian mortality could substantially increase (Loss et al. 2015). None of the alternatives would alter the expected avian mortality from the Projects and the Projects are not expected to be a substantial contributor of avian mortality to the annual wind energy fatality estimate (1.1%, using an estimate of 3,026 birds/year based on project-specific data and nationwide average of 265,259 bird collision fatalities/year across the US [AWWI 2020]).

None of the alternatives considered are expected to individually adversely impact the population viability of avian resources at a local or regional level (see Section 3.5.2.1). Impacts to birds from the Project will primarily be related to fatality or injury from Project operations, as most of the Project sites are already constructed and operating, and additional displacement effects are not anticipated at those facilities. Minor displacement effects may occur at the Bent Tree North and Whispering Willow South sites during construction; however, the sites will be constructed in previously disturbed habitat (i.e., active cropland) and therefore impacts are expected to be minor. Avian fatality is assumed to be the same under all three alternatives as cut-in speed adjustments have not been shown to have an effect on avian mortality (Smallwood and Bell 2020). Some forest bird fatalities resulting from operations of the multiple Project sites may be offset by the mitigation implemented for the covered species, as they may receive the habitat enhancement and protection benefits inherently associated with the bat habitat protection mitigation proposed under the action alternatives.

Table 3-4. Estimated annual avian fatality from anthropogenic sources in the United States.

Mortality Source	Fatality Estimate			Percentage	Source
	Central	Lower	Upper		
Cats	2,407,000,000	1,306,000,000	3,992,000,000	72.48	Loss et al. 2013a
Buildings	599,000,000	365,000,000	988,000,000	18.04	Loss et al. 2014a
Automobiles	199,600,000	88,700,000	339,800,000	6.01	Loss et al. 2014b
Agricultural pesticides	79,000,000	67,000,000	91,000,000	2.38	Pimentel et al. 1992 Mineau 2005
Power line collisions	22,800,000	7,700,000	57,300,000	0.69	Loss et al. 2014c
Communication towers	6,581,945	NA[1]	NA[1]	0.20	Longcore et al. 2012
Power line electrocutions	5,630,000	920,000	11,550,000	0.17	Loss et al. 2014c
Oil Pits	840,000	500,000	1,000,000	0.03	Trail 2006
Wind turbines (all)[2]	573,093	467,097	679,089	0.02	Smallwood 2013
Wind turbines (monopole)	234,000	140,000	328,000	0.01	Loss et al. 2013b
Total[3]	**3,321,025,038**	**1,836,287,097**	**5,481,329,089**	-	-

[1] No range of uncertainty produced in original study.
[2] Includes both old-generation lattice turbines and new-generation monopole turbines.

Mortality Source	Fatality Estimate			Percentage	Source
	Central	Lower	Upper		

[3] Total does not include "wind turbines (monopole)" as it is assumed to be inclusive under "wind turbines (all)".

Based on the installed capacity in Iowa of 12,428 MW (ACP 2023a), the estimated mortality rate would be between 8,700 and 155,350 birds/year (using a fatality rate range of 0.7 to 12.5 birds/MW from AWWI 2020). As previously stated, wind energy development is projected to grow to 709,817 MW across the continental US by 2050 (Gagnon et al. 2023, NREL 2023). Of that growth, Iowa is projected to account for 16,668 MW (Gagnon et al. 2023, NREL 2023). At 16,668 MW, the estimated avian mortality for the state's wind energy could be anywhere from 11,668 to 208,352 birds/year (using a fatality rate range of 0.7 to 12.5 birds/MW from AWWI 2020). Thus, avian fatality is expected to increase in the state as wind energy continues to grow, following the nationwide trend.

Based on the installed capacity in Minnesota of 4,537.5 MW, the estimated mortality rate would be between 3,177 and 56,719 birds/year (using a fatality rate range of 0.7 to 12.5 birds/MW from AWWI 2020). As previously stated, wind energy development is projected to grow to 709,817 MW across the continental US by 2050 (Gagnon et al. 2023, NREL 2023). Of that growth, Minnesota is projected to account for 23,502 MW (Gagnon et al. 2023, NREL 2023). At 9,290 MW, the estimated avian mortality for the state's wind energy could be anywhere from 16,452 to 293,775 birds/year (using a fatality rate range of 0.7 to 12.5 birds/MW from AWWI 2020). Thus, avian fatality is expected to increase in the state as wind energy continues to grow, following the nationwide trend.

Over time, wind-related fatalities could represent a higher source of mortality for birds than presented in Table 3-4; however, a determination of the significance of all bird fatality rates from wind energy in both states is beyond the scope of this EA because the Service does not have jurisdiction or control over the development of wind energy or the implementation of voluntary conservation measures.

Climate Change

Climate change has contributed to ecological and physiological stress for bird species in many different habitats via range shifts, (Rushing et al. 2020; Bellard et al. 2012; Illán et al. 2014) habitat loss (Mac Nally et al. 2009), higher risk of disease transmission (Van Hemert et al. 2014), and changes in resource availability or competition (Auer and Martin 2012). The 2022 State of the Birds report has identified a decline in bird populations in every habitat except wetlands over the last 50 years (NABCI 2022), with many species facing direct or indirect effects of climate change. Seventy species from the BCC list and Species of Greatest Conservation Need were identified as Tipping Point species in which the species has lost half or more of their breeding population in 50 years or have a very small population but lack sufficient monitoring data.

Migratory birds are of special concern, as phenological (i.e., timing of a periodic biological phenomenon in relation to climatic conditions) mismatches between food and habitat availability may result when birds are arriving earlier to their breeding grounds (PGC-PGBC 2015). In addition, extreme weather events, which are predicted to increase with climate change, as well as late spring storms, have been shown to kill migrating birds (Dionne et al. 2008; Zumeta and Holmes 1978). In the 2022 State of the Birds report, 269 BCC migratory bird species were identified as likely to become candidates for listing under the Endangered Species Act (NABCI 2022).

None of the considered alternatives would increase the effects of climate change on avian resources; instead, all three alternatives are expected have a beneficial impact by reducing greenhouse gas emissions

through the production of electricity via wind energy (i.e., a reduction in the amount of fossil fuels used to produce electricity). The difference in effects between the alternatives, or from current operations, is small relative to the overall beneficial effect for each alternative.

3.6 BAT RESOURCES

This section describes bat resources in general and the existing conditions for bats within the Project area. For the purposes of this EA, federally listed, state-listed, and non-listed bats (those species not listed as threatened or endangered under the ESA or by the states of Iowa or Minnesota) are addressed together in this section. The Indiana bat, northern long-eared bat, little brown bat, and tricolored bat make up the covered bat species, and the remaining five bat species whose ranges include the Project area make up the non-covered bat species.

3.6.1 Affected Environment

Nine bat species occur in Iowa and eight occur in Minnesota, all of which could occur in at least one of the project counties based on their known ranges (Iowa State University 2019, MDNR 2023b). Of these species, the Indiana bat and the northern long-eared bat are federally listed as endangered. The Service has also proposed to list the tricolored bat as endangered and is currently collecting information to review the status of the little brown bat to determine if threats to the species may be increasing its likelihood of extinction. The Indiana bat is state-listed as endangered in Iowa. The big brown bat (*Eptesicus fuscus*) and tricolored bat are listed as special concern species in Minnesota.

3.6.1.1 Status and Environmental Trends of Non-Covered Bat Species

Eight of the nine bat species whose ranges include the Project area have been documented at the Projects. The non-listed and non-covered species, including the big brown bat, eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), evening bat (*Nycticeius humeralis*), and silver-haired bat (*Lasionycteris noctivagans*), are discussed in this section. The other four species, the Indiana bat, northern long-eared bat, little brown bat, and tricolored bat, are discussed in Section 3.6.1.2. A summary of non-covered bat species that may occur in the project area is found in Table 3-5, below.

Table 3-5. Status and typical habitat of non-covered bat species potentially occurring in the Project Area.

Common Name	Scientific Name	Status	Summer Habitat	Winter Habitat[1]
Silver-haired bat	*Lasionycteris noctivagans*	None	Trees	Tree-roosting, long-distance migrant
Big brown bat	*Eptesicus fuscus*	None	Trees, structures, caves, mines	Hibernates in caves, mines, structures
Eastern red bat	*Lasiurus borealis*	None	Trees	Tree-roosting, long-distance migrant
Hoary bat	*Lasiurus cinereus*	None	Trees	Tree-roosting, long-distance migrant
Evening bat	*Nycticeius humeralis*	None	Trees, structures	Tree-roosting, long-distance migrant

[1]As per England et al. (2001) and BCI (2024).

Bats listed in Table 3-5 include both short-distance migrants that hibernate colonially within the region in winter (typically in caves or mines) and long-distance migrants that migrate out of the region in winter and are thought to hibernate primarily in trees or remain active. Bats of all species are typically absent from the landscape in the region of the Project area between mid-November and mid-March and either emerge from hibernacula or migrate to the region in spring (April-May). Bat species likely to occur in the Project area forage in a variety of habitats and include species adapted to foraging in cluttered riverine, as well as open habitats. Foraging habitat preference varies among species, likely driven by distribution and abundance of suitable insect prey and morphology of each bat species. Agricultural land does not provide roosting habitat for bats, but certain bat species may forage over agricultural fields although they are more likely to use forested and open water habitats (BCI 2024).

Little is known about the migratory behavior of bats. Cave-hibernating bats disperse up to several hundred miles from hibernacula during summer, with females often dispersing further from hibernacula than males (Fleming and Eby 2003; Roby and Gumbert 2016). Migratory tree bats migrate from hundreds to thousands of miles from their breeding grounds to mild climates where they openly hibernate in trees or may remain active throughout the winter and forage for food (Popa-Lisseanu and Voigt 2009). Seasonal timing and species composition of bat mortality at wind farms indicate bats are at increased risk of collision during migration, particularly during fall migration. This increased risk of mortality may be related to an attraction to tall structures, mating or courtship behavior, increased flight height, or failure to detect turbines during migratory flight (Kunz et al. 2007a, 2007b; Cryan 2008).

Local and global populations of the non-covered species are unknown; however, these wide-ranging species are believed to be in decline as a result of wind turbine collisions, habitat loss, WNS, and other causes (Winhold et al. 2008, Turner et al 2011, Frick et al. 2017, Rodhouse et al. 2019). The bats most affected by wind facilities are believed to be migratory tree bat species (i.e., hoary bats, eastern red bats, and silver-haired bats) that mostly emit low-frequency calls (Johnson et al. 2004). Bats that use low-frequency calls may be more inclined to forage above the tree line where there are few obstructions. Thus, tree bats may be more likely to fly in the rotor-swept zone of turbines when compared to smaller bat species that have different foraging and migration strategies.

3.6.1.2 Status and Environmental Trends of Covered Bat Species, Including Threatened and Endangered Bats

This section focuses on the bats proposed to be covered in the HCP, which include the federally endangered Indiana bat, federally endangered northern long-eared bat, little brown bat, and proposed endangered tricolored bat. The Indiana bat is also state-endangered in Iowa. Sections 3.3 through 3.6 of the Project HCP provide an in-depth account of the covered species. Table 3-7 provides a brief description of status, biology, behavior, and habitat requirements relevant to this EA and its analysis. For a more detailed description of these species, please refer to the Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision (USFWS 2007), the Service's Species Status Assessment (SSA) Report for the northern long-eared bat (USFWS 2022b), the Service's SSA Report for the Tricolored Bat (USFWS 2021), and the Kunz and Reichard (2010) Status Review of the Little Brown Bat. Additionally, three of the covered species (Indiana bat, little brown bat, and tricolored bat) were found during fatality monitoring at two of Alliant's covered projects (two little brown bats at Golden Plains and one Indiana bat, one little brown bat, and four tricolored bats at English Farms) associated with post-construction monitoring and research, see Section 3.7 of the HCP.

Table 3-6. Description of covered bat status, trends, biology, behavior, and habitat requirements.

Topic	Summary	Sources
Indiana bat		
Status	● Originally listed as in danger of extinction on March 11, 1967 (32 FR 4001). ● Estimated range-wide population in 2019 was 537,297, down 4.0% from 2017 (559,412) and roughly 19.2% lower than the 2007 estimate. ● Estimated range-wide population in 2022 was 596,431 (USFWS unpublished data). ● Estimated population in the OCRU was 276,317 in 2019 and 310,282 in 2022 (USFWS unpublished data). ● Becker's Quarry and Yew Ridge, two Priority 4 hibernacula approximately 100 miles northeast of the nearest Project area (English Farms) in Dubuque County, Iowa, are the closest known Indiana bat hibernacula. However, it is estimated Indiana bats no longer use these hibernacula. ● The largest known extant Priority 1 Indiana bat hibernaculum located in Hannibal, Missouri (Sodalis Nature Preserve) is located approximately 138 miles southeast of the English Farms Project area. ● WNS is a primary threat to the species' continued existence (see Section 3.2 of the HCP for a description of WNS). ● Eighty documented Indiana bat fatalities have occurred at wind energy facilities in the United States.	USFWS 1967, USFWS 2007, USFWS 2019b, USFWS 2022a
Trends	● Experienced rapid declines between 1960s and early 1990s due to habitat loss and degradation but increased in the mid-1990s in several states. ● The arrival of WNS in New York in 2006 caused dramatic population declines of cave-hibernating bats, including Indiana bats. The range-wide population has declined by 19.2% since 2007. ● Populations in the Ozark-Central Recovery Unit have declined by 8.1% since 2017. ● The population at the nearest known Priority 1 hibernaculum within migratory range of the Project, Sodalis Nature Preserve, is likely relatively stable given that the first detection of WNS in the hibernaculum was approximately 11 years ago in 2012, and the disease has likely passed the epidemic stage in this population. USFWS surveys over the last several years have not indicated a decrease in population size at the hibernaculum.	USFWS 2007, 2019b; Cheng et al. 2021

Topic	Summary	Sources
Seasonal Migration	● Maternity colonies tend to disband beginning in the first two weeks of August, with most bats leaving their summer ranges by mid-September. ● Highly mobile during fall, eventually congregating near hibernacula between August and October and swarming on a nightly basis for several weeks. ● Migrating bats generally follow a straight-line migration path, but do not typically fly in rain or when temps are below 9-10 degrees Celsius in spring and fall. ● A spring migration study at Blackball mine suggests that Indiana bats may follow watershed drainage corridors while migrating to their summer habitats in Illinois.	USFWS 2007, Cope and Humphrey 1977, Roby and Gumbert 2016, USFWS 2015
Summer Roosting	● Roost primarily in trees during summer, usually under exfoliating bark and occasionally using narrow crevices or cracks in trees located in semi-open areas of forest with greater solar exposure.	USFWS 2007
Foraging	● Nocturnal insectivores, feeding exclusively on flying insects. ● Typically forage from 6 feet to 100 feet above the ground and hunt primarily around, not within, the canopy of trees.	USFWS 2007
Occurrence in the Project Area	● No known caves or mines or critical habitat within the Project area to support hibernating Indiana bats. ● English Farms is the only Covered Project in the range of the Indiana bat. ● No Indiana bats are expected to be in the English Farms Project area November – March. ● Indiana bats could be present at English Farms during spring (April – May) or fall (August – October) migrations. ● Indiana bat summer records have been documented in Poweshiek County (county in which the English Farms Project is located), but the Project area itself is unlikely to support summer foraging or roosting habitat and no Indiana bats were detected during summer acoustic surveys at English Farms from 2012-2014 (see HCP Table 3.2).	Gardner et al. 1996., USFWS 2007
Northern long-eared bat		
Status	● Originally listed as threatened on January 14, 2016; subsequently up listed as endangered on November 30, 2022 (81 FR 1900-1922, 87 FR 73488), effective March 31, 2023. ● WNS is the primary threat to the species continued existence (see Section 3.2 of the HCP for a description of WNS). ● Typically, small numbers in numerous hibernacula across its range. ● Estimated range-wide population of 6,546,718 adults in 2016, with a corresponding pre-WNS population size in Iowa of approximately 102,330 adults and in Minnesota of approximately 829,890 adults. ● Current (2023) post-WNS population estimates of 201,266 adults range-wide, 1,196 in Iowa, and 11,232 in Minnesota. ● No designated critical habitat at this time.	USFWS 2013, USFWS 2015, USFWS 2016a, USFWS 2023a, Griffin 1940, Barbour and Davis 1969, Caire et al. 1979, Amelon and Burhans 2006, USFWS 2022b

Topic	Summary	Sources
Trends	● Recent estimates for the Midwest Representation Unit (including the Permit Area) showed a 24% decline in winter abundance, a 70% decline of extant winter colonies, and a 91% decline in summer abundance from 2010–2019. ● Range-wide abundance is predicted to decline 95% by 2030 and 99% by 2040.	USFWS 2022b
Seasonal Migration	● Occupy summer habitats from approximately April through September and begin to swarm near their hibernacula in August or September. ● Considered a short-distance migrant, with distances documented between 35 and 55 miles. ● Share hibernacula with other bat species. ● Individuals may rouse and switch hibernacula throughout the winter.	Caire et al. 1979, USFWS 2015, Fitch and Shump 1979, Griffin 1940, Whitaker and Rissler 1992, Caceres and Barclay 2000
Summer Roosting	● Inhabit forests and roost singly or in colonies in the cracks, crevices, and bark of both live and dead trees. ● May roost in structures, such as buildings, barns, sheds, and cabins.	Lacki and Schwierjohann 2001, Foster and Kurta 1999, Perry and Thill 2007
Foraging	● Forages on a variety of insects, such as moths, beetles, and spiders. ● Show preference for forested hillsides and ridges, as opposed to riparian areas.	Brack and Whitaker 2001, Feldhamer et al. 2009, Jung 2009, Owen et al. 2003, Foster and Kurta 1999, USFWS 2014
Occurrence in the Project Area	● Known to occur in 11 hibernacula throughout Minnesota, including two caves within 80 miles of the Bent Tree Project Area; no known hibernacula in Iowa. ● Woodland at or near Whispering Willow East may provide suitable summer habitat, but no suitable habitat is located within the Project area at any other sites. ● No northern long-eared bats are expected to be in the English Farms Project area November – March. ● Northern long-eared bats may be present during their spring (mid-March to mid-May) and fall (mid-August to mid-October) migrations. ● Northern long-eared bats have been confirmed present during their summer maternity season (mid-May to August) at Kossuth. Other Project areas may be used for summer foraging.	USFWS 2015, USFWS 2022b

Topic	Summary	Sources
Little brown bat		
Status	● Not a federally listed, proposed or candidate species, but is currently under a Discretionary Status Review on the National Listing Workplan. The listing decision is anticipated to occur in 2024. ● No federal critical habitat, conservation plans, or recovery plans exist for this species. ● Prior to the onset of WNS, little brown bats were abundant and widely distributed across much of North America. The range-wide population estimate of little brown bats was 6.5 million bats east of the 100th meridian. ● Limited information is available for little brown bats in Iowa and Minnesota. For this EA, we estimate that 31,984 little brown bats may be a reasonable estimate of the Iowa population to consider in this analysis. ● Threats include WNS and removal of roosts in buildings.	USFWS 2023b, Turner et al. 2011, Frick et al. 2010
Trends	● In the northeast, population trends of little brown bat showed that most hibernacula demonstrated stable or growing populations before the emergence of WNS. Post-WNS, hibernacula had precipitous mean declines of 85% in the first year, 62% in the second year, and 45% per year thereafter. ● Numbers of hibernating little brown bats have documented declines of 91% in 42 sites across five states (NY, PA, VE, VA, and WV). ● Some colonies in the northeast have shown amelioration in declines, population stabilization, and persistence following infection of WNS. ● In Minnesota, colonies showed declines of 48% in the established phase. ● The Service (unpublished data) estimates that little brown bats have declined by 57% across several Midwestern states over the last decade.	Frick et al. 2010, Turner et al. 2011, Langwig et al. 2012, Dobony et al. 2011, Maslo et al. 2015, Langwig et al. 2017, Pettit and O'Keefe 2017, Cheng et al. 2021 USFWS pers. comm.
Seasonal Migration	● Hibernate in caves and mines with other bat species from November until March or April. ● Females move to maternity sites in April. ● Little brown bats may migrate up to 200 miles to a suitable cave or mine for hibernation.	INHS 1999, ILDNR 2016
Summer Roosting	● Most females form maternity colonies in anthropogenic structures, but also large dead trees in cracks, crevices, or under exfoliating bark.	Humphrey and Cope 1976, Kunz et al. 1998
Foraging	● Forages for insects over wetlands, waterways, and edges of agricultural fields.	Fenton and Barclay 1980
Tricolored bat		

Topic	Summary	Sources
Status	● Not federally listed, but it is proposed endangered. ● Estimated abundance in 2020 of 67,898 tricolored bats range-wide. ● For this EA, we estimate that 15,634 tricolored bats may be a reasonable estimate of the Iowa population to consider in this analysis. We derived this estimate through analyzing suitable habitat, occupancy rates, and declines estimated from pre-and post-WNS records in Iowa. ● No federal critical habitat, conservation plans, or recovery plans exist for this species.	87 FR 56381, USFWS 2021
Trends	● Tricolored bats are a common species found throughout eastern North America but have experienced population declines since the onset of WNS in 2006. Cumulative declines in regional bat abundance across the eastern U.S. show declines of 34% (±38%) in tricolored bats from 1999-2011. ● Numbers of hibernating tricolored bats have documented declines of 75% in 42 sites across five states (NY, PA, VE, VA, and WV). ● Estimated population declines of 90–100% across 59% of the range. ● By 2030, range-wide abundance predicted to decline by 89%, the number of winter colonies predicted to decline by 91%, and the spatial extent predicted to decline by 65%. ● The Service estimates that tricolored bat abundance has declined by 52% range-wide since the onset of WNS.	Turner et al. 2011, Ingersoll et al. 2013, Pettit and O'Keefe 2017, Cheng et al. 2021, USFWS 2021
Seasonal Migration	● Hibernate singly in small caves during the winter. ● Females arrive and start forming colonies in the second half of April. ● Females disperse from colonies after young are weened (4 or 5 weeks after giving birth between early June and mid-July).	Feldhamer et al. 2015
Summer Roosting	● Most females form small maternity colonies in older forests and occasionally anthropogenic structures. ● Males roost singly.	Fujita and Kunz 1984; Perry and Thill 2007
Foraging	● Forages over wetlands, waterways, and edges of agricultural fields.	Hofmann 2008

3.6.1.3 Occurrence of Bat Resources in the Project Area

This section describes the presence of covered and non-covered bats within the Project Area according to pre-construction and post-construction surveys. Data presented in this EA are summarized from the Project's HCP and other site-specific surveys. A summary of the surveys is provided in _Ref159568334. Based on the results of the post-construction monitoring, eight species of bats have been found as fatalities in the Project area, including Indiana, tricolored, and little brown bats during fall migration at English Farms and little brown bats during fall migration at Golden Plains. Pre- and post-construction studies focused on potential impacts of turbines to bats. As such, these studies may not accurately reflect species composition within the Project area. However, they likely reflect the species composition of bats whose activities regularly put them in the rotor-swept zone of those turbines. Species composition of

mortality varied by Project; however, composition of the covered species consistently made up less than 3% of the total fatalities at each site.

Table 3-7. Summary of pre-construction and post-construction bat surveys at the Alliant Projects.

Survey	Summary	HCP Section and Citations
Pre-construction Acoustic	● Conducted at English Farms (2012, 2013, 2014), Golden Plains (2018), Kossuth (2018), Richland (2016, 2018), Upland Prairie (2017), and Whispering Willow North (2017). ● Presence/absence summer surveys targeting the northern long-eared bat were conducted at Upland Prairie and Whispering Willow North. ● Acoustic surveys at the remaining projects were conducted generally from April to October/November on meteorological (MET) towers, if available, or at ground level (1.5 meters high) in future turbine placement habitat (i.e., cultivated crops) and in potentially suitable habitat within/near the project area. ● Northern long-eared bat summer presence was confirmed at Kossuth; all other sites that conducted acoustic surveys have probable absence in the summer. ● Little brown bat summer presence was confirmed at Kossuth and Upland Prairie and summer presence is likely at English Farms, Golden Plains, and Whispering Willow North based on the recording of high frequency calls at those Projects. ● Tricolored bat summer presence was confirmed at Kossuth, Richland, and Upland Prairie and summer presence is likely at English Farms, Golden Plains, and Whispering Willow North based on the recording of high frequency calls at those Projects.	HCP Section 3.7 (Ecology and Environment, Inc. 2016, WEST 2018, Solick et al. 2019, Burns & McDonnell 2018a, Stantec 2018, Burns & McDonnell 2018b, WEST 2017, Burns & McDonnell 2017)

Survey	Summary	HCP Section and Citations
Post-construction Mortality	● Studies conducted in fall (July 1 – October 15) at Bent Tree (2020), Golden Plains (2020), Kossuth (2021), Richland (2021), Upland Prairie (2020), and Whispering Willow North (2020) when turbines were operating at manufacturer's cut-in speed. ● Studies conducted in 2020 during the entire bat active season (April 13 – October 16) at Franklin County and Whispering Willow East when turbines were operating at manufacturer's cut-in speed. ● Studies conducted at English Farms during the fall (August 1 – October 15) from 2019-2022. Turbines were operating at 6.9 m/s in 2019 and 2022. In 2020 and 2021 turbines operated at different cut-in speeds under a research study. ● Total of 1,105 bat carcasses found across all Projects and all years: 1 Indiana bat (0.1%), 4 tricolored bats (0.4%), 3 little brown bats (0.3%). No northern long-eared bats were found (see Table 3-8 and Table 3-9). ● Of the 199 carcasses found at the two projects that conducted monitoring during the entire bat active season (Franklin County and Whispering Willow East), 1 (0.5%) was found in spring (April 13 – May 15), 37 (18.6%) were found in summer (May 16 – July 14), and 161 (80.9%) were found in fall (July 15 – Oct 15).	HCP Section 3.7 (Pickle and O'Neil 2021a, Burns & McDonnell 2020a, 2020b, 2021, 2022, Pickle et al. 2021a, Pickle et al. 2021b, Voth et al. 2022a, Voth et al. 2022b, Pickle et al. 2021c, Pickle and O'Neil 2021b, Pickle et al. 2021d)

Table 3-8. Results of post-construction monitoring at the Projects by identified species and monitoring year.

Facility (survey year)	Species									Total
	Hoary bat	Eastern Red bat	Silver-haired bat	Big Brown bat	Evening bat	Indiana bat	Northern long-eared	Tricolored bat	Little Brown bat	
Bent Tree (2020)	17	8	7	4	0	0	0	0	0	**36**
English Farms (2019)	10	18	13	5	1	0	0	0	0	**49***
English Farms (2020)	46	109	61	22	1	1	0	1	0	**241**
English Farms (2021)	40	78	56	13	1	0	0	3	1	**192**
English Farms (2022)	3	8	2	1	0	0	0	0	0	**14**
English Farms Total (2019-2022)	**99**	**213**	**132**	**41**	**3**	**1**	**0**	**4**	**1**	**496***
Franklin County (2020)	12	20	7	3	0	0	0	0	0	**42**
Golden Plains (2020)	34	31	19	8	1	0	0	0	2	**96***
Kossuth (2021)	23	34	8	2	0	0	0	0	0	**67**
Richland (2021)	14	27	6	12	0	0	0	0	0	**59**
Upland Prairie (2020)	23	23	3	15	0	0	0	0	0	**64**
Whispering Willow East (2020)	63	57	26	9	1	0	0	0	0	**157***
Whispering Willow North (2020)	19	42	20	7	0	0	0	0	0	**88**
TOTAL	**304**	**455**	**228**	**101**	**5**	**1**	**0**	**4**	**3**	**1,105***

*Total represents total bats found, to include bats not identified to species that are not otherwise presented in this table

Table 3-9. Species Composition results of post-construction monitoring at the Projects by identified species.

Facility (survey year)	Species									Total
	Hoary bat	Eastern Red bat	Silver-haired bat	Big Brown bat	Evening bat	Indiana bat	Northern long-eared	Tricolored bat	Little Brown bat	
Bent Tree (2020)	47.2%	22.2%	19.4%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	**3.3%**
English Farms (2019)	20.4%	36.7%	26.5%	10.2%	2.0%	0.0%	0.0%	0.0%	0.0%	4.4%
English Farms (2020)	19.1%	45.2%	25.3%	9.1%	0.4%	0.4%	0.0%	0.4%	0.0%	21.8%
English Farms (2021)	20.8%	40.6%	29.2%	6.8%	0.5%	0.0%	0.0%	1.6%	0.5%	17.4%
English Farms (2022)	21.4%	57.1%	14.3%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%
English Farms Total (2019-2022)	**20.0%**	**42.9%**	**26.6%**	**8.3%**	**0.6%**	**0.2%**	**0.0%**	**0.8%**	**0.2%**	**44.9%***
Franklin County (2020)	28.6%	47.6%	16.7%	7.1%	0.0%	0.0%	0.0%	0.0%	0.0%	**3.8%**
Golden Plains (2020)	35.4%	32.3%	19.8%	8.3%	1.0%	0.0%	0.0%	0.0%	2.1%	**8.7%***
Kossuth (2021)	24.0%	35.4%	8.3%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	**6.1%**
Richland (2021)	14.6%	28.1%	6.3%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	**5.3%**
Upland Prairie (2020)	35.9%	35.9%	4.7%	23.4%	0.0%	0.0%	0.0%	0.0%	0.0%	**5.8%**
Whispering Willow East (2020)	40.1%	36.3%	16.6%	5.7%	0.6%	0.0%	0.0%	0.0%	0.0%	**14.2%***
Whispering Willow North (2020)	21.6%	47.7%	22.7%	8.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**8.0%**
TOTAL	**27.5%**	**41.2%**	**20.6%**	**9.1%**	**0.5%**	**0.1%**	**0.0%**	**0.4%**	**0.3%**	**100.0%***

*Species composition uses total bats found, to include bats not identified to species that are not otherwise presented in this table

3.6.2 Environmental Consequences

3.6.2.1 Impact Criteria

The following sections analyze potential impacts of each alternative on listed and unlisted bats. Major impacts may occur to other bats should implementation of an alternative result in a) observed Project mortality rates greatly exceeding the estimated rate for a wind project in the region; b) substantial loss or degradation of habitat; or c) substantial change in habitat conditions producing effects that result in additive reductions in naturally occurring populations.

Major impacts to covered bats could occur should implementation of an alternative result in a) naturally occurring populations reduced in numbers below levels for maintaining viability at local or regional level; or b) substantial loss or degradation of habitat that causes naturally occurring populations to be reduced in numbers below levels for maintaining viability at local or regional levels.

3.6.2.2 Effects to Bat Resources

Disturbance/Displacement

Limited information is available regarding the disturbance/displacement of bats at wind facilities (Kunz et al. 2007a). Based on the number and frequency of documented deaths of bat species observed at wind energy facilities throughout North America, there appears to be little to no avoidance of wind facilities by bats (USFWS 2011). Indeed, some researchers have suggested that migratory tree bats (i.e., hoary bats, eastern red bats, and silver-haired bats) may be attracted to wind turbines because of their migratory and mating behavior patterns (Kunz et al. 2007b; Cryan 2008). At dawn, these tree bats may mistake wind turbines for roost trees, thereby increasing the risk of fatality (Kunz et al. 2007b). Cryan (2008) suggested that male tree bats may be attracted to wind turbines by mistaking them as tall trees used as lekking sites (i.e., communal breeding site). Due to the lack of avoidance, bats are not expected to be disturbed or displaced from the Project as a result of project operations.

Turbine Related Fatality

Bat fatalities are documented to occur at wind energy facilities in the region (MEC 2019). Impact trauma from collisions with the rotating blades is considered to be the primary cause of bat fatalities (Johnson et al. 2004, Kunz et al. 2007b, Horn et al. 2008, Lawson et al. 2020), with barotrauma potentially playing a minor role (Baerwald et al. 2008, Rollins et al. 2012, Lawson et al. 2020). Determining why collisions occur, including whether and to what extent bats are attracted to turbines, remains an active area of research (reviewed in Cryan and Barclay 2009, Guest et al. 2022). Researchers continue to propose and test various hypotheses regarding bat-wind turbine interactions, including the association between land cover, resources, and environmental conditions and wind turbine collision risk (Thompson et al. 2017, Bennett and Hale 2018, de Jong et al. 2021), as well as behavioral factors that might make turbines attractive to bats (e.g., Horn et al. 2008, Cryan et al. 2014, Foo et al. 2017, Richardson et al. 2021). Several factors associated with variation in the extent and timing of bat fatalities at wind energy facilities include seasonality, temperature, wind speed, and species composition, as discussed further below.

Bat fatalities at wind energy facilities peak in the late summer and early fall while bats are migrating, a pattern that holds across facilities and geographic regions in North America (Arnett et al. 2008, Arnett and Baerwald 2013, Zimmerling and Francis 2016, AWWI 2020). For example, two years of monitoring

across 19 wind energy facilities in Iowa found that fatalities in the fall were at least an order of magnitude higher than the consistent, low levels of fatalities documented in the spring and summer (MEC 2019).

In addition to seasonality, daily weather conditions also influence the occurrence of bat fatalities. Bat fatalities have been found to be less common below 50°F. Although 50°F may not be a "hard cut-off" for bat activity, this temperature is expected to represent a threshold below which minimal activity is expected to occur (USFWS 2011). Wind speeds also play a role in bat fatalities. Most bat fatalities occur when wind speeds are less than 6.0 m/s (Arnett et al. 2008). Studies at numerous wind energy facilities have demonstrated that turbine operational protocols (i.e., adjusting the cut-in speed, or the wind speed at which turbines begin generating power, and/or feathering turbine blades to prevent freewheeling below that speed) significantly influence bat fatality (reviewed in Adams et al. 2021, Whitby et al. 2021; see Table 2-1). Therefore, it is expected that turbine related bat fatalities at the Projects would vary depending on the alternative and the associated cut-in speeds under which the turbines are operated.

Post-construction fatality surveys were conducted at all of Alliant's existing projects for one year except for English Farms where five years of post-construction monitoring have been completed (2019-2023). All projects except for English Farms were operating at manufacturer's cut-in speed during post-construction monitoring. Based on data from post-construction fatality surveys (see Section 3.6.1.3), the bat fatality rate[6] at Alliant's covered projects ranges from 15.90 to 58.30 bats per turbine[7] per year, with an average of 30.22 bats per turbine per year when operating at manufacturer's cut-in speed. English Farms is within the range of the Indiana bat and has been operating under avoidance measures or under a research permit since operations began. Under the research permit at English Farms in 2020, turbines were placed into one of three treatment groups: control ("minimal curtailment" i.e., manufacturer's cut-in), blanket curtailment up to 6.9 m/s, and bat smart curtailment (DARC) up to 6.9 m/s. It was predicted that turbines operating at manufacturer's cut-in speed (i.e., minimal curtailment) would take approximately 25.0 bats/turbine (Arnold 2022).

Bent Tree North and Whispering Willow South (WWS) are expected to be built within the first five years after permit issuance. Bent Tree North will be located immediately north of Bent Tree and Whispering Willow South will be located east of Whispering Willow North, both in landscapes similar to their adjacent projects. Therefore, impacts to bat species at these projects are expected to be similar to those expected at the adjacent projects, scaled to the proposed number of turbines at each project (68 at Bent Tree North and 30 at WWS). Note that for the purposes of this analysis, it was assumed that Bent Tree North and Whispering Willow East would be online for the entire 30-year permit term. This provides a conservative estimate of take but it is understood that these projects may not be online, and therefore not contributing to take, until a few years into the permit term.

Post-construction monitoring at each site covered various proportions of the bat active season (see Table 3-10). In order to get a take estimate for the entire bat active season, fatality rates were extrapolated using the seasonal fatality rate proportions from the MidAmerican post-construction mortality monitoring dataset (USFWS 2019a).

[6] These values include threatened, endangered, and other covered bat species, discussed later in this section.
[7] Per turbine estimates were used based on data from Johnson et al. 2016 which indicated that capacity (i.e., MW) may not be an accurate predictor, as a turbine with double the capacity does not have double the rotor-swept area, and, furthermore, the rotor-swept area is not a good indicator as larger areas result in a smaller fraction of the area occupied by the blades at any given moment. For this reason, it is assumed that repowered turbines will have the same fatality rates as they did prior to repowering.

Table 3-10. Estimated bat fatalities per turbine by project when operating at manufacturer's cut-in speed.

Project	Total Number of Turbines	Turbines within 1,000 ft of suitable habitat	Turbines within 2.7 miles of tricolored bat suitable habitat	Post-construction monitoring period	Estimated Fatalities per Turbine per monitoring period	Estimated Fatalities per Turbine per bat active season (March 15-November 15)
Bent Tree	122	11	16	July 1 - October 15	16.37	17.74
English Farms	69	0	42	August 1 - October 15	25.0	32.77
Franklin County	60	0	7	April 15 - October 15	25.24	25.42
Golden Plains	82	0	0	July 1 - October 15	44.65	48.38
Kossuth	56	0	20	July 1 - October 15	36.95	40.04
Richland	53	0	17	July 1 - October 15	53.8	58.30
Upland Prairie	121	0	27	July 1 - October 15	20.15	21.84
Whispering Willow East	121	6	69	April 15 - October 15	15.79	15.90
Whispering Willow North	81	0	0	July 1 - October 15	34.07	36.92
Bent Tree North	68	0	TBD	N/A	N/A	N/A
Whispering Willow South	30	0	TBD	N/A	N/A	N/A

During post-construction fatality monitoring conducted at the Projects, species composition of non-listed and non-covered bats varied by Project with composition of hoary bats ranging from 14.6% of all fatalities at Richland to 47.2% of all fatalities at Bent Tree (Table 3-11). Due to the large differences in species composition by Project, project-specific species composition rates were used to calculate take of non-listed and non-covered species. Total fatalities of each species at each project were then summed across all projects to get an annual estimate of each non-listed and non-covered species across the covered projects.

Table 3-11. Species composition of fatalities by Project with post-construction mortality data

Project	Species Composition				
	Hoary Bat	Eastern Red Bat	Silver-Haired Bat	Big Brown Bat	Evening Bat
Bent Tree	47.2%	22.2%	19.4%	11.1%	0.0%
English Farms	27.8%	50.0%	36.1%	13.9%	2.8%
Franklin County	28.6%	47.6%	16.7%	7.1%	0.0%
Golden Plains	35.4%	32.3%	19.8%	8.3%	1.0%
Kossuth	24.0%	35.4%	8.3%	2.1%	0.0%
Richland	14.6%	28.1%	6.3%	12.5%	0.0%
Upland Prairie	35.9%	35.9%	4.7%	23.4%	0.0%
Whispering Willow East	40.1%	36.3%	16.6%	5.7%	0.6%
Whispering Willow North	21.6%	47.7%	22.7%	8.0%	0.0%

The estimated impacts to non-covered bats are summarized in Table 3-12. Using the site-specific fatality rates for the projects when operating at manufacturer's cut-in speed (see Table 3-10), and the site-specific species composition results (see Table 3-11), an estimated 652,230 bats would be killed each year at Alliant's covered projects if no operational adjustments were made (Table 3-12).

Table 3-12. Summary of estimated non-covered bat fatalities by alternative annually and for the 30-year permit duration.

Species	Alternative 1: No Action Alternative		Alternative 2: Proposed Action Alternative		Alternative 3: More Restrictive Alternative	
	Annual	30 Years	Annual	30 Years	Annual	30 Years
Hoary Bat Fatality Estimate	1,952	58,560	6,717	201,510	4,532	135,960
Eastern Red Bat Fatality Estimate	2,313	69,390	7,987	239,610	5,359	160,770
Silver-haired Bat Fatality Estimate	1,080	32,400	3,591	107,730	2,508	75,240
Big Brown Bat Fatality Estimate	660	19,800	2,296	68,880	1,531	45,930
Evening Bat Fatality Estimate	28	840	78	2,340	68	2,040
Total Bats for Non-covered Species	**6,033**	**180,990**	**20,669**	**620,070**	**13,998**	**419,940**

The estimated impacts to the covered species are summarized in Table 3-13. Details on impact analysis by alternative are provided in the following sections. Take of the covered species was calculated using site-specific data from post-construction monitoring when turbines were operating at manufacturer's cut-in speed (3.0 m/s to 3.5 m/s, depending on the Project) (Pickle and O'Neil 2021a, Burns & McDonnell

2020a, 2020b, 2021, 2022, Pickle et al. 2021a, Pickle et al. 2021b, Voth et al. 2022a, Voth et al. 2022b, Pickle et al. 2021c, Pickle and O'Neil 2021b, Pickle et al. 2021d). Because these data were collected when WNS was fully realized, no adjustments for impacts of WNS were applied.

Table 3-13. Summary of estimated fatalities for covered species by alternative annually over the entire bat active season and for the 30-year permit duration.

Species	Alternative 1: No Action Alternative		Alternative 2: Proposed Action Alternative		Alternative 3: More Restrictive Alternative	
	Annual	30 Years	Annual	30 Years	Annual	30 Years
Indiana Bat Fatality Estimate	0	0	4.1	123	2.3	69
Northern Long-eared Bat Fatality Estimate	0	0	8.2	246	0.1	3
Little Brown Bat Fatality Estimate	0	0	117.9	3,536	71.4	2,142
Tricolored Bat Fatality Estimate	0	0	84.0	2,520	55.6	1,668
Total Bats for covered species	**0**	**0**	**214.2**	**6,425**	**129.5**	**3,882**

Bat fatality estimates across the bat active season at the Projects range from 15.90 to 58.30 bats per turbine per year when operating at manufacturer's cut-in speed (see Table 3-10). These all-bat fatality rates provide the baseline fatality rates to which we applied the expected percent reductions in bat fatalities above manufacturer's cut-in speed under the alternatives, as described in the following sections.

According to data collected from 2015 through 2017 across Iowa by MEC, 0.1% of bat fatalities occur in early spring (March 15 – March 31), 13.8% occur in the spring/summer (April 1 – July 14), 64.44% in the late summer/fall (July 15 – September 30), and 3.5% in the late fall (October 1 – November 15) (USFWS 2019a). This dataset provides recent information about bat fatality rates in a similar geographic area as the Projects.

No Action Alternative

Under the No Action Alternative, cut-in speeds would be raised from sunset to sunrise to 6.0 m/s during the spring/summer season (April 1 – July 14) at turbines within 2.7 miles of suitable tricolored bat habitat and to 8.0 m/s during the late summer/fall migratory period (July 15 – September 30) at all turbines each year. During the remainder of the active bat season (March 15 – March 31 and October 1 – November 15) turbines would be feathered below the manufacturer's cut-in speed (3.0 m/s – 3.5 m/s depending on the Project). Under the No-Action Alternative, we assume full avoidance (i.e., no take) for Indiana bat, northern long-eared bat, little brown bat, and tricolored bat (Table 3-13).

Fatality estimates for non-covered bat species under the No-Action Alternative are assumed to be greater than zero since fatalities could occur at higher wind speeds than the covered species. Because all existing Projects have fatality estimates when operating at manufacturer's cut-in speed, the Service applied expected bat fatality reductions at increased cut-in speeds over manufacturer's cut-in speed instead of from freewheeling. To do so, a baseline cut-in speed of 3.0 m/s was used to calculate reductions in acoustic exposure, meaning that the percent of bat passes recorded at 3.0 m/s or below became the baseline (i.e., "0") to compare all elevated cut-in speeds to. This prevents the need to remove the benefit

of curtailing below manufacturer's cut-in speed from the calculated fatality rates and then reapply this benefit based on the alternative being assessed. Therefore, calculated fatality rates when operating at manufacturer's cut-in speed were used to estimate take when operating at manufacturer's cut-in speed at various time periods as proposed under the action alternatives and no percent reduction when operating at manufacturer's was calculated. This same process was repeated for a baseline cut-in speed of 3.5 m/s because manufacturers cut-in speed varies between 3.0 m/s and 3.5 m/s depending on the Project. Using this methodology, the Service has determined that the level of operational minimization under the No-Action Alternative is expected to reduce non-covered bat fatality rates by (see Table 2-2):

- 61% - 64.5% above the expected reduction when operating at the 3.0 m/s or 3.5 m/s manufacturer's cut-in speed, respectively, when turbines within 2.7 miles of suitable tricolored bat habitat are feathered below 6.0 m/s, and
- 87.2% - 88.4% above the expected reduction when operating at the 3.0 m/s or 3.5 m/s manufacturer's cut-in speed, respectively, when turbines are feathered below 8.0 m/s.

The calculated reduction in fatalities is based on the assumption that the number of acoustic calls recorded at different wind speeds is directly proportional to the number of fatalities that would occur. This field of study is evolving as the use of acoustics at wind turbines expands. Therefore, we acknowledge here that this assumption may be refined in future NEPA and HCP analyses, but that this correlation represents the best available information at this time.

The annual non-covered bat fatality estimate under the No-Action Alternative was calculated by taking the total bat fatality estimate for each Project when operating at manufacturer's cut-in speed and extrapolating the fatality estimate using the seasonal fatality rate proportions from the MidAmerican post-construction mortality monitoring dataset (USFWS 2019a) (see Table 3-10). The percent reductions in fatality estimates expected under the feathering regime were then applied seasonally based on the equivalent reduction in bat acoustic calls from Iowa acoustic data (unpublished data), as summarized above and in Table 2-2. Based on these calculations, an estimated 6,033 fatalities of non-covered bats are expected annually (180,990 bats over 30 years) under the No-Action Alternative (Table 3-12). A summary of expected non-covered bat species fatalities by species is provided in Table 3-12.

HCP Alternative

The HCP used an informed Evidence of Absence (IEoA) approach. IEoA is an "informed" variation of the Evidence of Absence (EoA) approach, which is both a statistical framework and a software package, that utilized Alliant-specific carcass counts and the probability of detection from the post-construction monitoring data collected at the Alliant facilities in 2020 and 2021 (see Section 4.2 of the HCP). Under the HCP Alternative, turbines would be feathered below the manufacturer's cut-in speed from sunset to sunrise during the bat active season (March 15 – November 15). From July 15 – September 30 when air temperatures are above 50° F, the cut-in speed would be raised from manufacturer's cut-in speed to 4.0 m/s at all turbines at Franklin County, Whispering Willow East, and Richland and to 5.0 m/s at all turbines at Golden Plains and English Farms. Turbines at the remaining Projects will remain at manufacturer's cut-in speed from July 15 – September 30.

The IEoA approach in the HCP utilized the fatality rates at the Projects when operating at manufacturer's cut-in speed. They assumed operating under these protocols results in at least a 35% reduction for the covered species. Covered Species take may be reduced beyond 35% at some of the Alliant Projects due to additional minimization. However, because most of the Alliant Projects will still be feathering up to manufacturer's cut-in speeds for most of the bat active season, and take was calculated and allocated at

the fleet scale, not the individual project scale, no further reductions to covered species fatality rates beyond 35% was applied. Therefore, the authorized take rate of covered species under the HCP Alternative is:

- 4.1 Indiana bats per year (123 bats over 30-year permit duration)
- 8.2 northern long-eared bats per year (246 bats over 30-year permit duration)
- 117.9 little brown bats per year (3,536 bats over 30-year permit duration)
- 84.0 tricolored bats per year (2,520 bats over 30-year permit duration)

For non-covered species, the Service did still apply the assumed reductions over manufacturer's cut-in speed to those Projects where cut-in speed would be increased from July 15 – September 30 (i.e., at English Farms, Golden Plains, Franklin County, Whispering Willow East, and Richland). The non-covered species fatality rate was calculated by taking the calculated fatality rate from each project (see Table 3-10) and applying the assumed percent reduction at 5.0 m/s of 44.3% (based on a manufacturer's cut-in speed of 3.0 m/s) per acoustic data (see Table 2-2) to English Farms and Golden Plains, and the assumed percent reduction at 4.0 m/s of 12.1% or 19.9% depending on the manufacturer's cut-in speed (3.5 m/s or 3.0 m/s, respectively) based on acoustic data to Franklin County, Whispering Willow East, and Richland during the July 15 – September 30 curtailment window when 82.6% of fatalities are expected to occur (USFWS 2019a).

A summary of expected non-covered bat species fatalities is provided in Table 3-13. Under the HCP Alternative, approximately 20,669 fatalities of non-covered bat species are expected annually across the 11 Alliant Projects. Over the 30-year permit term, up to approximately 620,070 fatalities of non-covered bat are expected occur across the 11 Alliant Projects. If adaptive management measures should need to be implemented to further reduce covered species fatalities, the non-covered bat fatality rates would also be expected to decrease. The Service would consider potential impacts to non-covered bats that could occur with the implementation of proposed adaptive management measures, and approval would depend on the outcome of that evaluation.

More Restrictive Alternative

The More Restrictive Alternative would have all turbines at all 11 Alliant Projects feathered below cut-in speeds of 5.0 m/s from sunset to sunrise during from April 1 – September 30 (when 96.4% of bat fatalities are expected to occur [USFWS 2019a]) regardless of temperature. Feathering blades below 5.0 m/s is expected to reduce fatalities by 44.3% at facilities with a manufacturer's cut-in speed of 3.0 m/s and by 38.9% at facilities with a manufacturer's cut-in speed of 3.5 m/s (see Table 2-2). These reductions were applied to both the non-covered species and the covered species. Given turbine siting away from suitable summer habitat at all turbines at all 11 Alliant Projects except Whispering Willow East (6 turbines within 1,000 feet) and Bent Tree (11 turbines within 1,000 feet) and because implementing a cut-in speed of 5.0 m/s is considered avoidance for northern long-eared bat (USFWS 2023c), only Whispering Willow East and Bent Tree are expected to take northern long-eared bats under the More Restrictive Alternative. Under this alternative expected take of the covered species would be:

- 2.3 Indiana bats per year (69 bats over 30-year permit duration)
- 0.1 northern long-eared bat per year (3 bats over 30-year permit duration)
- 71.4 little brown bats per year (2,142 bats over 30-year permit duration)
- 55.6 tricolored bats per year (1,668 bats over 30-year permit duration)

Regional Impact of Turbine Fatality

Take estimates for the covered species were compared to the species' recovery unit or state population estimate. The OCRU was used for the Indiana bat and the Iowa population was used for the northern long-eared bat, little brown bat, and tricolored bat. The Iowa populations are expected to be smaller than those for Minnesota because of the available forest resources; however, these forest resources are not located in proximity to the Minnesota covered projects (Bent Tree and Bent Tree North). Therefore, while some of the take occurring at the covered projects will occur in Minnesota and may come from the Minnesota populations, the Iowa population was used for this impact analysis because it provides a more conservative estimate of impacts.

In 2019 the Indiana bat population in the OCRU was 276,317 Indiana bats (USFWS 2019b). In 2023, the adult northern long-eared bat population in Iowa was 1,196 northern long-eared bats (USFWS 2023a). The little brown bat and tricolored bat populations in Iowa have not been calculated by any studies currently available in the published literature. To provide a coarse estimate of the statewide little brown bat and tricolored bat population size, we utilized the methodology used in the MEC EIS Biological Opinion (BO; USFWS 2019a), updated to 2023.

Based on forested habitat, occupancy rates, home range size, and bat density data from 2016-2018, the MEC EIS BO determined the population of the tricolored bat in Iowa was 142,730 based on a bat density of 1 tricolored bat per 6.85-acre roost area, 2,875,600 acres of forest in Iowa, and an occupancy rate of 34% (USFWS 2019a)[8]. This same process was used for this analysis with updated inputs. The acres of suitable forested habitat was updated to use the habitat suitability model developed for the tricolored bat REA Model (USFWS 2022c), cut to the USFS canopy tree layer to exclude any foraging habitat for a new suitable habitat acreage of 2,663,079 acres in Iowa. The original occupancy rate of 34% was calculated based on acoustic sampling conducted across 60 counties in the state of Iowa in 2016, 2017, and 2018. In 2023 Stantec re-sampled a portion of the previous sites across 22 counties in Iowa to help determine the impact of WNS on Iowa populations (Stantec 2023). Occupancy in 2016-2018 was then compared to occupancy in 2023 to determine a rate of occupancy decline. This decline was determined to be 47.9% for the tricolored bat. Applying this 47.9% decline to the occupancy rate of 34% results in a new occupancy rate of 16.3% and an updated population of tricolored bats in Iowa of 15,634.

This same process was also implemented for the little brown bat. According to the Forests of Iowa 2021 report, Iowa has an estimated 2,851,077 acres of forest land (USFS 2022). Per the little brown bat REA Model, the little brown bat requires 46 acres per little brown bat (USFWS 2016b). The little brown bat occupancy rate in Iowa was calculated as 51.5% based on an occupancy rate of 53.8% in 2016-2018 and an occupancy rate decline of 4.4% when comparing 2023 occupancy to occupancy from 2016-2018. This results in an estimated little brown bat population in Iowa of 31,895.

Based on take estimates provided in Table 3-13, the annual percent impact for each species relative to the species' recovery unit or state population estimates are presented in Table 3-14. Based on these small percentages, we do not expect naturally occurring populations of the covered bat species to be reduced in numbers below levels for maintaining viability at local or regional level.

[8] (acres of forest in Iowa * occupancy rate) / (acres per tricolored bat roost area) * (number of bats occupying a roost area) = estimated number of tricolored bats in Iowa.

Table 3-14. Impact of annual take at the Project under each alternative relative to the state or regional population of each covered species.

Species Population	Annual Take Percentage of Species' Population		
	Alternative 1: No Action Alternative	Alternative 2: Proposed Action Alternative	Alternative 3: More Restrictive Alternative
Percent of Ozark-Central Recovery Unit Population of Indiana Bat (276,317)[1]	0	0.001	0.001
Percent of Iowa Northern Long-eared Bat Population (1,196)	0	0.686	0.008
Percent of Iowa Little Brown Bat Population (31,895)	0	0.370	0.224
Percent of Iowa Tricolored Bat Population (15,634)	0	0.537	0.356

Effects of Maintenance and Monitoring

Maintenance activities will be required to ensure the safety and operability of the Projects under all three alternatives being considered. Maintenance activities would occur primarily during daylight hours and may include increased noise, vibration, traffic, and human activity in the vicinity of the turbines while maintenance is being performed. We have no information to indicate that maintenance activities would differ between the no action and the action alternatives. Therefore, we conduct no further analysis on this activity.

Post-construction mortality surveys to be conducted under any of the action alternatives would result in additional human activity and traffic at the Projects, though the impacts of these activities on bat resources are not expected to differ greatly from the current conditions associated with the operation and maintenance of the operating facilities. Limited vegetation clearing would occur as part of routine maintenance activities under any of the alternatives under consideration, with some additional vegetation clearing that might be necessary for post-construction mortality surveys under any of the action alternatives. However, the impacts of vegetation clearing on bat resources would be minor, as the activities will occur only in areas already cleared or disturbed for agricultural purposes.

Effects of Mitigation

No mitigation would occur under the No Action Alternative (see Section 2.2.1). Under both action alternatives, forested habitat mitigation would be implemented and occur at the Two Rivers Conservation Bank (includes one site in Marshall County, Iowa and one site in Des Moines County, Iowa). There are currently 2,384,085 acres of deciduous forest habitat in Iowa and Freeborn County, Minnesota and 201,323 acres are protected (NLCD 2016, USGS GAP 2022). Under the Alternative 2 (Proposed Action), 612.4 acres of forested habitat mitigation would occur, and up to 1,416 additional acres of protected or restored summer roosting habitat or 1,176 additional acres of protected or restored open foraging habitat. Under Alternative 3 up to 3,183 acres of forested habitat preservation mitigation and up to 9 artificial roost structures would be implemented. The protection and/or restoration of between 612.4 (plus 1,416 or 1,176 acres) and 3,183 acres of forested habitat would increase the roosting and foraging opportunities for those bat species using the mitigation lands.

Other bat species making use of similar habitat will also receive the habitat enhancement and protection benefits inherently associated with the covered species' foraging habitat or roosting habitat protection mitigation proposed under the HCP. It is assumed that every acre of forested habitat protected for the covered species will also provide an acre of habitat for other forest bat species whose range overlaps with the mitigation site, though the exact species will depend on the occupancy of the specific site.

3.6.2.3 Cumulative Effects to Bat Resources

To assess the effect of planned wind energy development on covered bat species, we define the following analysis areas. For the Indiana bat, the analysis area is the OCRU, which includes Illinois and Missouri as well as portions of Iowa, Oklahoma, and Arkansas. For the northern long-eared bat, recovery units have not been established; thus, the population estimate for the states of Iowa and Minnesota is utilized in this analysis. A smaller geographic range is biologically reasonable for the northern long-eared bat, as the species is a shorter distance migrant than the Indiana bat (USFWS 2014). The states of Iowa and Minnesota is also the analysis area for the little brown bat, tricolored bat, and non-listed bats. State population estimates of little brown bat and tricolored bat are provided in Section 3.6.2.2.

These spatial scales provide the best available and most reasonable scales to use for population estimates of covered and non-covered bat species. The effects analysis uses a 30-year timeframe based on the requested duration of the ITP. The selected spatial and temporal scales provide a reasonable assessment of cumulative effects related to wind energy development, forested habitat change, climate change, and the spread of WNS.

Wind Energy Development

As discussed in Section 3.1.2, wind energy development is increasing nationwide. Based on the analysis of turbine related fatalities described in Section 3.6.2.2, operation of the Project and other wind energy development projects have the potential to kill bats. The Service recognizes that bats would sustain similar effects at all wind projects in the analysis area. In addition, wind energy development in the region could cumulatively reduce bat forest habitat, although most wind energy development would likely occur in agricultural lands in the region. Impacts to bats due to direct fatalities at wind energy facilities are discussed separately below for the Covered Species and non-covered bats.

As discussed in Section 3.2.1, to estimate the cumulative impact from wind development within the analysis areas, we used the NREL Mid-case scenario with nascent technologies (i.e., retrofits of natural gas and coal plants) and assuming current energy policies (i.e., state-specific clean energy goals and federal production tax credits). While these estimates are likely less accurate over time and based largely on assumptions, these projections are the best available estimates to use to estimate cumulative wind buildout within the cumulative analysis areas (see Table 3-1). The NREL projections fluctuate over time and vary based on the region being assessed. To provide the most conservative estimate, the max buildout over the NREL projected timeframe (i.e., through 2050) was used as the assumed max projected increase over the permit term.

Because nine of the covered projects are already built and operating, they have been contributing to the past and present impacts of bat fatalities from wind energy in the analysis areas. The analysis area for the northern long-eared bat, tricolored bat, and little brown bat is Iowa and Minnesota. Wind energy facilities in Iowa and Minnesota have a 2024 projected capacity of 18,466 MW, with a projected max increase to 40,170 MW during the permit term, based on the NREL Mid-case scenario (Table 3-1; Gagnon et al. 2023, NREL 2023). Bat fatality within the Midwest (USFWS Region 3 to include Minnesota, Iowa, Missouri, Wisconsin, Illinois, Indiana, Michigan, and Ohio) is estimated to average 10.87 bats/MW/year (AWWI 2020). This yields an estimated 2024 bat fatality rate of 200,730 bats per year in Iowa and

Minnesota with a projected increase to a max of 436,649 bats per year in Iowa and Minnesota during the permit term. Tricolored bats make up 0.6% of fatalities in the Region (AWWI 2020) for an estimated 2024 tricolored bat fatality rate of 1,205 tricolored bats per year in the Region with a projected increase to a max of 2,620 tricolored bats per year in the Region during the permit term. Little brown bats make up 3.4% of fatalities in the Region (AWWI 2020) for an estimated 2024 little brown bat fatality rate of 6,825 little brown bats per year in the Region with a projected increase to a max of 14,847 little brown bats per year in the Region during the permit term.

Under the No Action Alternative, the covered projects are not expected to contribute to the tricolored bat take within Iowa and Minnesota. Under the Proposed Action Alternative, the covered projects are expected to take 84 tricolored bats/year which represents 6.97% to 3.21% of the annual tricolored bat fatality from wind energy within Iowa and Minnesota in 2024 and at max capacity, respectively (Table 3-15). Under the More Restrictive Action Alternative, the covered projects are expected to take 55.6 tricolored bats/year which represents 4.61% to 2.12% of the annual tricolored bat fatality from wind energy within Iowa and Minnesota in 2024 and at max capacity, respectively (Table 3-15). The increase in tricolored bat fatalities under either action alternative does not result in a substantial addition to overall tricolored bat fatality in Iowa and Minnesota.

Under the No Action Alternative, the covered projects are not expected to contribute to the little brown bat take within Iowa and Minnesota. Under the Proposed Action Alternative, the covered projects are expected to take 117.9 little brown bats/year which represents 1.73% to 0.79% of the annual little brown bat fatality from wind energy within Iowa and Minnesota in 2024 and at max capacity, respectively (Table 3-15). Under the More Restrictive Action Alternative, the covered projects are expected to take 71.4 little brown bats/year which represents 1.05% to 0.48% of the annual little brown bat fatality from wind energy within Iowa and Minnesota in 2024 and at max capacity, respectively (Table 3-15). The increase in little brown bat fatalities under either action alternative does not result in a substantial addition to overall little brown bat fatality in Iowa and Minnesota.

Across its range, no northern long-eared bats have not been observed as fatalities under wind turbines since 2016, including in Iowa and Minnesota. As such, a species composition of fatalities cannot be calculated for the species. Based on the absence of observed fatalities at wind projects over the last eight years, the covered projects are expected to have a de minimus direct effect; therefore, a de minimus cumulative effect to the overall northern long-eared bat fatality in Iowa and Minnesota.

In the Indiana bat analysis area (the OCRU which includes Arkansas, Illinois, Iowa, Missouri, and Oklahoma), wind energy facilities have a 2024 projected capacity of 35,900 MW, with a projected max increase to 133,480 MW during the permit term, based on the NREL Mid-case scenario (Table 3-1; Gagnon et al. 2023, NREL 2023). Bat fatality within the OCRU is estimated to average 7.13 bats/MW/year and Indiana bats currently make up approximately 0.02% of all bat fatalities in the OCRU (USFWS 2023d). This yields an estimated 2024 Indiana bat fatality rate of 51.2 Indiana bats per year in the OCRU with a projected increase to approximately 190.3 Indiana bats per year in the OCRU during the permit term, assuming that new projects will have comparable Indiana bat risk profiles to existing projects. We note here that there is some unavoidable uncertainty in these estimations.

Under the No Action Alternative, the covered projects are not expected to contribute to the Indiana bat take within the OCRU. Under the Proposed Action Alternative, the covered projects are expected to take 4.1 Indiana bats/year which represents 8.0% to 2.15% of the annual Indiana bat fatality from wind energy within the OCRU in 2024 and at max capacity, respectively (Table 3-15). Under the More Restrictive Action Alternative, the covered projects are expected to take 2.3 Indiana bats/year which represents 4.5% to 1.2% of the annual Indiana bat fatality from wind energy within the OCRU in 2024 and at max

capacity, respectively (Table 3-15). The increase in Indiana bat fatalities under either action alternative does not result in a substantial addition to overall Indiana bat fatality in the OCRU.

Table 3-15. Contribution to overall fatality of each alternative based on the NREL Mid-case scenario with nascent technologies 2024 projected wind buildout and the maximum project wind buildout during the permit term for the covered species and all bats.

Species (analysis area)	All-Bat Fatality Rate (bats/MW/year)[1]	Species Composition of Fatalities[1]	2024 bat fatalities	Max annual bat fatalities during permit term	Contribution to overall fatality					
					No Action Alternative contribution to 2024 fatalities	No Action Alternative contribution to max fatalities	Proposed Action Alternative contribution to 2024 fatalities	Proposed Action Alternative contribution to max fatalities	More Restrictive Alternative contribution to 2024 fatalities	More Restrictive Alternative contribution to max fatalities
Indiana bat (OCRU)[3]	7.13	0.02%	51.2	1903.	0%	0%	8.01%	2.15%	4.49%	1.21%
Little brown bat (Iowa and Minnesota)	10.87	3.4%	6,825	14,847	0%	0%	1.73%	0.79%	1.05%	0.48%
Tricolored bat (Iowa and Minnesota)	10.87	0.6%	1,205	2,620	0%	0%	6.97%	3.21%	4.61%	2.12%
All bats (Iowa and Minnesota)	10.87	N/A	200,730	436,649	1.30%	0.60%	4.50%	2.07%	3.02%	1.39%

[1] All-bat fatality rates and species composition for the little brown bat, tricolored bat, and all bats are from AWWI (2020). The Indiana bat fatality rate and species composition are from USFWS (2023d)

[2] The Ozark-Central Recovery Unit (OCRU) includes Arkansas, Illinois, Iowa, Missouri, and Oklahoma

Under the No Action Alternative, the covered projects are expected to take 6,367 bats/year which represents 1.30% to 0.60% of the annual bat fatality from wind energy within Iowa and Minnesota in 2024 and at max capacity, respectively. Under the Proposed Action Alternative, the covered projects are expected to take 21,990 bats/year which represents 4.50% to 2.07% of the annual bat fatality from wind energy within Iowa and Minnesota in 2024 and at max capacity, respectively. Under the More Restrictive Action Alternative, the covered projects are expected to take 14,748 bats/year which represents 3.02% to 1.39% of the annual bat fatality from wind energy within Iowa and Minnesota in 2024 and at max capacity, respectively. The increase in bat fatalities under either action alternative does not result in a substantial addition to overall bat fatality in the Region.

The significance of current and potential future bat fatality rates across all wind projects in Iowa and Minnesota is unknown, especially for migratory tree bats. It is difficult to accurately estimate population sizes, and we do not have a good understanding of population demographic estimates (e.g., population trend or growth rate, mortality rates, fecundity) for many bat species, including migratory tree bats. However, a determination of the significance of all bat fatality rates from wind energy in Iowa and Minnesota is beyond the scope of this EA because the Service does not have jurisdiction or control over the development of wind energy or the implementation of voluntary conservation measures. Rather, we must evaluate if the consequences of any of the alternatives in this EA would have a significant impact on bat resources in the context of the currently affected environment, reasonably foreseeable planned actions, and environmental trends.

Climate Change

Climate change is anticipated to affect bat species in several ways (PGC-PFBC 2015). Affects may include higher mortality due to drought (O'Shea et al. 2011, Frick et al. 2010); increases in prey availability (Moosman et al. 2012) and riparian habitat (Menzel et al. 2005 as cited in PGC-PFBC 2015) due to increased precipitation; and range expansions or restrictions due to temperature changes (Arndt et al. 2012 as cited in PGC-PFBC 2015). Droughts may result in higher mortality for some species; this has been demonstrated for the big brown bat and little brown bat (O'Shea et al. 2011; Frick et al. 2010). Conversely, depending on the timing, increases in precipitation can be beneficial for insectivorous bat species by increasing prey availability (Moosman et al. 2012). The connection between WNS and climate change is unknown but warming climates may reduce the vulnerability of the little brown bat and other species to this pathogen (Ehlman et al. 2013).

None of the alternatives would increase the effects of climate change; instead, all alternatives would have varying levels of beneficial impact to the overall effects of climate change by reducing greenhouse gas emissions through the production of electricity via wind energy (i.e., a reduction in the amount of fossil fuels used to produce electricity). The difference in effects between the alternatives is small relative to the overall beneficial effect for each alternative.

White-nose Syndrome

WNS has emerged as the largest single source of mortality for cave-hibernating bats in recent years. As of March 2024, WNS has been confirmed in 40 states (including Iowa and Minnesota) and 8 Canadian provinces, as far west as Washington State (USFWS 2024a). As of 2012, estimates of total bat mortality had reached 6.7 million bats since discovery of the disease in 2006 (USFWS 2012). WNS was first confirmed in Iowa in 2015 in Des Moines County and in Minnesota during the winter of 2016-2017 at Forestville/Mystery Cave State Park (BCI 2015; MDNR 2023b). Twelve hibernating bat species are affected by WNS in North America: Indiana bat, northern long-eared bat, little brown bat, tricolored bat, big brown bat, cave bat (*Myotis velifer*), fringed bat (*Myotis thysanodes*), eastern small-footed bat (*Myotis leibii*), long-legged bat (*Myotis volans*), western long-eared bat (*Myotis evotis*), gray bat (*Myotis*

grisescens), and Yuma bat (*Myotis yumanensis*) (USFWS 2024b). To date, WNS has not been documented in migratory tree-roosting bat species (e.g., hoary bat, silver-haired bat, eastern red bat), which account for the majority of wind turbine related mortality; although the causative fungus, *Pseudogymnoascus destructans*, has been detected in eastern red bat, but no diagnostic signs of white-nose syndrome were present (USFWS 2024b).

Turner et al. (2011) documented an 88% decline in overall numbers of hibernating bats comparing pre- and post-WNS counts at 42 sites in five northeastern states with declines varying by species. At these sites, northern long-eared bats decreased by 98%, little brown bats by 91%, tricolored bats by 75%, and big brown bats by 41% (Turner et al. 2011). The rate at which WNS may impact the OCRU, Region 3, or Iowa and Minnesota bat populations cannot be predicted, as the progression from detection of a single bat with visible fungus to large-scale mortality has been observed to occur within a matter of weeks at some sites in the Northeast, while at others it has not occurred until the next hibernation season, or even later (Turner et al. 2011). However, it is expected that WNS will ultimately have similarly devastating impacts on hibernacula in the OCRU, Region 3, and Iowa and Minnesota, causing mortality similar to that observed in the northeastern United States and possibly the abandonment or extinction of certain hibernacula.

We estimate that WNS has impacted the covered species by the following: 11.4% decline of Indiana bats in Region 3 (2011 compared to 2019; USFWS 2019b), 90% decline of northern long-eared bats in the Midwest (USFWS 2023a); 52% decline in tricolored bats range-wide (USFWS 2021), and approximately 57% decline of little brown bats in the Midwest (USFWS unpublished data).

Research on the effects of WNS continues, and at this time it is unknown whether the current fatality rate from WNS will continue over the next 30 years. However, the additive fatality from the Project under any of the action alternatives is not anticipated to substantially increase overall covered and non-covered bat fatality in the Region, and bat fatality under the No Action Alternative is expected to be less than the other alternatives under consideration.

Conservation Projects

Project mitigation under the action alternatives would involve the protection of forested summer habitat for bats, particularly for the Covered Species. Bat habitat protection and restoration projects have, and continue to be, conducted periodically in USFWS Region 3 by entities such as state resource agencies, BCI, mining companies, and other wind developers. Habitat protection supports high reproductive success and survival to help offset the effects of habitat loss and WNS (e.g., see Kath 2022), and is one of the measures determined to be necessary to help protect the covered species (USFWS 2007, 2021d, 2022c; Kath 2022). Project mitigation would, therefore, have a cumulative beneficial impact in protecting bat habitat in USFWS Region 3. The No-Action Alternative would not contribute to beneficial cumulative effects since no mitigation would occur under this alternative.

3.7 AIR QUALITY AND CLIMATE

The Clean Air Act (CAA) of 1970 (42 U.S.C. §7401 et seq.) is a comprehensive federal law that regulates air emissions from stationary and mobile sources. The CAA authorizes the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare and regulate emissions of hazardous air pollutants. However, it is the responsibility of each state to develop and implement a plan for maintaining and enforcing the USEPA's established NAAQS.

We used data from the Iowa's Environmental Council (IEC), the IDNR, the American Clean Power Association (ACP), the Minnesota Pollution Control Agency (MPCA), EPA, and the U.S. Energy

Information Administration (USEIA) to assess air quality conditions and resource use relative to the Projects.

3.7.1 Affected Environment

We reviewed data from the monitoring stations closest to the Project areas: Des Moines, Waterloo, Emmetsburg, and Sioux City, Iowa for the sites in Iowa and Rochester, Minnesota for the Bent Tree Project area (IDNR 2023; MPCA 2022). All stations monitor fine particulates with a diameter of 2.5 micrometers or smaller ($PM_{2.5}$). Fine particulates are most often emitted from activities involving combustion (e.g., industrial, residential, and vehicular). Fine particulates can also form when certain gases emitted during combustion are transformed to a solid or liquid in the atmosphere. Large-scale agricultural burning or dust storms can also produce large volumes of fine particulates. Concentrations tend to be higher closer to urban areas and can fluctuate according to daily activity, such as when traffic is high, and during temperature changes throughout the day (MPCA 2022). Environmental consequences of fine particulate matter in the atmosphere can include acidic waterbodies and acid rain, change in nutrient balance in waters and soil, and damage of sensitive crops (USEPA 2023a). The NAAQS current standards for PM2.5 are 12.0 microgram per cubic meter (ug/m^3).

Annual $PM_{2.5}$ design values at the Iowa stations were 7.6 ug/m^3 (Des Moines), 7.9 ug/m^3 (Waterloo), 7.0 ug/m^3 (Emmetsburg), and 7.9 ug/m^3 (Sioux City), which all fall below the current NAAQS standards (AQB 2023). As of January 6, 2023, the EPA has a proposed decision to revise the annual $PM_{2.5}$ standard from 12.0 ug/m^3 to 9.0 to 10.0 ug/m^3 (USEPA 2023b), which the Iowa sites would still be in compliance with. The air monitoring station in Rochester, Minnesota recorded a 24-hour $PM_{2.5}$ value of 19 ug/m^3 and an annual $PM_{2.5}$ design value of 6.3 ug/m^3 from 2019 to 2021, which falls below the NAAQS.

Greenhouse gases (GHGs) are gases that warm the Earth's atmosphere by absorbing solar radiation reflected from the Earth's surface. The most common GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Scientists find that increasing GHG concentrations are warming the planet, and rising temperatures may, in turn, produce changes in precipitation patterns, storm severity, and sea level — a phenomenon commonly referred to as "climate change."

Of the 3.02 trillion kilowatt-hours (kWh) of electricity generated in 2022 at utility-scale (≥ 1 MW generating capacity) facilities in the United States, about 79% was from fossil fuels (coal, natural gas, and petroleum), about 8% was from nuclear energy, and about 13% was from renewable energy sources (USEIA 2023a).

Iowa's electrical energy is generated from renewables (65%), coal (25%), and natural gas (9%), with wind alone providing 62% of the state's electrical net generation (USEIA 2023b). Iowa ranks 3rd in the United States for installed combined wind, solar, and energy storage, with a capacity of 13,278 MW (ACP 2023b).

Minnesota's electrical energy is generated from renewables (31%), coal (27%), nuclear (24%), and natural gas (18%), with wind alone providing 23% of the state's electrical net generation (USEIA 2023c). Minnesota ranks 10th in the United States for installed combined wind, solar, and energy storage; with a capacity of 6,119 MW (ACP 2023c).

3.7.2 Environmental Consequences

3.7.2.1 Impact Criteria

The following sections analyze potential impacts of each alternative on air quality and climate. The CAA, and the CAA Amendments of 1990 established NAAQS for selected pollutants. The NAAQS established maximum levels of acceptable background pollution with a margin of safety to protect public health and welfare. Compliance with the NAAQS in Iowa is monitored by the IDNR and in Minnesota by the MPCA. The CEQ guidance requires federal agencies to consider GHG emissions and climate change when evaluating proposed actions.

3.7.2.2 Direct and Indirect Effects

Turbine operations do not generate air emissions and will not generate emissions under any of the alternatives considered. Carrying out maintenance activities under any of the alternatives is expected to require the same level of vehicle traffic resulting in carbon dioxide and particulates, but no change over the current conditions. However, these emissions are not anticipated to have a significant effect on local or regional air quality or contribute greatly to the amount of greenhouse gases. Turbine operations and maintenance activities will not generate any new sources of air pollutants. Mitigation activities will generate small amounts of emissions through the use of equipment for habitat restoration (e.g., gas powered chain saws); however, emissions are expected to be minimal and not have a significant impact on air quality or climate.

Higher cut-in speeds and longer operational curtailment periods result in less operational time and lost energy production potential. As a result, the No Action Alternative and More Restrictive Alternative would result in smaller net reductions in emissions on a regional scale than the Proposed Action, if this reduction in power production is made up by energy generation from fossil fuels. The Proposed Action is expected to produce more electricity per year due to less restrictive curtailment protocols.

Air quality and climate effects are already occurring as a result of existing Project operations and will be expected to continue throughout the operational life of the Projects, regardless of alternative. Air quality and climate effects as a result of the Whispering Willow South and Bent Tree North Projects, once built, are expected to be similar to the Projects already in operation. Therefore, none of the alternatives under consideration would have significant adverse or beneficial effects to air quality or climate conditions in Poweshiek, Franklin, Kossuth, Winnebago, Sac, Dickson, and Clay Counties, Iowa as well as in Freeborn County, Minnesota.

3.7.2.3 Cumulative Effects on Air Quality and Climate Change

Long-term trends show that air quality in the United States has improved over time with declines in air pollutant concentrations. Between 1970 and 2022, the combined emissions from six common pollutants ($PM_{2.5}$ and PM_{10}, sulfur dioxide [SO_2], oxides of nitrogen [NO_x], volatile organic compounds, carbon monoxide [CO], and lead [Pb]) dropped by 78% nationally (USEPA 2023).

Energy production and consumption trends show increasing use of clean energy sources from renewables and less-polluting sources like natural gas over coal (Table 3-16). Fossil fuels, however, still accounted for about 81% of total primary energy production in 2022 (USEIA 2023a). The majority (91.7%) of coal consumption in the United States (in 2022) was from the electric power sector (USEIA 2023d). As coal plants are retired and/or replaced with cleaner sources of energy, air quality trends are expected to experience continued improvements. Coal contribution to total energy consumption has decreased by

26% from 1950 to 2022 (USEIA 2023a). In 2022, coal consumption made up 10% (9.85 quadrillion Btu) of total U.S. energy consumption and production was 12.04 quadrillion Btu (USEIA 2023a).

Table 3-16. Energy production and consumption in the United States in 1950, 1975, 2000 and 2022 in quadrillion British thermal units (Btu) (USEIA 2023a).

Energy Source	1950		1975		2000		2022	
	Produced (quadrillion Btus)	Percent Comp.	Produced (quadrillion Btus)	Percent Comp.	Produced (quadrillion Btus)	Percent Comp.	Produced (quadrillion Btus)	Percent Comp.
Coal	14.06	40%	14.99	25%	22.73	32%	12.04	12%
Natural Gas	6.23	18%	19.64	32%	19.66	28%	37.10	36%
Crude Oil	11.45	32%	17.73	28%	12.36	17%	24.66	24%
Natural Gas Plant Liquids	0.81	2%	2.34	4%	2.55	4%	7.67	7%
Nuclear	0.00	0%	1.90	3%	7.86	11%	8.05	8%
Renewables	2.98	8%	4.69	8%	6.10	9%	13.40	13%
Total	*35.53*	*100%*	*61.29*	*100%*	*71.26*	*100%*	102.92	*100%*
Energy Source	**Consumed (quadrillion Btus)**	**Percent Comp.**	**Consumed (quadrillion Btus)**	**Percent Comp.**	**Consumed (quadrillion Btus)**	**Percent Comp.**	**Consumed (quadrillion Btus)**	**Percent Comp.**
Coal	12.35	36%	12.66	18%	22.58	23%	9.85	10%
Natural Gas	5.97	17%	19.95	28%	23.82	24%	33.41	33%
Petroleum	13.30	38%	32.70	46%	38.15	39%	35.85	36%
Nuclear	0.00	0%	1.90	3%	7.86	8%	8.05	8%
Renewables	2.98	9%	4.69	7%	6.10	6%	13.18	13%
Total	*34.60*	*100%*	*71.9*	*100%*	*98.51*	*100%*	*100.34*	*100*

Neither Iowa nor Minnesota produces crude oil, natural gas, or coal (USEIA 2023b, 2023c). In Iowa, coal production ended in the 1990s, but the state still possesses an estimated 1.1 billion tons of coal reserves.

In 2022, Iowa ranked 16th nationwide in coal use for electricity generation. Petroleum is mostly used by the transportation sector (about 75%) and Iowa is ranked 4th nationwide in hydrocarbon gas liquid consumption (USEIA 2023b). Natural gas accounts for approximately 1/4th of the total energy consumed in Iowa, mostly by the industrial sector (58%) (USEIA 2023b).

In Minnesota, ninety percent of the coal received is used for electrical power generation; however, the state's coal-fired generating capacity is set to decrease as 60% is scheduled for retirement by 2034. Per capita petroleum consumption in Minnesota is less than half of other states, with the transportation sector consuming most of what is used in the state (71%) (USEIA 2023c). One-fourth of the natural gas that passes through the state is consumed by the state, with the industrial sector accounting for 33% of state consumption. Approximately 20% of the natural gas goes to the electrical sector, with natural gas power generation substantially increasing over the past decade (USEIA 2023c).

In renewables, Iowa ranks as the top ethanol-producing state in the U.S. (1/4th of the U.S.'s total ethanol fuel production capacity), has the nation's largest biodiesel production capacity (1/5th of the nation's total capacity), is the second-largest wind power producer, and has managed to far exceed the RPS goals in in-state capacity from eligible renewable resources. In 2022, almost 33% of the total net electrical generation were powered by renewable resources, primarily wind (62%). The number of wind and solar farms are expected to increase in the coming years with most wind power to be generated in northwestern Iowa and solar in southwestern Iowa. Three percent of electrical generation in 2022 was from other renewable sources such as hydroelectric power, solar energy, and biomass (USEIA 2023b).

In Minnesota, renewables accounted for 31% of total in-state net electricity generation in 2022 followed by coal (27%), nuclear (24%), and natural gas (18%). Coal-fired plants moved fell from being the largest provider of net generation to below renewables and nuclear power in 2020 and then overtake nuclear the next year. In 2022 wind power provided 23% of the state's electrical net generation and accounted for more than 75% of the renewable generation. Wind power has almost doubled in size over the past decade and Minnesota now ranks eight in the U.S. in wind capacity, accounting for 3% of the nation's total. Maximum potential for wind power can be found in the southwestern part of the state. Among other renewable sources, biomass accounted for 2% of the total electrical generation (7% of renewable generation) and hydroelectric power accounted for 1% (4% renewable generation) despite the state's many water sources (USEIA 2023c).

The differences in alternatives considered in the EA do not significantly affect the Projects' contribution of renewable energy to each state or to the nation toward reducing GHG emissions. The first Project became operational in 2009 and each Project has been contributing toward the reductions and trends discussed above since it became operational.

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5.0 REFERENCES

Air Quality Bureau (AQB). 2023. Iowa Ambient Air Monitoring 2023 Network Plan. Iowa Department of Natural Resources. https://www.iowadnr.gov/Portals/idnr/uploads/air/monitoring/Network_Plan_2023.pdf

Amelon, S., and D. Burhans. 2006. Conservation Assessment: *Myotis septentrionalis* (northern long-eared bat) in the eastern United States. Pages 69-82 in F.R. Thompson, III, editor. Conservation assessments for five forest bat species in the eastern United States. General Technical Report NC-260, Technical Guide. U.S. Department of Agriculture, Forest Service, North Central Research Station, Columbia, Missouri, USA.

Arnett, E.B., W.K. Brown, W.P. Erickson, J.K. Fiedler, B.L. Hamilton, T.H. Henry, A. Jain, G.D. Johnson, J. Kerns, R.R. Koford, C.P. Nicholson, T.J. O'Connell, M.D. Piorkowski, and R.D. Tankersley. 2008. Patterns of bat fatalities at wind energy facilities in North America. Journal of Wildlife Management 72: 61-78.

Arnett, E.B., M.M.P. Huso, M.R. Schirmacher, and J.P. Hayes. 2011. Altering turbine speed reduces bat mortality at wind-energy facilities. Frontiers in Ecology and the Environment 9(4): 209-214.

Arnett, E. B. and E. F. Baerwald. 2013. Impacts of Wind Energy Development on Bats: Implications for Conservation. Pp. 435-456. *In*: R. A. Adams and S. C. Pederson, eds. Bat Ecology, Evolution and Conservation. Springer Science Press, New York.

Arnett, E. B., G. D. Johnson, W. P. Erickson, and C. D. Hein. 2013. A Synthesis of Operational Mitigation Studies to Reduce Bat Fatalities at Wind Energy Facilities in North America. A report submitted to the National Renewable Energy Laboratory (NREL), Golden, Colorado. Bat Conservation International (BCI), Austin, Texas. March 2013. Available online: https://www.energy.gov/sites/prod/files/2015/03/f20/Operational-Mitigation-Synthesis-FINAL-REPORT-UPDATED.pdf

American Clean Power Association (ACP). 2023a. Wind Energy in Iowa. Retrieved from https://cleanpower.org/wp-content/uploads/2022/08/StateFactSheet_Iowa.pdf

ACP. 2023b. Clean power state-by-state: Clean Power Iowa. Available at: https://cleanpower.org/facts/state-fact-sheets/. Updated September 2023.

ACP. 2023c. Clean power state-by-state: Clean Power Minnesota. Available at: https://cleanpower.org/facts/state-fact-sheets/. Updated September 2023.

Arnold, A. 2022. *Summary of Results of 2020 and 2021 Acoustic Smart Curtailment Study at the English Farms Wind Energy Facility* [Memorandum].

Auer, S. K., & Martin, T. E. 2013. Climate change has indirect effects on resource use and overlap among coexisting bird species with negative consequences for their reproductive success. *Global Change Biology*, *19*(2), 411-419.

Alliant Energy Wisconsin Power and Light Company (Alliant). 2023a. Bent Tree Bird and Bat Conservation Strategy. Bent Tree Wind Energy Facility, Freeborn County, Minnesota. May 19, 2023.

References

Alliant Energy Interstate Power and Light Company (Alliant). 2023b. English Farms Bird and Bat Conservation Strategy. English Farms Wind Energy Facility, Poweshiek County, Iowa. May 19, 2023.

Alliant Energy Interstate Power and Light Company (Alliant). 2023c. Golden Plains Bird and Bat Conservation Strategy. Golden Plains Wind Energy Facility, Kossuth and Winnebago Counties, Iowa. May 19, 2023.

Alliant Energy Wisconsin Power and Light Company (Alliant). 2023d. Kossuth Bird and Bat Conservation Strategy. Kossuth Wind Energy Facility, Kossuth County, Iowa. May 19, 2023.

Alliant Energy Interstate Power and Light Company (Alliant). 2023e. Richland Bird and Bat Conservation Strategy. Richland Wind Energy Facility, Sac County, Iowa. May 19, 2023.

Alliant Energy Interstate Power and Light Company (Alliant). 2023f. Whispering Willow East / Franklin County Bird and Bat Conservation Strategy. Whispering Willow East and Franklin County Wind Energy Facilities, Franklin County, Iowa. May 19, 2023.

Alliant Energy Interstate Power and Light Company (Alliant). 2020g. Whispering Willow North Bird and Bat Conservation Strategy. Whispering Willow North Wind Energy Facility, Franklin County, Iowa. May 19, 2023.

Alliant Energy Interstate Power and Light Company (Alliant). 2023h. Upland Prairie Bird and Bat Conservation Strategy. Upland Prairie Wind Energy Facility, Clay and Dickinson Counties, Iowa. May 19, 2023.

American Wind Wildlife Institute (AWWI). 2018. Bats and Wind Energy: Impacts, Mitigation, and Tradeoffs. Washington, DC. Available at www.awwi.org.

AWWI. 2020. AWWI Technical Report: 2nd Edition: Summary of Bird Fatality Monitoring Data Contained in AWWIC. Washington, DC. Available at www.awwi.org. © 2020 American Wind Wildlife Institute.

Baerwald, E.F., G.H. D'Amours, B.J. Klug, and R.M.R. Barclay. 2008. Barotrauma is a significant cause of bat fatalities at wind turbines. Current Biology 18: R695-R696.

Baerwald, E. F., J. Edworthy, M.Holder, and R. M. R. Barclay. 2009. A large-scale mitigation experiment to reduce bat fatalities at wind energy facilities. Journal of Wildlife Management 73:1077-1081.

Barbour, R. W., and W. H. Davis. 1969. Bats of America. University of Kentucky Press, Lexington, Kentucky, USA.

Bat Conservation International (BCI). 2015. WHITE-NOSE SYNDROME CONFIRMED IN IOWA; MORE THAN HALF OF ALL US STATES NOW AFFECTED. 4/16/15. Retrieved from https://www.batcon.org/press/white-nose-syndrome-confirmed-in-iowa-more-than-half-of-all-us-states-now-affected/ Accessed: March 2024.

Bat Conservation International (BCI). 2024. Species profiles: Iowa and Minnesota. https://www.batcon.org/about-bats/bat-profiles/?fwp_location=iowa%2Cminnesota. Accessed: January 2024.

Brack, V., and J. O. Whitaker. 2001. Foods of the northern myotis, *Myotis septentrionalis*, from Missouri and Indiana, with notes on foraging. Acta Chiropterologica 3: 203-210.

Bellard, C., Bertelsmeier, C., Leadley, P., Thuiller, W., & Courchamp, F. 2012. Impacts of climate change on the future of biodiversity. *Ecology letters*, 15(4), 365-377.

References

Bennett, V. J. and A. M. Hale. 2018. Resource Availability May Not Be a Useful Predictor of Migratory Bat Fatalities or Activity at Wind Turbines. Diversity 10(2): doi: 10.3390/d10020044.

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell). 2017. Bat Survey Report, Whispering Willow North and South Wind Farms. December 1, 2017.

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell). 2018a. Bat Acoustic Survey Report: Kossuth Wind Project. Report. Prepared for Alliant Energy. Prepared by Burns & McDonnell, Kansas City, Missouri. September 7, 2018.

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell). 2018b. Bat Call Analysis for the Richland Wind Energy Facility. Prepared for Alliant Energy. Prepared by Burns & McDonnell, Kansas City, Missouri. September 7, 2018.

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell). 2020a. Post-Construction Small Bird and Bat Mortality Survey Report. Prepared for Alliant Energy, Interstate Power and Light Company, English Farms Wind Energy Facility, Poweshiek County, Iowa. Prepared by Burns & McDonnell, Kansas City, Missouri. Version 2.0. January 28, 2020.

Burns & McDonnell. 2020b. Small Bird and Bat Post-Construction Mortality Monitoring Report. Prepared for Alliant Energy, Interstate Power and Light Company, English Farms Wind Energy Facility, Poweshiek County, Iowa. Prepared by Burns & McDonnell, Kansas City, Missouri. Version 1.0. December 9, 2020.

Burns & McDonnell. 2021. Year 3 Small Bird and Bat Post-Construction Mortality Monitoring Report. Prepared for Alliant Energy, Interstate Power and Light Company, English Farms Wind Energy Facility, Poweshiek County, Iowa. Prepared by Burns & McDonnell, Kansas City, Missouri. Version 1.0. November 8, 2021.

Burns & McDonnell. 2022. Year 4 Small Bird and Bat Post-Construction Mortality Monitoring Report. Prepared for Alliant Energy, Interstate Power and Light Company, English Farms Wind Energy Facility, Poweshiek County, Iowa. Prepared by Burns & McDonnell, Kansas City, Missouri. Version 1.0. DRAFT November 10, 2022.

Bureau of Land Management (BLM). 2018. Environmental Assessment. Revised Avian and Bat Protection Plan for Spring Valley Wind Energy Facility. Prepared by the BLM, Ely District Office, Nevada. May 2018. DOI-BLM-NV-L060-2017-0022-EA. Available online: https://eplanning.blm.gov/public_projects/nepa/106509/144550/178155/Spring_Valley_Wind_ABPP_Final_EA_-May_2018.pdf

Caceres, M. C., and R. M. Barclay. 2000. *Myotis septentrionalis*. Mammalian Species No. 634. American Society of Mammalogists, Lawrence, Kansas, USA. 12 May 2000.

Caire, W., R. K. LaVal, M. L. LaVal, and R. Clawson. 1979. Note on the ecology of *Myotis keenii* in eastern Missouri. American Midland Naturalist 102: 404-407.

Cavitt. J.F. and Martin, T.E. 2002. Effects of forest fragmentation on brood parasitism and nest predation in eastern and western landscapes. Studies in Avian Biology, Issue 25. Conference Paper. 7 pp.

Cheng, T. L., J. D. Reichard, J. T. H. Coleman, T. J. Weller, W. E. Thogmartin, B. E. Reichert, A. B. Bennett, H. G. Broders, J. Campbell, K. Etchison, D. J. Feller, R. Geboy, T. Hemberger, C. Herzog, A. C. Hicks, S. Houghton, J. Humber, J. A. Kath, R. A. King, S. C. Loeb, A. Massé, K. M. Morris, H. Niederriter, G. Nordquist, R. W. Perry, R. J. Reynolds, D. B. Sasse, M. R. Scafini, R. C. Stark, C. W. Stihler, S. C. Thomas, G. G. Turner, S. Webb, B. J. Westrich, and W. F. Frick. 2021. The Scope and

Severity of White-Nose Syndrome on Hibernating Bats in North America. Conservation Biology: doi: 10.1111/cobi.13739.

Center for Biological Diversity and Defenders of Wildlife. 2016. Petition to list the tricolored bat *Perimyotis subflavus* as threatened or endangered under the Endangered Species Act. https://ecos.fws.gov/docs/tess/petition/61.pdf. June 14, 2016.

Cope, J. B., and S. R. Humphrey. 1977. Spring and autumn swarming behavior in the Indiana bat, *Myotis sodalis*. Journal of Mammalogy 58: 93-95.

Cryan, P. M. 2008. Mating behavior as a possible cause of bat fatalities at wind turbines. Journal of Wildlife Management 72: 845-849.

Cryan, P. M. and R. M. R. Barclay. 2009. Causes of Bat Fatalities at Wind Turbines: Hypotheses and Predictions. Journal of Mammalogy 90(6): 1330-1340. doi: 10.1644/09-MAMM-S-076R1.1.

Cryan, P. M., P. M. Gorresen, C. D. Hein, M. R. Schirmacher, R. H. Diehl, M. M. Huso, D. T. S. Hayman, P. D. Fricker, F. J. Bonaccorso, D. H. Johnson, K. Heist, and D. C. Dalton. 2014. Behavior of Bats at Wind Turbines. Proceedings of the National Academy of Sciences 111(42): 15126-15131. doi: 10.1073/pnas.1406672111.

Database of State Incentives for Renewables & Efficiency (DSIRE). 2023a. Alternative Energy Law (AEL). N.C. Clean Energy Technology Center. Accessed at https://programs.dsireusa.org/system/program/detail/265. Accessed January 2024.

Database of State Incentives for Renewables & Efficiency (DSIRE). 2023b.Renewable Energy Standard. N.C. Clean Energy Technology Center. Accessed at: https://programs.dsireusa.org/system/program/detail/2401. November 8, 2023. Accessed January 2024.

de Jong, J., L. Millon, O. Håstad, and J. Victorsson. 2021. Activity Pattern and Correlation between Bat and Insect Abundance at Wind Turbines in South Sweden. Animals 11(11): e3269. doi: 10.3390/ani11113269.

Dionne, M., C. Maurice, J. Gauthier, and F. Shaffer. 2008. Impact of Hurricane Wilma on migrating birds: the case of the Chimney Shift. The Wilson Journal of Ornithology 120:784-792.

Dobony, C.A., Hicks, A.C., Langwig, K.E., von Linden, R.I., Okoniewski, J.C., and Rainbolt, R.E. 2011. Journal of Fish and Wildlife Management 2(2):190-195. December 1, 2011.

DSIRE. 2020. Programs: Iowa. NC Clean Energy Technology Center, NC State University. https://programs.dsireusa.org/system/program/ia#:~:text=Iowa's%20Renewable%20Portfolio%20Standard&text=Iowa's%20RPS%20requires%20a%20minimum,Energy%20Interstate%20Power%20and%20Light. Accessed March 2024.

DSIRE. 2023. Renewable Energy Standard: Minnesota. NC Clean Energy Technology Center, NC State University. https://programs.dsireusa.org/system/program/detail/2401. Accessed March 2024.

Ecology and Environment, Inc. 2016. Bat Acoustical Monitoring Report for the Proposed English Farms Wind Project, Poweshiek County, Iowa. Prepared for English Farms Wind Project, LLC, Southlake Technology Park, Lenexa, Kansas. Prepared by Ecology and Environment, Inc. Arlington, Virginia. March 2016.

Ehlman, S.M., J.J. Cox, and P.H. Crowley. 2013. Evaporative water loss, spatial distributions, and survival in white-nose-syndrome-affected little brown myotis: a model. Journal of Wildlife Mammalogy 94:572-583.

Erickson, W.P., G.D. Johnson, M.D. Strickland, D.P. Young, K.J. Sernka, and R.E. Good. 2001. Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States. A National Wind Coordinating Committee (NWCC) Resource Document. August 2001.

Erickson, W.P., G.D. Johnson, D.P. Young, M.D. Strickland, R.E. Good, M. Bourassa, K. Bay, and K.J. Sterna. 2002. Synthesis and comparison of baseline avian and bat use, raptor nesting and mortality information from proposed and existing wind developments. Final report prepared for Bonneville Power Administration, Portland, Oregon. WEST, Inc., Cheyenne, Wyoming. 124 pp.

Erickson, W.P., M.M. Wolfe, K.J. Bay, D.H. Johnson, and J.L. Gehring. 2014. A comprehensive analysis of small-passerine fatalities from collision with turbines at wind energy facilities. PLoS ONE. 9(9): e107491.

Feldhamer, G.A., T.C. Carter, and J.O. Whitaker, Jr. 2009. Prey consumed by eight species of insectivorous bats from southern Illinois. American Midland Naturalist 162: 43-51.

Feldhamer, G.A., Hofmann, J.A., Carter, T.C., and Kath, J.A. 2015. Bats of Illinois. Indiana State University Center for Bat Research, Outreach and Conservation. Terre Haute, Indiana. 84 pp.

Fenton, B. and Barclay, R.M.R. 1980. *Myotis lucifugus*. Mammalian Species 142(142).

Fernández-Bellon, D., Wilson, M.W., Irwin, S. and O'Halloran, J. 2019. Effects of development of wind energy and associated changes in land use on birds densities in uplands areas. Conservation Biology 33(2):413-422.

Fitch, J. H., and K. A. Shump. 1979. *Myotis septentrionalis*. Mammalian Species No. 121. American Society of Mammalogists, Lawrence, Kansas, USA. 8 June 1979.

Fleming, T. H., and P. Eby. 2003. Ecology of bat migration. Pages 156-197 in T. H. Kunz and M. B. Fenton, editors. Bat ecology. The University of Chicago Press, Chicago, Illinois, USA.

Frick, W.F., D.S. Reynolds, and T.H. Kunz. 2010. Influence of climate and reproductive timing on demography of little brown Myotis *lucifugus*. Journal of Animal Ecology 79: 128-136.

Frick, W.F., Baerwald, E.F., Pollock, J.F., Barclay, R.M.R., Szymanski, J.A., Weller, T.J., Russel, A.L., Loeb, S.C., Medellin, R.A., and McGuire, L.P. 2017. Fatalities at wind turbines may threaten population viability of a migratory bat. Biological Conservation 209:172-177. February 2017.

Foo, C. F., V. J. Bennett, A. M. Hale, J. M. Korstian, A. J. Schildt, and D. A. Williams. 2017. Increasing Evidence That Bats Actively Forage at Wind Turbines. PeerJ 5: e3985. doi: 10.7717/peerj.3985.

Foster, R., and A. Kurta. 1999. Roosting ecology of the northern bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). Journal of Mammalogy 80(2): 659-672.

Fujita, M. and Kunz, T.H. 1984. *Pipistrellus subflavus*. Mammalian Species, 228:1-6.

Gagnon, P., A. Pham, W. Cole, S. Awara, A. Barlas, M. Brown, P. Brown, V. Carag, S. Cohen, A. Hamilton, J. Ho, S. Inskeep, A. Karmakar, L. Lavin, A. Lopez, T. Mai, J. Mowers, M. Mowers, C. Murphy, P. Pinchuk, A. Schleifer, B. Sergi, D. Steinberg, and T. Williams. 2023. 2023 Standard Scenarios Report: A U.S. Electricity Sector Outlook. Golden, Colorado. NREL/TP-6A40-87724. National

Renewable Energy Laboratory. Revised January 2024. Available online: https://www.nrel.gov/docs/fy24osti/87724.pdf.

Golden Plains Wind Energy Facility (GPWEF). 2023. Golden Plains Bird and Bat Conservation Strategy, Kossuth and Winnebago Counties, Iowa. May 2023.

Gardner, J.E., Hofmann, J.E., and Garner, J.D. 1996. Summer distribution of the federally endangered Indiana bat (*Myotis sodalis*) in Illinois. Transactions of the Illinois State Academy of Science 89: 187-196.

Good, R. E, W. Erickson, A. Merrill, S. Simon, K. Murray, K. Bay, and C. Fritchman. 2011. Bat monitoring studies at the Fowler Ridge Wind Farm, Benton County, Indiana. April 1-October 31, 2010. Western EcoSystems Technology, Inc. Cheyenne, Wyoming, USA. 28 January 2011.

Good, R. E., A. Merrill, S. Simon, K. Murray, and K. Bay. 2012. Bat monitoring studies at the Fowler Ridge Wind Farm, Benton County, Indiana. April 1-October 31, 2011. Western EcoSystems Technology, Inc. Bloomington, Indiana, USA. 31 January 2012.

Griffin, D. R. 1940. Notes on the life histories of New England cave bats. Journal of Mammalogy 21: 181-187.

Guest, E. E., B. F. Stamps, N. D. Durish, A. M. Hale, C. D. Hein, B. P. Morton, S. P. Weaver, and S. R. Fritts. 2022. An Updated Review of Hypotheses Regarding Bat Attraction to Wind Turbines. Animals 12(3): 343. doi: 10.3390/ani12030343.

Hamilton, D., S. Simon, and A. Kreger. 2017. Raptor Nest Survey. Golden Plains Wind Energy Project, Kossuth and Winnebago Counties, Iowa. Prepared for EDF Renewable Energy, Philadelphia, Pennsylvania. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. November 3, 2017.

Hoen, B.D., Diffendorfer, J.E., Rand, J.T., Kramer, L.A., Garrity, C.P., and Hunt, H.E., 2018, United States Wind Turbine Database (ver. 6.1, November 2023): U.S. Geological Survey, American Clean Power Association, and Lawrence Berkeley National Laboratory data release, https://doi.org/10.5066/F7TX3DN0.

Hein, C. D., A. Prichard, T. Mabee, and M. R. Schirmacher. 2013. Effectiveness of an Operational Mitigation Experiment to Reduce Bat Fatalities at the Pinnacle Wind Farm, Mineral County, West Virginia, 2012. Bat Conservation International, Austin, Texas, and ABR, Inc., Forest Grove, Oregon. April 2013.

Hein, C. D., A. Prichard, T. Mabee, and M. R. Schirmacher. 2014. Efficacy of an Operational Minimization Experiment to Reduce Bat Fatalities at the Pinnacle Wind Farm, Mineral County, West Virginia, 2013. Final Report. An annual report submitted to Edison Mission Energy and the Bats and Wind Energy Cooperative. Bat Conservation International, Austin, Texas. February 2014.

Hofmann, J.E. 2008. Field manual of Illinois mammals. Illinois Natural History Survey Manual 12. Illinois Natural History Survey, Champaign. 358 pp.

Horn, J.W., E.B. Arnett and T.H. Kunz. 2008. Behavioral responses of bats to operating wind turbines. Journal of Wildlife Management 72(1): 123-132.

Humphrey, S.R. and Cope, J.B. 1976. Population ecology of the little brown bat, *Myotis lucifugus*, in Indiana and north-central Kentucky. Spec. Publ., Ameri. Soc. Mamm. 4:1-81.

Illán, J. G., Thomas, C. D., Jones, J. A., Wong, W. K., Shirley, S. M., & Betts, M. G. 2014. Precipitation and winter temperature predict long-term range-scale abundance changes in Western North American birds. *Global Change Biology*, *20*(11), 3351-3364.

Iowa Department of Agriculture and Land Stewardship (IDALS). 1999. Fox River Water Quality Project. Accessed March 2024. https://iowaagriculture.gov/water-resources-bureau/fox-river-water-quality-project.

IDALS. 2007. Price Creek Watershed Project. Accessed March 2024. https://iowaagriculture.gov/water-resources-bureau/price-creek-watershed-project.

Iowa Department of Natural Resources (IDNR). 2015a. Iowa's Wildlife Action Plan: Chapter four: Habitats of Species of Greatest Conservation Need. Accessed December 2023. https://www.iowadnr.gov/Portals/idnr/uploads/Wildlife%20Stewardship/iwap/IWAP_chap04.pdf.

IDNR. 2015b. Iowa's Wildlife Action Plan: Chapter eight: Priorities for Conservation Actions. Accessed March 2024. https://www.iowadnr.gov/portals/idnr/uploads/Wildlife%20Stewardship/iwap_chap8.pdf.

IDNR. 2023. Iowa's 2023 Forest Health Highlights. Forest Health Program. December 2023. https://www.iowadnr.gov/Portals/idnr/uploads/forestry/Forest%20Health/foresthealthhighlights2023.pdf

IDNR. 2024. Iowa Natural Areas Inventory Query Interactive Mapping, Natural Areas Inventory. Available at: https://programs.iowadnr.gov/naturalareasinventory/pages/Query.aspx (Accessed: 18 March 2024).

State Historical Society of Iowa (SHSI). 2023. Changes in Land Use. Department of Administrative Services. https://history.iowa.gov/history/education/educator-resources/primary-source-sets/changes-land-use. Accessed December 2023.

Iowa Environmental Council (IEC). 2023. Iowa's Electric Generation: Condition of the State 2023. https://www.iaenvironment.org/webres/File/Program%20Publications/iowa_electric_generation_2023_final.pdf. Accessed December 2023.

Iowa State University. 2019. Iowa Bats. Available at: https://store.extension.iastate.edu/product/15456-PDF Accessed: January 2024.

IUCN. 2024. The IUCN Red List of Threatened Species. Version 2023-1. https://www.iucnredlist.org. Accessed on 5 January 2024.

Ingersoll, T.E., Sewall, B.J., and Amelon, S.K. 2013. Improved analysis of long-term monitoring data demonstrates marked regional declines of bat populations in the eastern United States. PLoS One 8(6):e65907. June 21, 2013.

Iskali, G., J. Lombardi, R. Clark, and K. DuBridge. 2019. Post-Construction Monitoring for the Kelly Creek Wind Farm, Kankakee and Ford Counties, Illinois. Final Report: August 1 – October 12, 2018. Prepared for Kelly Creek Wind, LLC, San Diego, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. March 15, 2019.

Johnson, G.D., M.K. Perlik, W.P. Erickson and M.D. Strickland. 2004. Bat Activity, Composition and Collision Mortality at a Large Wind Plant in Minnesota. Wildlife Society Bulletin 32(4): 1278-1288.

Johnson, D.H., S.R. Loss, K.S. Smallwood, and W.P. Erickson. 2016. Avian fatalities at wind energy faciltiies in North America: a comparison of recent approaches. Human-Wildlife Interactions 10(1):7-18.

Jung, K., 2009. Effects of Urbanization on Neotropical Aerial Insectivorous Bats. University of Ulm, Germany, Ulm.

Kossuth Wind Energy Facility (KWEF). 2023. Kossuth Bird and Bat Conservation Strategy, Kossuth County, Iowa. May 2023.

Kerlinger, P. 1995. How Birds Migrate. Stackpole Books. Mechanicsburg, PA.

Kerlinger, P. 2002. An Assessment of the Impacts of the Green Mountain Power Corporation's Wind Power Facility on Breeding and Migrating Birds in Searsburg, Vermont. Prepared for the Vermont Department of Public Service Montpelier, Vermont. Prepared by Curry & Kerlinger, LLC. March 2002.

Kunz, T.H., Wrazen, J.A., and Burnett, C.D. 1998. Changes in body mass and fat reserves in pre-hibernating little brown bats (*Myotis lucifugus*). Ecoscience 5:8-17.

Kunz, T.H., E.B. Arnett, B.M. Cooper, W.P. Erickson, R.P. Larkin, T. Mabee, M.L. Morrison, M.D. Strickland, and J.M. Szewczak. 2007a. Assessing impacts of wind-energy development on nocturnally active birds and bats: a guidance document. Journal of Wildlife Management 71: 2449-2486.

Kunz, T.H., E.B. Arnett, W.P. Erickson, A.R. Hoar, G.D. Johnson, R.P. Larkin, M.D., Strickland, R.W. Thresher, and M.D. Tuttle. 2007b. Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. Frontiers in Ecology and the Environment 5: 315-324.

Kunz, T. H., & Reichard, J. D. 2010. Status review of the little brown myotis (*Myotis lucifugus*) and determination that immediate listing under the Endangered Species Act is scientifically and legally warranted. *Boston University, Boston, MA*.

Lacki, M.J., and J.H. Schwierjohann. 2001. Day-roost characteristics of northern bats in mixed mesophytic forest. Journal of Wildlife Management 65: 482-488.

Langwig, K.E., Frick, W.F., Bried, J.T., Hicks, A.C., Kunz, T.H., and Kilpatrick, A.M. 2012. Sociality, density-dependence and microclimates determine the persistence of populations suffering from a novel fungal disease, white-nose syndrome. Ecology Letters 15:1050-1057.

Langwig, K.E., Hoyt, J.R., Parise, K.L., Frick, W.F., Foster, J.T., and Kilpatrick, A.M. 2017. Resistance in persisting bat populations after white-nose syndrome invasion. Philosophical Transactions of the Royal Society B, 372:20160044.

Lawson, M., D. Jenne, R. Thresher, D. Houck, J. Wimsatt, and B. Straw. 2020. An Investigation into the Potential for Wind Turbines to Cause Barotrauma in Bats. PLoS ONE 15(12): e0242485. doi: 10.1371/journal.pone.0242485.

Leddy, K. L., K. F. Higgins, and D. E. Naugle. 1999. Effects of wind turbines on upland nesting birds in Conservation Reserve Program grasslands. Wilson Bulletin 111: 100–104.

Longcore, T., Rich, C., Mineau, P., MacDonald, B., Bert, D.G., Sullivan, L.M., Mutrie, E., Gauthreaux, Jr., S.A., Avery, M.L., Crawford, R.L., Manville II, A.M., Travis, E.R., Drake, D. 2012. An estimate of avian mortality at communication towers in the United States and Canada. PLoS ONE 7(4): e34025. April 2012.

Loss, S.R., Will, T., and Marra, P.P. 2013a. The impact of free-ranging domestic cats on wildlife of the United States. Nat. Comm. 4: 1396.

Loss, S.R., Will, T., and Marra, P.P. 2013b. Estimates of bird collision mortality at wind farms in the contiguous United States. Biol. Cons. 168: 201-209.

Loss, S.R., Will, T., Loss, S.S., and Marra, P.P. 2014a. Bird-building collisions in the United States: estimates of annual mortality and species vulnerability. Condor 16: 8-23.

Loss, S.R., Will, T., and Marra, P.P. 2014b. Estimation of annual bird mortality from vehicle collisions on roads in the United States. Journal of Wildlife Management 78: 763-771.

Loss, S.R., Will, T., and Marra, P.P. 2014c. Refining estimates of bird collision and electrocution mortality at power lines in the United States. PLoS ONE 9: e101565.

Loss, S.R., Will, T., and Marra, P.P. 2015. Direct mortality of birds from anthropogenic causes. *Annual Review of Ecology, Evolution, and Systematics* 46:99-120. December 2015.

Merriman, J. 2021. How Many Birds Are Killed by Wind Turbines?. American Bird Conservancy. Available at: https://abcbirds.org/blog21/wind-turbine-mortality/. Accessed: January 2024.

Mac Nally, R., Bennett, A. F., Thomson, J. R., Radford, J. Q., Unmack, G., Horrocks, G., & Vesk, P. A. 2009. Collapse of an avifauna: climate change appears to exacerbate habitat loss and degradation. *Diversity and Distributions*, *15*(4), 720-730.

Marques, A.T., H. Batalha, S. Rodriques, H. Costa, M.J.R. Pereira, C. Fonseca, M. Mascarenhas, and J. Bernardino. 2014. Understanding bird collisions at wind farms: an updated review on the causes and possible mitigation strategies. Biological Conservation 179(2014): 40-52.

Martin, C., E. Arnett, and M. Wallace. 2013. Evaluating Bird and Bat Post-Construction Impacts at the Sheffield Wind Facility, Vermont, 2012 Annual Report. Prepared for Bat Conservation International and First Wind. March 25, 2013.

Maslo, B., Valent, M., Gumbs, J.F., and Frick, W.F. 2015. Conservation implications of ameliorating survival of little brown bats with white-nose syndrome. Ecological Applications 25(7):1832-1840.

MidAmerican Energy Company (MEC). 2019. Final Habitat Conservation Plan MidAmerican Energy Company Iowa Wind Energy Project Portfolio. April 2019. Available at: https://ecos.fws.gov/docs/plan_documents/thcp/thcp_2970.pdf.

Miles, Patrick D.; Kepler, Dennis. 2017. Forest of Minnesota, 2015. Resource Update FS-105. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 4 p.

Mineau, P. 2005. Direct losses of birds to pesticides – beginnings of a quantification. U.S. Department of Agriculture, U.S. Forest Service. Gen. Tech. Report PSW-GTR-191.2005.

Minnesota Board of Water and Soil Resources (BWSR). 2023. One Watershed, One Plan. Accessed March 2024. https://bwsr.state.mn.us/one-watershed-one-plan.

Minnesota Department of Commerce. 2023. Wind Energy Data & Info. Retrieved from https://mn.gov/commerce/energy/solar-wind/wind-energy-data-info/

Minnesota Department of Natural Resources (MDNR). 2016. Minnesota's Wildlife Action Plan 2015-2025. Accessed March 2024. https://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/mnwap/wildlife-action-plan-2015-2025.pdf.

References

Minnesota Department of Natural Resources (MDNR). 2023a. Rare Species Guide. Retrieved from https://www.dnr.state.mn.us/rsg/index.html. Accessed January 2024.

MDNR. 2023b. Bats of Minnesota. Retrieved from https://www.dnr.state.mn.us/mammals/bats.html#:~:text=WNS%20was%20first%20confirmed%20in,has%20declined%20by%20over%2090%25. Accessed March 2024.

Minnesota IT Services Geospatial Information Office. Freeborn County Land Use and Cover: State of Minnesota 1988-1990 map. Accessed December 2023. https://www.mngeo.state.mn.us/maps/LandUse/lu_free.pdf.

Minnesota Pollution Control Agency (MPCA). 2022. 2023 Air Monitoring Network Plan for Minnesota. https://www.pca.state.mn.us/sites/default/files/aq10-21a.pdf

Minnesota State Demographic Center. 2020. Our Projections population projections dataset. Available at Data by Topic: Our Projections / MN State Demographic Center

Moosman, P.R., H.H. Thomas, and J.P. Veilleux. 2012. Diet of the widespread insectivorous bats *Eptesicus fuscus* and *Myotis lucifugus* relative to climate and richness of bat communities. Journal of Mammology 93(2): 491-496.

National Renewable Energy Laboratory (NREL). 2023. Scenario Viewer: Data Downloader—Standard Scenarios 2023. NREL, U.S. Department of Energy. December 2023 updated January 2024. Accessed February 2024. Available online: https://scenarioviewer.nrel.gov/

Natural Resources Consulting, Inc. (NRC). 2008. Pre-Construction Bird Survey. Prepared for Alliant Energy. Prepared by NRC.

North American Bird Conservation Initiative (NABCI). 2022. The State of the Birds, United States of America, 2022. https://www.stateofthebirds.org/2022/wp-content/uploads/2022/10/state-of-the-birds-2022-spreads.pdf. Accessed January 2024.

O'Shea, T.J., L.E. Ellison, and T.R. Stanlety. 2011. Adult survival and population growth rate in Colorado big brown bats (*Eptesicus fuscus*). Journal of Mammalogy 92: 433-443.

Owen, S.F., M.A. Menzel, W.M. Ford, B.R. Chapman, K.V. Miller, J.W. Edwards, and P.B. Wood. 2003. Home-range size and habitat used by the northern Myotis (*Myotis septentrionalis*). American Midland Naturalist 150: 352-359.

Packett, D.L. and Dunning, Jr., J.B. 2009. Stopover habitat selection by migrant landbirds in a fragmented forest-agricultural landscape. The Auk, 126(3): 579-589. July 1, 2009.

Partners in Flight. 2020. Population Estimates Database, version 3.1. Available at http://pif.birdconservancy.org/PopEstimates. Accessed on January 5, 2024.

Perry, R. W., and R. E. Thill. 2007. Roost selection by male and female northern long-eared bats in a pine-dominated landscape. Forest Ecology and Management 247: 220-226.

Peterson, T.S., B. McGill, C.D. Hein, and A. Rusk. 2021. Acoustic exposure to turbine operation quantifies risk to bats at commercial wind energy facilities. Wildlife Society Bulletin 45(4):552–565. DOI:10.1002/wsb.1236.

Pettit, J.L. and O'Keefe, J.M. 2017. Impacts of white-nose syndrome observed during long-term monitoring of a midwestern bat community. Journal of Fish and Wildlife Management 8(1):69-79.

Pickle, J. and N. O'Neil. 2021a. Post-Construction Bird and Bat Fatality Monitoring Study, Bent Tree Wind Energy Facility, Freeborn County, Minnesota: July – October 2020. Prepared for Wisconsin Power and Light Company, Madison, Wisconsin. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. February 19, 2021.

Pickle, J. and N. O'Neil. 2021b. Post-Construction Bird and Bat Fatality Monitoring Study, Whispering Willow East Wind Energy Facility, Franklin County, Iowa: April – October 2020. Prepared for Interstate Power and Light Company, Cedar Rapids, Iowa. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. February 19, 2021.

Pickle, J., N. O'Neil, and M. Tuma. 2021a. Post-Construction Bird and Bat Fatality Monitoring Study, Franklin County Wind Energy Facility, Franklin County, Iowa: April – October 2020. Prepared for Alliant Energy, Cedar Rapids, Iowa. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. February 19, 2021.

Pickle, J., N. O'Neil, and M. Tuma. 2021b. Post-Construction Bird and Bat Fatality Monitoring Study, Golden Plains Wind Energy Facility, Kossuth and Winnebago Counties, Iowa: July 2020 – October 2020. Prepared for Interstate Power and Light Company, Cedar Rapids, Iowa. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. February 19, 2021.

Pickle, J., N. O'Neil, and E. Coffey-Wick. 2021c. Post-Construction Bird and Bat Fatality Monitoring Study, Upland Prairie Wind Energy Facility, Clay and Dickinson Counties, Iowa: July 1 – October 17, 2020. Prepared for Interstate Power and Light Company, Cedar Rapids, Iowa. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. February 19, 2021.

Pickle, J., N. O'Neil, and E. Coffey-Wick. 2021d. Post-Construction Bird and Bat Fatality Monitoring Study, Whispering Willow North Wind Energy Project, Franklin County, Iowa: July – October 2020. Prepared for Interstate Power and Light Company, Cedar Rapids, Iowa. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. February 19, 2021.

Pimentel, D., Acquay, H., Biltonen, M., Rice, P., Silva, M., Neslon, J., Lipner, V., Giordano, S., Horowitz, A., and D'Amore, M. 1992. Environmental and economic costs of pesticide use. BioScience 42(10): 750-760. 11 pp.

Popa-Lisseanu, A.G. and Voigt, C.C. 2009. Bats on the move. Journal of Mammalogy 90(6): 1283-1289. December 15, 2009.

Richardson, S. M., P. R. Lintott, D. J. Hosken, T. Economou, and F. Mathews. 2021. Peaks in Bat Activity at Turbines and the Implications for Mitigating the Impact of Wind Energy Developments on Bats. Scientific Reports 11: 3636. doi: 10.1038/s41598-021-82014-9.

Richland Wind Energy Facility (RWEF). 2023. Richland Bird and Bat Conservation Strategy, Sac County, Iowa. May 2023.

Roby, P. and M. Gumbert. 2016. Final Report, Bats and Wind Energy: A Comparison Between Spring and Autumn Migration Behavior. Delivered to: M. Cook, U.S. Fish and Wildlife Service Headquarters, Falls Church, VA. Completed by: P. Roby and M. Gumbert, Copperhead Environmental Consulting, Inc., Paint Lick, Kentucky.

Roby, P. L., M. W. Gumbert, and M. J. Lacki. 2019. Nine years of Indiana bat (Myotis sodalis) spring migration behavior. Journal of Mammalogy, 100 (5): 1501-1511.

Rodhouse, T.J., Rodriguez, R.M., Banner, K.M., Ormsbee, P.C., Barnett, J., and Irvine, K.M. 2019. Evidence of region-wide bat population decline from long-term monitoring and Bayesian occupancy models with empirically informed priors. Ecology and Evolution 9(19):11078-11088. September 11, 2019.

Rollins, K. E., D. K. Meyerholz, G. D. Johnson, A. P. Capparella, and S. S. Loew. 2012. A Forensic Investigation into the Etiology of Bat Mortality at a Wind Farm: Barotrauma or Traumatic Injury? Veterinary Pathology 49(2): 362-371.

Rushing, C. S., Royle, J. A., Ziolkowski Jr, D. J., & Pardieck, K. L. 2020. Migratory behavior and winter geography drive differential range shifts of eastern birds in response to recent climate change. *Proceedings of the National Academy of Sciences*, 117(23), 12897-12903.

Shaffer, J.A. and D.H. Johnson. 2008. Displacement Effects of Wind Developments on Grassland Birds in the Northern Great Plains. In Proceedings of the NWCC Wind Wildlife Research Meeting VII. Milwaukee, Wisconsin. October 28-29, 2008.

Shaffer, J.A. and Buhl, D.A. 2016. Effects of wind-energy facilities on breeding grassland bird distributions. Conservation Biology 30(1):59-71.

Straw BR and Others. 2022. Analytical Assessments in Support of the U.S. Fish and Wildlife Service 3-Bat Species Status Assessment. https://ecos.fws.gov/ServCat/Reference/Profile/142341

Simon, S. 2017. Large Bird Use Study, Kossuth Wind Energy Project, Kossuth County, Iowa. Final Report: March 15, 2016 – February 26, 2017. Prepared for Kossuth Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 22 pages + appendices.

Simon, S., S. Agudelo, and T. Mattson. 2016. Raptor Nest Survey Results for the Golden Plains Wind Energy Project. Kossuth and Winnebago Counties, Iowa. Prepared for EDF Renewable Energy, Philadelphia, Pennsylvania. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. April 22 - 23, 2016.

Simon, S. and L. Bishop-Boros. 2017. Avian Use Study Golden Plains Wind Energy Project Winnebago and Kossuth Counties, Iowa. Interim Report: February 2016 – January 2017. Prepared for EDF Renewable Energy, Inc., Philadelphia, Pennsylvania. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 26 pages + appendices.

Simon, S. and A. S. Cossette. 2019. Large Bird Use Study, Kossuth Wind Energy Project, Kossuth County, Iowa. Final Report: March 13, 2018 – March 8, 2019. Prepared for Kossuth Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 22 pages + appendices.

Simon, S. and R. McDonald. 2017. Small Bird Use Study, Kossuth Wind Energy Project, Kossuth County, Iowa. Final Report: March 15 – November 27, 2016. Prepared for Kossuth Wind Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 18 pages + appendices.

Simon, S., D. Pham, and S. Agudelo. 2018. Eagle Use Study Golden Plains Wind Energy Project, Winnebago and Kossuth Counties, Iowa. Year Two Report: February 2017 – January 2018. Prepared for EDF Renewable Energy, Inc., Philadelphia, Pennsylvania. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. 21pages.

Smallwood, K. S. 2013. Comparing Bird and Bat Fatality-Rate Estimates among North American Wind-Energy Projects. Wildlife Society Bulletin 37(1): 19-33.

Smallwood, K.S. and Bell, D.A. 2020. Effects of wind turbine curtailment on bird and bat fatalities. Journal of Wildlife Management 84(4): 685-696.

Solick, D., S. Simon, and B. Hyzy. 2019. Bat Activity Surveys for the Golden Plains Wind Energy Project, Kossuth and Winnebago Counties, Iowa. Prepared for EDF Renewable Energy, Inc, Philadelphia, Pennsylvania. Prepared by Western Ecosystems Technology, Inc. (WEST), Golden Valley, Minnesota. 68 pp.

State Data Center. 2010. Iowa Census Data Tables: Projections. Projections of total population: 2010-2040. Available at https://www.iowadatacenter.org/browse/projections.html

Stantec Consulting Ltd. 2012. Wolfe Island Wind Plant, Post-Construction Follow-up Plan, Bird and Bat Resources, Monitoring Report No. 6, July – December 2011. Prepared for TransAleta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. July 2012.

Stantec Consulting Services Inc (Stantec). 2015. 2014 Bird and Bat Post-Construction Monitoring Report – Laurel Mountain Wind Energy Project, Randolph and Barbour Counties, West Virginia. Prepared for AES Laurel Mountain Wind, LLC. January 2015.

Stantec. 2018. Richland Wind Energy Project Bat Acoustic Survey Report, Sac County, Iowa. Prepared for: Richland Wind Energy LLC. March 29, 2018.

Stantec. 2023. Bat Presence or Probable Absence Survey USFWS Iowa Priority 1 and 2 Sites 22 Counties Across the State of Iowa. December 2023.

Strickland, D. 2004. Overview of Non-Collision Related Impacts from Wind Projects. In Proceedings of the Wind Energy and Birds/Bats Workshop: Understanding and Resolving Bird and Bat Impacts. Washington DC. May 18-19, 2004. Prepared by RESOLVE, Inc. Washington D.C., Susan Savitt Schwartz, ed., September 2004.

Tidhar, D., M. Sonnenberg, and D. Young. 2013. 2012 Post-Construction Carcass Monitoring Study for the Beech Ridge Wind Farm, Greenbrier County, West Virginia – Final Report, April 1- October 28, 2012. Prepared for Beech Ridge Wind Farm, Beech Ridge Energy, LLC. January 18, 2013.

Thompson, M., J. A. Beston, M. Etterson, J. E. Diffendorfer, and S. R. Loss. 2017. Factors Associated with Bat Mortality at Wind Energy Facilities in the United States. Biological Conservation 215: 241-245. doi: 10.1016/j.biocon.2017.09.014.

Trail, P.W. 2006. Avian mortality at oil pits in the United States: A review of the problem and efforts for its solution. Environmental Management 38(4): 532-44. October 2006.

Turner, G.G., D.M. Reeder, and J.T.H. Coleman. 2011. A five-year assessment of mortality and geographic spread of white-nose syndrome in North American bats and a look to the future. Bat Research News 52: 13-27.

U.S. Army Corps of Engineers (USACE). 2021. UMRR Program – Huron Island Complex HREP-Pool 18. Published October 1, 2021. Rock Island District. Accessed March 2024. https://www.mvr.usace.army.mil/About/Offices/Programs-and-Project-Management/District-Projects/Projects/Article/1172718/umrr-program-huron-island-complex-hrep-pool-18/.

U.S. Census Bureau. 2023. Explore Census Data. U.S. Census Bureau, Washington D. C. Accessed February 2023. Available online: https://data.census.gov/cedsci/

United States Department of Agriculture Forest Service (USFS). 2021. Forests of Minnesota, 2020. Resource Update FS-326. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station. 2p. https://doi.org/10.2737/FS-RU-326.

USFS. 2022. Forests of Iowa, 2021. Resource Update FS-363. Madison, WI: U.S. Department of Agriculture, Forest Service. 2p. https://doi.org/10.2737/FS-RU-363.

U.S. Department of Energy (USDOE). 2015. Wind Vision: A New Era for Wind Power in the United States. Retrieved from https://www.energy.gov/sites/prod/files/WindVision_Report_final.pdf

USEIA. 2023a. U.S. Energy Facts Explained. Updated May 3, 2023. Available at: https://www.eia.gov/energyexplained/us-energy-facts/. Accessed December 2023.

USEIA. 2023b. Iowa State Profile and Energy Estimates. U.S. Department of Energy, U.S. Energy Information Administration. Washington, DC. https://www.eia.gov/state/analysis.php?sid=IA.Accessed December 2023.

USEIA. 2023c. Minnesota State Profile and Energy Estimates. U.S. Department of Energy, U.S. Energy Information Administration. Washington, DC. https://www.eia.gov/state/analysis.php?sid=MN. .Accessed December 2023.

USEIA. 2023d. Annual Coal Report 2023. U.S. Department of Energy, U.S. Energy Information Administration. Washington, DC. October 2023.

U.S. Environmental Protection Agency (USEPA). 2023a. Particulate Matter (PM) Pollution: Health and Environmental Effects. Available at: https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naaqs-pm. Accessed December 2023.

USEPA. 2023b. Particulate Matter (PM) Pollution: National Ambient Air Quality Standards (NAAQS) for PM. Available at: https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naaqs-pm. Accessed December 2023.

USEPA. 2023. Our Nation's Air. Available at: https://gispub.epa.gov/air/trendsreport/2023/#home. Accessed December 2023.

USFWS. 1999. Indiana Bat (*Myotis sodalis*) Revised Recovery Plan. Region 3, U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. 53 pp.

USFWS. 2007. Indiana bat (*Myotis sodalis*) draft recovery plan: first revision. Region 3, U.S. Fish and Wildlife Service, Fort Snelling, Minnesota, USA.

USFWS. 2008. Birds of conservation concern 2008. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia, USA. 85 pp. Available at: http://www.fws.gov/migratorybirds/.

USFWS. 2011. Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects. Revised October 26, 2011. Available online: https://www.fws.gov/media/indiana-bat-section-7-and-section-10-guidance-wind-energy-projects. Accessed December 2022.

USFWS. 2012. North American bat death toll exceeds 5.5 million from white-nose syndrome. U.S. Fish and Wildlife Service. News Release January 17, 2012.

USFWS. 2014. Northern Long-eared Bat Interim Conference and Planning Guidance, USFWS Regions 2, 3, 4, 5, & 6. January 6, 2014.

References

USFWS. 2015. Threatened species status for the northern long-eared bat with 4(d) rule; final rule and interim rule. Federal Register 80: 17974-18033. 2 April 2015.

USFWS. 2016a. Programmatic biological opinion on final 4(d) rule for the northern long-eared bat and activities excepted from take prohibitions. Midwest Regional Office, Bloomington, Minnesota, USA. 5 January 2016.

USFWS. 2016b. R3 LBB REA Model v1.user. Created by Jennifer Szymanski, Forest Clark, and Erik Olson and programmed by Drew Laughland.

USFWS. 2019a. Biological Opinion for the MidAmerican Energy Company Incidental Take Permit and Habitat Conservation Plan. November 2019. Available at: https://ecos.fws.gov/docs/plan_documents/bobs/bobs_2966.pdf

USFWS. 2019b. 2019 Indiana Bat (Myotis sodalis) Population Status Update. U.S. Fish and Wildlife Service, Bloomington, Indiana, USA. 27 July 2019.

USFWS. 2021. Species Status Assessment Report for the Tricolored Bat (*Perimyotis subflavus*), Version 1.1. December 2021. Hadley, Massachusetts.

USFWS. 2022a. Indiana Bat Fatalities at Wind Energy Facilities. U.S. Fish and Wildlife Service Midwest Region. https://www.fws.gov/sites/default/files/documents/Indiana%20Bat%20Fatalities%20at%20Wind%20Energy%20Facilities.pdf. Last updated March 2022. Accessed: March 2024.

USFWS. 2022b. Species Status Assessment Report for the Northern Long-Eared Bat (*Myotis septentrionalis*). Version 1.1. USFWS, Great Lakes Region, Bloomington, Minnesota. March 22, 2022. Available online: https://www.fws.gov/media/species-status-assessment-report-northern-long-eared-bat

USFWS. 2022c. USFWS Region 3 Tricolored Bat Resource Equivalency Analysis (REA) Model Version 1 User's Guide. November 22, 2022.

USFWS. 2023a. Appendix A. Interim Consultation Framework for the Northern Long-Eared Bat: Standing Analysis. Valid from March 31, 2023 through April 1, 2024. USFWS, Department of the Interior. March 6, 2023. Available online: https://www.fws.gov/media/appendix-standing-analysis-interim-consultation-framework-northern-long-eared-bat

USFWS. 2023b. National Listing Workplan: 5-Year Workplan. U.S. Fish and Wildlife Service Ecological Services. https://www.fws.gov/sites/default/files/documents/national-domestic-listing-workplan-fiscal-years-2023-2027.pdf. April 2023.

USFWS. 2023c. Land-based Wind Energy Interim Voluntary Guidance for the Northern Long-eared Bat (*Myotis septentrionalis*). U.S. Fish and Wildlife Service. March 6, 2023. https://www.fws.gov/sites/default/files/documents/Interim%20Wind%20Guidance%20NLEB_6Mar23.pdf

USFWS. 2023d. DRAFT Environmental Assessment for Proposed Habitat Conservation Plan and Incidental Take Permit for The Cardinal Point Wind Project McDonough and Warren Counties, Illinois. May 2023. https://www.regulations.gov/document/FWS-R3-ES-2023-0080-0003

USFWS. 2024a. White-nose Syndrome: Where is it now? https://www.whitenosesyndrome.org/about/where-is-it-now. Accessed March 2024.

USFWS. 2024b. Bats Affected by WNS. https://www.whitenosesyndrome.org/static-page/bats-affected-by-wns. Accessed March 2024.

U.S. Forest Service (USFS) and Bureau of Land Management (BLM). 2019. White-Nose Syndrome Frequently Asked Questions Oregon and Washington USFS, BLM. March 2019. Available online: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd501625.pdf

U.S. Geological Survey (USGS) Gap Analysis Project (GAP). 2022. Protected Areas Database of the United States (PAD-US) 3.0: U.S. Geological Survey data release, https://doi.org/10.5066/P9Q9LQ4B.

Van Hemert, C., Pearce, J. M., & Handel, C. M. 2014. Wildlife health in a rapidly changing North: focus on avian disease. *Frontiers in Ecology and the Environment*, *12*(10), 548-556.

Voth, M., N. O'Neil, and M. Tuma. 2022a. Post-Construction Bird and Bat Fatality Monitoring Study, Kossuth Energy Project, Kossuth County, Iowa: July – October 2021. Prepared for Wisconsin Power and Light Company, Madison, Wisconsin. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. March 2, 2022.

Voth, M., J. Pickle, M. Tuma, and T. Prebyl. 2022b. Post-Construction Bird and Bat Fatality Monitoring Study, Richland Energy Project, Sac County, Iowa: July – October 2021. Prepared for Interstate Power and Light Company, Cedar Rapids, Iowa. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota. March 2, 2022.

Western EcoSystems Technology, Inc. (WEST). 2017. Northern Long-Eared Bat Surveys, Upland Prairie Wind Project, Clay, Dickinson, and Osceola Counties, Iowa. Prepared for Apex Clean Energy, Inc. Prepared by WEST. August 1, 2017.

Western EcoSystems Technology, Inc. (WEST). 2018. Qualitative Re-Analysis of Bat Acoustic Data from the English Farms and North English Wind Projects in Poweshiek County, Iowa. Prepared for Interstate Power and Light Company. Prepared by WEST. December 18, 2018. Western EcoSystems Technology, Inc. (WEST). 2021. Regional Summaries of Wildlife Fatalities at Wind Facilities in the United States and Canada. 2020 Report from the Renew Database. WEST, Cheyenne, Wyoming. June 30, 2021. Available online: https://west-inc.com/wp-content/uploads/2021/07/WEST_2020_RenewWildlifeFatalitySummaries.pdf

Whispering Willow East and Franklin County Wind Energy Facilities (WWE and Franklin). 2023. Whispering Willow East/ Franklin County Bird and Bat Conservation Strategy, Franklin County, Iowa. May 2023.

Whispering Willow North Wind Energy Facility (WWN). 2023. Whispering Willow North Bird and Bat Conservation Strategy, Franklin County, Iowa. May 2023.

Whitaker, J.O., Jr., and L.J. Rissler. 1992. Winter activity of bats at a mine entrance in Vermillion County, Indiana. American Midland Naturalist 127: 52-59.

Winegrad, G. 2004. Why Avian Impacts are a Concern in Wind Energy Development. In Wind Energy and Birds/Bats Workshop Proceedings. Washington, DC. May 18-19, 2004. Prepared by RESOLVE, Inc. Susan Savitt, ed. September 2004.

Winhold, L., Kurta, A., and Foster, R. 2008. Long-term change in an assemblage of North American bats: are eastern red bats declining? Acta Chiropterologica 10(2):359-366.

Young, D., and J. Gruver. 2011. Bat Mist Netting and Acoustic Surveys Beech Ridge Wind Energy Project GreenBrier and Nicholas Counties, West Virginia. Prepared for Beech Ridge Energy LLC. Prepared by Western EcoSystems Technology, Inc. Revised June 27, 2011.

Young, D.P., S. Nomani, Z. Courage, and K. Bay. 2012. NedPower Mount Storm Wind Energy Facility Post-Construction Avian and Bat Monitoring, July-October 2011. Prepared for NedPower Mount Storm, LLC. Prepared by Western EcoSystems Technology, Inc. February 27, 2012.

Young, D., C. Nations, M. Lout, and K. Bay. 2013. 2012 Post-Construction Monitoring Study, Criterion Wind Project, Garret County, Maryland, April – November 2012. Prepared for Criterion Power Partners, LLC. Prepared by Western EcoSystems Technology, Inc. January 15, 2013.

Zia Engineering & Environmental Consultants, LLC (Zia). 2008a. Phase 1 Avian and Bat Assessment, Whispering Willow Wind Farm East, Franklin County, Iowa. Report prepared for Alliant Energy.

Zia Engineering & Environmental Consultants, LLC (Zia). 2008b. Summary of Preconstruction Fall 2008 Avian Surveys, Whispering Willow Wind Farm – East. Report Prepared for Alliant Energy.

Zia Engineering & Environmental Consultants, LLC (Zia). 2009. Summary of Spring 2009 Avian Surveys, Whispering Willow Wind Farm – East. Report prepared for Alliant Energy.

Zia Engineering & Environmental Consultants, LLC (Zia). 2010. Phase 1 Avian and Bat Assessment, Whispering Willow Wind Farm Central, Franklin County, Iowa. Report prepared for Alliant Energy.

Zimmerling, J. and C. Francis. 2016. Bat Mortality Due to Wind Turbines in Canada: Bats and Wind Turbines. Journal of Wildlife Management 80(8): 1360-1369. doi: 10.1002/jwmg.21128.

Zumeta, D.C., and R.T. Holmes. 1978. Habitat shift and roadside mortality of scarlet tanagers during a cold wet New England spring. Wilson Bulletin 90(4): 575-586.

APPENDIX A – Covered projects land cover and protected areas figures

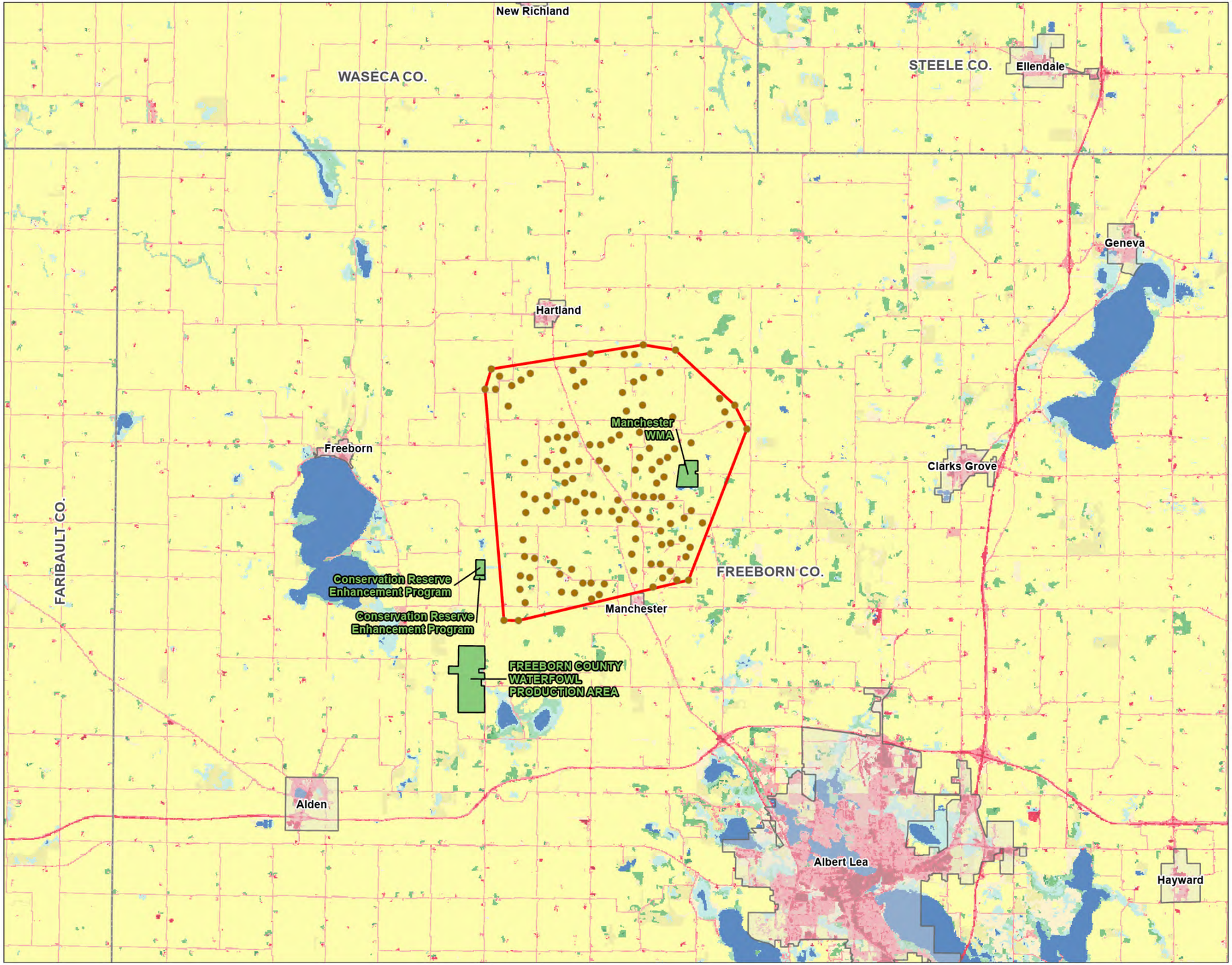

Figure No.
2

DRAFT

Title
NLCD and Protected Areas
Bent Tree Wind Farm

Client/Project
Alliant
EA

193709513

Project Location
Iowa and Minnesota

Prepared by JD on 2024-02-29
TR by XXX on 2024-XX-XX
IR by XXX on 2024-XX-XX

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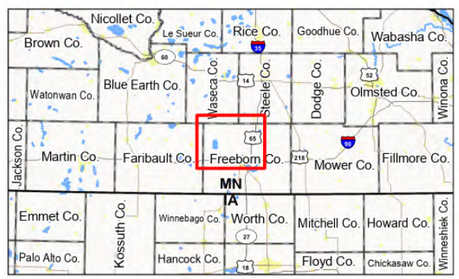
Legend
- Project Area
- Turbine
- Protected Area

NLCD Land Cover
- Open Water
- Perennial Snow/Ice
- Developed Open Space
- Developed Low Intensity
- Developed Medium Intensity
- Developed High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Dwarf Scrub
- Shrub/Scrub
- Grassland/Herbaceous
- Sedge/Herbaceous
- Lichens
- Moss
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands



Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, Alliant, Esri, USCB, USGS

Stantec

Figure No.
2

DRAFT

Title
NLCD and Protected Areas
English Farms

Client/Project
Alliant
EA

193709513

Project Location
Iowa and Minnesota

Prepared by JD on 2024-02-29
TR by XXX on 2024-XX-XX
IR by XXX on 2024-XX-XX

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Legend
- Project Area
- Turbine
- Protected Area

NLCD Land Cover
- Open Water
- Developed Open Space
- Developed Low Intensity
- Developed Medium Intensity
- Developed High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, Alliant, Esri, USCB, USGS

Stantec

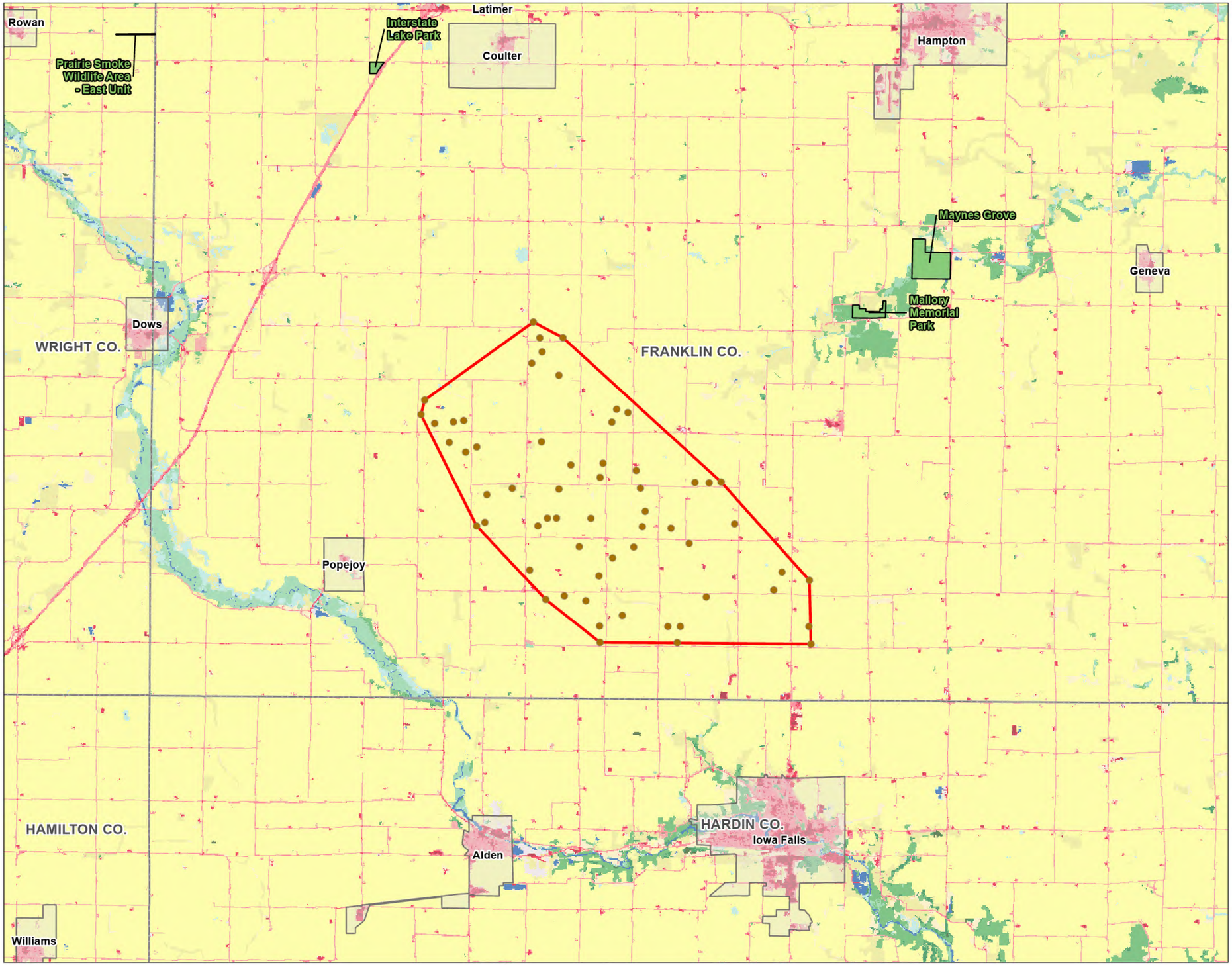

Figure No.
2

DRAFT

Title
NLCD and Protected Areas
Franklin County Wind Farm

Client/Project
Alliant
EA

193709513

Project Location
Iowa and Minnesota

Prepared by JD on 2024-02-29
TR by XXX on 2024-XX-XX
IR by XXX on 2024-XX-XX

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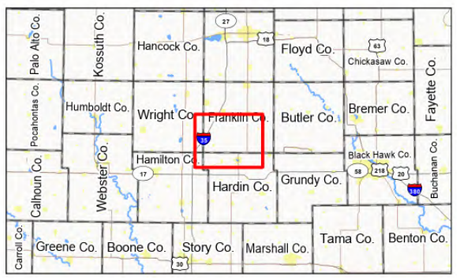
Legend
- Project Area
- Turbine
- Protected Area

NLCD Land Cover
- Open Water
- Developed Open Space
- Developed Low Intensity
- Developed Medium Intensity
- Developed High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands



Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, Alliant, Esri, USCB, USGS

Stantec

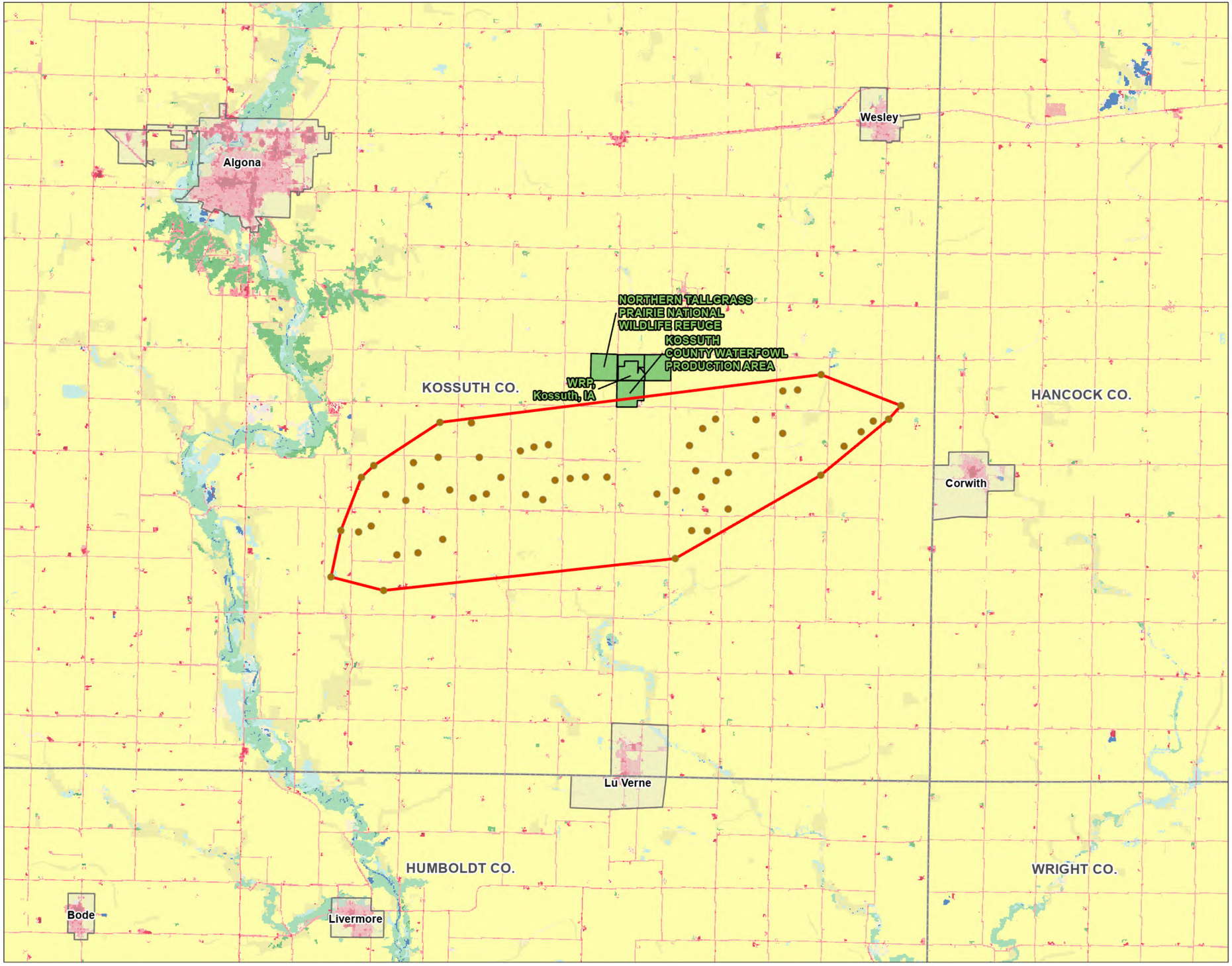


Figure No.
2

DRAFT

Title
NLCD and Protected Areas
Kossuth

Client/Project
Alliant
EA

193709513

Project Location
Iowa and Minnesota

Prepared by JD on 2024-02-29
TR by XXX on 2024-XX-XX
IR by XXX on 2024-XX-XX

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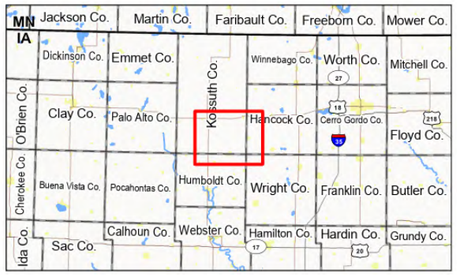
Legend
- Project Area
- Turbine
- Protected Area

NLCD Land Cover
- Open Water
- Developed Open Space
- Developed Low Intensity
- Developed Medium Intensity
- Developed High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands



Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, Alliant, Esri, USCB, USGS

Stantec

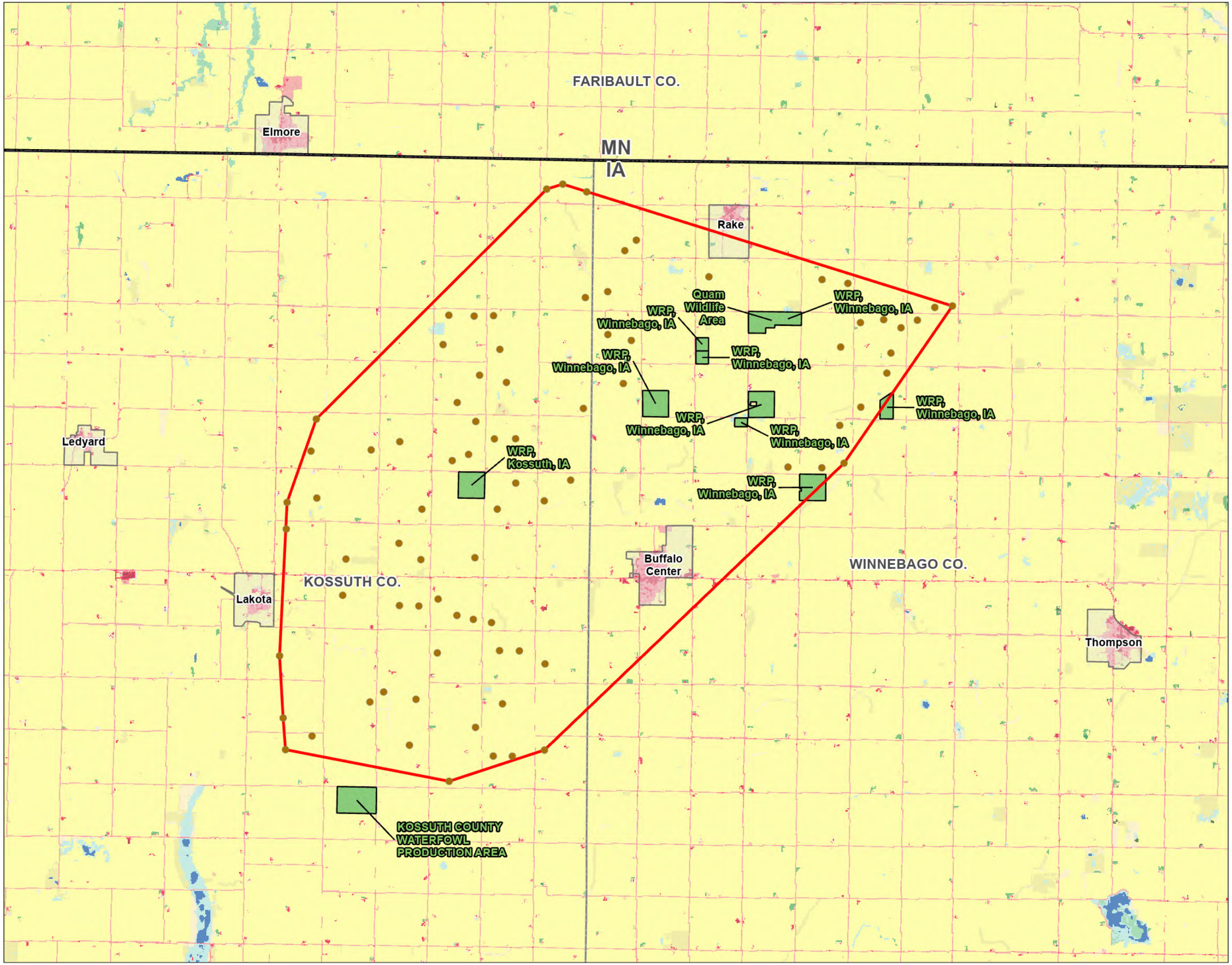


Figure No.
2

DRAFT

Title
NLCD and Protected Areas
Golden Plains

Client/Project
Alliant
EA

193709513

Project Location
Iowa and Minnesota

Prepared by JD on 2024-02-29
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IR by XXX on 2024-XX-XX

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Legend
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NLCD Land Cover
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- Pasture/Hay
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- Woody Wetlands
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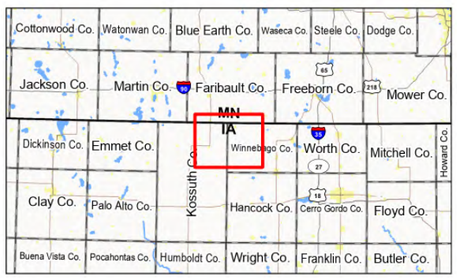

Notes
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Stantec

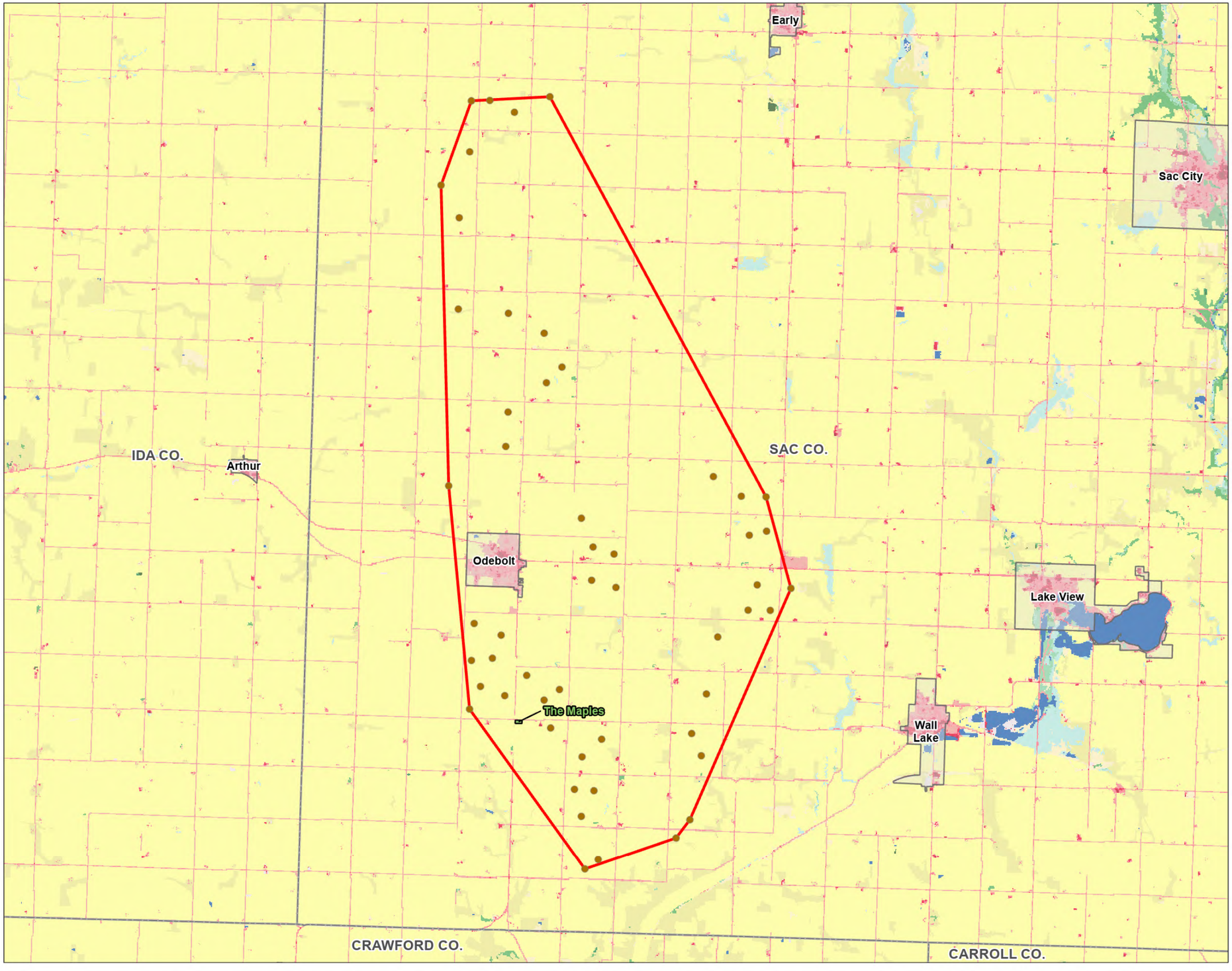

Figure No.
2

DRAFT

Title
NLCD and Protected Areas
Richland

Client/Project
Alliant
EA

193709513

Project Location
Iowa and Minnesota

Prepared by JD on 2024-02-29
TR by XXX on 2024-XX-XX
IR by XXX on 2024-XX-XX

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(At original document size of 11x17)
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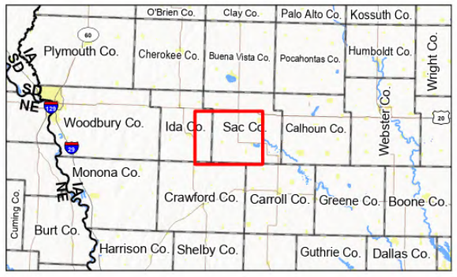
Legend
- Project Area
- Turbine
- Protected Area

NLCD Land Cover
- Open Water
- Perennial Snow/Ice
- Developed Open Space
- Developed Low Intensity
- Developed Medium Intensity
- Developed High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Dwarf Scrub
- Shrub/Scrub
- Grassland/Herbaceous
- Sedge/Herbaceous
- Lichens
- Moss
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands



Notes
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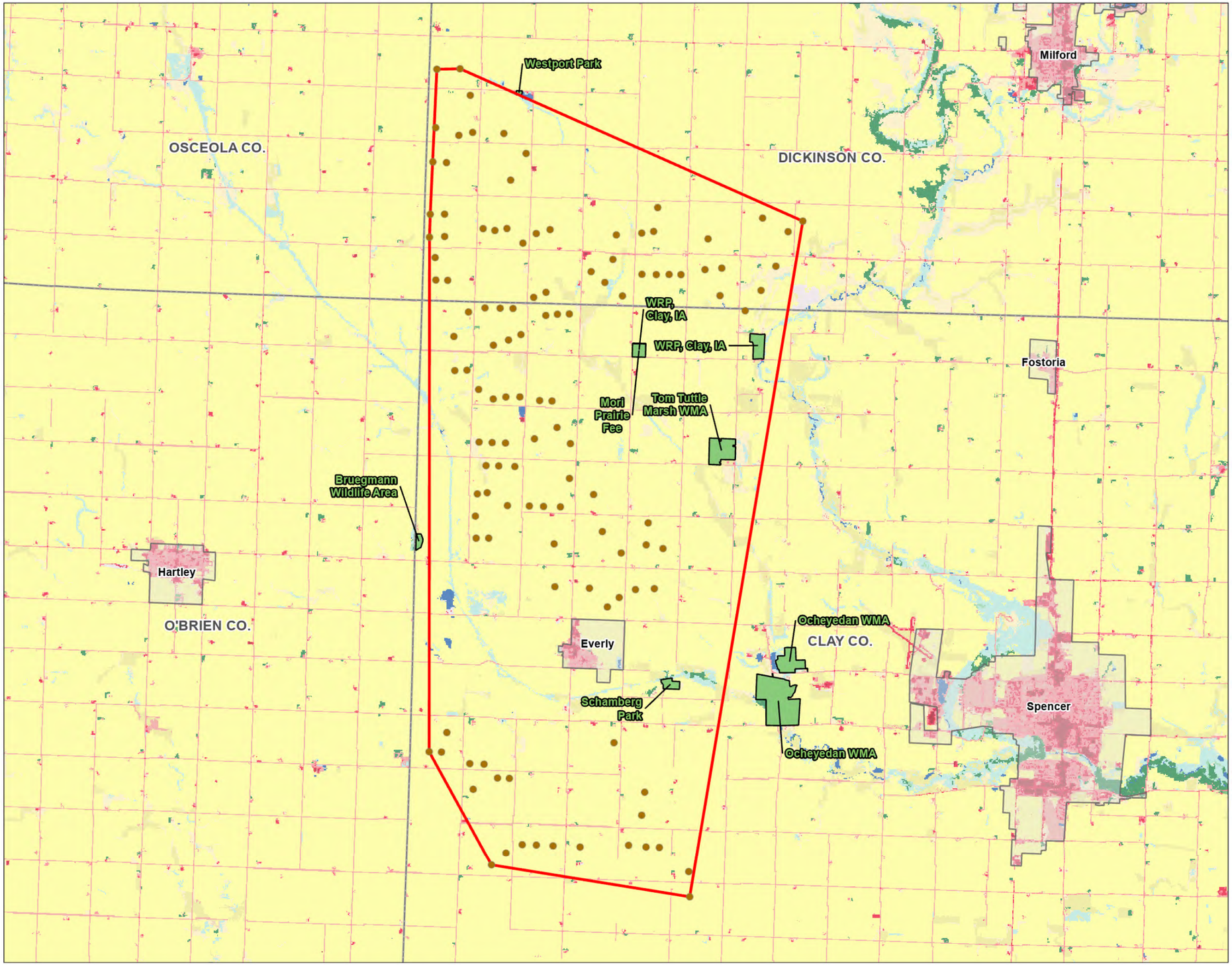

Figure No.
2

DRAFT

Title
NLCD and Protected Areas
Upland Prairie

Client/Project
Alliant
EA

193709513

Project Location
Iowa and Minnesota

Prepared by JD on 2024-02-29
TR by XXX on 2024-XX-XX
IR by XXX on 2024-XX-XX

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Legend
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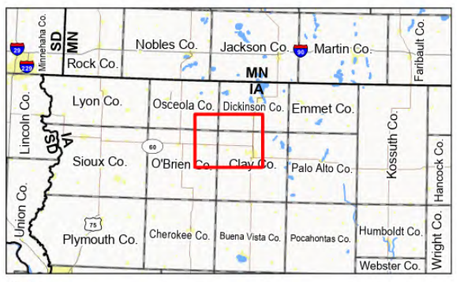

Notes
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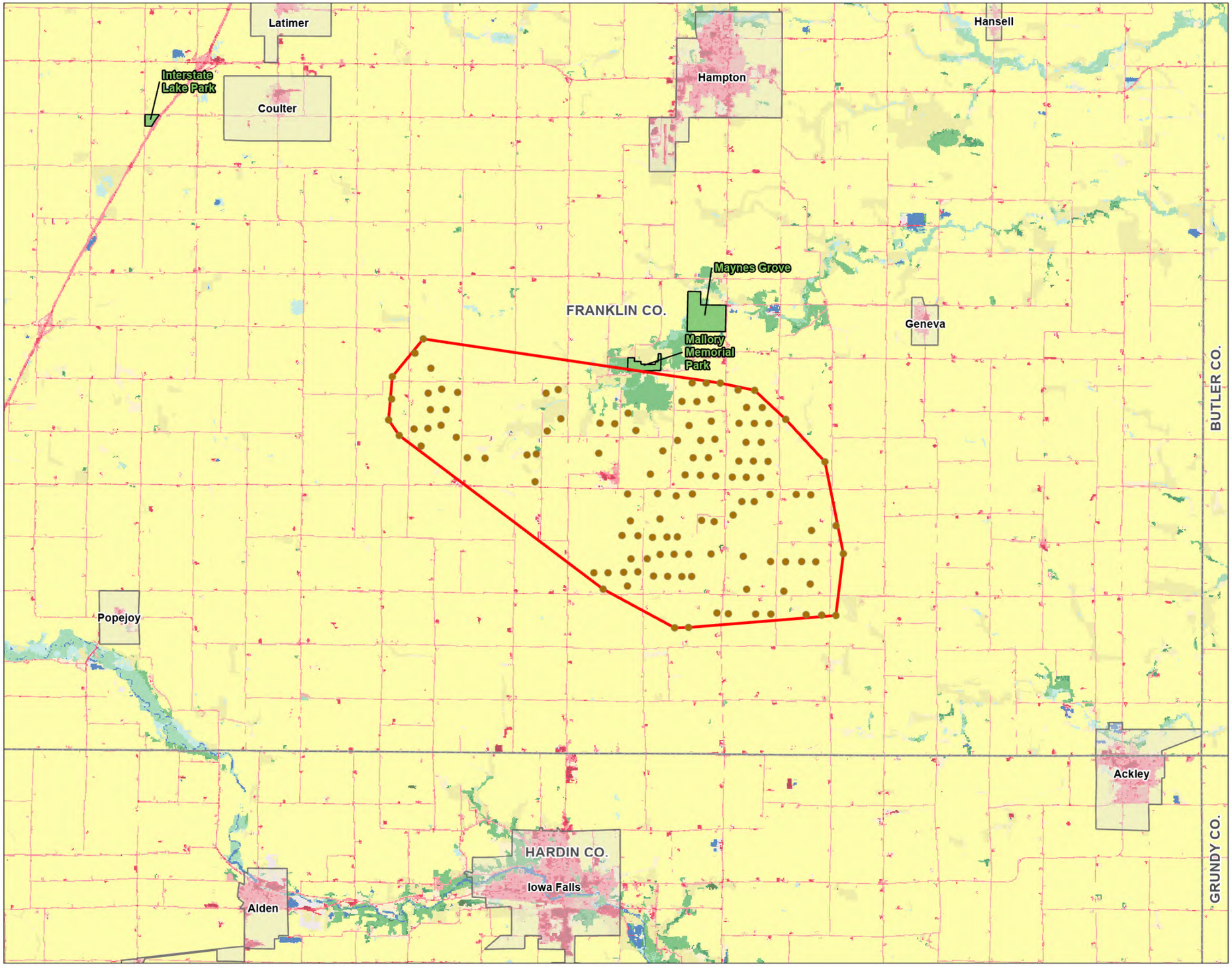

Figure No.
2

DRAFT

Title
NLCD and Protected Areas
Whispering Willow East

Client/Project
Alliant
EA

193709513

Project Location
Iowa and Minnesota

Prepared by JD on 2024-02-29
TR by XXX on 2024-XX-XX
IR by XXX on 2024-XX-XX

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Legend
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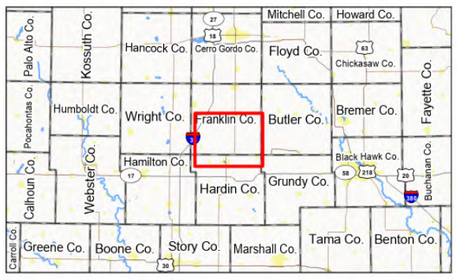

Notes
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Stantec

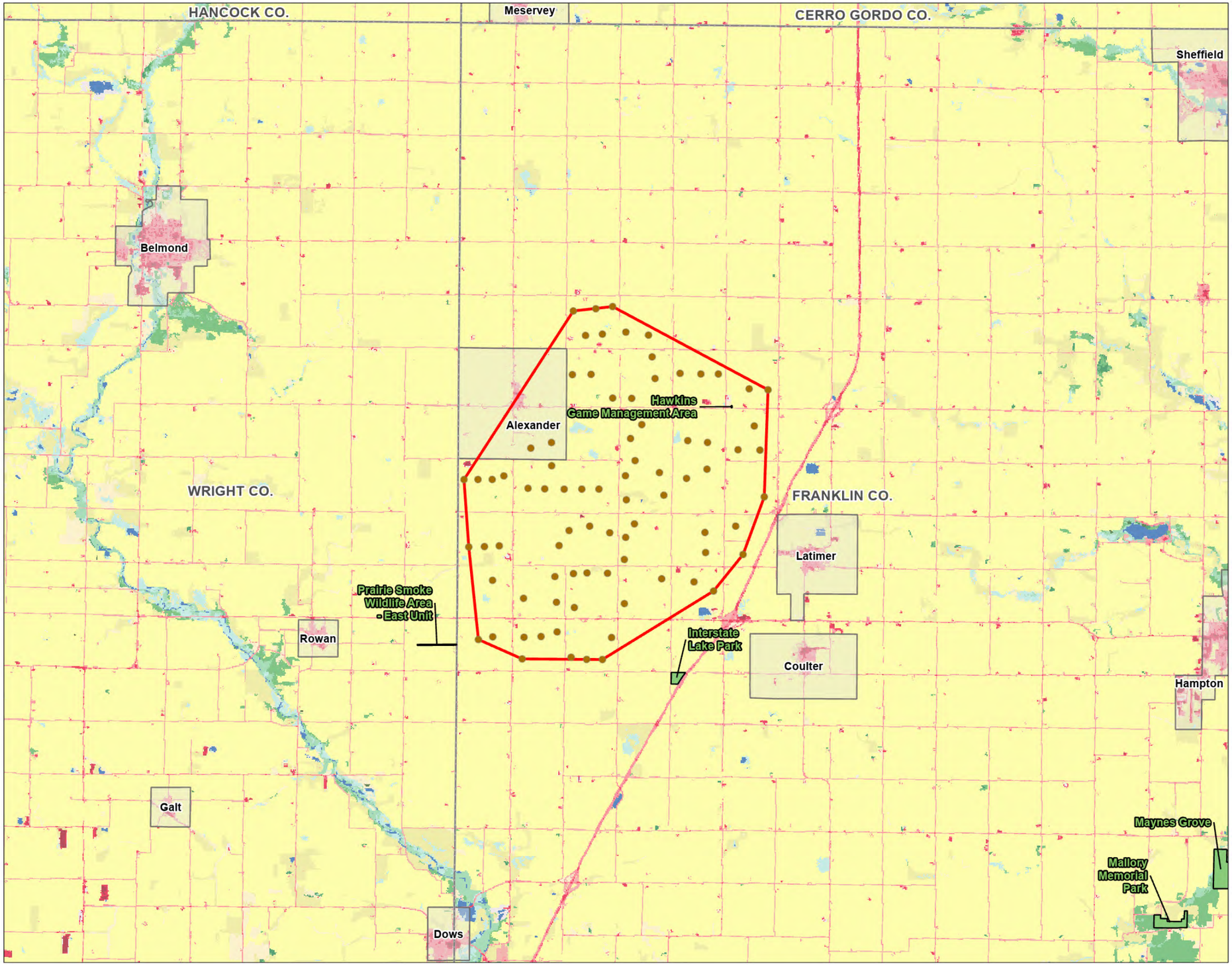

Figure No.
2

DRAFT

Title
NLCD and Protected Areas
Whispering Willow North

Client/Project
Alliant
EA

193709513

Project Location
Iowa and Minnesota

Prepared by JD on 2024-02-29
TR by XXX on 2024-XX-XX
IR by XXX on 2024-XX-XX

N

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Legend
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NLCD Land Cover
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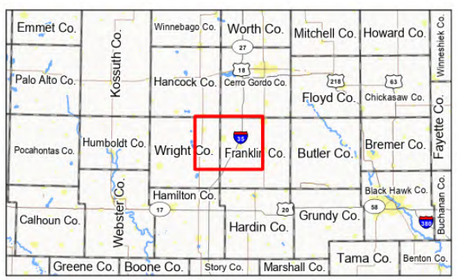

Notes
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Stantec