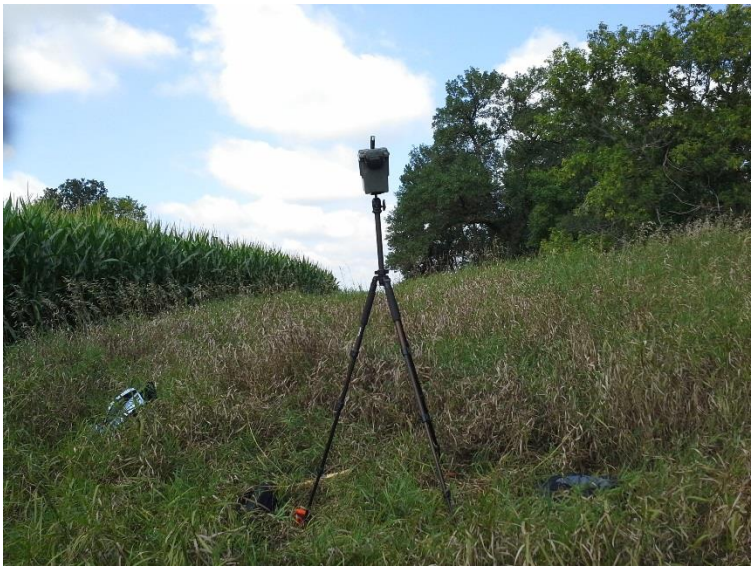
NORTHERN LONG-EARED BAT PRESENCE/ABSENCE SURVEY REPORT

Red Pine Wind Project
Lincoln and Lyon Counties, Minnesota



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REPORT REFERENCE

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INTRODUCTION

EDF Renewable Energy (EDF) is considering the development of the Red Pine Wind Project (Project), located in Lincoln and Lyon Counties, Minnesota. To better understand the potential use of the Project area during the summer months by the federally threatened northern long-eared bat (*Myotis septentrionalis*; NLEB), EDF requested that Western Ecosystems Technology, Inc. (WEST) conduct acoustic and mist-net presence / probable absence surveys for NLEB. The main objectives of the summer bat surveys were to: 1) collect site specific information on bat use of the Project area that will be useful in evaluating potential impacts to bats from the proposed Project, 2) collect site specific information on bat use and location of roost and/or maternity trees within the Project area that will be helpful in designing a wind power project that minimizes potential adverse impacts to bats; and 3) collect site specific information that can be used to evaluate risk to state and federally-listed bat species with potential to occur in the Project area to inform the need for further consultation with the Minnesota Department of Natural Resources and US Fish and Wildlife Service (USFWS) regarding these species.

This report describes the results of the NLEB acoustical and mist-netting assessment completed for the Project by WEST. These surveys were done following the Phase 1 and Phase 2 survey recommendations found in the USFWS *Northern Long-eared Bat Interim Conference and Planning Guidance* (USFWS 2014a) and *2015 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2015).

NORTHERN LONG-EARED BAT SUMMER HABITAT REQUIREMENTS

NLEB are forest dependent species, generally relying on forest features for both foraging and roosting during the summer months (USFWS 2013; USFWS 2007). In particular, NLEB appear to be a forest interior species that require adequate canopy closure for both roost and foraging habitat (Lausen 2009). Additionally, riparian areas are considered critical resource areas for many species of bats because they support higher concentrations of prey, provide drinking areas, and act as unobstructed commuting corridors (Grindal et al. 1999). While NLEB are associated with forest habitats, they also occur in agricultural settings where forest habitats have been highly fragmented. Wing morphology of the NLEB makes them ideally suited for the high maneuverability required for gleaning-type foraging within a cluttered forest interior (Henderson and Broders 2008). Abundance of NLEB prey items, particularly beetles and moths, are typically higher in more closed forest stands than in openings, which supports studies which have found NLEB tend to avoid open habitats (Owen et al. 2003).

During the summer, NLEB roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees (USFWS 2007; USFWS 2013). Males and non-reproductive females may also roost in cooler places, like caves and mines. NLEB seem opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. NLEB have also been found, rarely, roosting in structures like barns and sheds.

During the summer months, NLEB are unlikely to cross over large open lands (i.e., land lacking suitable habitat) to search for foraging and roosting habitats, but rather to use tree-lined linear features as travel corridors to and from roosting and foraging habitats (USFWS 2014a). These tree-lined corridors may be important for bats as navigational aids in agricultural landscapes, as protection from predators and wind, and may act to concentrate insect prey (Verboom and Huitema 1997). The NLEB is expected to be particularly tied to intact forested habitats; for example, Henderson and Broders (2008) found that NLEB did not travel more than 255 feet (78 meters) from the edge of intact forest structure. A study of nine female NLEB using an intensively managed forest in West Virginia found this species forages in areas with forest patch sizes between 114 and 161 acres (46 and 65 hectares; Owen et al. 2003); however, studies in landscapes dominated by agricultural activities found NLEB can use woodlots and riparian zones with as little as 15 to 49 acres (6 to 20 hectares) of forest cover (Henderson and Broders 2008; Foster and Kurta 1999).

TECHNICAL APPROACH

Northern Long-eared Bat Presence/Absence Summer Surveys – Site Selection

Acoustic surveys followed the USFWS *2015 Range-Wide Indiana Bat Summer Survey Guidelines* issued on April 15, 2015 (USFWS 2015), which are also applicable to NLEB, per the *Northern Long-Eared Bat Interim Conference and Planning Guidance* (USFWS 2014a). Following the summer guidelines (USFWS 2015), the level of effort for acoustic surveys is one site for every 123 acres (50 hectares [ha]) of suitable habitat within a non-linear project area.

WEST conducted a desktop assessment of potential NLEB habitat within the Project boundary. Potential foraging or roosting habitat within the Project is fairly limited, with relatively few areas where shelterbelts and larger forested patches are separated by less than 305 meters (m; 1,000 feet; [ft]; Figure 1). This connected habitat totals approximately 515 acres (0.8 square miles

[mi^2]) within the Project boundary, while approximately 744 acres (1.2 mi^2) of forested habitat is isolated (more than 305 m (1,000 ft) from connected corridors, small (less than 15 acres) wood lots). In total, 5 acoustic survey sites were selected within the Project boundary with potential NLEB habitat on leased land (Figure 1).

Acoustic surveys

Acoustic surveys were conducted from August 6 - 13, 2015, with two stations at each of the five sites for a minimum of four detector nights per site, consistent with USFWS guidelines (USFWS 2015). Bats were surveyed using SD2 AnaBat™ ultrasonic detectors (Titley Electronics Pty Ltd., NSW, Australia). Acoustic monitoring began before sunset and continued for the entire night. Survey duration at each site (consisting of two stations) was for a minimum of two nights. If weather conditions such as persistent rain (greater than 30 minutes), strong winds (greater than 9 miles per hour [mph; 14 kilometers per hour (kph)] for more than 30 minutes), or persistent cold temperatures (below 10 degrees Celsius [°C; 50 degrees Fahrenheit (°F)] for more than 30 minutes) occurred during the first five hours of a survey night, then that site was surveyed for an additional night (USFWS 2015). To maximize the quality of recorded echolocation calls, detectors were positioned at least one meter off the ground, at ≥ 45° angle, and with PVC tube weatherproofing (Britzke et al. 2010, USFWS 2014a). Sensitivity was set to 6 on all detectors.

Bat calls were identified to species using the 'candidate' acoustic bat ID program Bat Call Identification (BCID; Allen 2012). If the bat ID program identified calls as NLEB with a high degree of probability ($P < 0.05$), then qualitative analysis was conducted to determine if NLEB were present or absent at the site. Qualitative echolocation call analysis was conducted by a biologist experienced with acoustic identification and who met required USFWS qualifications (Dr. Kevin Murray of WEST; USFWS 2015). If probable NLEB echolocation call sequences identified by BCID were not characteristic of NLEB, contained distinct calls produced by species other than NLEB or were of insufficient quality, they were reclassified. Per USFWS guidelines, NLEB were considered present at sites with probable calls verified by qualitative analysis. NLEB were considered absent from sites with no probable NLEB calls or from sites with probable NLEB calls that were not verified by qualitative analysis.

Mist-netting

Mist-netting occurred at the same five sites from August 9 - 13, 2015, consistent with guidance in the *2015 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2015) and the *NLEB Interim Conference and Planning Guidance* (USFWS 2014).

Standard two-ply, 75 denier, nylon mist-nets with a mesh size of 38 millimeters (1.30 inches) were used at all mist-net sites. Mist-netting began at sunset and continued for at least five hours. Nets were checked every 10 minutes. Net locations were typically established at least 30 m (98.4 ft) apart within each mist-net site whenever possible. Disturbance in the form of noise and movement were minimized at all net locations. Two mist-net locations per site were surveyed. Mist-nets were located in the general vicinity of acoustic detection sites in suitable bat habitat. Specific mist-net sites were determined on-site by permitted bat biologists with NLEB research experience. If weather conditions such as persistent rain (more than 30 minutes), strong winds (greater than 9 mph for more than 30 minutes), or persistent cold temperatures (below 10°C [50°F] for greater than 30 minutes) occurred during the netting period, then those net nights were re-surveyed. All mist-net surveys were performed by staff permitted and approved by USFWS (Permit # TE234121-7), and Minnesota Department of Natural Resources (DNR; Special Permit NO. 19614 Second Addendum Scientific Collection for research purposes) to capture and handle NLEB.

For each mist-net night the date, start and end time, site description, site coordinates, mist-net specifics, and weather data (temperature, cloud cover, wind speed, precipitation, and moon phase) were recorded. All captured bats were identified to species. In addition, sex, age, reproductive condition, body mass (grams), forearm length (millimeters), and capture status (recapture/new) were recorded. To assess exposure to White-Nose Syndrome (WNS), a Reichard Index score (0-3) was recorded for all captured bats. To prevent cross contamination of captured bats with *Pseudogymnoascus destructans*, the fungus that causes WNS, the USFWS WNS decontamination protocols were followed for all mist-netting efforts. Captured bats were measured and processed immediately and were usually released within 15 minutes. Species of bats captured were photo-documented. If any NLEB or little brown bats were caught, voucher photographs of species-specific identifiable features (e.g. head, body, calcar, foot, toe hairs etc.) were taken.

RESULTS

Acoustical Analysis

AnaBat detectors surveyed 10 stations at five acoustic survey sites, from August 6 - 13, 2015. UTM coordinates and brief site descriptions for each site are listed in Table 1. Pictures and datasheets with site descriptions are found in Appendices A and B. WEST checked weather at the Tyler weather station (KMNTYLER2), which can be found on Weather Underground's Wundermap (http://www.wunderground.com/wundermap/). Weather conditions at the 10 stations at all five sites for all survey nights met the criteria established by the USFWS (2015), covering at least four detector nights per site.

Acoustic surveys were completed at 10 stations at five sites for a total of 45 detector nights (Tables 1 and 2). BCID identified a total of 2,205 bat call files and identified 2,156 files (98%) to species. Average number of bat calls per detector-night was 49. Table 2 summarizes the number of detector nights, number of bat call files, and number of bat calls identified to species at each site. Table 3 provides information on species identifications for each site.

Based on the screening done by the call identification programs, one station (Station 3A) at one site recorded potential NLEB calls with a p-value less than 0.05 for the maximum-likelihood estimation (Table 4); therefore data from that station was included in qualitative analysis (USFWS 2015). Station 3A recorded probable (i.e., p-value <0.05) NLEB calls on two nights (Table 4). Qualitative analysis did not verify the presence of NLEB at the one station (Station 3A) with probable NLEB calls (Tables 4 and 5).

Mist-Net Surveys

Mist-nest surveys were completed at the five sites between August 9 - 13, 2015 (Tables 6 and 7). Datasheets describing the mist-net sites are included in Appendix F. A total of seven bats at two sites were captured, including one big brown bat (*Eptesicus fuscus*) at net site 1A, one silver-haired bat (*Lasionycteris noctivagans*) at net site 1B, two big brown bats, one eastern red bat (*Lasiurus borealis*) and one hoary bat (*Lasiurus cinereus*) at net site 3A, and one eastern red bat at net site 3B (Table 7). No NLEB were captured during the 2015 mist-net surveys. Photos of captured bat species are included in Appendix D, and capture details for all bats can be found in Appendix E.

DISCUSSION/CONCLUSIONS

Limited information is available NLEB migratory pathways and behaviors. While there is some information suggesting this species tends to follow forested areas and avoid open areas if possible, these bats may occasionally move through non-forested areas.

If these bats occur in the Project area during the summer months, they will likely occur within or near (within 1,000 feet) suitable wooded habitat patches. WEST surveyed for NLEB at five locations in areas of habitat within the Red Pine Wind Project; both acoustical and mist-netting surveys were conducted at all five locations.

NLEB was not qualitatively verified at any of the ten acoustic stations at the five surveyed sites, and no NLEB were captured during mist-netting surveys. Therefore this species is considered likely absent from the proposed Project. Surveys are considered complete for all 10 stations at the five sites, and no further action is recommended to confirm NLEB bat absence pursuant to USFWS *Northern Long-eared Bat Interim Conference and Planning Guidance* (USFWS 2014a) and *2015 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2015) (Table 5).

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Table 1. Location and site description of 10 acoustic survey stations at the Red Pine Wind Project.

Site ID	Station ID	Zone	Easting†	Northing†	Site Description
1	A	UTM14	724131	4927728	next to pond beside corn field, <100m from road
1	B	UTM14	724140	4927793	on berm to north of pond, corn field to south and west, <100 ft from road
2	A	UTM14	730849	4930351	forest edge, stream about 60m southeast
2	B	UTM14	730864	4930545	small forest corridor
3	A	UTM14	736908	4920189	forest corridor on the edge of alfalfa and corn fields
3	B	UTM14	737028	4920063	along forest edge opening into cornfield
4	A	UTM14	728650	4923785	forest edge opening to field
4	B	UTM14	728844	4923700	small forest edge, stream ~50 feet to the north
5	A	UTM14	728520	4934945	stream along forest edge, <100 meters from road
5	B	UTM14	728337	4934873	forest stream

† = NAD 1983

Table 2. Number of bat calls recorded at each acoustic survey station determined by BCID for the Red Pine Wind Project.

Acoustic Survey Site	Acoustic Survey Station	ID program	Total Bat Calls	Calls Identified	Detector Nights	Bat Calls/ Detector Night
1	A	BCID	129	124 (96%)	4	32.3
	B	BCID	159	158 (99%)	3	53
2	A	BCID	83	78 (94%)	2	41.5
	B	BCID	41	40 (98%)	2	20.5
3	A	BCID	1,122	1,101 (98%)	7	160.3
	B	BCID	263	259 (98%)	7	37.6
4	A	BCID	180	173 (96%)	5	36
	B	BCID	84	82 (98%)	7	12
5	A	BCID	40	39 (98%)	2	20
	B	BCID	104	102 (98%)	6	17.3
Total		**BCID**	**2,205**	**2,156 (98%)**	**45**	**49**

Table 3. Summary of BCID echolocation call identifications for the Red Pine Wind Project

Site ID	Station ID	EPFU[1]	LABO	LACI	LANO	MYLU	MYSE	PESU	UNK	Total
1	A	53	9	4	29	7	0	22	5	**129**
1	B	87	10	2	54	1	0	4	1	**159**
2	A	6	15	22	30	1	0	4	5	**83**
2	B	5	4	9	16	0	0	6	1	**41**
3	A	625	259	58	109	5	2	43	21	**1120**
3	B	64	52	66	65	0	0	12	4	**263**
4	A	78	23	17	37	2	0	16	7	**180**
4	B	18	4	22	35	0	0	3	2	**84**
5	A	9	8	3	16	0	0	3	1	**40**
5	B	23	7	27	44	0	0	1	2	**104**
Total		**968**	**391**	**230**	**435**	**16**	**2**	**114**	**49**	**2,205**

[1] EPFU = Big Brown Bat; LABO = Eastern Red Bat; LACI = Hoary Bat; LANO = Silver-haired Bat; MYLU = Little Brown Bat; MYSE = Northern Long-eared Bat; PESU = Tri-colored bat; UNK = Unknown.

Table 4. Summary of NLEB call identifications by BCID and qualitative analysis[1] for stations with potential northern long-eared bat calls at the Red Pine Wind Project.

Site ID	Station ID	Date	Identification Method	MYSE (NLEB)
3	A	August 10	BCID	1
			Qualitative	0
3	A	August 12	BCID	1
			Qualitative	0

[1] Only calls with p-values < 0.05 for the maximum-likelihood estimation were included in qualitative analysis (USFWS 2014a).

Table 5. Summary of actions at each acoustic survey site for the Red Pine Wind Project.

Site	Station ID	NLEB Calls	Probable NLEB Calls (P < 0.05)	NLEB Qualitatively Verified	Recommended Action
1	A	No	No	No	Survey complete
1	B	No	No	No	Survey complete
2	A	No	No	No	Survey complete
2	B	No	No	No	Survey complete
3	A	Yes	Yes	No	Survey complete
3	B	No	No	No	Survey complete
4	A	No	No	No	Survey complete
4	B	No	No	No	Survey complete
5	A	No	No	No	Survey complete
5	B	No	No	No	Survey complete

Table 6. Location and site description of mist-net sites for the 2015 northern long-eared bat surveys at the Red Pine Wind Project

Site ID	Net	Zone	Easting	Northing	Site Description
1	A	14	724129	4927724	wooded fringe around pond
	B	14	724141	4927785	wooded fringe around pond
2	A	14	731219	4930647	riparian area across stream
	B	14	731087	4930627	riparian area across stream
3	A	14	736888	4920166	open corridor in forest patch
	B	14	737001	4920090	field road in forest patch
4	A	14	728633	4923810	riparian area across stream
	B	14	728647	4923759	old stream corridor in forest patch
5	A	14	728494	4934929	open meadow patch in forest
	B	14	728461	4934953	forest edge by road

Table 7. Summary of bat captures at mist-net sites for the 2015 northern long-eared bat surveys at the Red Pine Wind Project

Site	Big Brown Bat (EPFU)	Eastern Red Bat (LABO)	Hoary Bat (LACI)	Silver-Haired Bat (LANO)	Little Brown Bat (MYLU)	Northern Long-Eared Bat (NLEB)	Unknown	Total
1A	0	0	0	1	0	0	0	**1**
1B	1	0	0	0	0	0	0	**1**
3A	2	1	1	0	0	0	0	**4**
3B	0	1	0	0	0	0	0	**1**
Total	**3**	**2**	**1**	**1**	**0**	**0**	**0**	**7**

Appendix A. Maps of Survey Sites

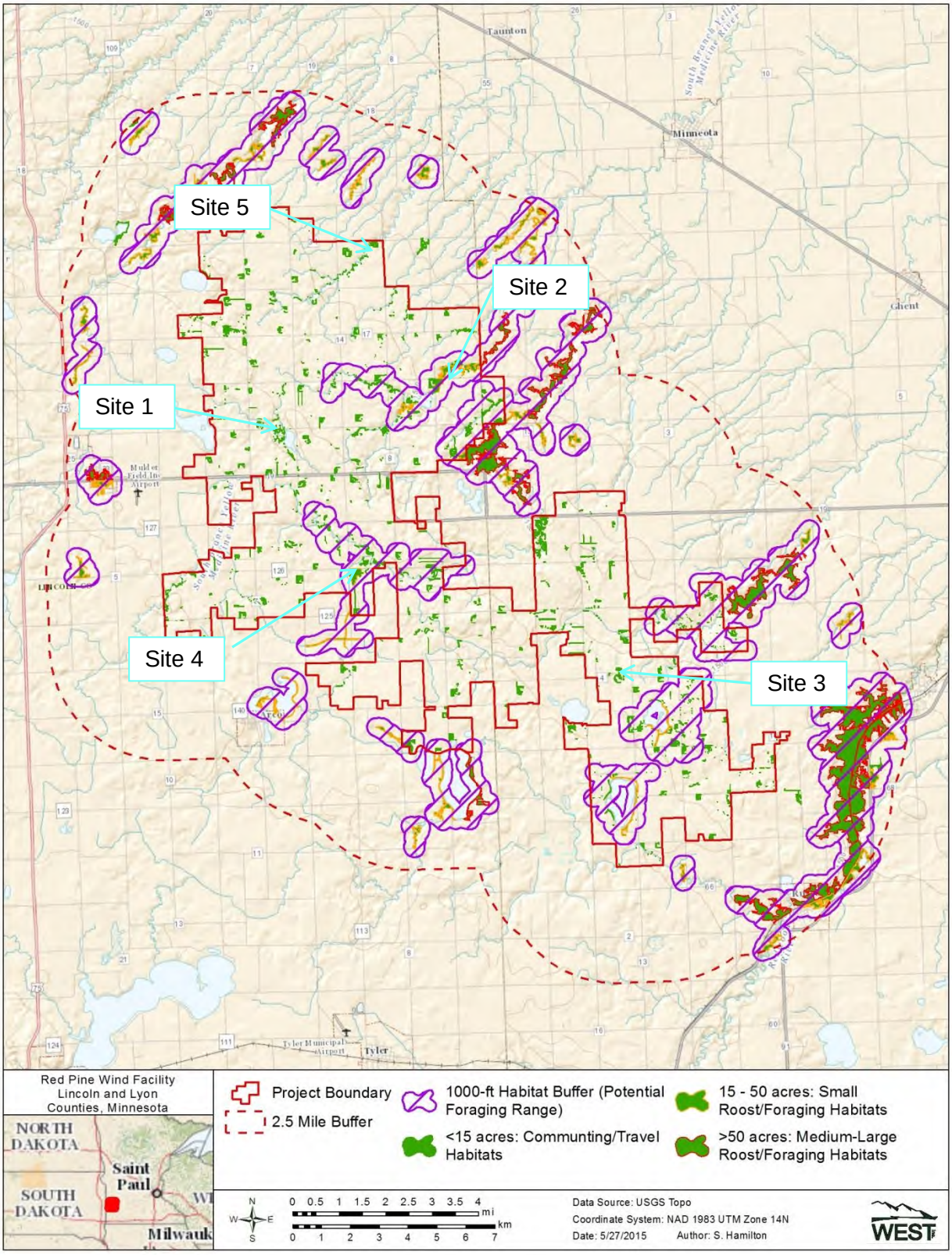


Figure 1. Location of Northern Long-Eared Bat Presence/Absence Survey Sites

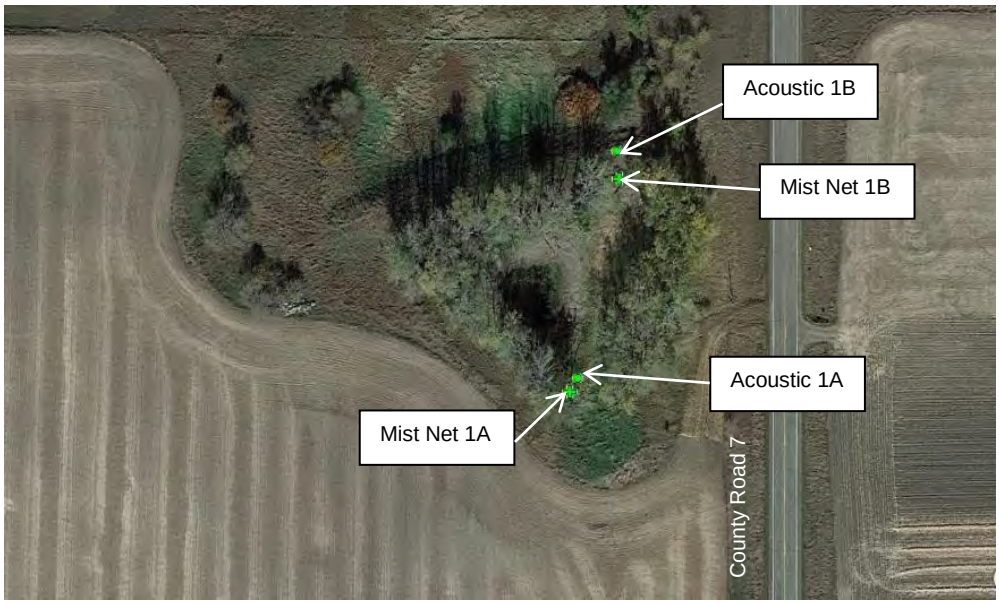


Figure 2. Site 1 Acoustic and Mist Net Survey Locations

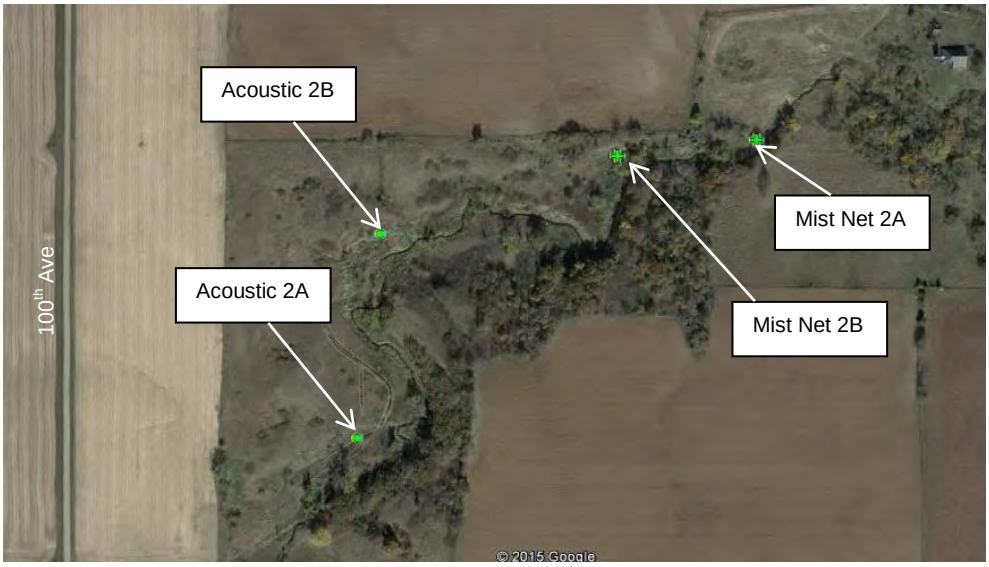


Figure 3. Site 2 Acoustic and Mist Net Survey Locations

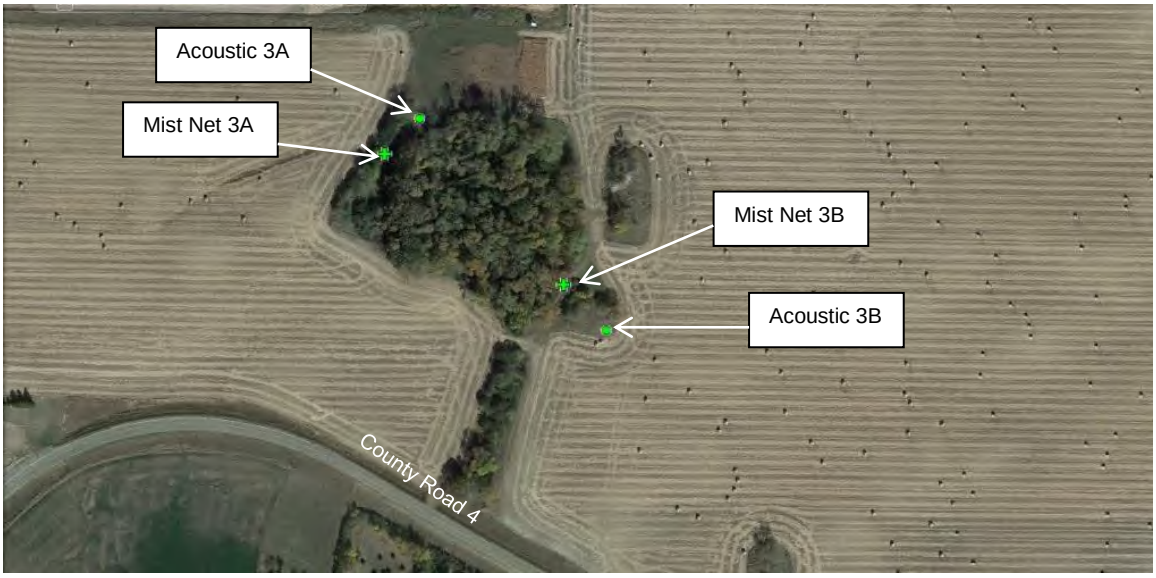


Figure 4. Site 3 Acoustic and Mist Net Survey Locations

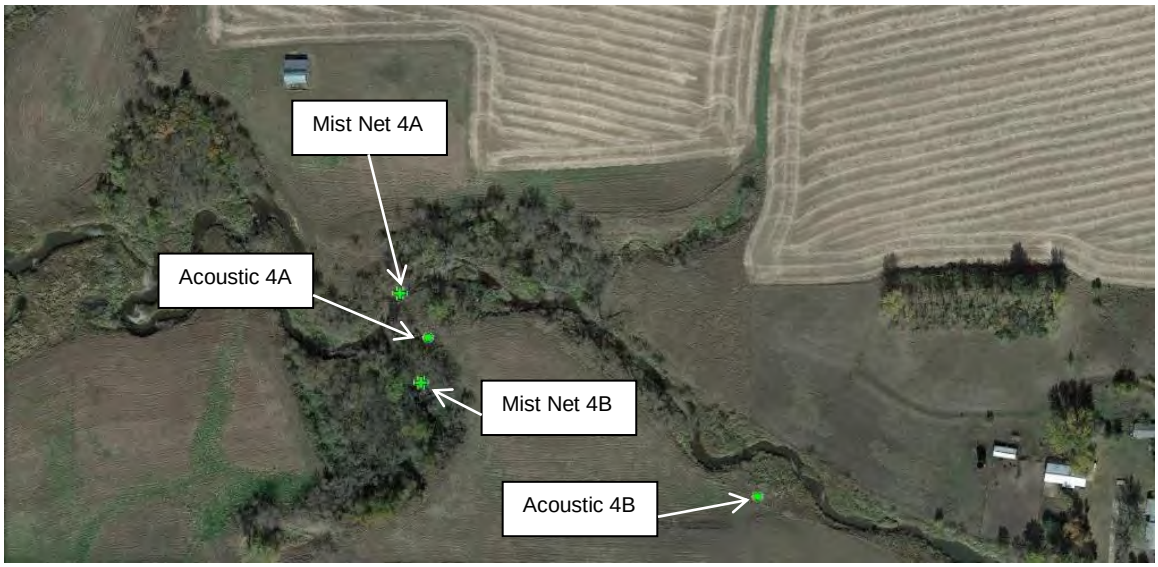


Figure 5. Site 4 Acoustic and Mist Net Survey Locations

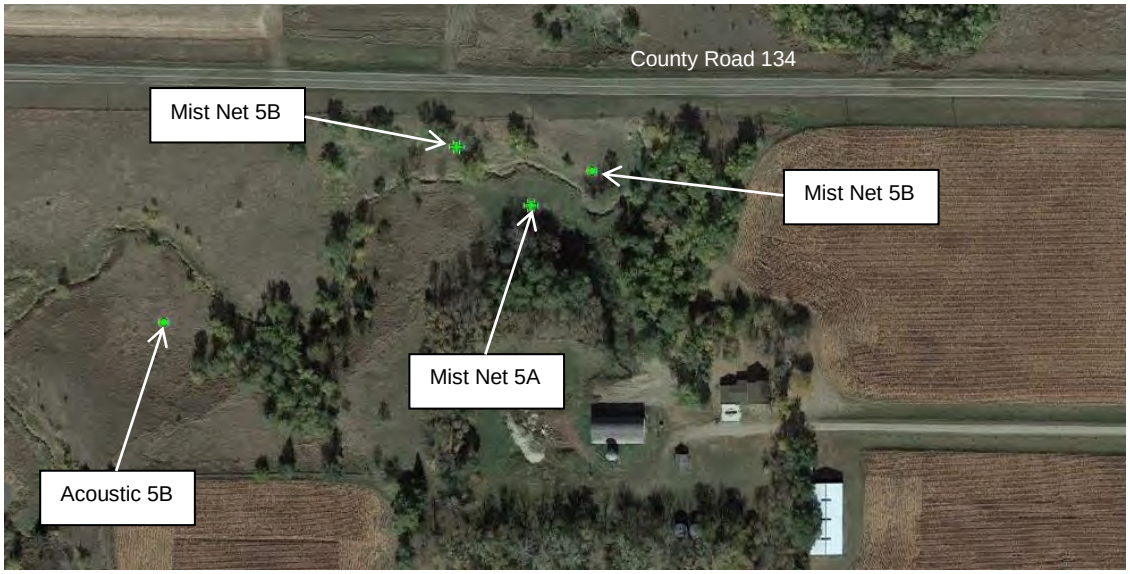


Figure 6. Site 5 Acoustic and Mist Net Survey Locations

Appendix B. Photos of Acoustic Survey Sites

1A Photos: detector cone (left), location (top-right), orientation (bottom-right)

1B Photos: detector cone (left), location (top-right), orientation (bottom-right)

2A Photos: detector cone (left), location (top-right), orientation (bottom-right)

2B Photos: detector cone (left), location (top-right), orientation (bottom-right)

3A Photos: detector cone (left), location (top-right), orientation (bottom-right)

3B Photos: detector cone (left), location (top-right), orientation (bottom-right)

4A Photos: detector cone (left), location (top-right), orientation (bottom-right)

4B Photos: detector cone (left), location (top-right), orientation (bottom-right)

5A Photos: detector cone (left), location (top-right), orientation (bottom-right)

5B Photos: detector cone (left), location (top-right), orientation (bottom-right)

Appendix C. Datasheets from Acoustic Survey Sites

Acoustic Monitoring Station 2015 Data Form

Project: Red Pine

Start Date: 8/7/15 Start Time: 15:30

End Date: 8/14/15 End Time: 0241

Observers: T. Harvey, L. Garrett

Observers: BHale

Station Information:

County: Lincoln State: MN Station #: site 1 (A)

Datum: NAD27 (NAD83) Zone: 14 T Northing: *(7 digits)* 4927728 Easting: *(6 digits)* 724131

Detector Type: (SD2) SD1 SM3 SM2 Detector Serial #: 82579 Battery source: (12V) AA's

Microphone Ht (m): *(from ground)* 1.5 Aspect: *(Cardinal Direction of mic)* 337°

Photo ID #s: Detector Location: ✓ Detector Orientation: ✓ Detection Cone: ✓

Comments: *(e.g.: Non-standard housing/waterproofing used? Was detector disturbed? Nightly rain?)*

Settings Checklist:

	At start	At end
Sensitivity *(normally 6)*	6	6
DIV Ratio(s) *(should be 16)*	16	16
Testing indicators *(should see Data LED flicker and hear static from speaker)*	✓Data LED lit Static heard	✓Data LED lit Static heard
Volume *(should be lowest setting)*	low	0
LED Lights *(should be Standby, unless between 1800 and 0800 hrs)*	Record Status (Standby) Error Data	(Record) Status Standby Error Data
Battery voltage *(replace when <10V at end)*	12.84	12.18

Habitat Comments: *(Within 100m radius of Anabat)*

Composition: % Forested: 20% Agricultural: 20 % Water: 20% Open: 40

Water Resources:	Description (#, size, type, etc.):
Stream	N/A
Pools/Ponds	small pond in front of unit, ~30m
Wetlands	N/A

Forest Resources:

Stand Age (even, young, mature, etc.): mature

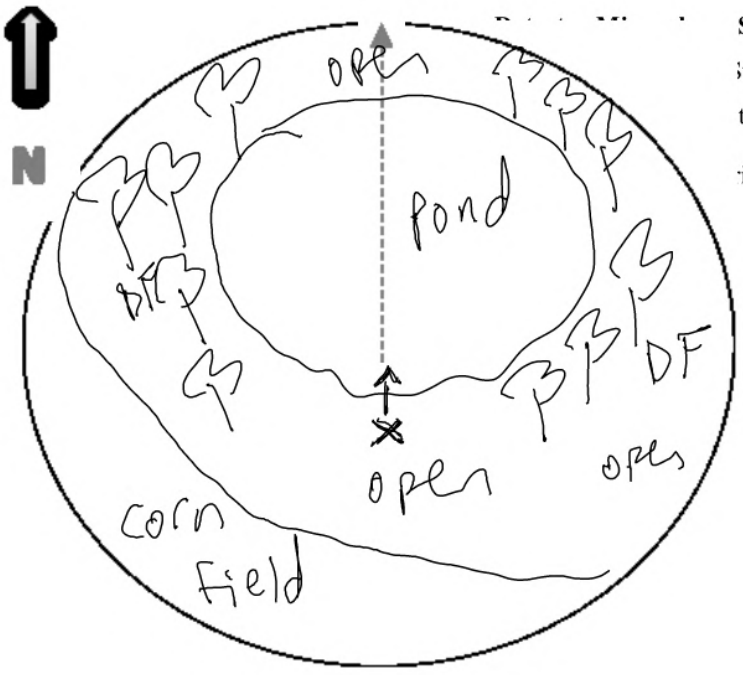
Forest Type: deciduous

# of Snags: >10

Habitat Map:

Closure/Density %: Canopy: 10 Mid-story: 3 Understory: 7

Dominant Tree sps: eastern cottonwood



Sampling: Forest Edge Road Shelterbelt (Pond)

Stream River Wetland Forest Canopy Opening

t Corridor Wooded Fenceline Other *(describe below)*

itten Description of habitat, bat features, and topography:

~30m pond beside corn field

road <100m from site

Features outside the 100m radius *(rocky outcrop, cliff, mine, cave, anthropogenic structure, etc.)*:

NA

Acoustic Monitoring Station 2015 Data Form

Project: Red Pine

Start Date: 8/7/15 Start Time: 15:57

End Date: 8/10/15 End Time: 2021

Observers: T. Harvey, L. Garrett

Observers: BHale

Station Information:

County: Lincoln State: MN Station #: site 1 (B)

Datum: NAD27 (NAD83) Zone: 14T Northing: *(7 digits)* 4927793 Easting: *(6 digits)* 724140

Detector Type: SD2 (SD1) SM3 SM2 Detector Serial #: 5653 Battery source: (12V) AA's

Microphone Ht (m): *(from ground)* 1.5 Aspect: *(Cardinal Direction of mic)* 260°

Photo ID #s: Detector Location: ✓ Detector Orientation: ✓ Detection Cone: ✓

Comments: *(e.g.: Non-standard housing/waterproofing used? Was detector disturbed? Nightly rain?)*

67m from site A. could not get it further due to habitat and land limitations. Tri-pod angle adjustment knob missing. No replacement, so we made do with it

Settings Checklist:

	At start	At end
Sensitivity *(normally 6)*	6 1/2	6.5
DIV Ratio(s) *(should be 16)*	16	16
Testing indicators *(should see Data LED flicker and hear static from speaker)*	✓Data LED lit Static heard	✓Data LED lit Static heard
Volume *(should be lowest setting)*	low	0
LED Lights *(should be Standby, unless between 1800 and 0800 hrs)*	Record (Standby) Status Error Data	(Record) Standby Status Error Data
Battery voltage *(replace when <10V at end)*	12.43	12.04

Habitat Comments: *(Within 100m radius of Anabat)*

Composition: % Forested: 30 % Agricultural: 10 % Water: 20 % Open: 40

Water Resources:

Description (#, size, type, etc.):	
Stream	N/A
Pools/Ponds	small pond (~30m) to the south
Wetlands	N/A

Forest Resources:

Stand Age (even, young, mature, etc.): mature

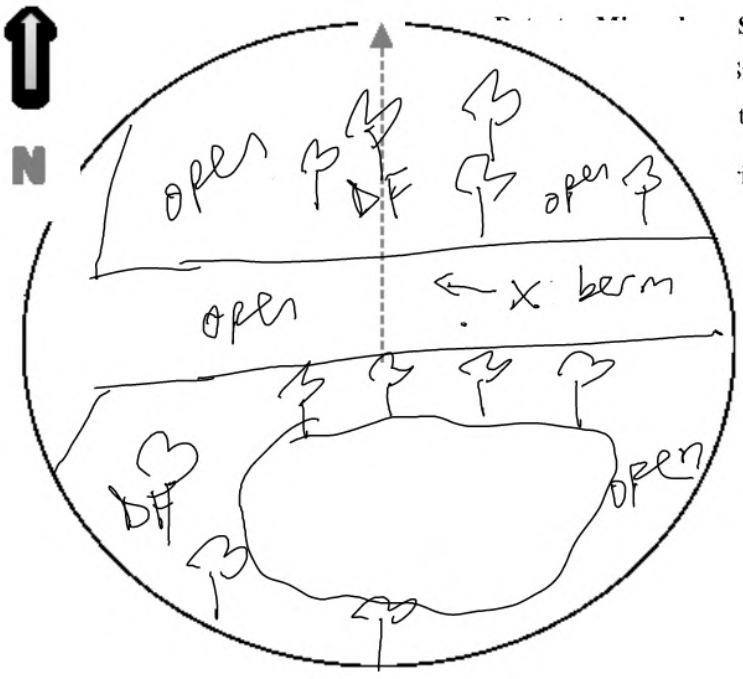
Forest Type: deciduous

# of Snags: >10

Habitat Map:

Closure/Density %: Canopy: 15 Mid-story: 10 Understory: 5

Dominant Tree sps: Eastern cottonwood, siberian elm



Sampling: Forest Edge Road Shelterbelt (Pond)

Stream River Wetland Forest Canopy Opening

t Corridor Wooded Fenceline Other *(describe below)*

itten Description of habitat, bat features, and topography:

on berm to N of pond
corn field to S and W
road <100m away

Features outside the 100m radius *(rocky outcrop, cliff, mine, cave, anthropogenic structure, etc.)*:

N/A

Acoustic Monitoring Station 2015 Data Form

Project: Red Pine

Start Date: 8/6/15 Start Time: 14:05

End Date: 8/8/15 End Time: 9:15

Observers: T. Harvey, L. Garrett

Observers: T. Harvey, L. Garrett

Station Information:

County: Lincoln State: MN Station #: site 2 (A)

Datum: NAD27 (NAD83) Zone: 14T Northing: *(7 digits)* 4930351 Easting: *(6 digits)* 730849

Detector Type: (SD2) SD1 SM3 SM2 Detector Serial #: 81811 Battery source: (12V) AA's

Microphone Ht (m): *(from ground)* 1.5 Aspect: *(Cardinal Direction of mic)* 253°

Photo ID #s: Detector Location: ✓ Detector Orientation: ✓ Detection Cone: ✓

Comments: *(e.g.: Non-standard housing/waterproofing used? Was detector disturbed? Nightly rain?)*

Settings Checklist:

	At start	At end
Sensitivity *(normally 6)*	6	6
DIV Ratio(s) *(should be 16)*	16	16
Testing indicators *(should see Data LED flicker and hear static from speaker)*	✓Data LED lit ✓Static heard	✓Data LED lit ✓Static heard
Volume *(should be lowest setting)*	low	low
LED Lights *(should be Standby, unless between 1800 and 0800 hrs)*	Record Status (Standby) Error Data	Record Status (Standby) Error Data
Battery voltage *(replace when <10V at end)*	12.78	12.47

Habitat Comments: *(Within 100m radius of Anabat)*

Composition: % Forested: 50 % Agricultural: 0 % Water: 0 % Open: 50

Water Resources:

	Description (#, size, type, etc.):
Stream	creek about 60m SE of site
Pools/Ponds	N/A
Wetlands	N/A

Forest Resources:

Stand Age (even, young, mature, etc.): mature

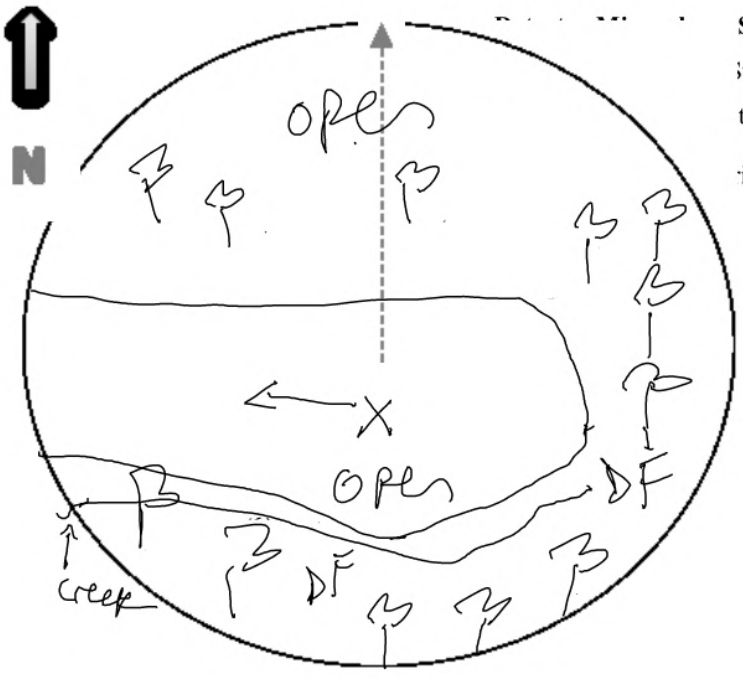
Forest Type: decidous

# of Snags: 8

Habitat Map:

Closure/Density %: Canopy: 25 Mid-story: 15 Understory: 10

Dominant Tree sps: mixed oak



Sampling: (Forest Edge) Road Shelterbelt Pond Stream River Wetland Forest Canopy Opening t Corridor Wooded Fenceline Other *(describe below)*

Written Description of habitat, bat features, and topography:

forest edge
Stream about 60m to SE

Features outside the 100m radius *(rocky outcrop, cliff, mine, cave, anthropogenic structure, etc.)*:

N/A

Acoustic Monitoring Station 2015 Data Form

Project: Red Pine

Start Date: 8/6/15 Start Time: 14:46

End Date: 8/8/15 End Time: 9:29

Observers: T. Harvey, L. Garrett

Observers: T. Harvey, L. Garrett

Station Information:

County: Lincoln State: MN Station #: site 2 (B)

Datum: NAD27 (NAD83) Zone: 14T Northing: *(7 digits)* 4930545 Easting: *(6 digits)* 730864

Detector Type: (SD2) SD1 SM3 SM2 Detector Serial #: 81729 Battery source: (12V) AA's

Microphone Ht (m): *(from ground)* 1.5 Aspect: *(Cardinal Direction of mic)* 240°

Photo ID #s: Detector Location: ✓ Detector Orientation: ✓ Detection Cone: ✓

Comments: *(e.g.: Non-standard housing/waterproofing used? Was detector disturbed? Nightly rain?)*

Settings Checklist:

	At start	At end
Sensitivity *(normally 6)*	6	6
DIV Ratio(s) *(should be 16)*	16	16
Testing indicators *(should see Data LED flicker and hear static from speaker)*	✓Data LED lit ✓Static heard	✓Data LED lit ✓Static heard
Volume *(should be lowest setting)*	low	low
LED Lights *(should be Standby, unless between 1800 and 0800 hrs)*	Record Status (Standby) Error Data	Record Status (Standby) Error Data
Battery voltage *(replace when <10V at end)*	12.83	12.53

Habitat Comments: *(Within 100m radius of Anabat)*

Composition: % Forested: 50 % Agricultural: 0 % Water: 0 % Open: 50

Water Resources:

Resources:	Description (#, size, type, etc.):
Stream	N/A
Pools/Ponds	N/A
Wetlands	N/A

Forest Resources:

Stand Age (even, young, mature, etc.): mature

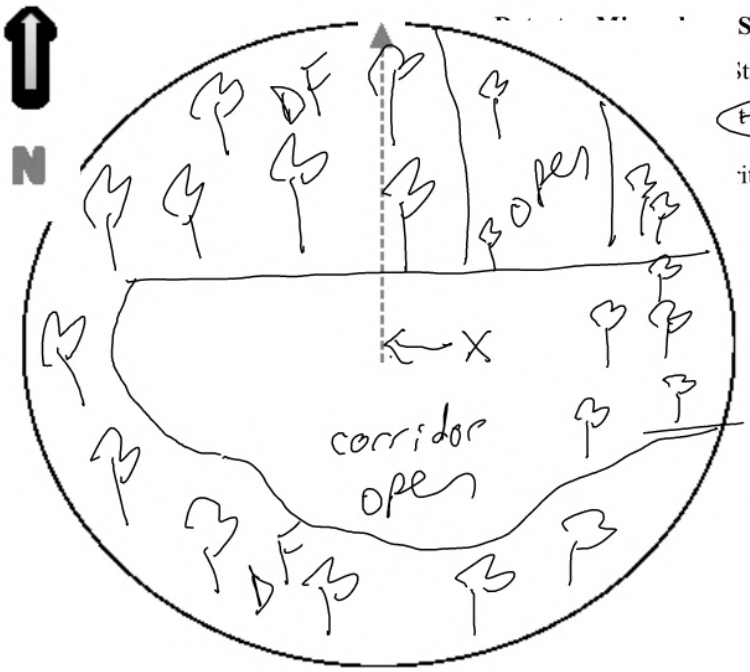
Forest Type: deciduous

# of Snags: 7

Habitat Map:

Closure/Density %: Canopy: 25 Mid-story: 10 Understory: 15

Dominant Tree sps: Box elder



Sampling: Forest Edge Road Shelterbelt Pond Stream River Wetland Forest Canopy Opening (Corridor) Wooded Fenceline Other *(describe below)*

Written Description of habitat, bat features, and topography:

small forest corridor

Features outside the 100m radius *(rocky outcrop, cliff, mine, cave, anthropogenic structure, etc.)*:

N/A

Acoustic Monitoring Station 2015 Data Form

Project: Red Pine

Start Date: 8/7/15 Start Time: 12:25

End Date: 8/14/15 End Time: 0058

Observers: T. Harvey, L. Garrett

Observers: BHale

Station Information:

County: Lyon State: MN Station #: site 3 (A)

Datum: NAD27 (NAD83) Zone: 14 T Northing: *(7 digits)* 4920189 Easting: *(6 digits)* 736908

Detector Type: SD2 (SD1) SM3 SM2 Detector Serial #: 3685 Battery source: (12V) AA's

Microphone Ht (m): *(from ground)* 1.5 Aspect: *(Cardinal Direction of mic)* 270°

Photo ID #s: Detector Location: ✓ Detector Orientation: ✓ Detection Cone: ✓

Comments: *(e.g.: Non-standard housing/waterproofing used? Was detector disturbed? Nightly rain?)*

20 m N NW of original pt.
176 m from site B, unable to go farther due to crops at edge of forest

Settings Checklist:

	At start	At end
Sensitivity *(normally 6)*	6	6
DIV Ratio(s) *(should be 16)*	16	16
Testing indicators *(should see Data LED flicker and hear static from speaker)*	✓ Data LED lit ✓ Static heard	✓ Data LED lit ✓ Static heard
Volume *(should be lowest setting)*	low	0
LED Lights *(should be Standby, unless between 1800 and 0800 hrs)*	Record Status (Standby) Error Data	(Record) Status Standby Error Data
Battery voltage *(replace when <10V at end)*	12.51	11.88

Habitat Comments: *(Within 100m radius of Anabat)*

Composition: % Forested: 30 % Agricultural: 60 % Water: 0 % Open: 10

Water Resources:	Description (#, size, type, etc.):
Stream	N/A
Pools/Ponds	N/A
Wetlands	N/A

Forest Resources:

Stand Age (even, young, mature, etc.): mature

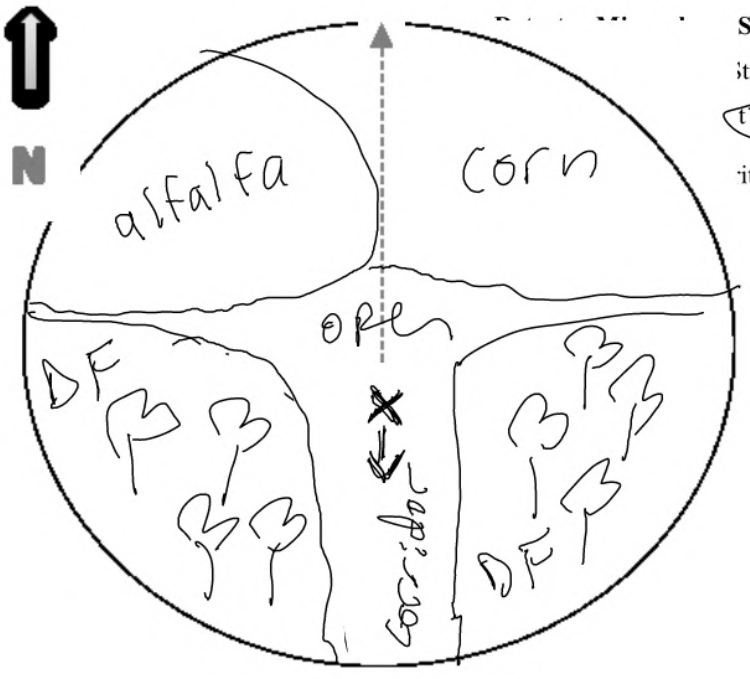
Forest Type: deciduous

# of Snags: 3

Habitat Map:

Closure/Density %: Canopy: 15 Mid-story: 5 Understory: 10

Dominant Tree sps: Green Ash, box elder, oak sp.



Sampling: Forest Edge Road Shelterbelt Pond

Stream River Wetland Forest Canopy Opening

(t Corridor) Wooded Fenceline Other *(describe below)*

Written Description of habitat, bat features, and topography:

forest corridor on edge of Alfalfa and corn fields

Features outside the 100m radius *(rocky outcrop, cliff, mine, cave, anthropogenic structure, etc.)*:

N/A

Acoustic Monitoring Station 2015 Data Form

Project: Red Pine

Start Date: 8/7/15 Start Time: 11:42

End Date: 8/14/15 End Time: 0122

Observers: T. Harvey, L. Garrett

Observers: B Hale

Station Information:

County: Lyon State: MN Station #: site 3 (B)

Datum: NAD27 (NAD83) Zone: 14 T Northing: *(7 digits)* 4920063 Easting: *(6 digits)* 737028

Detector Type: (SD2) SD1 SM3 SM2 Detector Serial #: 81991 Battery source: (12V) AA's

Microphone Ht (m): *(from ground)* 1.5 Aspect: *(Cardinal Direction of mic)* 250°

Photo ID #s: Detector Location: ✓ Detector Orientation: ✓ Detection Cone: ✓

Comments: *(e.g.: Non-standard housing/waterproofing used? Was detector disturbed? Nightly rain?)*

Settings Checklist:

	At start	At end
Sensitivity *(normally 6)*	6	6
DIV Ratio(s) *(should be 16)*	16	16
Testing indicators *(should see Data LED flicker and hear static from speaker)*	✓Data LED lit Static heard	✓Data LED lit Static heard
Volume *(should be lowest setting)*	low	0
LED Lights *(should be Standby, unless between 1800 and 0800 hrs)*	Record Status (Standby) Error Data	(Record) Status Standby Error Data
Battery voltage *(replace when <10V at end)*	12.76	11.34

Habitat Comments: *(Within 100m radius of Anabat)*

Composition: % Forested: 30 % Agricultural: 60 % Water: 0 % Open: 10

Water Resources:	**Description (#, size, type, etc.):**
Stream	N/A
Pools/Ponds	N/A
Wetlands	N/A

Forest Resources:

Stand Age (even, young, mature, etc.): mature

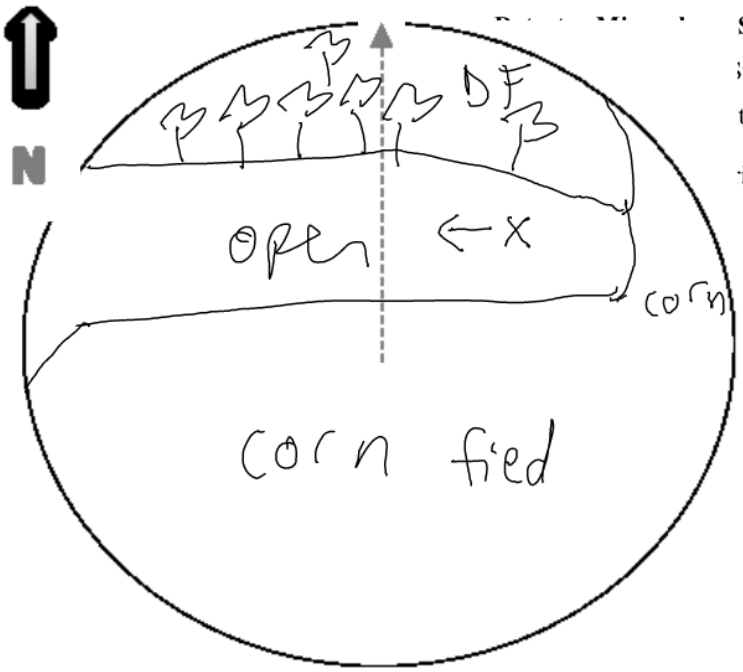
Forest Type: deciduous

# of Snags: 3

Habitat Map:

Closure/Density %: Canopy: 15 Mid-story: 5 Understory: 10

Dominant Tree sps: Green Ash



Sampling: (Forest Edge) Road Shelterbelt Pond

Stream River Wetland Forest Canopy Opening

t Corridor Wooded Fenceline (Other *(describe below)*)

itten Description of habitat, bat features, and topography:

small forest edge, opening into corn field

Features outside the 100m radius *(rocky outcrop, cliff, mine, cave, anthropogenic structure, etc.)*:

N/A

Acoustic Monitoring Station 2015 Data Form

Project: Red Pine

Start Date: 8/7/15 Start Time: 10:00

End Date: 8/13/15 End Time: 2015

Observers: T. Harvey, L. Garrett

Observers: BHale

Station Information:

County: Lincoln State: MN Station #: site 4 (A)

Datum: NAD27 (NAD83) Zone: 14T Northing: *(7 digits)* 4923785 Easting: *(6 digits)* 728650

Detector Type: (SD2) SD1 SM3 SM2 Detector Serial #: 80695 Battery source: (12V) AA's

Microphone Ht (m): *(from ground)* 1.5 Aspect: *(Cardinal Direction of mic)* 128°

Photo ID #s: Detector Location: V Detector Orientation: ✓ Detection Cone: ✓

Comments: *(e.g.: Non-standard housing/waterproofing used? Was detector disturbed? Nightly rain?)*

26 m NW of original pt.

Settings Checklist:

	At start	At end
Sensitivity *(normally 6)*	6	6
DIV Ratio(s) *(should be 16)*	16	16
Testing indicators *(should see Data LED flicker and hear static from speaker)*	✓ Data LED lit Static heard	✓ Data LED lit Static heard
Volume *(should be lowest setting)*	low	0
LED Lights *(should be Standby, unless between 1800 and 0800 hrs)*	Record (Standby) Status Error Data	Record Standby Status Error Data
Battery voltage *(replace when <10V at end)*	12.85	11.73

Habitat Comments: *(Within 100m radius of Anabat)*

Composition: % Forested: 60 % Agricultural: 0 % Water: 0 % Open: 40

Water Resources:

	Description (#, size, type, etc.):
Stream	stream about 50m N
Pools/Ponds	N/A
Wetlands	N/A

Forest Resources:

Stand Age (even, young, mature, etc.): mature

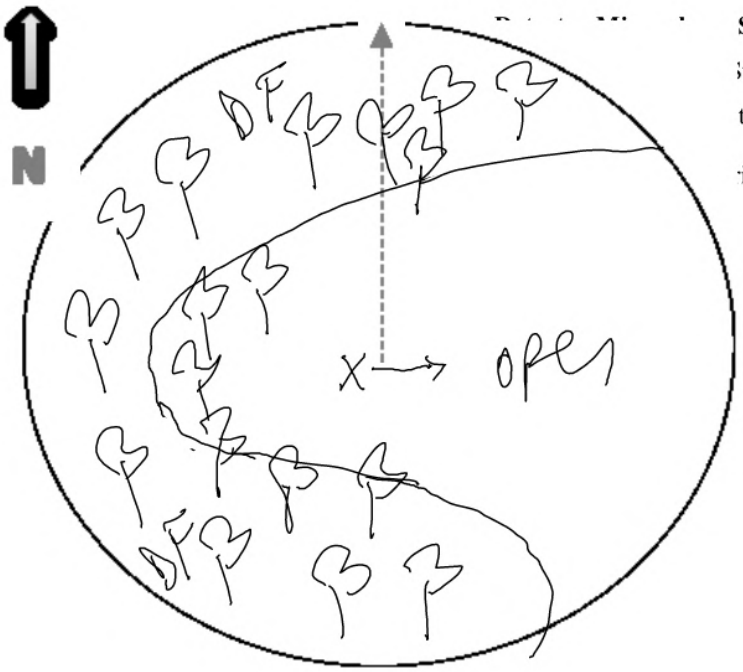
Forest Type: deciduous

# of Snags: 9

Habitat Map:

Closure/Density %: Canopy: 30 Mid-story: 15 Understory: 15

Dominant Tree sps: American elm



Sampling: (Forest Edge) Road Shelterbelt Pond

Stream River Wetland Forest Canopy Opening

t Corridor Wooded Fenceline Other *(describe below)*

itten Description of habitat, bat features, and topography:

forest edge opening to field

Features outside the 100m radius *(rocky outcrop, cliff, mine, cave, anthropogenic structure, etc.)*:

N/A

Acoustic Monitoring Station 2015 Data Form

Project: Red Pine

Start Date: 8/7/15 Start Time: 10:27

End Date: 8/14/15 End Time: 0022

Observers: T. Harvey, L. Garrett

Observers: BHale

Station Information:

County: Lincoln State: MN

Station #: site 4 (B)

Datum: NAD27 (NAD83) Zone: 14T

Northing: *(7 digits)* 4923700 Easting: *(6 digits)* 728844

Detector Type: (SD2) SD1 SM3 SM2

Detector Serial #: 80723 Battery source: (12V) AA's

Microphone Ht (m): *(from ground)* 1.5

Aspect: *(Cardinal Direction of mic)* 294°

Photo ID #s: Detector Location: V

Detector Orientation: ✓ Detection Cone: ✓

Comments: *(e.g.: Non-standard housing/waterproofing used? Was detector disturbed? Nightly rain?)*

Settings Checklist:

	At start	At end
Sensitivity *(normally 6)*	6	6
DIV Ratio(s) *(should be 16)*	16	16
Testing indicators *(should see Data LED flicker and hear static from speaker)*	~~Data~~ LED lit Static heard	Data LED lit ✓ Static heard
Volume *(should be lowest setting)*	low	0
LED Lights *(should be Standby, unless between 1800 and 0800 hrs)*	Record ~~Standby~~ Status Error Data	(Record) Standby Status Error Data
Battery voltage *(replace when <10V at end)*	12.81	11.72

Habitat Comments: *(Within 100m radius of Anabat)*

Composition: % Forested: 27 % Agricultural: 0 % Water: 3 % Open: 70

Water Resources:

Resources:	Description (#, size, type, etc.):
Stream	creek ~50 ft to N
Pools/Ponds	N/A
Wetlands	N/A

Forest Resources:

Stand Age (even, young, mature, etc.): mature/young

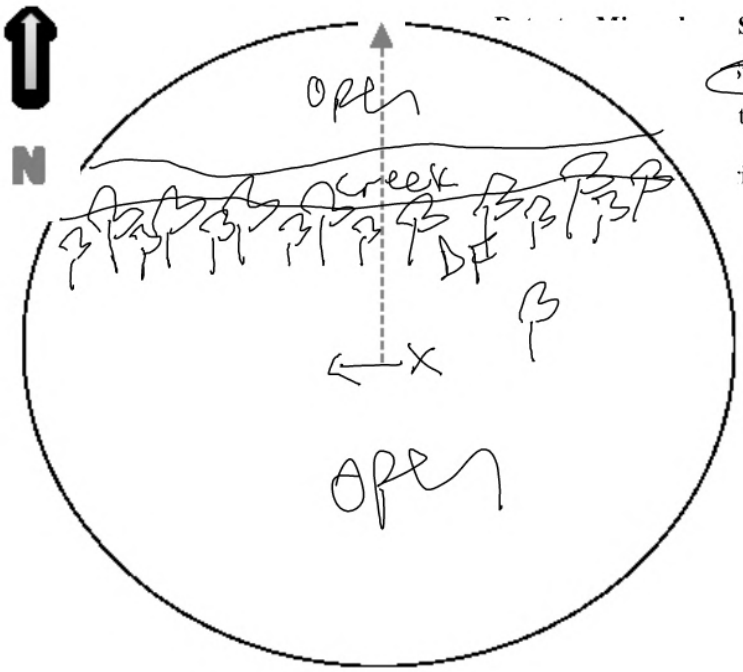
Forest Type: deciduous

# of Snags: 5

Habitat Map:

Closure/Density %: Canopy: 15 Mid-story: 7 Understory: 5

Dominant Tree sps: Box elders



Sampling: (Forest Edge) Road Shelterbelt Pond (Stream) River Wetland Forest Canopy Opening t Corridor Wooded Fenceline Other *(describe below)*

itten Description of habitat, bat features, and topography:

small forest edge

Stream ~ 50 ft to N.

Features outside the 100m radius *(rocky outcrop, cliff, mine, cave, anthropogenic structure, etc.)*:

farm building

Acoustic Monitoring Station 2015 Data Form

Project: Red pine

Start Date: 8/6/15 Start Time: 11:35

End Date: 8/8/15 End Time: 10:40

Observers: T. Harvey, L. Garrett

Observers: T. Harvy, L. Garrett

Station Information:

County: Lincoln State: MN Station #: site 5 (A)

Datum: NAD27 (NAD83) Zone: 14T Northing: *(7 digits)* 4934945 Easting: *(6 digits)* 728520

Detector Type: (SD2) SD1 SM3 SM2 Detector Serial #: 80923 Battery source: (12V) AA's

Microphone Ht (m): *(from ground)* 1.5 Aspect: *(Cardinal Direction of mic)* 250°

Photo ID #s: Detector Location: ✓ Detector Orientation: ✓ Detection Cone: ✓

Comments: *(e.g.: Non-standard housing/waterproofing used? Was detector disturbed? Nightly rain?)*

46 m. north of original point

Settings Checklist:

	At start	At end
Sensitivity *(normally 6)*	6	6
DIV Ratio(s) *(should be 16)*	16	16
Testing indicators *(should see Data LED flicker and hear static from speaker)*	√Data LED lit √Static heard	√Data LED lit √Static heard
Volume *(should be lowest setting)*	low	low
LED Lights *(should be Standby, unless between 1800 and 0800 hrs)*	Record Status (Standby) Error Data	Record Status (Standby) Error Data
Battery voltage *(replace when <10V at end)*	12.68	12.37

Habitat Comments: *(Within 100m radius of Anabat)*

Composition: % Forested: 50 % Agricultural: 0 % Water: 3 % Open: 47

Water Resources:

Resources:	Description (#, size, type, etc.):
Stream	small creek
Pools/Ponds	N/A
Wetlands	N/A

Forest Resources:

Stand Age (even, young, mature, etc.): mature

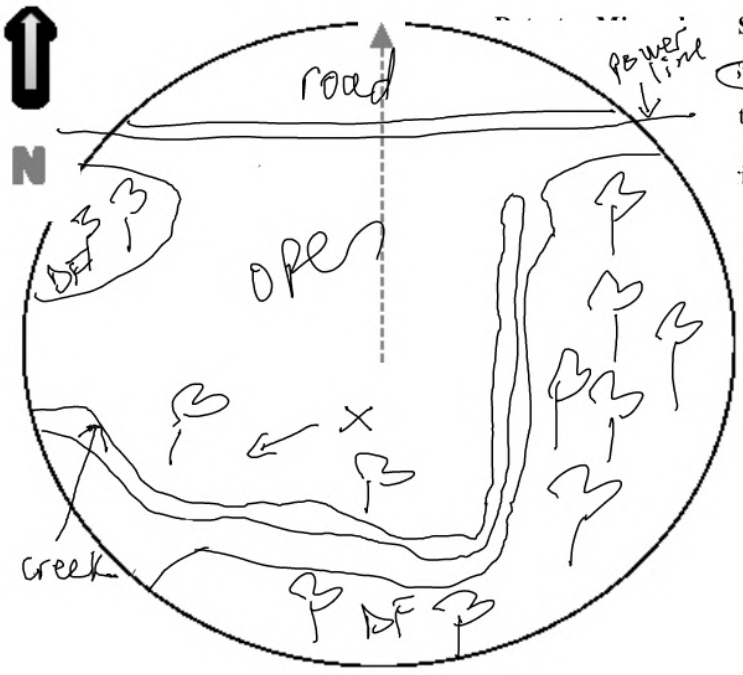
Forest Type: deciduous

# of Snags: 4

Habitat Map:

Closure/Density %: Canopy: 25 Mid-story: 10 Understory: 15

Dominant Tree sps: american elm



Sampling: (Forest Edge) Road Shelterbelt Pond (stream) River Wetland Forest Canopy Opening t Corridor Wooded Fenceline Other *(describe below)*

itten Description of habitat, bat features, and topography:

stream along forest edge, road less than 100 m from point

Features outside the 100m radius *(rocky outcrop, cliff, mine, cave, anthropogenic structure, etc.)*:

N/A

Acoustic Monitoring Station 2015 Data Form

Project: Red pine

Start Date: 8/8/15 Start Time: 12:48

End Date: 8/14 End Time: 2042

Observers: T. Harvey, L. Garrett

Observers: L Gedacht

Station Information:

County: Lincoln State: MN Station #: site 5 (B)

Datum: NAD27 (NAD83) Zone: 14T Northing: *(7 digits)* 4934873 Easting: *(6 digits)* 728337

Detector Type: (SD2) SD1 SM3 SM2 Detector Serial #: 81729 Battery source: (12V) AA's

Microphone Ht (m): *(from ground)* 1.5 Aspect: *(Cardinal Direction of mic)* 64°

Photo ID #s: Detector Location: ✓ Detector Orientation: ✓ Detection Cone: ✓

Comments: *(e.g.: Non-standard housing/waterproofing used? Was detector disturbed? Nightly rain?)*

Deployed other side of creek from RP5A

Settings Checklist:

	At start	At end
Sensitivity *(normally 6)*	6	6
DIV Ratio(s) *(should be 16)*	16	16
Testing indicators *(should see Data LED flicker and hear static from speaker)*	✓Data LED lit ✓Static heard	✓Data LED lit Static heard
Volume *(should be lowest setting)*	low	0
LED Lights *(should be Standby, unless between 1800 and 0800 hrs)*	Record Status (Standby) Error Data	(Record) Status Standby Error Data
Battery voltage *(replace when <10V at end)*	12.55	–

Habitat Comments: *(Within 100m radius of Anabat)*

Composition: % Forested: 30 % Agricultural: 0 % Water: 3 % Open: 67

Water Resources:	Description (#, size, type, etc.):
Stream	small creek
Pools/Ponds	N/A
Wetlands	N/A

Forest Resources:

Stand Age (even, young, mature, etc.): mature

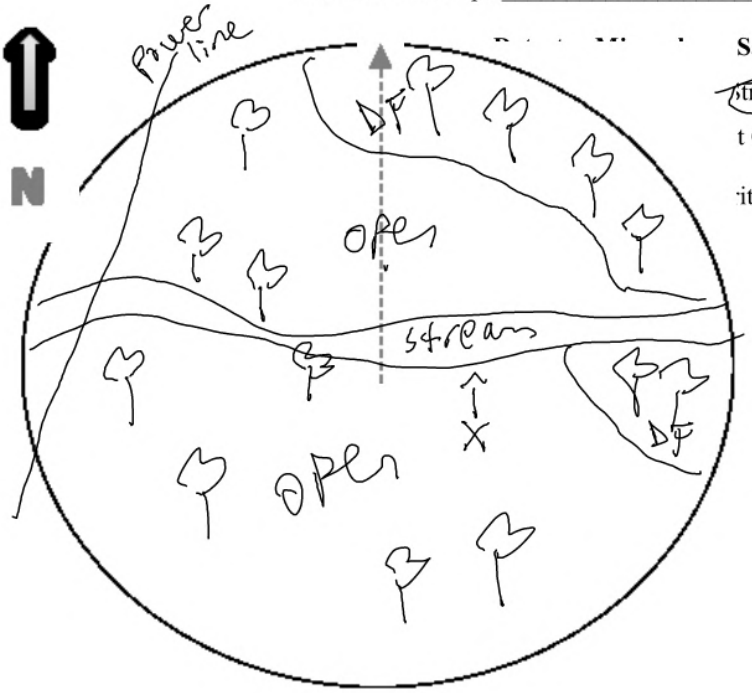
Forest Type: deciduous

# of Snags: 1

Habitat Map:

Closure/Density %: Canopy: 15 Mid-story: 10 Understory: 5

Dominant Tree sps: american elm



Sampling: Forest Edge Road Shelterbelt Pond (Stream) River Wetland Forest Canopy Opening t Corridor Wooded Fenceline Other *(describe below)*

itten Description of habitat, bat features, and topography:

stream along forest

Features outside the 100m radius *(rocky outcrop, cliff, mine, cave, anthropogenic structure, etc.)*:

N/A

Appendix D. Photographs of Captured Bats

Photo D1. Big grown bat (EPFU) captured at Site 1

Photo D2.Silver-haired bat (LANO) captured at Site 1

Photo D3. Big brown bat (EPFU) captured at Site 3

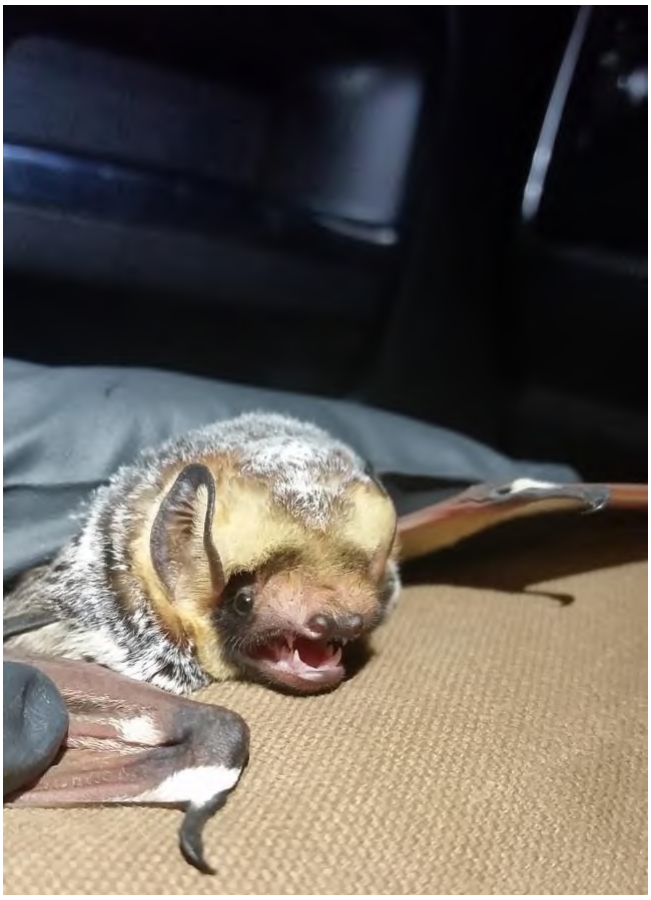


Photo D4. Hoary bat (LACI) captured at Site 3.

Appendix E. Mist-Net Capture Details

Appendix E1. Details of bats captured at Red Pine Wind Project

Site	Date	Species	Sex	Age	Reproductive Status	Reichard Score	Weight (g)	Forearm Length (mm)
1A	8/9/15	Silver-haired bat	Male	Adult	Reproductive	0	11	40.6
1B	8/10/15	Big brown bat	Female	Adult	Non-reproductive	1	25.5	48.1
3A	8/13/15	Big brown bat	Male	Adult	Non-reproductive	0	16	47.1
3A	8/13/15	Big brown bat	Male	Adult	Non-reproductive	0	15.5	46.7
3A	8/13/15	Hoary bat	Male	Juvenile	Non-reproductive	0	19.5	53.1
3A	8/14/15	Eastern red bat	Male	Juvenile	Non-reproductive	0	10	37
3B	8/14/15	Eastern red bat	Female	Juvenile	Non-reproductive	0	7	41

Appendix F. Datasheets from Mist-Net Survey Sites

Site Description and Weather Data Form

Project: Red Pine
Site ID: RP Alt 1
Location (County/State): Lincoln Co., MN
GPS (each net set) & Photo ID #:
Net A 2×9m 724129 4927724 (14 T)
Net B 2×6m 724141 4927785 (14 T)

Sunset Time: 2040
Date/Net Night: 8/9/15 Night 1
Biologists: BHale

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation
Start Time: 2040	20.0	2.1	SW	90%	N	92%	none
End Time: 0140	17.7	2.6	W	15%	N	96%	none
Weather Comments:	light rain 1 hour prior to sunset moon: 23% illumination						

Moon Phase: New (1/4) 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Vegetation

Dominant Canopy Species: Populus deltoides

Estimate Canopy Tree Age: (use estimated dbh)

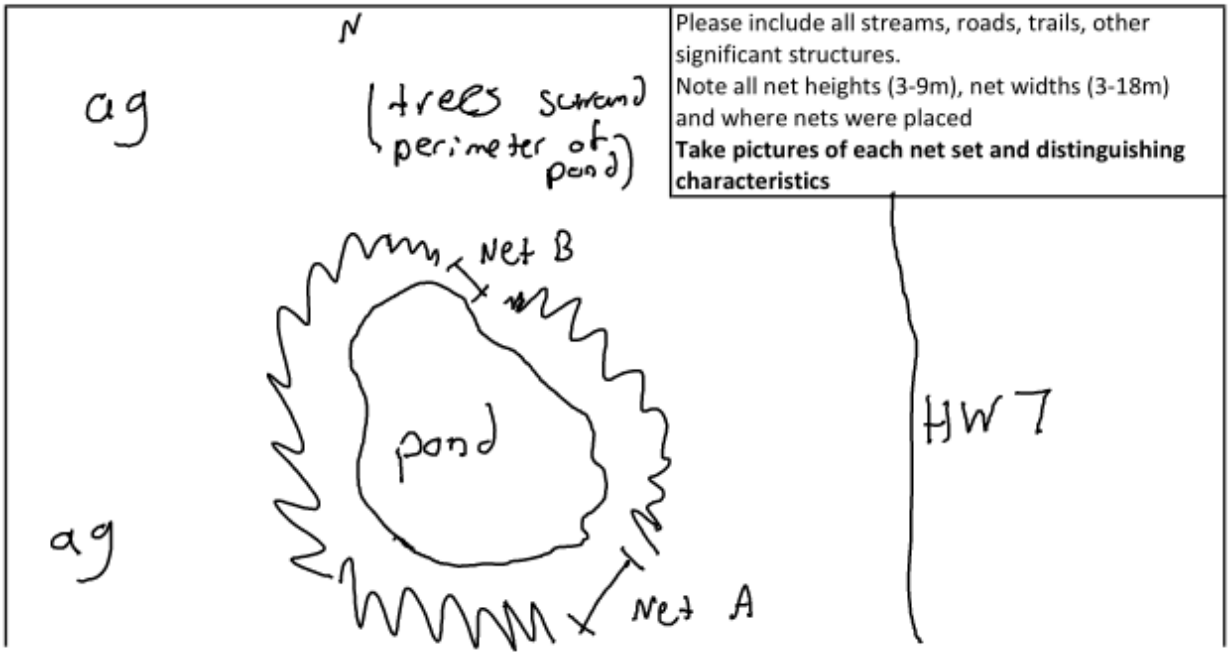
Circle one

<5 = young (5 - 30 = mature) >30 = old

Percent Canopy Closure: 15%

Net Site Sketch

Please include all streams, roads, trails, other significant structures.
Note all net heights (3-9m), net widths (3-18m) and where nets were placed
Take pictures of each net set and distinguishing characteristics



Site Description and Weather Data Form

Project: Red Pine
Site ID: RP Alt 1
Location (County/State): Lincoln Co., MN
GPS (each net set) & Photo ID #:
Net A 2×9m 724129 4927724 (14T)
Net B 2×6m 724141 4927785 (14T)

Sunset Time: 2038
Date/Net Night: 8/10/15 Night 2
Biologists: BHale

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation
Start Time: 2040	22.7	0	-	0%	N	69%	none
End Time: 0140	16.8	1.6	W	0%	N	89%	none
Weather Comments:	moon: 15% illumination						

Moon Phase: New (1/4) 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Vegetation

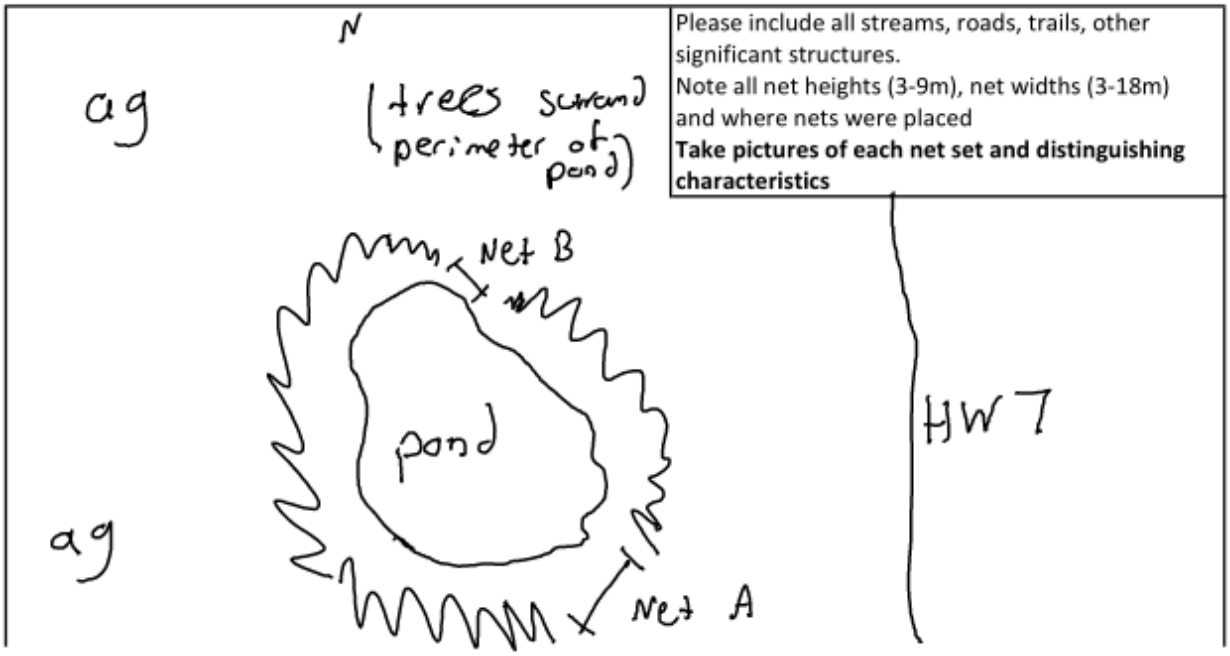
Dominant Canopy Species: Populus deltoides
Estimate Canopy Tree Age: (use estimated dbh)

Circle one		
<5 = young	5 - 30 = mature	>30 = old

Percent Canopy Closure: 15%

Net Site Sketch

Please include all streams, roads, trails, other significant structures.
Note all net heights (3-9m), net widths (3-18m) and where nets were placed
Take pictures of each net set and distinguishing characteristics



Site Description and Weather Data Form

Project: Red Pine
Site ID: RP-2
Location (County/State): Lincoln, MN
GPS (each net set) & Photo ID #:
A: 14T 0731219 RP2-Net A 4930647
B: 14T 0731087 RP2 - Net B 4930627
Sunset Time: 2033
Date/Net Night: 8/13/15 - Night 1
Biologists: Curtis Hart, Lindsay Godacht

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation
Start Time: 2033	23.0	0	N/A	50	N	88.9	none
End Time: 0133	17.9	0	N/A	0	N	99.1	none
Weather Comments:	—						

Moon Phase: (New) 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Vegetation

Dominant Canopy Species: Acer negundo

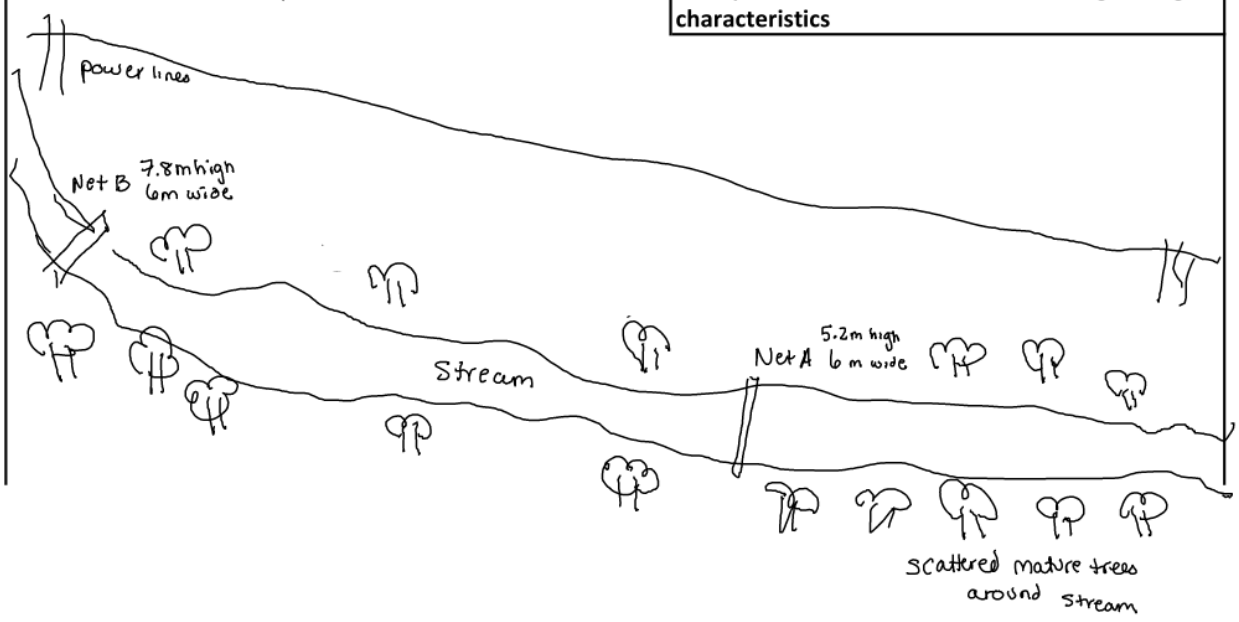
Estimate Canopy Tree Age: (use estimated dbh)

Circle one		
<5 = young	5 - 30 = mature	>30 = old

Percent Canopy Closure: 20%

Net Site Sketch

Please include all streams, roads, trails, other significant structures.
Note all net heights (3-9m), net widths (3-18m) and where nets were placed
Take pictures of each net set and distinguishing characteristics



Site Description and Weather Data Form

Project: Red Pine
Site ID: RP-2
Location (County/State): Lincoln, MN
GPS (each net set) & Photo ID #:
A: 14T 0731219 RP2-Net A
4930647
B: 14T 0731087 RP2-Net B
4930627
Sunset Time: 2031
Date/Net Night: 08/14/15 - Night 2
Biologists: Curtis Hart, Lindsay Godacht

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation
Start Time: 2031	20.8	0	N/A	0	N	95.4	none
End Time: 0131	21.0	1.1	W	0	N	97.4	none
Weather Comments:							

Moon Phase: (New) 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Vegetation

Dominant Canopy Species:

Percent Canopy Closure:

Estimate Canopy Tree Age: (use estimated dbh)

	Circle one	
<5 = young	5 - 30 = mature	>30 = old

Net Site Sketch

Please include all streams, roads, trails, other significant structures.
Note all net heights (3-9m), net widths (3-18m) and where nets were placed
Take pictures of each net set and distinguishing characteristics

Site Description and Weather Data Form

Project: Red Pine
Site ID: RP_3
Location (County/State): Lyon / MN
GPS (each net set) & Photo ID #:
NETA: 14T 0736888 4920166
NETB: 14T 0737001 4920090

Sunset Time: 2031
Date/Net Night: 8/13/15 Night 1
Biologists: BHale

Time:	Temp C°	m/s Wind Speed ~~(kph)~~	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation
Start Time: 2030	24.0	2.1	NW	10	N	65%	none
End Time: 0130	21.0	1.6	SE	10	N	83%	none
Weather Comments:							

Moon Phase: New 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Vegetation

Dominant Canopy Species: Acer negundo

Percent Canopy Closure: 75

Estimate Canopy Tree Age: (use estimated dbh)

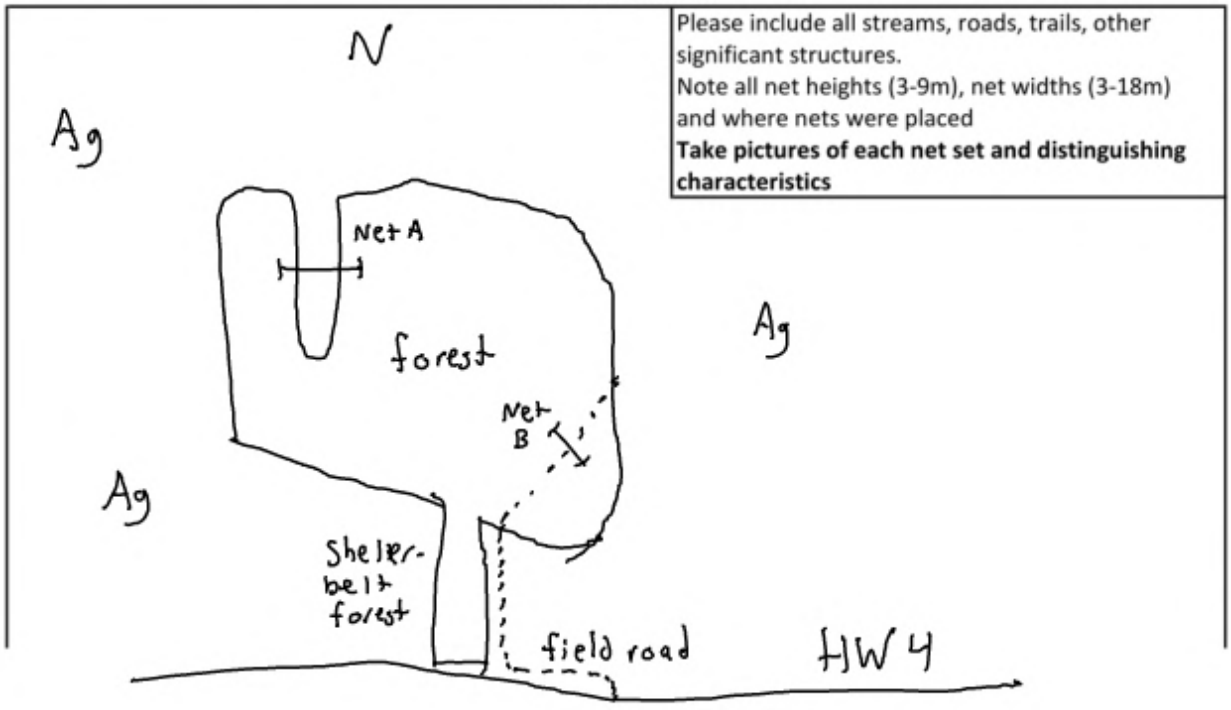
Circle one

5 - 30=

<5 = young mature >30 = old

Net Site Sketch

Please include all streams, roads, trails, other significant structures.
Note all net heights (3-9m), net widths (3-18m) and where nets were placed
Take pictures of each net set and distinguishing characteristics



Site Description and Weather Data Form

Project: Red Pine
Site ID: RP_3
Location (County/State): LYON / MN
GPS (each net set) & Photo ID #: NETA: 14T 0736888 4920166
NETB: 14T 0737001 4920090

Sunset Time: 2032
Date/Net Night: 08/14/15 Night 2
Biologists: H. Otto

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation
Start Time: 2032	24.3	0.5	N	0	N	92.1	0
End Time: 0132	21.2	0.3	N	0	N	96.7	0
Weather Comments:							

Moon Phase: (New) 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Vegetation

Dominant Canopy Species: Acer negundo

Estimate Canopy Tree Age: (use estimated dbh)

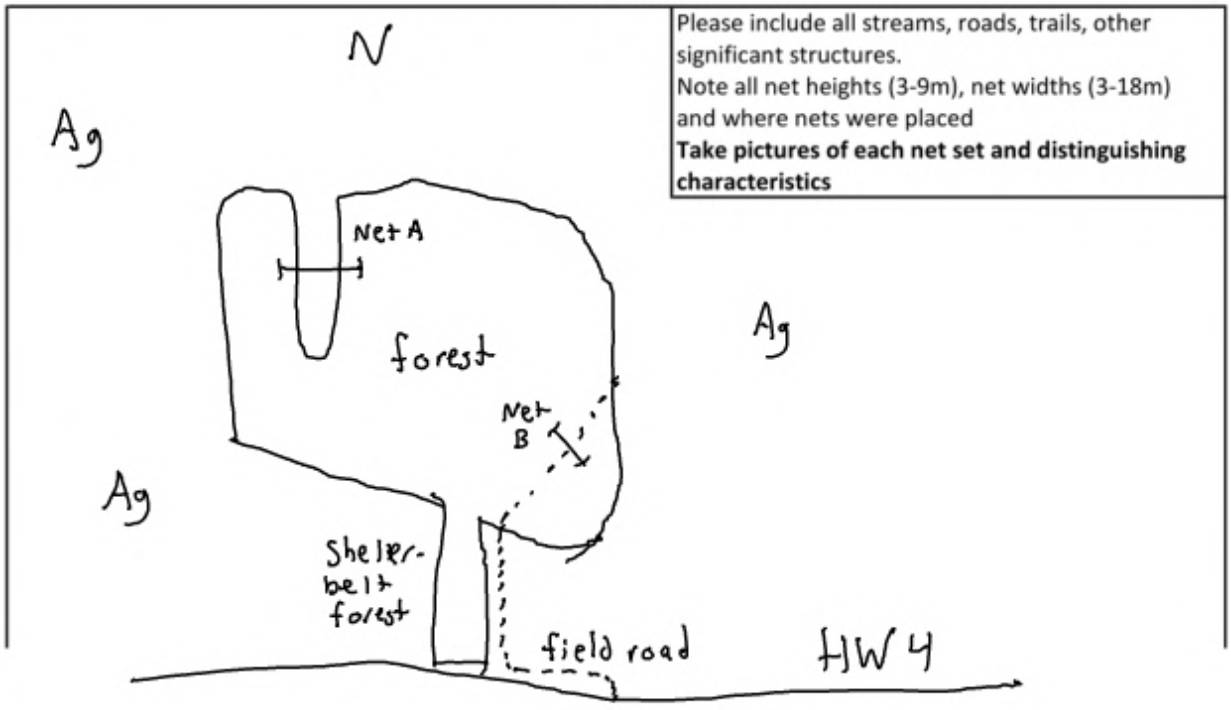
Circle one

<5 = young (5 - 30 = mature) >30 = old

Percent Canopy Closure: 75

Net Site Sketch

Please include all streams, roads, trails, other significant structures.
Note all net heights (3-9m), net widths (3-18m) and where nets were placed
Take pictures of each net set and distinguishing characteristics



TD

Site Description and Weather Data Form

Project: Red Pine
Site ID: 4
Location (County/State): Lincoln Co. Minnesota
GPS (each net set) & Photo ID #: NetA 14T 0728633 4923810
NetB 14T 0728647 4923759

Sunset Time: 20:33
Date/Net Night: 08-12-2015 Night 1
Biologists: Travis Brown

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation
Start Time: 20:33	26	10	W	0	N	Unknown	0
End Time: 01:33	22	13	W	0	N	Unknown	0
Weather Comments:							

Moon Phase: (New) 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Vegetation

Dominant Canopy Species: Salix nigra
Juglans nigra

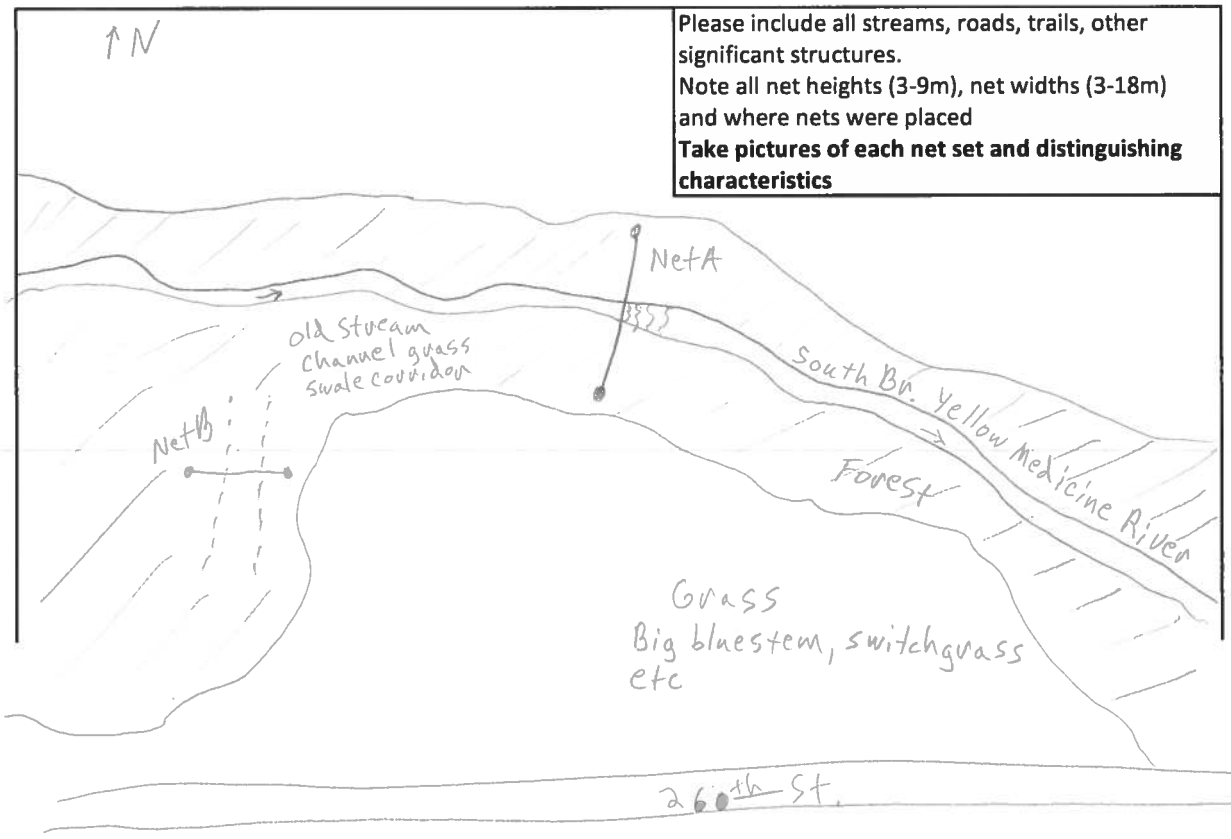
Percent Canopy Closure: 70 %

Estimate Canopy Tree Age: (use estimated dbh)

Circle one		
<5 = young	(5 - 30 = mature)	>30 = old

Net Site Sketch

Please include all streams, roads, trails, other significant structures.
Note all net heights (3-9m), net widths (3-18m) and where nets were placed
Take pictures of each net set and distinguishing characteristics



Site Description and Weather Data Form

Project: Red Pine
Site ID: 4
Location (County/State): Lincoln Co. MN
GPS (each net set) & Photo ID #: Net A 14T 0728633 4923810
Net B 14T 0728647 4923759

Sunset Time: 20:32
Date/Net Night: 8-13-2015 Night 2
Biologists: Travis Brown

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation
Start Time: 20:30	24	8	W	50	N	unk	<0.01"
End Time: 01:35	20	0	NA	0	N	unk	0
Weather Comments:	A Few drops of rain prior to setup.						

Moon Phase: (New) 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Vegetation

Dominant Canopy Species:

Estimate Canopy Tree Age: (use estimated dbh)

Circle one		
<5 = young	5 - 30 = mature	>30 = old

Percent Canopy Closure:

Net Site Sketch

Please include all streams, roads, trails, other significant structures.
Note all net heights (3-9m), net widths (3-18m) and where nets were placed
Take pictures of each net set and distinguishing characteristics

See night 1

Site Description and Weather Data Form

Project: Red Pine
Site ID: RP5
Location (County/State): Lincoln Co., MN
GPS (each net set) & Photo ID #: Net A 2x18m 14T 728494 4934929
Net B 2x6m 14T 728461 4934953

Sunset Time: 2037
Date/Net Night: 8/11/15 Night 1
Biologists: BHale

Time:	Temp C°	m/s Wind Speed ~~(kph)~~	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation
Start Time: 2040	20.2	1.6	NW	0	N	82%	none
End Time: 0140	16.3	0	-	0	N	94%	none
Weather Comments:	8% Illumination moonset: 1834 moonrise: 0338						

Moon Phase: New (1/4) 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Vegetation

Dominant Canopy Species: Populus deltoides
Salix Willow

Percent Canopy Closure: 25%

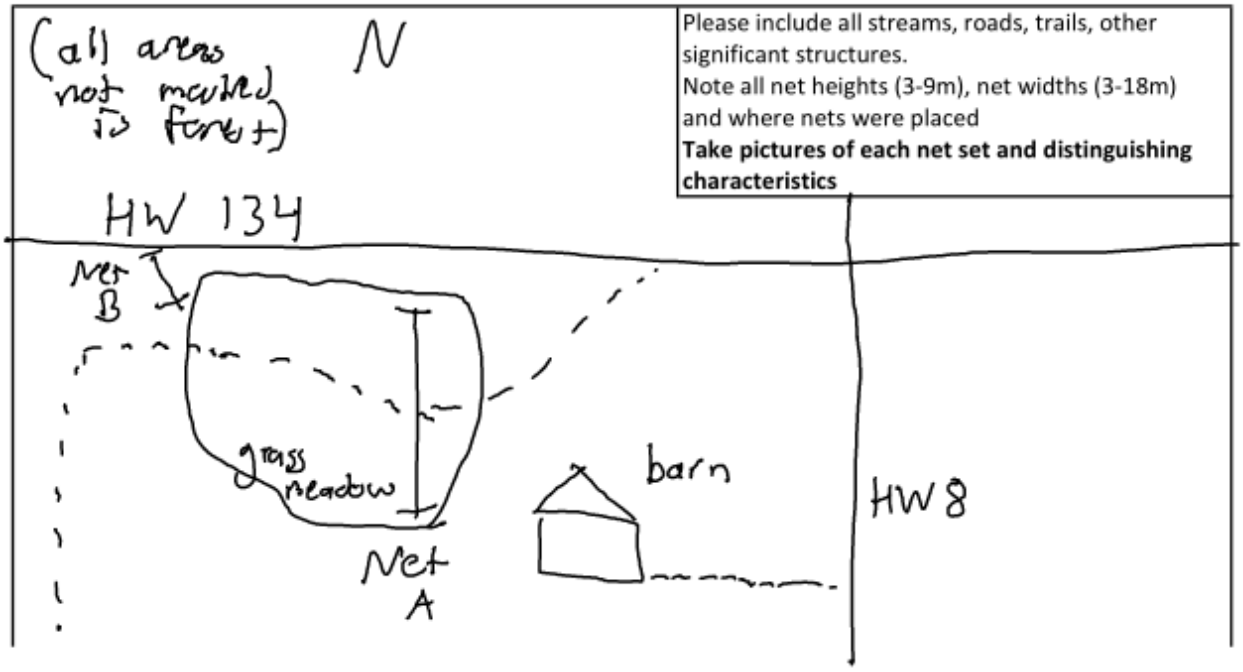
Estimate Canopy Tree Age: (use estimated dbh)

Circle one

<5 = young | (5 - 30 = mature) | >30 = old

Net Site Sketch

Please include all streams, roads, trails, other significant structures.
Note all net heights (3-9m), net widths (3-18m) and where nets were placed
Take pictures of each net set and distinguishing characteristics



Site Description and Weather Data Form

Project: Red Pine
Site ID: RP5
Location (County/State): Lincoln Co., MN
GPS (each net set) & Photo ID #:
Net A 2×18m 14T 728494 4934929
Net B 2×6m 14T 728461 4934953

Sunset Time: 2035
Date/Net Night: 8/12/15 Night 2
Biologists: BHale

Time:	Temp C°	m/s Wind Speed ~~(kph)~~	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation
Start Time: 2040	24.3	3.1	SW	0	N	73%	none
End Time: 0140	24.0	4.2	SW	0	N	70%	none
Weather Comments:	4% Illumination moonset: 1915 moonrise: 0435						

Moon Phase: New (1/4) 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Vegetation

Dominant Canopy Species: Populus deltoides
Salix Willow

Percent Canopy Closure: 25%

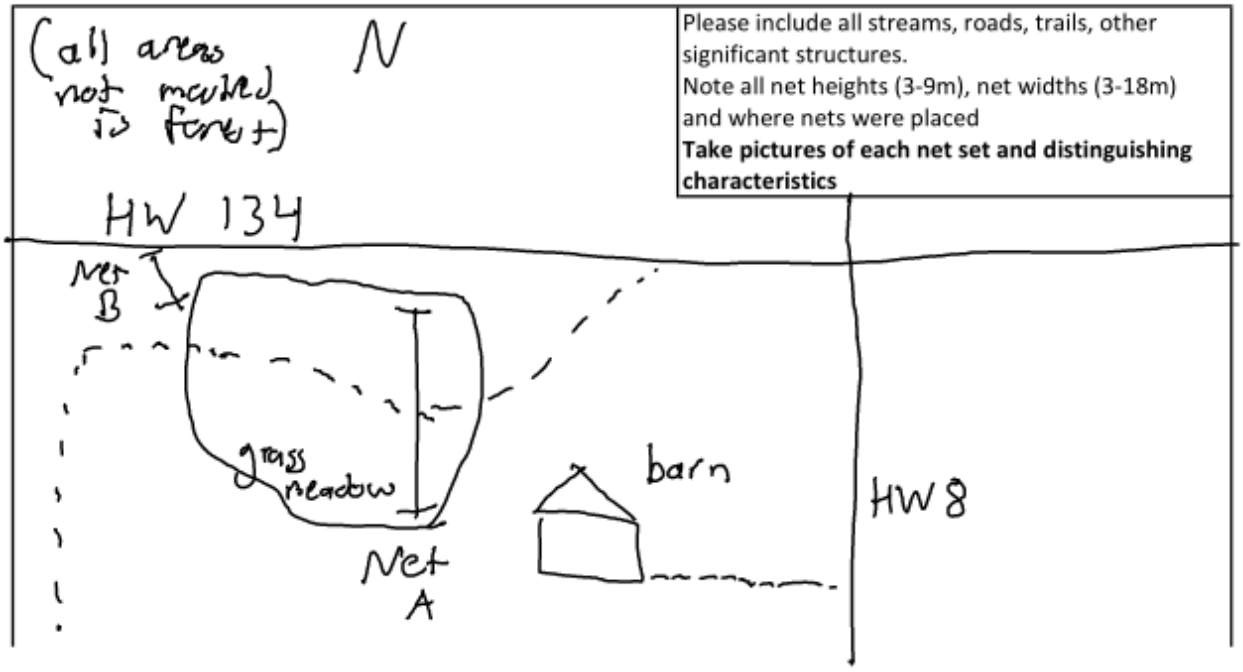
Estimate Canopy Tree Age: (use estimated dbh)

Circle one

<5 = young | 5 - 30 = mature | >30 = old

Net Site Sketch

Please include all streams, roads, trails, other significant structures.
Note all net heights (3-9m), net widths (3-18m) and where nets were placed
Take pictures of each net set and distinguishing characteristics



Eagle Nest Survey Results for the Red Pine Wind Energy Project Lincoln County, Minnesota

Draft Report

Prepared for:

EDF Renewable Energy, Inc.

Prepared by:

Western EcoSystems Technology, Inc.
1710 Douglas, Suite 283
Golden Valley, MN 55422

May 5, 2016

STUDY PARTICIPANTS

Western EcoSystems Technology

Joyce Pickle	Project Manager
Chad Rittenhouse	Research Biologist
Adam Kreger	GIS Specialist

REPORT REFERENCE

Pickle, J., C. Rittenhouse and A. Kreger. 2016. Eagle Nest Survey Results for the Red Pine Wind Project, Lincoln County, Minnesota. Final Report: May 5, 2016. Prepared for EDF Renewable Energy, Inc. Prepared by Western EcoSystems Technology, Inc. (WEST), Golden Valley, Minnesota

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INTRODUCTION

EDF Renewable Energy (EDF) is developing the Red Pine Wind Project (Project) in Lincoln County, Minnesota (Figure 1). WEST conducted a ground-based raptor nest survey in 2015 covering a two-mile buffer of the 2015 Project boundary. EDF requested that Western EcoSystems Technology, Inc. (WEST) conduct an aerial-based eagle nest survey in 2016 of the modified 2016 Project boundary following the U.S. Fish and Wildlife Service (USFWS) *Eagle Conservation Plan Guidance: Module 1 – Land-based Wind Energy, Version 2* (ECPG; USFWS 2013). This report provides results of the eagle nest survey conducted at the Project on March 29 - 31, 2016.

STUDY AREA

The Project is located on about 42,000 acres in Lincoln County in southwest Minnesota, approximately thirteen miles west of the town of Marshall and ten miles east of the town of Hendricks in western Minnesota (Figure 1). The proposed Project is located in the Northern Glaciated Plains Level III Ecoregion, with portions in the Prairie Coteau and Prairie Coteau Escarpment Level IV Ecoregions (U.S. Environmental Protection Agency [USEPA] 2013a). This region, previously dominated by shortgrass and tallgrass prairies, seasonal and semi-permanent wetlands, mixed tall shrubs, and riparian and oak-aspen groves, has been extensively converted to farmland and cropland, livestock production, and pasture lands (USEPA 2013b). Topography in the region is flat to gently rolling.

METHODS

Aerial Raptor Nest Survey

One aerial survey was conducted from a helicopter in late March (March 29 – 31, 2016), a period before leaf out when eagles would be actively tending to a nest or incubating eggs. Aerial surveys were conducted in accordance with the guidance provided in the *Eagle Conservation Plan Guidance: Module 1 – Land-based Wind Energy, Version 2* (ECPG; USFWS 2013) and the USFWS Inventory and Monitoring Protocols (Pagel et al. 2010). An experienced raptor ecologist and a skilled helicopter pilot conducted the survey. Raptors are defined here as kites, accipiters, buteos, harriers, eagles, falcons, and owls. However, the main focus of the survey was to identify bald eagle nests. Bald eagle nest surveys focused on locating eyries (large, stick nest structures) in suitable eagle nesting substrate (trees, transmission lines, cliff faces, etc.) within and around the proposed Project (Figure 1), considering a 10-mile buffer (Figure 1). Efforts were made to minimize disturbance to breeding raptors; the greatest possible distance at which the species could be identified was maintained, with distances varying depending upon nest location and wind conditions.

In general, all potential bald eagle and raptor nest habitat was surveyed by flying meandering transects between 0.25 and 0.5 miles apart, flying at speeds of 60 to 75 miles per hour throughout the proposed Project and associated 10-mi buffer. Surveys were typically conducted between 07:00 hours and 18:00 hours. The locations of all potential eagle nests were recorded

using a hand-held Global Positioning System (GPS); coordinates were set at Latitude/Longitude (hddd.ddddd°) World Geodetic System (WGS) 84 unit. This included all confirmed and potential nests regardless of their activity status. To determine the status of a nest, the biologist relied on clues that included behavior of adults and presence of eggs, young, or whitewash. Nest type, nest status, nest condition, and substrate, were recorded at each nest location to the extent possible.

Terminology

Included below are descriptions of terms used during the documentation of nests (see Results section).

Nest ID - WEST assigned a unique nest identification number for each nest documented.

Species - A species was assigned to each nest when possible, otherwise, it was classified as an unknown raptor nest. Nests documented as unknown raptor species are defined as any stick nest that did not have an occupant associated with it at the time of the survey. Many times nests will become abandoned or no longer used, and over time, may become a historic nest site. Unknown raptor nests, including old nests or nests that could become suitable for raptors, are documented in order to populate a nest database to ensure that future surveys include all potentially suitable nest sites.

Nest Condition - Nest condition was categorized using descriptions ranging from poor to excellent. Although the determination of nest condition can be subjective and may vary between observers, it gives a general sense of when a nest or nest site may have last been used. Nests in poor to fair condition are typically in disrepair, sloughing, or sagging heavily, and would require some level of effort to rebuild in order to be suitable for successful nesting. Nests in good to excellent condition are those that appear to have been well maintained, have a well-defined bowl shape, are not sagging or sloughing, and appear to be suitable for nesting.

Substrate - The substrate in which a nest was observed was recorded to provide observers a visual reference. Substrates range from manmade structures (such as power lines, nest platforms, and dock hoists) to biological and physical structures (conifer and deciduous tree species, cliff faces).

Nest Status - WEST categorizes basic nest use consistent with definitions from the ECPG. Nests were classified as occupied if any of the following were observed at the nest structure: (1) an adult in an incubating position, (2) eggs, (3) nestlings or fledglings, (4) occurrence of a pair of adults (or, sometimes sub-adults), (5) a newly constructed or refurbished stick nest in the area where territorial behavior of a raptor had been observed early in the breeding season, or (6) a recently repaired nest with fresh sticks (clean breaks) or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath. Occupied nests were further classified as active if an egg or eggs had been laid or nestlings were observed, or inactive if no eggs or chicks were present. A nest that does not meet the above criteria for “occupied” was classified as “unoccupied”.

RESULTS

Aerial Raptor Nest Survey

A WEST biologist detected a total of 10 eagle nests during aerial surveys conducted on March 29 - 31, 2016 (Table 1). Seven occupied bald eagle nests and three inactive likely bald eagle nests were identified (Table 1; Figure 1).

No occupied or potential bald eagle nests were located within the Project (Figure 1). No bald eagles were observed during the survey within the Project boundary. Seven occupied active bald eagle nests were documented in this survey, along with three likely bald eagle nests that appeared to be inactive and/or unoccupied (Figure 1). The two bald eagle nests documented by WEST in 2015 were both active in 2016; an additional five active bald eagle nests were observed within the expanded 10-mile survey area. No federal or state-listed threatened or endangered raptor species were observed nesting within the Project or associated buffer.

Nest A – this nest is located approximately 1.9 miles east of the Project boundary, and was active in 2015. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey. The nest is therefore considered occupied and active (Appendix A, Figure A).

Nest B – this nest is located approximately 0.8 mile west of the Project boundary, and was occupied but inactive in 2015. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey. The nest is therefore considered occupied and active (Appendix A, Figure B).

Nest C – this nest is located approximately 0.8 mile west-southwest of the Project boundary just to the northeast of the Northern Tallgrass Prairie National Wildlife Refuge unit, and was not observed in 2015. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey. The nest is therefore considered occupied and active (Appendix A, Figure C).

Nest D – this nest is located approximately 2.0 miles north of the Project boundary, and was outside of the 2015 survey area. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey; when it flew off the nest, two eggs were visible. The nest is therefore considered occupied and active (Appendix A, Figure D).

Nest E – this nest is located approximately 6.8 miles southwest of the Project boundary on the northern shore of Lake Benton, and was outside of the 2015 survey area. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey. The nest is therefore considered occupied and active (Appendix A, Figure E).

Nest F – this nest is located approximately 6.7 miles west of the Project boundary on the northern shore of Lake Shaokatan, and was outside of the 2015 survey area. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey; when it flew off the nest, three eggs were visible. The nest is therefore considered occupied and active (Appendix A, Figure F).

Nest G – this nest is located approximately 7.5 miles north of the Project boundary, and was outside of the 2015 survey area. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey. The nest is therefore considered occupied and active (Appendix A, Figure G).

Nest H – this nest is located approximately 3.6 miles east of the Project boundary on a tree on the island in Island Lake, and was outside of the 2015 survey area. The nest is in good condition and is consistent with an eagle nest, but no signs of activity were observed (Appendix A, Figure H).

Nest I – this nest is located approximately 5.7 miles west of the Project boundary within the Ash Lake WMA, and was outside of the 2015 survey area. The nest is in good condition and is consistent with an eagle nest, but no signs of activity were observed (Appendix A, Figure I).

Nest J – this nest is located approximately 5.8 miles northwest of the Project boundary, and was outside of the 2015 survey area. The nest is in poor condition and is consistent with an eagle nest, but no signs of activity were observed (Appendix A, Figure J).

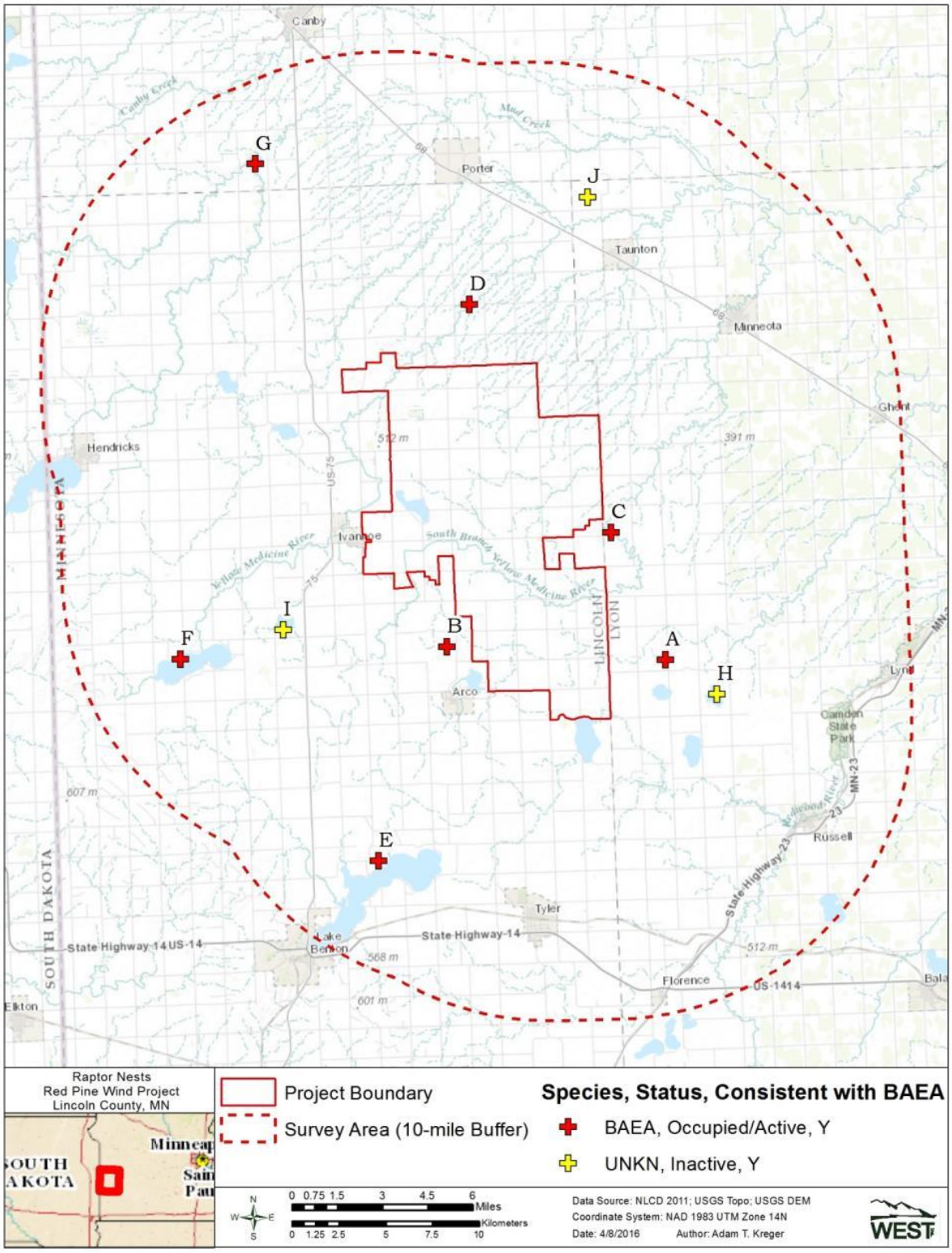

Figure 1. Overview of the Red Pine Wind Project, Lincoln County, Minnesota, and associated 10-mile buffer, nest locations, and bald eagle observations during raptor nest surveys conducted March 29-31, 2016 survey.

Table 1. Eagle nest unique ID (NEST ID), locations (Lat/Long, hddd.dddd°; WGS 84) and features for identified nests during the March 29-31, 2016 survey for the Red Pine Wind Project, Lincoln County, Minnesota.

Nest	Nest ID	Species	Nest Substrate	Latitude	Longitude	Status at time of survey	Condition
A	032916-BAEA-MN-175	Bald Eagle	Tree	44.39921	-96.0405	occupied, active	Good
B	033016-BAEA-MN-186	Bald Eagle	Tree	44.40915	-96.1878	occupied, active	Good
C	032916-BAEA-MN-177	Bald Eagle	Tree	44.46089	-96.0745	occupied, active	Good
D	033016-BAEA-MN-184	Bald Eagle	Tree	44.57303	-96.1642	occupied, active	Good
E	033016-BAEA-MN-188	Bald Eagle	Tree	44.30697	-96.2384	occupied, active	Good
F	033116-BAEA-MN-197	Bald Eagle	Tree	44.40707	-96.3669	occupied, active	Good
G	033116-BAEA-MN-201	Bald Eagle	Tree	44.64394	-96.305	occupied, active	Good
H	032916-UNKN-MN-169	Likely Bald Eagle	Tree	44.38148	-96.0071	unoccupied, inactive	Good
I	033116-UNKN-MN-198	Likely Bald Eagle	Tree	44.41962	-96.2966	unoccupied, inactive	Good
J	032916-UNKN-MN-180	Likely Bald Eagle	Tree	44.62316	-96.0824	unoccupied, inactive	Poor

DISCUSSION/CONCLUSION

These surveys provided additional information on eagle nest distribution and activity status within the vicinity of the Project. Aerial survey results indicate that there are no bald eagle nests within the Project. The mean inter-nest distance of all 10 bald eagle nests observed (active and likely inactive nests) is 4.8 miles. The ECPG states that eagle pairs at nests within one-half the mean internest distance, in this case 2.4 miles, are susceptible to disturbance take and blade strike mortality. However, it is anticipated that most flight corridors used by nesting bald eagles are located much closer than 2.4 miles from the nest. Additionally, the draft Midwest Wind Energy Multi-Species Habitat Conservation Plan, of which EDF is a participating member, lists 1.6 miles as a maximum area for turbine setbacks from bald eagle nests, with potential for turbines to be sited closer if evidence shows they are not located within higher use travel corridors.

LITERATURE CITED

Buehler, D. A. 2000. Bald Eagle (Haliaeetus leucocephalus), Number 506 in A. Poole and F. Gill, editors, The Bird of North America. The Birds of North America, Inc. Philadelphia, Pennsylvania

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APPENDIX A: IMAGES OF OCCUPIED-ACTIVE BALD EAGLE NESTS AND UNKNOWN-INACTIVE LIKELY BALD EAGLE NESTS IN THE 10-MILE BUFFER OF THE RED PINE WIND PROJECT, LINCOLN COUNTY, MINNESOTA

Figure A. Nest A is located approximately 1.9 miles east of the Project boundary, and was active in 2015. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey. The nest is therefore considered occupied and active in 2016.

Figure B. Nest B is located approximately 0.8 mile west of the Project boundary, and was occupied but inactive in 2015. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey. The nest is therefore considered occupied and active in 2016.

Figure C. Nest C is located approximately 0.8 mile west-southwest of the Project boundary just to the northeast of the Northern Tallgrass Prairie National Wildlife Refuge unit, and was not observed in 2015. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey. The nest is therefore considered occupied and active in 2016.

Figure D. Nest D is located approximately 2.0 miles north of the Project boundary, and was outside of the 2015 survey area. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey; when it flew off the nest, two eggs were visible. The nest is therefore considered occupied and active in 2016.

Figure E. Nest E is located approximately 6.8 miles southwest of the Project boundary on the northern shore of Lake Benton, and was outside of the 2015 survey area. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey. The nest is therefore considered occupied and active in 2016.

Figure F. Nest F is located approximately 6.7 miles west of the Project boundary on the northern shore of Lake Shaokatan, and was outside of the 2015 survey area. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey; when it flew off the nest, three eggs were visible. The nest is therefore considered occupied and active in 2016.

Figure G. Nest G is located approximately 7.5 miles north of the Project boundary, and was outside of the 2015 survey area. The nest is in good condition, and an adult bald eagle was seen sitting in the nest during the 2016 aerial survey. The nest is therefore considered occupied and active in 2016.

Figure H. Nest H is located approximately 3.6 miles east of the Project boundary on a tree on the island in Island Lake, and was outside of the 2015 survey area. The nest is in good condition and is consistent with an eagle nest, but no signs of activity were observed during the aerial survey in 2016.

Figure I. Nest I is located approximately 5.7 miles west of the Project boundary within the Ash Lake WMA, and was outside of the 2015 survey area. The nest is in good condition and is consistent with an eagle nest, but no signs of activity were observed during the aerial survey in 2016.

Figure J. Nest J is located approximately 5.8 miles northwest of the Project boundary, and was outside of the 2015 survey area. The nest is in poor condition and is consistent with an eagle nest, but no signs of activity were observed during the aerial survey in 2016.

Appendix J

Draft Avian and Bat Protection Plan

Red Pine Wind Project
Lincoln County, Minnesota

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DRAFT

Red Pine Wind Energy Project
Avian and Bat Protection Plan

Lincoln County, Minnesota

Prepared by
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Prepared For
EDF Renewable Energy, Inc.

April 2016

EXECUTIVE SUMMARY

EDF Renewable Energy (EDF) is proposing the development of the Red Pine Wind Energy Project in Lincoln County, Minnesota (Project). As part of the wind energy development process, the tiered approach detailed in the final Land-Based Wind Energy Guidelines (WEG) was followed and agency recommendations were incorporated. In Minnesota, development of a Avian and Bat Protection Plan (ABPP) is required for a Large Wind Energy Conversion System Site Permit. The purpose of the ABPP is to develop and implement a program to identify and avoid risks to avian and bat species that may result from construction and operation of the Project.

Information gathered during Tier 1, 2, and 3 studies was used in Project design and turbine siting to reduce potential impacts to birds and bats and their habitats. Tier 4 studies will address the Tier 4 questions using data from post construction surveys conducted after the facility is fully operational.

Tier 1 and 2 studies included a Critical Issues Analysis, an Ecological Risk Assessment, a Habitat Delineation Desktop Analysis and a northern long-eared bat (NLEB) desktop habitat assessment. These analyses concluded that potential impacts from the proposed facilities could be mitigated with pre-construction design and siting based on recommended setbacks and avoidance areas, and with continued agency coordination to avoid critical habitats.

Tier 3 studies included avian use surveys, general bat use surveys, NLEB presence/absence surveys, native prairie field surveys, breeding bird surveys, and raptor/eagle nest surveys to determine potential impacts to birds and bats and other sensitive species. The Tier 3 studies indicated that the potential risk for negative impacts is comparable to other facilities in Minnesota and throughout North America. Thus, population level impacts are not expected as a result of the Project construction or operation, due in part to the limited suitable habitat present within the Project and to the predominantly agricultural landscape.

Tier 4 studies will include post-construction surveys to estimate the impacts of the facilities on birds and bats. For this survey, the focus is on the Tier 4a questions set forth in the WEG (USFWS 2012a). Post-construction surveys and commitments will include fatality monitoring (i.e. standardized carcass searches and bias trials), operations personnel training, and adaptive management as deemed necessary.

Tier 5 studies generally include additional post-construction studies and research efforts. The WEG state that Tier 5 research “will not be necessary for most wind energy projects.” The decision on whether Tier 5 studies are necessary will be informed by results of the Tier 4 studies, but these studies are not anticipated for the Project.

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Western EcoSystems Technology, Inc. (WEST)

1.0 INTRODUCTION

EDF Renewable Energy (EDF) is developing the Red Pine Wind Energy Project in Lincoln County, Minnesota (Project), located approximately 13 miles west of Marshall, Minnesota (Figure 1). Wildlife surveys were conducted by the original owner in 2013-2014 for an initial project boundary. EDF acquired the Project in 2015, and has been conducting additional Tier 3 surveys through 2016. EDF is committed to implementing the Land-Based Wind Energy Guidelines (WEG) from the U.S. Fish and Wildlife Service (USFWS 2012a), and the State guidance from the Minnesota Department of Natural Resources (MNDNR; 2011), as well as considering recommendations that have been received to date from the USFWS and MNDNR during the developing process (Appendix A). This Avian and Bat Protection Plan (ABPP) describes EDF's approach to avoid and/or minimize potential impacts to birds and bats that may result from the construction and operation of the Project, and describe adaptive management measures that will be implemented if appropriate during operation.

Specifically, this ABPP document was developed to:

1. Provide a framework for fulfilling the application requirements for a Large Wind Energy Conversion System (LWECS) Site Permit issued by the Minnesota Public Utilities Commission (PUC), in accordance with the Chapter 216F, Minnesota Statutes;
2. Respond to the recommendation of the USFWS WEG for completion of a ABPP and a post-construction fatality monitoring protocol;
3. Consolidate documentation of steps already taken to avoid and minimize potential effects on birds and bats during the Project planning and development;
4. Identify and implement steps to further reduce the potential for avian and bat fatality or other potential adverse effects on birds and bats at the Project, including the plan for implementation of adaptive management measures if they are determined to be appropriate; and
5. Increase the understanding and coordination between EDF and state and federal wildlife agencies.

In addition to birds and bats, EDF has also closely evaluated and implemented measures to avoid impacts to other sensitive biological and natural resources in consultation with the appropriate agencies, including identifying and avoiding impacts to native grasslands. Additionally, potential risks and avoidance measures associated with bald eagles is described in detail in a separate Eagle Conservation Plan (ECP) developed for the Project (Appendix C).

1.1 Project Description

The Project is located approximately 13 miles west of Marshall and just east of Ivanhoe in Lincoln County, Minnesota (Figure 1). This region of Minnesota has been previously disturbed through extensive agricultural cultivation and therefore provides a low risk location for a wind facility. The Project lies within the Northern Glaciated Plains Level III Ecoregion, with portions in

the Prairie Coteau and Prairie Coteau Escarpment Level IV Ecoregions (U.S. Environmental Protection Agency [USEPA] 2013a). Historically, this ecoregion supported tall- and shortgrass prairies, seasonal and semi-permanent wetlands, mixed tall shrubs, and riparian and oak-aspen groves. However, most of the area has been converted to agricultural use with row crop production, livestock production, and pasture lands as the primary activities (USEPA 2013).

The Project boundary has changed throughout the development process. The initial area that was examined in a 2009 Tier 1/Critical Issues Analysis encompassed approximately 15,000 acres in Lincoln and Lyon Counties. Tier 2 and Tier 3 studies conducted in 2013 and 2014 focused on a larger, 38,800 acre boundary. After EDF purchased the Project in 2015, the boundary increased to approximately 46,000 acres in Lincoln and Lyon Counties; this boundary was used for Tier 2 and Tier 3 studies conducted in 2015. The current 2016 Project boundary encompasses approximately 42,000 acres, dropping all areas in Lyon County and overlapping the western portion of the 2015 boundary and extending west (Figure 2). The land cover in the Project is primarily cropland (71.4%), followed by herbaceous lands (11.0%) and hay/pasture (9.6%). All other land cover types constitute less than 5% of the Project area (Table 1, Figure 3). There are relatively few wooded areas within the Project, including trees and shrubs around farmsteads, shelter belts, and along creeks and drainages.

Ownership within the project area is largely private, but several protected areas are located in or near the Project (US Geological Survey [USGS] 2012). Several MNDNR Wildlife Management Areas (WMA) are present in the Project area, as well as several USDA Farm Service Agency Conservation Reserve Enhancement Program parcels (Figure 4). A unit of the Northern Tallgrass Prairie National Wildlife Refuge (NWR) is located adjacent to the Project boundary, USFWS Waterfowl Production Areas (WPAs) are located to the east and south, and Camden State Park is about eight miles southeast of the Project.

Table 1. Land Use/Land Cover types within the Red Pine Wind Energy Project in Lincoln County, Minnesota.

Land Use/Cover	Cover (Acres)	Percent Cover (%)
Cultivated Crops	30,058.9	71.4
Herbaceous	4,640.6	11.0
Hay/Pasture	4,040.8	9.6
Developed	1,878.5	4.5
Open Water	944.1	2.2
Emergent Herbaceous Wetlands	337.6	0.8
Deciduous Forest	165.5	0.4
Barren Land	41.8	0.1
Woody Wetlands	14.7	0.0
Total	**42,122.6**	**100**

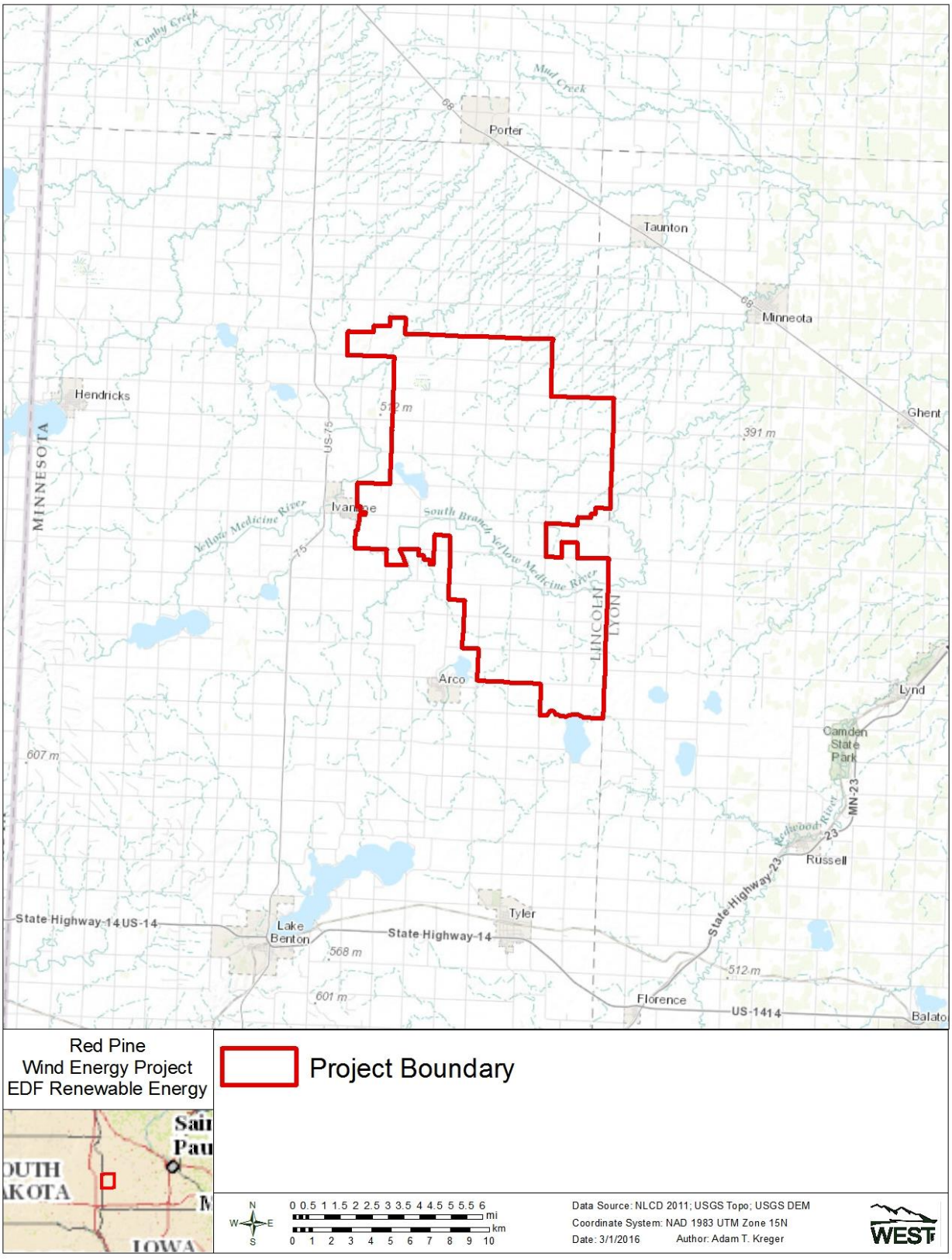

Figure 1. Location of the Red Pine Wind Energy Project in Lincoln County, Minnesota.

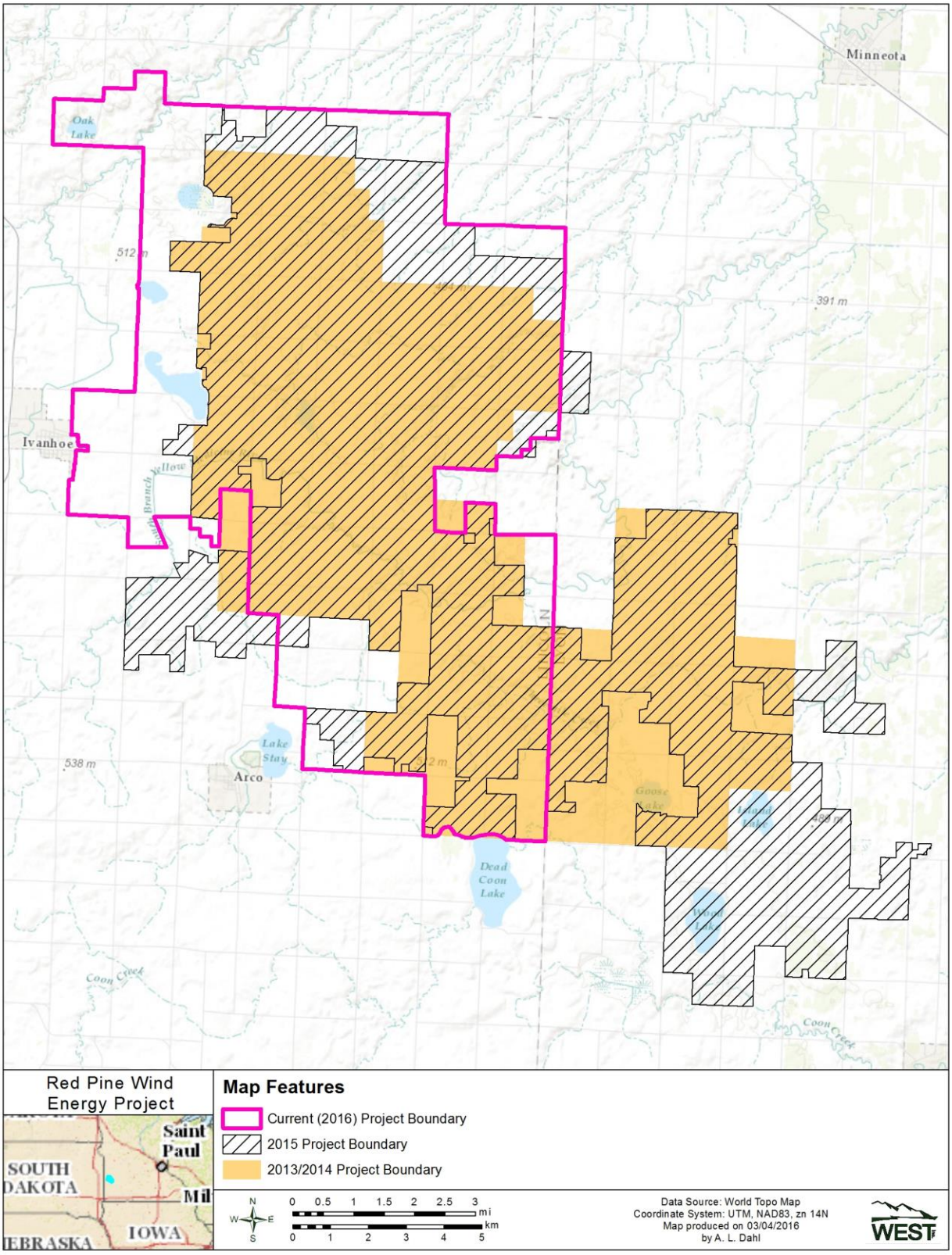

Figure 2. 2013/2014, 2015 and current 2016 Project boundaries for the Red Pine Wind Energy Project in Lincoln and Lyon Counties, Minnesota.

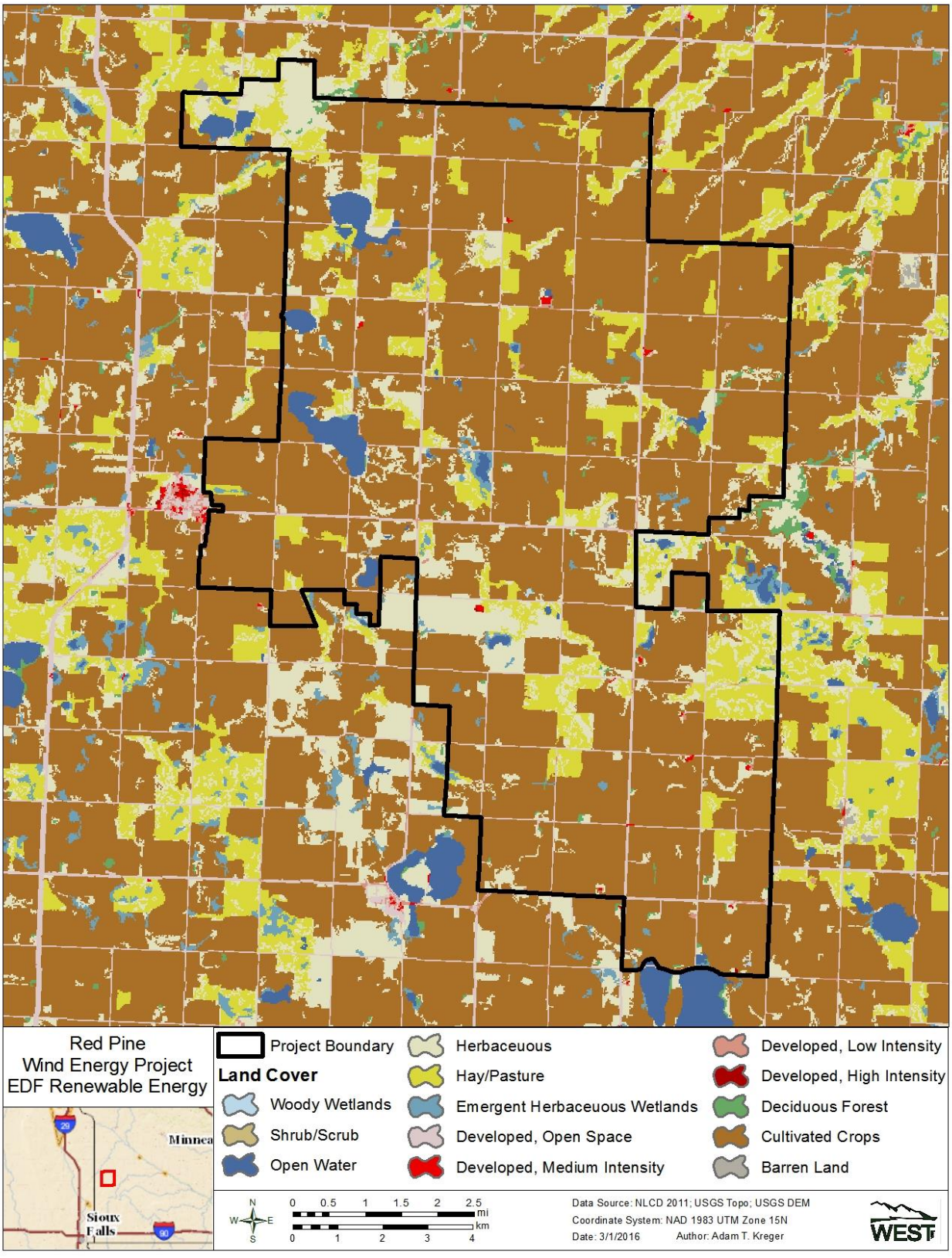

Figure 2. Land Cover within the Red Pine Wind Energy Project in Lincoln County, Minnesota.

The Project will consist of utility scale wind turbines totaling in a nameplate capacity of 200 megawatts (MW) and their associated infrastructure (turbine pads, access roads, and underground collection system), a Project substation, operations and maintenance (O&M) facilities, and approximately 3 miles (mi) of proposed 345 kilovolt (kV) overhead transmission line from the Project substation to the Project's interconnection point to the electric grid at the Brookings – Hampton CapX2020 345 kV line. All turbines will be placed in cultivated agricultural lands to the extent possible, minimizing impacts to wildlife and habitat (Figures 4a – 4c).

Figure 4. Potential Turbine Layouts within the Red Pine Wind Energy Project in Lincoln County, Minnesota.

1.2 Project Siting, Construction and Best Management Practices

The siting and development process for the Project included a tiered-study review process that follows the tiered approach detailed in the final USFWS WEG (USFWS 2012a). Information gathered during Tier 1, 2, and 3 studies was used during the turbine and infrastructure siting process to minimize potential impacts to birds and bats and their habitats. Prior to designing the facility layout, EDF incorporated setback and constraint information from literature reviews, Tiers 1, 2, and 3 studies, and agency recommendations resulting from meetings and regular correspondence with the USFWS and the MNDNR (Appendix A). This information was used to modify the Project boundary, establish setbacks and inform site design.

1.2.1 Project Siting Measures Used to Reduce Impacts

- The Project is sited in a heavily cultivated landscape to avoid and minimize impacts to wildlife and habitats.
- Between 2015 and 2016 the Project boundary was reduced from 46,000 acres to 42,000 acres, and was consolidated and shifted to avoid protected areas, natural communities, records of special status species, potential bat roosting and foraging habitat, MNDNR-recommended areas of avoidance and bald eagle nests that were identified in the vicinity of the eastern and southern portions of the 2015 boundary.
- Turbine siting avoids larger portions of potential habitat such as unbroken tracts of native prairie remnants, large blocks of grasslands, wetlands and wooded areas within the Project as well as Minnesota County Biological Survey (MCBS) natural communities and Sites of Moderate and High Biodiversity, WMAs and public waters, thereby lowering the potential impact to birds and bats in general.
- The Project, as originally planned, would have required more than 30 miles of overhead 115 kilovolt (kV) transmission line. The current configuration for the Project will require a shorter (3 mi) overhead transmission 345 kV line to connect from the Project substation to the Project's interconnection point to the electric grid, thus reducing the bird impacts from transmission facilities. All other collector/collection power lines will be placed underground.
- Standard setbacks for non-participating landowners, residences, state and federally owned management areas (i.e., five rotor diameters [RD]/three RD), noise, airports, etc. will be implemented.
- Existing roads and field accesses will be used or improved for access roads when practicable.
- Impacts to wetlands and water resources will be avoided, or if avoidance is not feasible they will be minimized and mitigated by following provisions of the Clean Water Act (CWA 1972) and Minnesota Wetland Conservation Act.

Project siting measures used to reduce impacts to eagles are discussed in the ECP (Appendix C).

1.2.2 Project Design Used to Reduce Impacts

- Wind turbines designed with tubular towers and no external ladders or platforms on the towers or nacelles will be used so bird perching and nesting opportunities are minimized.
- Larger and taller turbine design results in slower blade rotation that reduces the collision probability for birds and bats passing through the rotor-swept area, and more room between the rotor-swept area and the ground reduces risk for raptors, such as northern harriers that typically fly close to the ground.
- The number of turbines with visibility lighting will be minimized, within Federal Aviation Administration (FAA) requirements.
- FAA-approved lighting uses the shortest allowable flash duration, the minimum allowed flashes per minute, and all lights flash at the same time so that nocturnal migrating birds are not disoriented by lights.
- Lighting at the operations and maintenance (O&M) facility, Project substation, and other installations is minimized and designed so that light is directed downward (toward the access or work area) and is hooded to prevent light from shining into the sky and attracting or disorienting nocturnal migrants. Motion or heat-activated lighting is used where practicable.
- Meteorological (met) towers are designed to minimize collision risk for birds by installing the minimum number of met towers needed and constructing met towers without guy wires, or if guy wires are used they will be marked with diverters. Temporary guyed met towers will be removed within one year of operation.
- Electrical collection systems within the Project will be buried underground.
- Above-ground electrical lines, transformers, and conductors follow guidance from the Avian Power Line Interaction Committee (APLIC 1994, 2006, 2012) to avoid and minimize risk of potential avian collisions or electrocutions.

1.2.3 Operational Procedures to Minimize Impacts

- The Project will follow voluntary operation measures to minimize bat fatalities, including, when commercially feasible, committing to feathering turbine blades up to the manufacturer set cut-in speed at night during the fall bat migration season (August 1 – October 31) whenever evening temperatures exceed 50 degrees Fahrenheit.
- A Site Environmental Plan specific to the operational activities will be developed and implemented by the Site Environmental Manager including, but not limited to:
  - Exhibits identifying sensitive resources and associated set-backs.
  - An employee orientation program to raise awareness of any wildlife issues on the site, as well as how to treat sensitive resource areas.
  - Instructions for employees and contractors to drive at an appropriate speed on all public and private roads in the Project area, in consideration of potential wildlife that may be present and to promote general site safety.
  - Instructions for employees to avoid harassing or disturbing wildlife, especially during the breeding seasons.

- Federal and state measures for handling toxic substances to minimize contamination of water and wildlife resources.
- Local policies for noxious weed control (e.g., cleaning vehicles and equipment arriving from areas with known invasive species issues, using locally sourced topsoil, identification and annual removal, etc.).
- Parts and equipment that may be used as cover by prey will not be stored in the vicinity of wind turbines.
- During normal operational activities, if facility personnel discover carrion on or near Project facilities, reasonable measures will be taken to minimize attracting predators/scavengers such as raptors and vultures.
- Wildlife Response and Reporting System (WRRS) will be implemented to establish protocols for identifying and communicating bird and bat fatalities.

Project operational measures used to reduce impacts to eagles are discussed in the ECP (Appendix C).

1.3 Key Avian and Bat Regulations

1.3.1 Federal Endangered Species Act

Certain species at risk of extinction, including many birds and bats, are protected under the federal Endangered Species Act of 1973 (ESA; 16 U.S.C. §§ 1531 *et seq.*, as amended). The ESA defines and lists species as "endangered" or "threatened" and provides regulatory protection for the listed species. The federal ESA provides a program for conservation and recovery of threatened and endangered species and ensures the conservation of designated critical habitat that the USFWS has determined is required for the survival and recovery of listed species. Section 9 of the federal ESA prohibits the "take" of species listed by USFWS as threatened or endangered. Take is defined as follows: "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct." Section 10(a) of the federal ESA includes provisions for the authorization of take that is incidental to, but not the purpose of, otherwise lawful activities. Under Section 10(a)(1)(B), an Incidental Take Permit may be issued if take is incidental and does not jeopardize the survival and recovery of the species.

1.3.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA; 6 U.S.C. §§ 703-711) prohibits the taking of migratory birds, their eggs, parts, and nests, except when specifically permitted by regulations. The word "take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" 50 C.F.R. § 10.12. The USFWS maintains a list of all species protected by the MBTA at 50 C.F.R. § 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Due to the potential for resident and migratory birds within the Project Area, compliance with the MBTA has been considered in the development of this ABPP. Unlike ESA and Bald and Golden Eagle Protection Act (BGEPA), no

permits are available to authorize incidental take of an MBTA-protected species from a wind facility.

1.3.3 Bald and Golden Eagle Protection Act

The purpose of the Bald and Golden Eagle Protection Act (BGEPA; 16 USC 668–668c, as amended), administered by the USFWS, is to protect bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*), including their nests, eggs, and parts (BGEPA 1940). The BGEPA states that "no person shall take, possess, sell, purchase, barter, offer for sale, purchase or barter, transport, export, or import any bald or golden eagle alive or dead, or any part, nest or egg without a valid permit to do so."

BGEPA defines the take of an eagle to include "…to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb." The term "disturb" is defined in regulations found at 50 C.F.R. § 22.3 to include to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle, (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

BGEPA authorizes the Secretary of the Interior to permit the take of bald or golden eagles for several defined purposes, including when "necessary to permit the taking of such eagles for the protection of wildlife or of agricultural or other interests in any particular locality." Based on this authority, the USFWS published a final rule (Eagle Permit Rule) on September 11, 2009 (see 50 C.F.R. Parts 13 and 22) the USFWS set in place rules establishing two new permit types: 1) individual permits that can be authorized in limited instances of disturbance and in certain situations where other forms of take may occur, such as human or eagle health and safety; and 2) programmatic permits that may authorize incidental take that occurs over a longer period of time or across a larger area (USFWS 2009).

The Eagle Permit Rule authorizes take of bald eagles and golden eagles where take: (1) is compatible with the preservation of the bald and golden eagle; (2) is associated with and not the purpose of an otherwise lawful activity; and (3) cannot practicably be avoided (50 C.F.R. § 22.26).

1.3.4 Minnesota Threatened and Endangered Species Laws

The 2010 Minnesota Statutes, specifically the Protection of Threatened and Endangered Species (Minn. Stat. 84.0895), includes the language "Notwithstanding any other law, a person may not 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, except as provided in subdivisions 2 and 7." The Statute directs the Commissioner of the MNDNR to develop lists of endangered species, threatened species, and species of concern.

1.4 Alignment with USFWS Wind Energy Guidelines

Until recently, the USFWS had been recommending, and many wind energy companies had been developing, Avian and Bat Protection Plans (ABPP) for wind projects. In Minnesota, it is a standard requirement of the LWECS Site Permit to develop an ABPP for the operation of the Project. With publication of the final Land-based Wind Energy Guidelines (WEG), the USFWS began recommending development of a Bird and Bat Conservation Strategy (BBCS) instead of an ABPP (USFWS 2012). While the components may be generally the same, the BBCS is a mechanism by which wind energy companies document the studies, analyses, agency input, and decisions in navigating through the WEG to help avoid and minimize impacts to environmental resources. This ABPP aligns with the recommendations included in both the WEG guidelines for a BBCS and the USFWS's *Eagle Conservation Plan Guidance* from April 2013, briefly describes the efforts completed as part of Tier 1-3, and the agency input during these tiers, and proposes an approach to Tier 4.

The WEG outlines a tiered approach to assessing suitability and risks to wildlife at a potential wind resource area. The "tiered" approach ensures that sufficient data are collected to enable project proponents to make informed decisions about continued development of a proposed project (USFWS 2012). At each tier, potential issues associated with the development or operations of the project are identified and questions are formulated to guide the decision process. This process starts with a broad scope and provides more site-specific detail at each tier as more data are gathered and the potential for avian and bat issues are better understood.

2.0 PRE-CONSTRUCTION: TIER 1-3 SUMMARY

2.1 Tiers 1 and 2

As described in the WEG, Tiers 1 and 2 evaluate potential issues that may need to be addressed before further actions can be taken with the development or operations of the Project. The objective of the Tier 1 study is to assist the developer in further identifying a potential wind site. Tier 1 studies provide a preliminary evaluation or screening of public data from federal, state, and tribal entities and offer early guidance about the sensitivity of the site, in regards to flora and fauna. The objective of Tier 2 studies is to determine the effects of the proposed project on any Federal and State sensitive species. Tier 2 studies typically include a more substantive review of existing information, including publicly available data on land use land cover, topography, wetland data, wildlife, habitat, and sensitive plant distribution, a reconnaissance level site visit, and making first contact with agencies involved.

Information gathered during Tier 1 and 2 included Critical Issues Analysis (CIA; prepared for the Project by CH2MHILL in 2009), an Ecological Risk Assessment (prepared for the Project by Westwood Professional Services in 2010), a Habitat Delineation Desktop Analysis (Red Pine Wind Project Habitat Mapping report prepared for the Project by Western EcoSystems Technology, Inc. [WEST] in 2014), and a northern long-eared bat (NLEB) desktop habitat assessment (prepared for the Project by WEST in 2015). These studies indicated that sensitive

bird and bat species and important habitats for these species had the potential to occur within the Project area, but that in general there was relatively limited potential for foraging or roosting bat habitat. In addition, the general agricultural nature of the Project would provide limited habitat for special concern avian species. Although construction and operation of the Project might pose some risk to grassland breeding birds and waterbirds as well as bats, these reports concluded that wildlife impacts could be minimized by gathering more information to inform site development.

Consistent with Tier 1 as described in the WEGs, these analyses included a review of desktop data for environmental constraints within the vicinity of the Project, including a landscape scale review of a large portion of Lincoln and Lyon Counties based on publicly available data:

- topographic and aerial maps,
- state and nation-wide land use data,
- watershed information,
- geologic features, soils, field guides,
- National Wetland Inventory (NWI) mapping,
- North American Breeding Bird Survey (BBS) routes,
- Minnesota Natural Heritage Information System (NHIS),
- Federal Emergency Management Agency (FEMA) flood maps,
- information published by the MNDNR and USFWS, and
- personal communications with the agencies (Appendix A)

In accordance with Tier 2, a field reconnaissance visit was conducted in November 2010 as part of the Ecological Risk Assessment to evaluate in greater detail the habitats and resources available within the Project. These analyses also included a more detailed review of the following aspects:

- Cultural and archaeological resource databases
- Vegetation and habitat mapping
- Rare and unique natural resources
- Permitting processes for the Project

Potential species of concern in Lincoln and Lyon Counties were mostly associated with prairies, wetlands, and riparian habitats, and included 12 State- and Federally-listed threatened and endangered species (Blanding's turtle [*Emydoidea blandingii*], Dakota skipper [*Hesperia dacotae*], hair-like beak-rush [*Rhynchospora capillacea*], loggerhead shrike [*Lanius ludovicianus*], Ottoe skipper [*Hesperia ottoe*], burrowing owl [*Athene cunicularia*], elktoe [*Alasmidonta marginata*], Henslow's sparrow [*Ammodramus henslowii*], and Wilson's phalarope [*Phalaropus tricolor*], piping plover [*Charadrius melodus*], Topeka shiner [*Notropis topeka*], and western prairie-fringed orchid [*Platanthera preclara*]). The eastern pipistrelle bat, a State special concern species, was determined to have a moderate potential for occurrence in the Project area. The Tier 2 studies indicated that several types of conservation lands and lands enrolled in

conservation easements were scattered throughout and around the Project, and that grassland, pastures, and hayfields within the Project area might include prairie remnants with the potential to support rare or sensitive species. A 2011 comment letter from the MNDNR indicated that the Project contained some prairie corridor and prairie core areas as identified in the Minnesota Prairie Conservation Plan.

A habitat delineation desktop analysis in 2013 and a subsequent assessment completed in 2015 for the revised Project boundary indicated that some native grassland habitats are located within the Project boundary. Based on the presence of grasslands, native prairie, and wooded habitats, these studies indicated that there was potential for rare and sensitive species to occur within the Project. Additionally, between the 2013 surveys and 2015, the NLEB was listed as a threatened species pursuant to the federal ESA. Therefore, a Tier 2 level habitat assessment for the NLEB was conducted in 2015 by WEST (described further in Section 2.2.6).

The information from databases, agency communications, and field review was used to avoid or minimize impacts to sensitive resources, to identify environmental constraints for the siting of the Project facilities, and to develop a scope for further field studies to be conducted in Tier 3.

2.2 Tier 3 – Baseline Survey Results

The information gathered in Tiers 1 and 2 indicated that additional surveys were needed to evaluate potential direct and indirect impacts to birds, bats, and native prairie habitats, and to inform siting and impact avoidance measures. These surveys included breeding bird transect surveys (Derby and Dahl 2014), one year of avian use surveys (Derby and Rintz 2014), raptor nest surveys (Derby 2013 and Kreger et al. 2015), general acoustic surveys for bats (Derby et al. 2014), and NLEB presence/absence surveys (Pickle et al. 2015), as well as an on-site field evaluation for potential native prairie tracts within leased lands, conducted by WEST biologists in September 2015. Starting in December 2015, an additional full year of eagle use surveys is underway based on the current Project boundary (see Appendix C). The data collected and methods used to conduct the Tier 3 studies were consistent with the recommendations in the WEG. Each study is summarized below.

2.2.1 Native Prairie Field Assessment

A native prairie field assessment was conducted in September 2015 to evaluate potential native prairie habitat on leased lands within the 2015 Project boundary. The biologists viewed all potential grassland parcels within leased lands, either from the road or when necessary by walking in to grassland areas. Biologists noted which grassland parcels appeared to be previously tilled and which appeared to never have been tilled (i.e., native). For areas where there was some question, historical aerials were consulted to determine if the parcel had been cultivated in the past. Native and non-native grassland parcels were delineated in GIS and used to inform siting decisions (Figure 5). Changes in the Project boundary since September 2015 may require additional surveys to better inform layout design and fulfill the Department of

Commerce's LWECS requirements, if Project infrastructure is proposed in grassland areas that were not field checked as part of the 2015 survey.

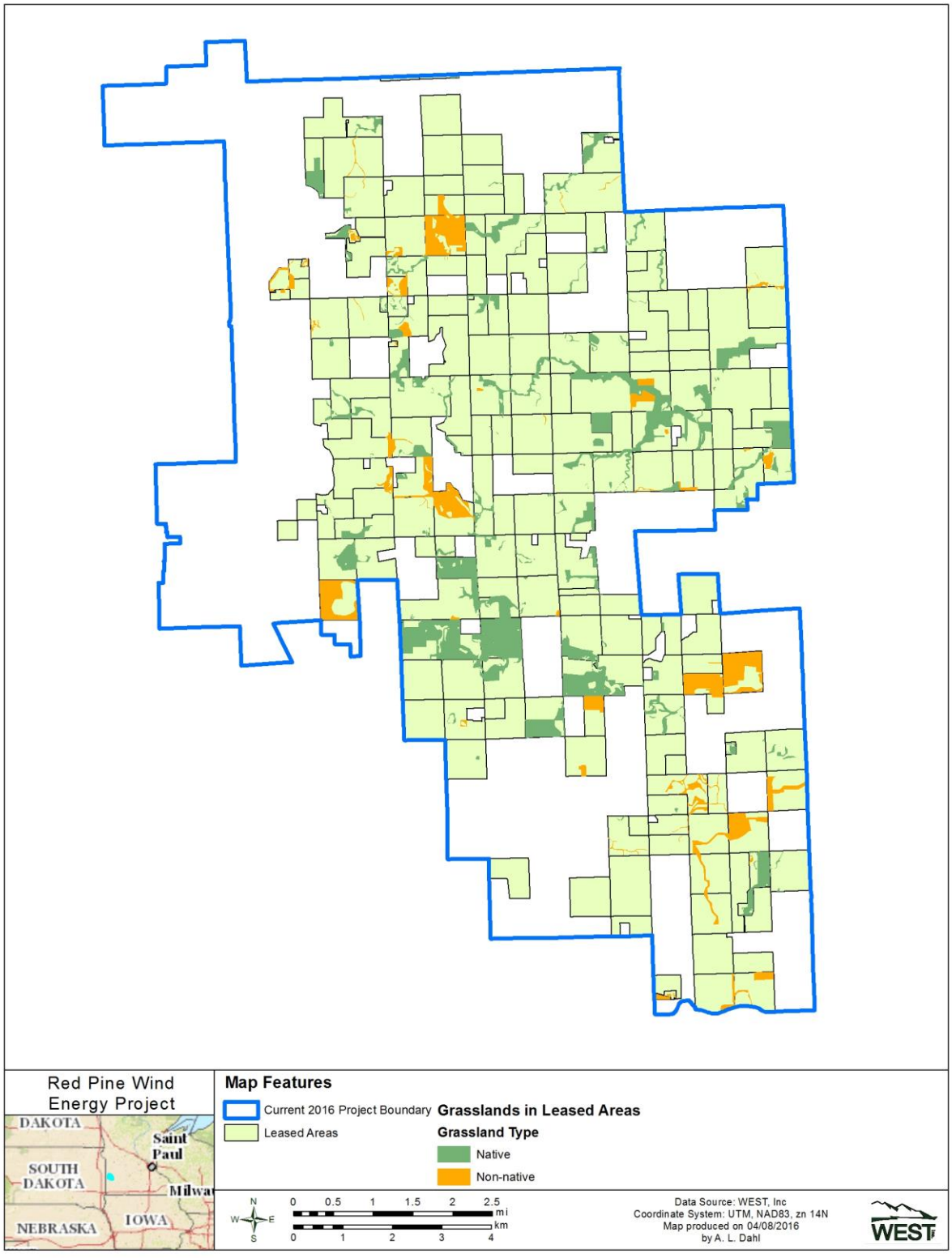

Figure 5. Native and Non-native grasslands within leased lands (2015) in the Red Pine Wind Energy Project in Lincoln County, Minnesota.

2.2.2 Breeding Bird Transect Surveys

The primary objective of the breeding bird transect surveys was to provide site-specific bird resource and use data for evaluating potential impacts of the Project and to inform siting and design of the facility to minimize impacts to birds. During the 2013 breeding bird survey, 16 grassland transects were surveyed three times from June 11 to July 10, 2013. Forty seven avian species were recorded, with bobolink, red-winged blackbird, common yellowthroat, cliff swallow, and clay-colored sparrow, accounting for approximately half of the individual observations (Derby and Dahl 2014). Passerines made up 85.9% of observations and had the highest mean bird use, with blackbirds/orioles and grassland birds/sparrows accounting for the majority of passerine observations; bird use of the Project appeared to be relatively evenly dispersed without any apparent spatial pattern. No federal endangered, threatened, candidate or proposed species and no Minnesota endangered, threatened species, or special concern species were observed during transect surveys. Two bird species, the dickcissel (77 individuals) and grasshopper sparrow (four), designated as USFWS Bird of Conservation Concern for the Prairie Potholes and Partners in Flight priority species in the Northern Tallgrass Prairie, were observed during surveys. The bobolink (243) and sedge wren (15) are also Partners in Flight priority species in the Northern Tallgrass Prairie. This study indicated that the Project appears to be representative of a typical agricultural/grassland landscape setting in the Midwest and that the Project does not appear to have any large or unusual populations of breeding resident birds.

2.2.3 Avian Use Surveys

The primary objective of the avian use study was to document use in the Project for a one year period to help evaluate potential impacts of the Project on birds. It also provided a means to compare potential impacts of the Project with other local, regional, and national projects. The resulting avian use data was compared to data collected at numerous other wind resource areas using similar protocols. Many of these wind resource areas also have post-construction fatality data, which allows for a relative prediction of avian mortality. The detailed results of the 2013/2014 avian use survey can be found in Appendix B.

Twenty fixed-points were selected to encompass representative habitats and topography of the Project. A total of 336 survey hours were conducted at the points between March 22, 2013 and March 16, 2014. The avian use survey results indicated overall species richness was higher for large birds, being highest in the spring and lowest in the winter, with an inverse temporal species richness pattern for small birds. Waterfowl, gulls/terns, and passerines had the highest abundance overall (number of birds/800-m plot/20-min survey); temporal changes in abundance were observed among seasons, with waterfowl and waterbirds being most abundant in spring and summer, and passerines in fall and winter. Waterfowl, diurnal raptors, gulls/terns, and passerines had the highest mean use during spring, summer, fall, and winter, respectively (Appendix B). Waterfowl and passerines has the highest species richness overall. Red-tailed hawks (*Buteo jamaicensis;* 37 individuals/plot/20-min survey), northern harriers (*Circus cyaneus;* 36 individuals/plot/20-min survey), and bald eagle (*Haliaeetus leucocephalus*; 11

individuals/plot/20-min survey) were the most commonly observed raptors overall. Mean raptor use at the Project was relatively low and comparable to that reported at facilities in Illinois and South Dakota (Appendix B). Diurnal raptor mean use was higher in spring and lower in winter with most of the raptor use being attributable to northern harriers and red-tailed hawks, while overall eagle use was low across seasons (0.05 raptors/800-m plot/20-min survey or less in each season).

No federally endangered, threatened, candidate, or proposed species were detected during bird use studies at the Project. In addition, no discernible patterns of bird use concentration were observed (Derby and Rintz 2014). Species observed during the 60-minute fixed-point surveys included 136 common terns (*Sterna hirundo*), a State threatened species, 2,455 Franklin's gulls (*Leucophaeus pipixcan*) and 209 American white pelican (*Pelecanus erythrorhynchos*), two state special concern bird species and 34 bald eagles. All of the flying common terns, Franklin gulls, and American white pelicans, and approximately 80% of flying diurnal raptors were observed flying within the rotor swept area.

2.2.4 Raptor Nest Surveys

The objective of the raptor nest surveys was to locate and record raptor nests that may be subject to disturbance and displacement effects by wind energy facility construction and operation. Two ground-based surveys were conducted in mid-May 2013 and mid-April 2015, during the period before leaf out when raptors would be actively tending to a nest or incubating eggs. Surveys were conducted in accordance with the guidance provided in the USFWS Inventory and Monitoring Protocols (Pagel et al. 2010). Although all raptor nests were documented, surveys focused on locating bald eagle nests (large, stick nest structures) in suitable eagle nesting substrate (trees, transmission lines, etc.) within the Project area and a two mile buffer.

During the 2013 raptor nest surveys, 18 raptor nest structures were documented with no confirmed eagle nests observed. During the 2015 raptor nest surveys, 46 raptor nest structures were documented, with one potential bald eagle nest within the Project area and one confirmed occupied bald eagle nest in the vicinity of the Project (Kreger et al. 2015; Appendix B). The majority of raptor nests observed within the Project area and a 2-mile buffer (40 nests) appeared to be unoccupied and not identified to a particular species (Appendix B). Follow-up nest monitoring surveys, conducted in 2015 at the two nests that were identified as confirmed or potential bald eagle nests located in the 2-mile buffer, suggested that Goose Lake (0.9 mile south of the nest) and Dead Coon Lake (3.2 miles southwest of the nest) may be primary foraging areas. Further information on the follow-up eagle nest monitoring at the Project can be found in Appendix C.

In 2016, WEST biologists focused on identifying eagle nests within a 10 mile buffer of the current Project boundary, per the ECPG and recommendation of the USFWS, and an aerial survey was conducted on March 29 and 30. Seven occupied active bald eagle nests were documented in this survey, along with three likely bald eagle nests that appeared to be inactive

and/or unoccupied (Appendix C). The two bald eagle nests documented in 2015 were both active in 2016; an additional five active bald eagle nests were observed within the expanded 10 mile survey area.

2.2.5 Acoustic Bat Surveys

The objective of the acoustic bat surveys was to estimate the seasonal and spatial patterns of activity in the Project by bats. Acoustic surveys for bats were conducted at five sampling locations during 901 detector-nights between April 22 and October 17, 2013 (Derby et al. 2014; Appendix B).

The general bat activity survey indicated that fall migration recorded at the ground met tower detectors at the Project was higher than at other facilities in the Midwest (Appendix B). However, mean bat activity at the Project's ground met tower detectors during the fall migration period (7.43 ± 0.89 bat passes per detector-night) was moderate compared to activity at other studies with similar data at North American wind energy facilities. Low frequency calls, consistent with big brown bats, hoary bats, and silver-haired bats, accounted for the majority (61.2% - 84.7%) of classified bat passes, with the remaining as high frequency (Derby et al. 2014).

2.2.6 Northern Long-eared Bat Presence/Absence Surveys

To help understand the potential for this Project to impact the NLEB, EDF requested that WEST conduct a desktop analysis specifically following the USFWS' *Northern Long-Eared Bat Interim Conference and Planning Guidance* (January 2014) to confirm presence or absence of this species during the summer months. The first phase of these guidelines includes going through an initial project screening process that includes conducting a habitat assessment.

The NLEB is a forest dependent species, generally relying on forest features for both foraging and roosting during the summer months (USFWS 2013; USFWS 2007). Specifically, NLEB appear to be a forest interior species that require adequate canopy closure for both roost and foraging habitat (Lausen 2009). Additionally, riparian areas are considered critical resource areas for many species of bats because they support higher concentrations of prey, provide drinking areas, and act as unobstructed commuting corridors (Grindal et al. 1999). While this species is associated with forest habitats, it also occurs in agricultural settings where forest habitats have been highly fragmented. Wing morphology of the NLEB makes them ideally suited for the high maneuverability required for gleaning-type foraging within a cluttered forest interior (Henderson and Broders 2008). Abundance of NLEB prey items, particularly beetles and moths, are typically higher in more closed forest stands than in openings, which supports studies which have found NLEB tend to avoid open habitats (Owen et al. 2003).

During the summer months, NLEB is unlikely to cross over large open lands (i.e., land lacking suitable habitat) to search for foraging and roosting habitats, but rather to use tree-lined linear features as travel corridors to and from roosting and foraging habitats (USFWS 2014a). These

tree-lined corridors may be important for bats as navigational aids in agricultural landscapes, as protection from predators and wind, and may act to concentrate insect prey (Verboom and Huitema 1997). The NLEB is expected to be particularly tied to intact forested habitats; for example, Henderson and Broders (2008) found that NLEB did not travel more than 255 feet (78 meters) from the edge of intact forest structure. A study of nine female NLEBs using an intensively managed forest in West Virginia found this species forages in areas with forest patch sizes between 114 and 161 acres (46 and 65 hectares; Owen et al. 2003); however, studies in landscapes dominated by agricultural activities found NLEB can use woodlots and riparian zones with as little as 15 to 49 acres (6 to 20 hectares) of forest cover (Henderson and Broders 2008; Foster and Kurta 1999).

The NLEB habitat assessment for the Project was conducted in spring 2015. WEST conducted a desktop assessment of potential NLEB habitat within the 2015 Project boundary and a 2.5 mile buffer, following the USFWS' 2014 guidance. As NLEB have similar habitat requirements as Indiana bats, the approach used in this habitat evaluation followed recommendations for habitat assessments included in the USFWS's *Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects* (USFWS 2011). The guidance assesses the potential for bats to be present within the Project boundary based on presence of travel/commuting corridors within the Project boundary and connectivity to foraging or roosting habitat within a 2.5 mile buffer of Project turbines. Connectivity is defined in the guidance as commuting habitat within 1,000 feet (ft) and connected to roosting or foraging habitat within the 2.5 mile buffer of the Project boundary (USFWS 2011). The 1,000-ft distance is based on observations of NLEB behavior indicating that isolated trees might only be suitable as habitat when they are less than 1,000 feet from other forested/wooded habitats – based on available telemetry data on foraging activity, it is reasonable to conclude that these bats are unlikely to occur within project areas located more than 1,000 ft from wooded areas (USFWS 2014a; USFWS 2011).

Potential roosting, foraging, and community habitat for NLEB were assessed in the Project from a desktop analysis using this guidance as a tool and measurement of suitability and determination of potential presence. For purposes of this review, WEST categorized habitat patches that are 14 acres of less as potential commuting/travel corridors (generally shelterbelts or small woodlots); patches 15-49 acres were considered small roost/foraging areas (larger woodlots and riparian forests); and patches greater than 50 acres were considered medium-large roost/foraging areas (larger contiguous riparian forests).

Potential foraging or roosting habitat within the Project was determined to be fairly limited, with relatively few areas where shelterbelts and larger forested patches are separated by less than 1,000 feet; (Appendix B). This connected (suitable) habitat totaled approximately 515 acres (0.8 square miles) within the 2015 Project boundary, while approximately 744 acres (1.2 square miles) of forested habitat was determined to be isolated and unsuitable for NLEB habitat (i.e., more than 1,000 feet from connected corridors and less than 15 acres in patch size). The USFWS guidelines' minimum survey efforts require one survey site for every 123 acres of suitable habitat. Therefore, based on the habitat assessment results, up to five sites (515 acres divided by 123 acres = 4.2 sites) are recommended for presence/absence surveys.

NLEB presence/absence surveys were conducted at the Project with USFWS input and approval regarding the location of survey sites. In total, five survey sites were selected within the Project boundary with potential NLEB habitat on leased lands (Appendix B).

The presence/absence surveys were conducted by acoustics and mist-netting in August 2015, consistent with guidance in the 2015 Range-Wide Indiana Bat Summer Survey Guidelines (USFWS 2015) and the NLEB Interim Conference and Planning Guidance (USFWS 2014). Acoustic surveys occurred from August 6 through 13, 2015 with two acoustic survey stations at each of five sites for a minimum of four detector nights per site. Mist-netting occurred at five sites from August 9 through 13, 2015.

No NLEB were verified during acoustic analysis or captured during mist-netting presence/absence surveys (Pickle et al. 2015; Appendix B). No caves or mines that might serve as potential hibernacula for NLEB were identified within the Project boundaries or nearby (USGS 2013).

Although the Project boundary has changed, the NLEB habitat assessment developed in 2015 covers the current 2016 Project boundary (Figure 6), and four of the five survey sites are in the current Project boundary. The current Project boundary encompasses less potential NLEB habitat (426 acres of patches 15 acres or greater) than the 2015 boundary. Based on the negative results of the 2015 survey and pursuant to the 2015 Range-Wide Indiana Bat Summer Survey Guidelines (USFWS 2015) and the NLEB Interim Conference and Planning Guidance (USFWS 2014), no additional presence/absence surveys are proposed for NLEB.

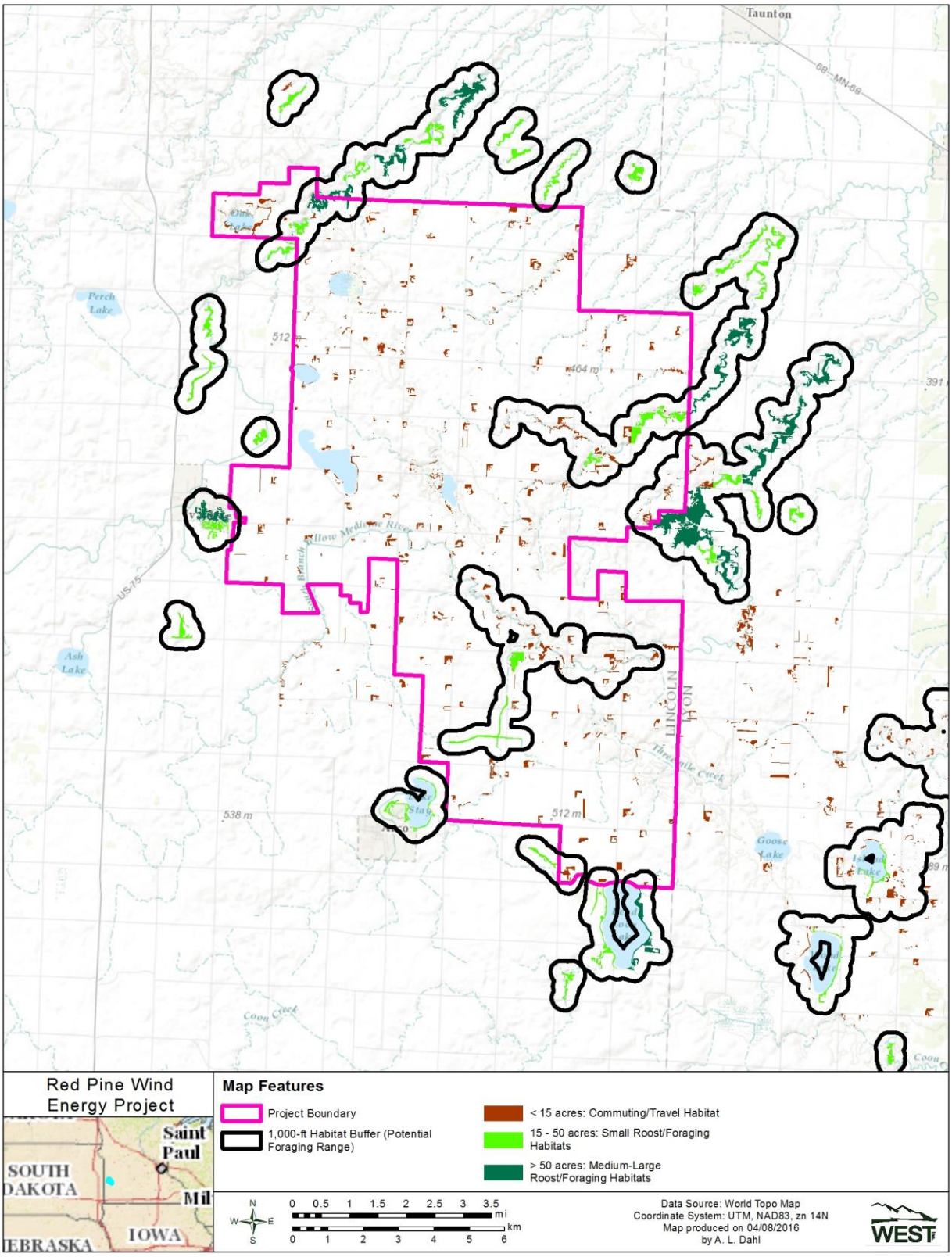

Figure 6. Potential NLEB Habitat in the Red Pine Wind Energy Project in Lincoln County, Minnesota.

2.2.7 Summary of Tier 3 Questions

1. Do Field Studies Indicate That Species of Concern are Present on or Likely to Use the Proposed Site?

No federal endangered or threatened species were detected during baseline studies. One state threatened species (common tern [*Sterna hirundo*], 130 individuals) and two state special concern bird species (Franklin's gull [2,455 individuals] and American white pelican [209 individuals]) were observed during the bird use surveys conducted at the Project. Bald eagles were detected at the site, as described in further detail in the ECP (Appendix C). NLEB were not documented during summer presence/absence surveys, although there is some potential they could occur during fall migration, similar to anywhere in their range.

2. Do Field Studies Indicate Potential for Significant Adverse Impacts on the Affected Populations of Species of Habitat Fragmentation Concern?

There is no indication that species of habitat fragmentation concern are present. Some habitat loss/displacement impacts are likely to occur, but given the already heavily modified cultivated landscape, these effects are predicted to be insignificant.

3. What Is the Distribution, Relative Abundance, Behavior, and Site Use of Species of Concern Identified in Tiers 1 or 2, and to What Extent Do These Factors Expose These Species to Risk from the Proposed Project?

Overall mean diurnal raptor use observed within the Project was 0.22 raptors/800-m plot/20-min survey; diurnal raptor use was the highest use in spring (0.58 raptors/800-m plot/20-min survey) followed by summer (0.21), fall (0.14) and winter (0.02; Appendix B). Red-tailed hawks and northern harriers were the most common raptor species observed during surveys, followed by bald eagles.

The fixed point avian use surveys indicated seasonal patterns in mean bird use and species richness. Canada goose (*Branta canadensis*) and Franklin's gull were the most abundant birds recorded year-round (number of birds/800-m plot/20-min survey), followed by far by common grackle (*Quiscalus quiscula*), American crow (*Corvus americanus*) and European starling (*Sturnus vulgaris*). On a seasonal basis, they were also among the most commonly-recorded species. None of the above species are listed at the federal or state level; however, the Franklin's gull is a state special concern bird. Additionally, one state threatened species (common tern), two state special concern species (American white pelican and Franklin's gull), and one eagle species (bald eagle) were observed incidentally or during the 2013/2014 60-minute fixed point avian use surveys (see Appendix B for further details). Breeding bird surveys indicated a bird community representative of agricultural landscapes, with bobolink, red-winged blackbird, common yellowthroat, cliff swallow, and clay-colored sparrow as the most abundant species.

As stated above, NLEB were not documented during summer presence/absence surveys, although there is some potential they could occur during fall migration, similar to anywhere in

their range. During the summer, NLEB sometimes roost in man-made structures (buildings, barns, sheds, etc.), but are more commonly associated with forest habitat which is sparse in the Project. During construction of the Project, it is possible that summer roost habitat could be disturbed, but this is unlikely because no structures are planned for removal and very few trees will be cleared. Woodlands and forested areas within the Project are primarily limited to farmsteads and riparian corridors – areas that are avoided by the Project. Only a few scattered trees and shrubs along field edges and shelterbelts would potentially be disturbed by construction of collector lines or access roads. Impacts to this species during construction are further anticipated to be avoided because they not expected to occur in the Project during the summer based on Tier 3 studies, and no maternity roosts are documented in the vicinity.

NLEB hibernate in caves and abandoned mines, usually from mid-October to March or April. Although there are no NHIS records for bats in the vicinity of the proposed Project and no caves or mines have been identified within the Project boundaries or its vicinity (USGS 2013, MNDNR letter dated November 20, 2015), all seven of Minnesota's bats can be found throughout Minnesota. Given NLEB will typically migrate from 40 to 50 miles between summer habitat and hibernation sites, it is possible the NLEB migrates through the area during the spring and fall migratory periods. While the species, as with all bats in northern latitudes, migrate from hibernacula or points south in the spring, impacts to NLEB and bats in general during spring migration have been very limited across the Midwest. The USFWS' primary concern for NLEB is during fall migration period, since that is when impacts to this species have been observed from other existing wind projects. As stated above, turbines are not planned for placement within the limited wooded areas in the Project area. This avoids impact to potential roost trees as well as avoiding impacts to foraging individuals during the summer period. The USFWS draft guidelines for northern long-eared bats indicate that average foraging distance for the species is 1.5 miles; however, this is when they are in continuous or near continuous forest stands or along tree rows/hedgerows, little of which exists in the Project. Based on the guidelines, the species does not travel far from tree cover, (approximately 1,000 foot maximum). Siting turbines in open crop fields should therefore minimize impacts to foraging individuals. Operational impacts during the summer are not anticipated at the Project because the Tier 3 surveys showed no summer use. Potential impacts during the fall migration period will be minimized by EDF's commitment to voluntary operation measures including, when commercially feasible, feathering turbine blades up to the manufacturer set cut-in speed at night during the fall bat migration season (August 1 – October 31) whenever evening temperatures exceed 50 degrees Fahrenheit.

Based on correspondence with the USFWS and the MNDNR, the western prairie fringed orchid, Topeka shiner, and the Dakota skipper are not likely to occur within the Project (USFWS letter dated February 2011; MNDNR letter dated August 3, 2015), while the Poweshiek skipperling was identified as potentially occurring within the southeast portion of the 2013 and 2015 Project boundary. The MNDNR Natural Heritage Information System letter dated November 20, 2015 (Appendix A) noted records of several species of concern and native plant communities in the vicinity of the 2015 boundary, but the majority of these records occurred in Lyon County, which is no longer part of the Project boundary. Potential impacts to special concern species that have

the potential to occur in the current 2016 Project boundary will be further addressed prior to construction activities as required by the LWECS Site Permit. These species will also be addressed in the Construction Environmental Management Plan that EDF will develop for onsite construction activities, as discussed in Section 3.2.

4. What are the Potential Risks of Adverse Impacts of the Proposed Project to Individuals and Local Populations of Species of Concern and Their Habitats?

As currently proposed, the proposed Project boundary includes or is adjacent to several WMAs, a NWR. and Sites of Biodiversity Significance, and includes native prairie remnants, lakes, wetlands, streams and forests that might represent potential habitat for several sensitive species; as stated above, bird use and community composition was comparable to other agricultural areas in the region, while bat activity within the Project was moderate compared to other projects in North America. Additionally, the MNDNR identified several areas of recommended Avoidance Areas in their August 2015 comment letter. By avoiding the placement of turbines in native grasslands, wooded habitats, MCBS natural communities and MNDNR's identified Avoidance Areas, EDF has sited the Project facilities to minimize wildlife impacts, including direct (mortality) and indirect (habitat loss and fragmentation) impacts. The Project turbines are being placed in agricultural fields, and facilities are avoiding impacts to native grasslands and minimizing the amount of tree removal that will be necessary. Therefore adverse effects in these habitats and to associated species of concern are not expected to occur as a result of the Project activities.

6. How Can Developers Mitigate Identified Significant Adverse Impacts?

Project design and construction best management practices are being developed based on the results from Tier 3 studies and information available in the WEG and from other studies at wind energy facilities. These steps to avoid and reduce impacts are described in Section 1.2 and Section 3.

7. Are There Studies That Should Be Initiated at This Stage That Would Be Continued In Either Tier 4 or Tier 5?

EDF plans to conduct Tier 4 post-construction monitoring studies for the Project as detailed in Section 4.

2.2.8 Potential Impacts to Birds and Bats

Tier 3 of the WEG recommends that wind facility operators evaluate the potential direct and indirect impacts from a project on birds and bats. The analysis presented below addresses the impacts associated with project siting and turbine placement, construction, operations and maintenance, and decommission of wind energy facilities.

The USFWS and other wildlife agencies generally recommend that the siting of wind projects and placement of turbines is one of the major methods to minimize potential impacts to wildlife.

The Project is dominated by agriculture and to the extent possible, turbines will be in cultivated fields. No turbines will be placed in native grassland tracts.

Bird species diversity is typical of an intensive agricultural landscape with small patches of grassland, woodlands, and wetlands. Impacts to migratory birds are anticipated to be low, similar to other projects in southern Minnesota and elsewhere in the Midwest. Displacement to nesting migratory birds is expected to be minimal.

Overall raptor use was low throughout the Project and pre-construction raptor use data is known to correlate with post-construction raptor fatality rates on other wind projects. Therefore, impact to raptors is expected to be low at the Project. Bald eagles were observed within the Project and two bald eagle nests were located within and around the Project (see Appendix C for additional discussion of potential impacts to bald eagles).

Based on the Project's location in an agricultural area, EDF anticipates that any impact to bats will fall within the range of other wind energy projects in southern Minnesota and the Midwest region. However, it is unclear from the mixed survey data across the years what the actual level of bat mortality may be, as pre-construction bat use levels do not appear to be correlated to post-construction fatality levels. Overall, based on the location of the Project, general lack of habitat within the Project Area, fatality data from facilities close to the Project and the moderate bat activity levels (when compared to facilities throughout the U.S.) observed during Tier 3 surveys, moderate levels of bat mortality could occur from the Project but significant adverse impacts are not anticipated. The post-construction fatality monitoring surveys planned for the Project (see Section 4) are designed to provide empirical data on actual bat fatalities that can be compared to the pre-construction survey data from the Project Area. EDF has also developed adaptive management measures that may be used if bat mortality is higher than expected, as detailed in Section 6.

2.3 Summary of Agency Consultations

The WEG highlight that consultation with state and federal wildlife agencies is paramount early in the development process as the developer gathers the information necessary for the tiered review process. Red Pine Wind Project, LLC, and EDF proactively obtained input on the Project throughout the siting and development processes. This ABPP reflects the comments and recommendations made during the consultation process with these agencies. The agency consultation letters are attached in Appendix A.

Red Pine Wind Project, LLC received early comments and input from the agencies during the Critical Issues Analysis and Ecological Risk Assessment processes in 2009 through 2011, including comment letters from the MNDNR and USFWS. Those comments highlighted recommendations to avoid sensitive habitats within and around the Project boundary, including the Lincoln WPA and Northern Tallgrass Prairie NWR, as well as the wetlands and forests scattered throughout the Project. The MNDNR requested that EDF consult further with them as

the Project moved forward into the PUC LWECS Site Permit process. These recommendations were incorporated in the development process for the Project.

During initial communications with the USFWS on February 2 and February 27, 2013 to review the status of the Project and the anticipated Tier 3 baseline avian and bat survey effort (Appendix A), recommended surveys for initial assessment of biological resources were discussed, as well as recommended avoidance and minimization strategies. No significant risks or specific species of concern were identified during this meeting, with the exception a request for the Project to be setback two miles from the Northern Tallgrass Prairie NWR, and to meet the MNDNR's 3 RD/5 RD regulatory setback from WPAs and WMAs.

On July 21, 2015, EDF and WEST met with the Department of Commerce, USFWS, and MNDNR to review the results of the Tier 3 studies that had been conducted to date, discuss issues associated with the Project boundary expansion, and review proposed additional Tier 3 surveys for NLEB (Appendix A). The MNDNR stated that due to relatively high bat activity (compared to other projects in Minnesota) and the presence of potential bat habitat, the agency's comment letter would likely indicate that the Project may have the potential for higher than average bat mortality, and would look for EDF to propose adaptive management measures if higher than expected bat mortality was detected in post-construction mortality surveys. The presence of eagle nests in the vicinity of the project was also discussed in this meeting. Further studies and avoidance and minimization measures that were developed as a result of coordination with the agencies regarding eagles is included in the ECP (Appendix C).

The MNDNR Division of Ecological and Water Resources provided a comment letter on August 3, 2015. The letter included recommendations, including: following the standard 3 RD/5 RD setbacks from state lands; avoidance of calcareous fens; no turbines placed in identified Avoidance Areas (general areas where MNDNR indicated had higher potential for wildlife activity); two years of post-construction fatality monitoring; consideration of a phased construction approach; operational measures including feathering the blades below manufacturer's cut-in speed as well as consideration of additional curtailment if bat fatality is shown to be higher than expected; and inclusion of adaptive management triggers and measures in the ABPP that will be used to minimize impacts to wildlife, particularly bats, if post-construction monitoring shows higher than expected impacts.

As part of the LWECS Site Permit process, EDF will further coordinate with the USFWS and the MNDNR on the proposed layout(s) as well as the revised 2016 Project boundary. As additional recommendations and comments are received from the agencies, this ABPP will be updated to include them.

3.0 SITING AND CONSTRUCTION PHASE WILDLIFE MEASURES

3.1 Siting Measures

As summarized in Section 1.2.1, the Project has incorporated Tier 1 through 3 information in the siting process to avoid and minimize potential impacts to wildlife. Siting decisions have also incorporated comments from agencies. These measures are described further below.

3.1.1 Project Boundary Changes

The 2015 Project boundary removed a portion of the Northern Tallgrass NWR from the previous (2013/2014) Project boundary extent. The 2016 Project boundary removed all land from Lyon County and focused development in Lincoln County. The majority of NHIS records of species of concern and native communities were in Lyon County, so this change resulted in avoidance and minimization of potential impacts to these resources. The boundary change also resulted in many of the MNDNR's identified Avoidance Areas being removed from the Project, removed relatively larger areas of grassland habitat, and resulted in an overall smaller Project boundary. As described further in the ECP (Appendix C), the current Project boundary also moved the Project boundary to be at least 1.9 miles away from the active bald eagle nest that was identified in 2015, and the Project boundary was also moved farther away from the inactive bald eagle nest.

3.1.2 Turbine and Associated Facility Siting

Within the modified Project boundary, EDF is siting turbines to further avoid and minimize potential impacts. This includes avoidance of impacts to native prairie parcels, as well as all mapped MCBS native communities, areas mapped as having Moderate or High Biodiversity Significance, and wooded habitat suitable for NLEB (in patches 15 acres or larger). Areas identified by the MNDNR as Avoidance Areas will be avoided as much as possible. The MNDNR indicated that the boundaries were not meant to be exact, so if turbines are proposed within the boundaries of the identified areas, EDF will discuss these locations with the MNDNR. Impacts to wetlands will be avoided and minimized to the extent feasible, and any impacts will be permitted following Section 404 and Minnesota Clean Water Act requirements. Additionally, turbines will be set back at least one mile from the Northern Tallgrass Prairie NWR. As described in further detail in the ECP (Appendix C), turbines will be sited at least one mile from identified bald eagle nests.

3.2 Construction Measures

Construction activities are planned to start in 2017. Measures that will be taken to minimize wildlife impacts during construction are described below.

3.2.1 Avoidance of Native Landscapes

The Project turbines will be entirely within agricultural lands, minimizing or eliminating most construction-related wildlife impacts. To the extent possible, the Project layout will be developed to use the existing public and private road network to the degree possible and to avoid clearing forests and natural habitats during Project construction; therefore no impacts to these habitats are anticipated. If design changes result in proposed impacts within potential areas of native prairie or wetland communities that may contain listed plant species, EDF will coordinate with the Department of Commerce, the USFWS and MNDNR to determine if pre-construction surveys are recommended, and will conduct those surveys prior to any ground-disturbing activities in these habitats.

3.2.3 Construction Personnel Training

All construction personnel will be trained to identify potential wildlife conflict situations and proper responses. This training will include sensitivity to nesting birds and other wildlife that may be encountered. For example, if an unknown raptor nest is encountered by construction personnel, they will be instructed to stop work in the area and contact the biological monitor. The biological monitor will assess the situation and work with construction personnel to implement a plan for continuing construction to avoid impact to the nest. If other protected wildlife resources are encountered, a similar course of action will be followed; construction will cease until the biological monitor can determine an appropriate plan to allow construction to continue without causing an impact. Additionally, training will include education on the standard measures to be followed during construction to minimize wildlife impacts, including:

- Industry-standard best management practices will be implemented to protect topsoil and adjacent resources and to minimize soil erosion.

- All surface-disturbed areas will be restored to the approximate original contour and reclaimed in accordance with easement agreements.

- Removal or disturbance of vegetation will be minimized through site management (e.g., by utilizing previously disturbed areas, designating limited equipment/materials storage yards and staging areas, scalping) and reclaiming all disturbed areas not required for operations.

- Speed limits on Project access roads (25 mph) will be followed to minimize wildlife mortality due to vehicle collisions.

- Travel will be restricted to designated roads; no off-road travel will be allowed except in emergencies.

- Construction activities will be performed using standard construction best management practices so as to minimize the potential for accidental spills of solid material, contaminants, debris, and other pollutants. Excavated material or other construction materials will not be stockpiled or deposited near or on stream banks.

- No burning or burying of waste materials will occur at the Project site. All contaminated soil and construction debris will be removed and disposed of in approved landfills in accordance with appropriate environmental regulations.

A trained biologist will conduct the training and work with EDF to develop the communications plan. The training and communications protocol, as well as other environmental and permitting requirements for the Project during construction will be captured in a Construction Environmental Management Plan that EDF will develop prior to any onsite activities.

4.0 POST-CONSTRUCTION: TIER 4

According to the WEG, "during post-construction tiers (including Tier 4), developers are assessing whether actions taken in earlier tiers to avoid and minimize impacts are successfully achieving the goals and, when necessary, taking additional steps to compensate for impacts" (USFWS 2012). The specific questions to be investigated in Tier 4 are:

1. What are the bird and bat fatality rates for the project?
2. What are the fatality rates of species of concern?
3. How do the estimated fatality rates compare to the predicted fatality rates?
4. Do bird and bat fatalities vary within the project site in relation to site characteristics?
5. How do the fatality rates compare to the fatality rates from existing projects in similar landscapes with similar species composition and use?
6. What is the composition of fatalities in relation to migrating and resident birds and bats at the site?
7. Do fatality data suggest the need for measures to reduce impacts?

After the field surveys and analysis are completed in accordance with the protocol described below, EDF will review the efforts and make a determination pursuant to the WEG "Decision Framework for Tier 4a Fatality Monitoring" (USFWS 2012) to determine the need for further monitoring or if any measures are needed to reduce impacts.

4.1 Formal Avian and Bat Fatality Monitoring

Fatality monitoring will provide information on the impact of the Project on birds and bats and give an indication if any specific turbines or Project facilities are responsible for a significant proportion of fatalities. While pre-construction surveys did not indicate significant potential impacts for birds in this Project, nearby wind energy facilities with similar biological characteristics have documented eagle fatalities. Although no listed bat species were detected during acoustic or mist-netting surveys, general bat use within the Project was relatively high compared to other pre-construction studies in Minnesota, raising concern by the MNDNR for potential adverse effects on bat populations. The current plans for the post-construction monitoring are to focus on eagles and bats as the primary species of concern while still addressing the question of impacts to birds in general. Impacts to avian and bat species are anticipated to be within the overall range of other Minnesota and Midwestern facilities. The

objective of the monitoring will be to determine if the avian and bat fatality rates are lower, similar to, or higher than other Minnesota, regional and national studies.

Fatality monitoring will begin after all the turbines have been commissioned and are fully operational, and will be conducted by a third party biologist. Due to the relatively high bat use compared to other projects in Minnesota and per the recommendation of the MNDNR, two years of post-construction fatality monitoring will be conducted. During the first year monitoring will focus on large birds (e.g. raptors) and bats as primary species of concern, but will also investigate if there are larger than expected impacts to all birds; these results will help inform the appropriate scope and protocol for the second year of surveys in coordination with state and federal wildlife agencies' staff.

The duration and intensity of carcass searches, the number of selected turbines, and the levels of searcher efficiency and carcass removal trials are consistent with general wind industry standard practices and the recommendations from with the Department of Commerce, MNDNR, and the USFWS. A detailed discussion of each of the major fatality monitoring components is included below.

4.1.1 Survey Period

Formal carcass searches will be conducted for two years, as allowed by weather conditions. Standardized searches of will be conducted at least monthly during winter and more frequently during the spring, summer, and fall. The following dates will be used for defining seasons in the study during the first year of monitoring:

Spring	March 1 – April 30
Summer	May 1 – July 31
Fall	August 1 - October 31
Winter	November 1 – February 28

4.1.2 Turbine Selection Method

The avian and bat fatality monitoring will include a search of a subset of turbines selected to provide representative coverage throughout the Project. These plots will be selected by the third-party biologist.

4.1.3 Search Methods

The objective of the standardized carcasses searches is to systematically search turbine locations for bat and bird casualties that are attributable to collision with project facilities.

Within the search plots, surveyors will scan the area in all directions out 5 m as they walk each transect spaced 10 m apart. At each search turbine, the following data will be recorded: date, start time, end time, observer, and which turbine number was searched. When a bat or bird

carcass is found during a search, the searcher will place a metal pin flag or similar marker at the carcass and finish searching the plot. After the plot has been completely searched, the searcher will return to each carcass and record information on a fatality data sheet, including date, species, sex (when possible) and age (when possible), observer name, turbine number, distance from turbine (m), azimuth from turbine, Universal Transverse Mercator [UTM] coordinates, habitat surrounding carcass, visibility class, condition of carcass (intact, partial, scavenged), and estimated time of death (e.g., <1 day, 2 days). Digital photographs will be taken of all carcasses, any injuries, and surrounding habitat. Rubber gloves will be used to handle all carcasses to eliminate possible transmission of rabies or other diseases and to reduce possible human scent bias for carcasses later used in carcass removal trials.

4.1.4 Injured Wildlife Handling and Reporting Protocol

All injured raptors, waterfowl, waterbirds, federally- or state-listed bird species, and federally-listed bats will be promptly delivered to the appropriate rehabilitation center or other approved facility as specified in state and federal permits; or as directed by necessary law enforcement personnel. All injured non-protected bird and bat species will be humanely euthanized on site.

Appropriate wildlife salvage/collection permits will be sought from the states and the USFWS. Dissemination of data (e.g., to the USFWS Special Agent and other agency representatives) will be done following the permits, if provided.

4.1.5 Incidental Finds Outside of Formal Searches

Casualties found outside the formal search area by carcass searchers will be treated following the standard survey protocol as closely as possible. Casualties found in non-search areas (e.g., near a turbine not included in the search area for that day) will be coded as incidental discoveries and will be documented in a similar fashion as those found during standard searches, but not included in the analysis.

4.1.7 Weather Monitoring

Weather conditions will be documented during each survey period. Weather conditions to be documented include:

- Weather from the night prior to the survey day, collected from on-site meteorological towers supplemented by National Weather Service data. Night visibility characterized by estimating the percent of cloud cover and the presence or absence of fog. Precipitation from the night prior to the survey day will be documented using National Weather Service data sources.
- Weather for the morning of the survey day, including: cloud cover, temperature, wind direction and wind speed.

4.1.8 Carcass Information

The condition of each carcass found will be recorded using the following categories:

- Intact/Complete - a carcass that is completely intact, is not badly decomposed, and shows no sign of being fed upon by a predator or scavenger.
- Scavenged/Dismembered - an entire carcass or a majority of a carcass, which shows signs of being fed upon by a predator or scavenger, or a portion(s) of a carcass in one location (e.g., wings, skeletal remains, portion of a carcass, etc.), or a carcass that has been heavily infested by insects.

For birds found, this additional category will be included:

- Feather Spot - 10 or more feathers at one location indicating predation or scavenging.

In addition to carcasses, all injured bats and birds observed in search plots or elsewhere in the Project will be recorded and treated as an incidental fatality for analysis purposes.

4.1.9 Searcher Efficiency Trials

The objective of the searcher efficiency trials is to estimate the percentage of casualties which are found by searchers. Searcher efficiency trials will be conducted in the same plots that carcass searches occur. Trials will be conducted during all seasons. Estimates of searcher efficiency will be used to adjust the total number of carcasses found for those missed by searchers, correcting for detection bias. Searcher efficiency trials will be conducted within both the search plots and on roads and pads.

Searcher efficiency trials will begin when carcass search studies begin. Personnel conducting carcass searches will not know when trials are conducted or the location of the detection carcasses. During both survey years, approximately 25 bird carcasses will be used each season, along with 50 total bat carcasses for summer and fall trials. Bird carcasses will include both large and small birds to best represent species that may be encountered in the field. Bird carcasses will consist of non-native/non-protected or commercially available species such as house sparrows (*Passer domesticus*), European starlings (*Sturnus vulgaris*), rock pigeons (*Columbia livia*), bobwhite quail (*Colinus virginianus*), hen mallards (*Anas platyryhnchos*) or hen pheasants (*Phasianus colchicus*).

All carcasses will be placed at random locations within areas being searched prior to the carcass search on the same day. Carcasses will be dropped from waist high or higher and allowed to land in a random posture. Each trial carcass will be discreetly marked prior to dropping so that it can be identified as a study carcass after it is found. The number and location of the detection carcasses found during the carcass search will be recorded. The number of carcasses available for detection during each trial will be determined immediately after the trial by the person responsible for distributing the carcasses.

4.1.10 Carcass Removal Trials

The objective of carcass removal trials is to estimate the likelihood that a carcass is removed by scavengers as a function of the time (measured in days) since the trial carcasses are placed in the field. Carcass removal includes removal by predation or scavenging, or removal by other means such as being plowed into a field. Estimates of carcass removal will be used to adjust the total number of carcasses found for those removed from the study area, correcting for removal bias.

Carcass removal trials will begin when carcass search studies begin. During both survey years, approximately 25 bird carcasses will be used each season, along with a total of 50 bat carcasses for summer and fall trials. Bird carcasses will consist of the same species as the searcher efficiency trials species. Carcasses will be placed on a minimum of two dates during each season, spreading the trials throughout the year to incorporate the effects of varying weather, climatic conditions, and scavenger densities.

All carcasses will be placed at random locations within the search area. Carcasses will be dropped from waist high or higher and allowed to land in a random posture. Each trial carcass will be discreetly marked prior to dropping so that it can be identified as a study carcass if it is found by other searchers or wind facility personnel.

Personnel conducting carcass searches will monitor the trial birds over a 30 day period according to the following schedule as closely as possible. Carcasses will be checked every day for the first 4 days, and then on day 7, day 10, day 14, day 20, and day 30. This schedule may vary depending on weather and coordination with the other survey work. Experimental carcasses will be left at the location until the end of the carcass removal trial. At the end of the 30-day period any evidence of the carcasses that remain will be removed.

Scavenger removal rates will be regularly checked to confirm that removal rates are not exceedingly short. If the removal time is very short, there are means to address this such that additional uncertainty is not added into the analysis unnecessarily. Ways to address very short removal times are to increase search frequency, put out carcasses at night if avian scavengers are suspected of removing carcasses (i.e., some avian predators that are active during the day may cue in on and remove carcasses immediately after placement), or possibly other options. The frequency of the standardized searches may be increased if carcass removal rates by scavengers are so high at the Project site that it precludes accurate bird and bat fatality estimates. For example, more frequent searches could be necessary if scavengers are removing a majority of carcasses from the site within a few hours or days. Based on removal trials at other wind project sites in the region, this level of carcass scavenging is not anticipated.

4.1.11 Estimation of Fatality

Fatality estimates for the monitoring period will be provided for three categories: 1) bats, 2) all birds, and 3) raptors. The primary purpose of the proposed fatality monitoring is to document bat and large bird (e.g., raptor) fatalities.

Estimates of facility-related fatalities will be based on:

(1) Observed number of carcasses found during standardized searches during the monitoring year for which the cause of death is either unknown or is probably facility-related.
(2) Non-removal rates expressed as the estimated average probability a carcass is expected to remain in the study area and be available for detection by the searchers during removal trials.
(3) Searcher efficiency expressed as the proportion of planted carcasses found by searchers during searcher efficiency trials.
(4) Percent of area searched at each turbine (i.e., takes into consideration road and pad sampling) and percentage of carcasses found at varying distances from turbine.

The majority of studies conducted to date use one of four estimators: The so-called naïve estimator (Johnson et al. 2000), Shoenfeld (2004), Jain (2005), or Huso (2010). The naïve estimator is no longer widely accepted, in that it failed to make appropriate corrections for experimental bias. In general, whenever search intervals are long and carcass persistence times are short, these estimators will produce similar results. However, when the opposite is true, different estimates may result. In general, Shoenfeld's estimator tends to be biased low, while Huso's and Jain's tend to be biased high. When only a single search is considered for searcher efficiency, Jain's estimator will be biased high in most cases. Based on current knowledge and practice, it is proposed to use the Shoenfeld estimator and the Huso estimator. Another estimator may be used (i.e. Warren-Hicks and Wolpert) if it is considered a viable alternative at the time of analysis.

4.2 Incidental Monitoring

4.2.1 Training of On-Site Staff

All operations personnel will be trained to identify potential wildlife conflicts and the proper response. This training will include sensitivity to birds and other wildlife. An incidental reporting process will be developed for operations personnel ensuring they can document bird or bat casualties during routine maintenance work and at other times that they are within the Project Area. Incidentally found wildlife will be reported according to LWECS Site Permit requirements for the life of the Project.

4.2.2 Injured Wildlife Handling and Reporting Protocol

Any injured wildlife observed during operations of the Project will be left in place until EDF's primary biological/ecological representative has been contacted. EDF will then decide the most appropriate course of action depending on the condition and species of injured animal discovered.

4.2.3 Primary Biologist/Ecologist Contact

The contact information for EDF's primary biological/ecological representative is included in Section 7.4.

4.3 Assessment of Habitat Loss, Degradation, and Fragmentation

No species of habitat fragmentation concern have been identified in the Project Area. The Project is located in a landscape that has been highly disturbed by agricultural activities. To the extent possible, all Project turbines will be located at sites in agricultural fields cultivated for corn or soybean production, away from sensitive areas, native prairie remnants, woodlands, and forests, wetlands and waterbodies. The Project access roads and collector lines are also largely found in cultivated agricultural fields. Given the limited potential for direct impacts to wildlife habitats, no post-construction monitoring of habitat loss, degradation, or fragmentation (consistent with a Tier4b analysis from the WEG) is currently anticipated.

4.4 Post-Construction Results and Recommendations Reporting Protocol

EDF will prepare an annual report summarizing the results of the monitoring and assessment completed as described in Sections 4.1 and 4.2.

Specific to the formal avian and bat fatality monitoring, the report will include turbine specific information on found carcasses along with estimated fatality rates for birds and bats. Fatality estimates will be calculated for bats, all birds, and raptors, at a minimum. Seasonal estimates for both birds and bats will also be reported. Estimated fatality rates will be calculated using the total number of carcasses found along with data from searcher efficiency and carcass removal trials. The report will include an analysis that provides a comparison of fatality estimates, searcher efficiency, and scavenger removal rates between the cleared plots and road and pad searches. Additionally, the report will include information on the results from incidental monitoring, eagle nest surveys, and eagle use surveys.

In addition to the summary report that will be completed after the post-construction monitoring, EDF will provide the necessary quarterly and annual incident reports to the PUC, the MNDNR, and the USFWS, identifying recommendations for next steps. Data from these Tier 4 studies will be one component in implementing the adaptive management portion of this ABPP (see Section 6.0).

4.5 Agency Coordination – Tier 4

Within three months of completing the Tier 4 study fieldwork, EDF will communicate the results of the Tier 4 studies to the USFWS, Department of Commerce, and MNDNR, discussing potentially significant issues and notifying these agencies of any adaptive management strategies it plans to implement as a result of these studies.

5.0 RESEARCH: TIER 5

In addition to the Tiers 1-4 described above, the WEG contain a *Tier 5 Other Post-Construction Studies*. In general, the studies identified in Tier 5 are research-related and "will not be necessary for most wind energy projects". Results from the Tier 4 studies will determine the necessity for Tier 5 studies, but these studies are not anticipated for the Project.

6.0 ADAPTIVE MANAGEMENT AND OPERATIONS MEASURES

Within the WEG, the Department of the Interior defines adaptive management as "an iterative decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Comprehensively applying the tiered approach embodies the adaptive management process" (USFWS 2012). The WEG further notes that adaptive management at most wind facilities is unlikely to be needed if they are sited in accordance with the tiered approach. Nevertheless, EDF recognizes the value of applying this approach to its Project activities that include some uncertainty. As such, EDF has incorporated an adaptive approach for the conservation of wildlife potentially impacted by the Project.

Section 2.0 of this ABPP describes the tiered approach used to study wildlife conditions and predict Project impacts. Based on Project siting decisions made in response to pre-construction monitoring actions (turbines sited greater than two miles from active bald eagle nests and away from sensitive habitat), and results to date of overall biological monitoring, no significant adverse impacts are anticipated from the Project. The anticipated fatality rate for birds and raptors is expected to be within the overall range for other projects in the region (Tables 2 and 3). Publicly available studies from Minnesota suggest the range of estimated fatality rates is 0.27 to 5.93 birds/MW/year and 0 to 0.47 raptors/MW/year. Based on publicly available studies in Minnesota (Table 4), the anticipated fatality rate for bats ranges from 0.74 to 15.85 bats/MW/year, with a mean of 3.65 bats/MW/year. To confirm the anticipated impacts, post-construction fatality surveys will be conducted after the facility is fully functioning using a third party biologist according to the methods set forth in Section 4. For adaptive management measures referring to eagles see the Eagle Conservation Plan (Appendix C).

Table 2. Wind energy facilities in Minnesota with fatality data for all bird species.

Wind Energy Facility	Fatality Estimate[A]	No. of Turbines	Total MW
Buffalo Ridge, MN (Phase III; 1999)	5.93	138	103.5
Moraine II, MN	5.59	33	49.5
Buffalo Ridge, MN (Phase I; 1996)	4.14	73	25
Elm Creek II, MN	3.64	62	148.8
Buffalo Ridge, MN (Phase I; 1999)	1.43	73	25
Buffalo Ridge, MN (Phase II; 1999)	3.57	143	107.25
Buffalo Ridge, MN (Phase I; 1998)	3.14	73	25
Buffalo Ridge, MN (Phase I; 1997)	2.51	73	25
Buffalo Ridge, MN (Phase II; 1998)	2.47	143	107.25
Elm Creek, MN	1.55	67	100

A=number of bird fatalities/MW/year
Data from the following sources:

Facility	Fatality Estimate	Facility	Fatality Estimate
Buffalo Ridge, MN (Phase III; 99)	Johnson et al. 2000a	Buffalo Ridge, MN (Phase I; 97)	Johnson et al. 2000a
Moraine II, MN	Derby et al. 2010d	Buffalo Ridge, MN (Phase II; 98)	Johnson et al. 2000a
Buffalo Ridge, MN (Phase I; 96)	Johnson et al. 2000a	Elm Creek, MN	Derby et al. 2010c
Elm Creek II, MN	Derby et al. 2012b	Buffalo Ridge, MN (Phase I; 99)	Johnson et al. 2000a
Buffalo Ridge, MN (Phase II; 99)	Johnson et al. 2000a		
Buffalo Ridge, MN (Phase I; 98)	Johnson et al. 2000a		

Table 3. Wind energy facilities in Minnesota with fatality data for raptors.

Wind Energy Facility	Raptor Fatality Estimate[A]	No. of Turbines	Total MW
Buffalo Ridge, MN (Phase I; 1996)	0.47	73	25
Moraine II, MN	0.37	33	49.5
Buffalo Ridge, MN (Phase I; 1997)	0	73	25
Buffalo Ridge, MN (Phase I; 1998)	0	73	25
Buffalo Ridge, MN (Phase I; 1999)	0	73	25
Elm Creek, MN	0	67	100
Buffalo Ridge, MN (Phase III; 1999)	0	138	103.5
Buffalo Ridge, MN (Phase II; 1998)	0	143	107.25
Buffalo Ridge, MN (Phase II; 1999)	0	143	107.25
Elm Creek II, MN	0	62	148.8

A = number of fatalities/MW/year

Data from the following sources:

Facility	Fatality Estimate	Facility	Fatality Estimate
Buffalo Ridge, MN (Ph. I; 96)	Johnson et al. 2000a	Elm Creek, MN	Derby et al. 2010c
Moraine II, MN	Derby et al. 2010d	Buffalo Ridge, MN (Ph. III; 99)	Johnson et al. 2000a
Buffalo Ridge, MN (Ph. I; 97)	Johnson et al. 2000a	Buffalo Ridge, MN (Ph. II; 98)	Johnson et al. 2000a
Buffalo Ridge, MN (Ph. I; 98)	Johnson et al. 2000a	Buffalo Ridge, MN (Ph. II; 99)	Johnson et al. 2000a
Buffalo Ridge, MN (Ph. I; 99)	Johnson et al. 2000a	Elm Creek II, MN	Derby et al. 2012b
		Elm Creek II, MN	Derby et al. 2012b

Table 4. Wind energy facilities in Minnesota with fatality data for bats.

Wind Energy Facility	Fatality Estimate[A]	No. of Turbines	Total MW
Lakefield, MN (2012)	15.85	137	205.5
Big Blue, MN (2013)	6.33	18	36
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	4.35	143	107.25
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	3.71	138	103.5
Grand Meadows, MN (2013)	3.11	67	100.5
Oak Glen, MN (2013)	3.09	24	44
Elm Creek II, MN (2011-2012)	2.81	62	148.8
Buffalo Ridge, MN (Phase III; 1999)	2.72	138	103.5
Buffalo Ridge, MN (Phase II; 1999)	2.59	143	107.25
Moraine II, MN (2009)	2.42	33	49.5
Buffalo Ridge, MN (Phase II; 1998)	2.16	143	107.25
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	1.81	138	103.5
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	1.64	143	107.25
Elm Creek, MN (2009-2010)	1.49	67	100
Buffalo Ridge, MN (Phase I; 1999)	0.74	73	25

A = Number of fatalities per megawatt per year

Data from the following sources:

Facility	Fatality Estimate	Facility	Fatality Estimate
Buffalo Ridge, MN (Ph. II; 01/Lake Benton I)	Johnson et al. 2004	Buffalo Ridge, MN (Ph. II; 98)	Johnson et al. 2000a
Buffalo Ridge, MN (Ph. III; 01/Lake Benton II)	Johnson et al. 2004	Buffalo Ridge, MN (Ph. III; 02/Lake Benton II)	Johnson et al. 2004
Elm Creek II, MN	Derby et al. 2012b	Buffalo Ridge, MN (Ph. II; 02/Lake Benton I)	Johnson et al. 2004
Buffalo Ridge, MN (Ph. III; 99)	Johnson et al. 2000a	Elm Creek, MN	Derby et al. 2010c
Buffalo Ridge, MN (Ph. II; 99)	Johnson et al. 2000a	Buffalo Ridge, MN (Ph. I; 99)	Johnson et al. 2000a
Moraine II, MN	Derby et al. 2010d		

6.1 Unexpected Avian, Bat, and/or Habitat Impacts

Based on the results of the Tier 4 monitoring program described in Sections 4.1 through 4.3, adaptive management measures could be considered to further avoid, minimize, or compensate for unanticipated and significant project impacts to wildlife. Thresholds for considering an adaptive response will include:

- mortality of an eagle or mortality of a species listed as endangered/threatened under the federal Endangered Species Act or Minnesota's Endangered Species Statute. Note that the final 4(d) ruling for the NLEB currently exempts wind energy projects from incidental take of this species during operation. Any documented NLEB mortality will be reported to the USFWS and Department of Commerce but no adaptive management measures are proposed under the current 4(d) rule. If the status of the NLEB is downgraded, or the 4(d) rule is changed, EDF will update this ABPP and adaptive management measures as appropriate; or
- significant levels of mortality of unlisted species of birds or bats. Significance will be determined by qualified biologists and will be based on the latest information available, including the most recent data on species' population sizes and trends. For example, even relatively high levels of mortality of the most common species may not be significant. Conversely, lower levels of mortalities of less common species may be of

more concern, particularly if these species appear to be at risk (e.g., USFWS's Birds of Conservation Concern).

As stated above, bat mortality at the Red Pine project is expected to be within the range reported for other wind projects in Minnesota. In particular, EDF's commitment to voluntary operation measures including, when commercially feasible, feathering turbine blades up to the manufacturer set cut-in speed at night during the fall bat migration season whenever evening temperatures exceed 50 degrees Fahrenheit, is expected to minimize impacts to bats.

However, in order to address the MNDNR's concerns over potential impacts to bats, EDF proposes specific assessment methods to determine when agency coordination will occur to determine if adaptive management measures should be considered. If post-construction monitoring or the incidental operational monitoring detect bat mortality exceeding the established adaptive management triggers, EDF will take remedial actions.

Because the Red Pine project is not expected to result in higher bat mortality than has been observed in Minnesota to date, adaptive management in response to the standard mortality monitoring will occur if:

- Bat fatality rate exceeds 15.85 bats/MW/year , the maximum rate observed at Minnesota wind projects at the time of the ABPP development; or
- Five or more dead or injured bats are detected at the project within one five day period.

Using the maximum bat fatality rate from Minnesota as a criterion will indicate that the risk to bats at the Red Pine project was incorrectly characterized and consequently, that re-evaluation of the risk to bats at the Red Pine project is necessary. Finding five or more carcasses will indicate that a particular impact event occurred and/or a specific turbine or turbine string may be of particular unanticipated risk, and that further focused assessment is necessary.

During the post-construction monitoring period, EDF will notify the PUC of bat fatality rates and whether or not the adaptive management criteria have been met at the time of the annual monitoring report submittal. If five or more dead or injured bats are found in one five day period, the PUC will be notified within 24 hours. If the bat mortality criteria described above for adaptive management are met, EDF will investigate, based on the available data, the circumstances under which the measure occurred (five fatalities found at one turbine, or overall fatality rate), the species affected, and whether population-level[1] impacts may be occurring. EDF will coordinate with the PUC regarding the conclusions of the investigation and discuss the implementation of potential minimization measures (e.g., operational changes) and/or mitigation measures (e.g., reduce non-Red Pine sources of mortality for the affected species).

[1] Population will be evaluated at the smallest level for which reliable population size and/or trend data are available. Local, regional, or range-wide populations may be evaluated depending on the data available for the particular species.

Following the implementation of remedial actions, EDF will calculate estimates of non-listed bat fatality rates from the monitoring data collected at the Red Pine project for at least one subsequent year to evaluate the effectiveness of the adaptive management measures.

After the intensive post-construction monitoring period, incidental monitoring will be used to continue to monitor impacts to bats over the life of the Red Pine project. Bat carcasses will be reported regularly to EDF's environmental staff. Quarterly reports shall be submitted to the PUC for the life of the project, identifying any dead or injured bat species found, as well as location and date. If at any point over the life of the Red Pine project, five or more dead or injured bats are detected within a five day period, EDF will notify the PUC within 24 hours; if federally listed species are affected, the USFWS will also be notified. As described above, EDF will then investigate, based on the available data, the circumstances under which the event occurred, the species affected, and whether population-level impacts may be occurring. EDF will coordinate with the PUC and DNR regarding the conclusions of the investigation and discuss the implementation of potential minimization measures (e.g., operational changes) and/or mitigation measures (e.g., reduce non-Red Pine sources of mortality for the affected species).

6.2 Additional Adaptive Management Compensation

As described above in Section 4, if the impacts observed in the first year of monitoring represent a significant impact to wildlife, the second year of post-construction fatality monitoring could be modified to provide further information to be used in implementing adaptive management measures. This second year would likely focus on the any significant impacts identified for species of concern. For example, if it is found that the bat fatalities at the Project are significant based on analysis of the post-construction fatality data, a second year of fatality monitoring could be done that focuses on the time period when bats were found as fatalities in year one (e.g., July-October). The same protocol as stated above would be used for searches but with a focus on a concentrated search period and reduced plot sizes to narrow the search to the area where bat carcasses are most likely to be found (e.g., closer to the turbines).

Some of the adaptive management measures options that could be considered depending on the results of the post-construction mortality monitoring and taking into account economic feasibility[2] include:

- regular removal of livestock or big game carcasses from Project Area;
- prey-base habitat management (e.g., removal of rock/brush piles found in proximity to turbines);
- installation or modifications of anti-perching, anti-nesting devices, or electrocution protection devices on "problem" Project facilities; or
- operational minimization (e.g., feathering, modified operations from sundown to sunrise, alteration of cut-in speeds).

[2] Once a project is operational there is a fixed amount of capital expenditure and the only available source of funding is from operational budgets, which must be within the economic parameters of the Project.

6.3 Action Plan Should New Risks Arise

In addition to adaptive management triggered based on the results of the post-construction mortality studies, additional adaptive measures will be considered as a result of other studies or incidental wildlife observations during Project operations. Operations staff will also be trained to implement an incidental wildlife reporting protocol (Section 4.2). EDF will communicate the results of this monitoring to the USFWS and any further decisions regarding the scope of additional survey efforts (if needed) or adaptive management will be coordinated with the USFWS.

There may be other scenarios where new risks require additional measures: finding a eagle roost or nest location, for example, that dictate a need for individual turbines to be monitored more closely for use and fatalities. The intent of monitoring is to document changes in use (e.g., higher use) in a timely manner such that management changes (e.g., removal of prey sources) or operations changes can be implemented and potential impact to bald eagles and bats continues to be minimized.

Finally, EDF will consider implementing adaptive management measures if the status of any species potentially impacted by the Project changes, such as if any species become listed under federal or state protected species regulations, or the status of a species is changed (such as the NLEB as discussed in Section 6.1).

6.3.1 Agency Correspondence

Prior to implementing any new action plan or major modification to this ABPP, EDF will consult with the Department of Commerce, MNDNR, and USFWS.

7.0 IMPLEMENTATION OF THE ABPP

7.1 Document Availability

This ABPP will be maintained by EDF's environmental representative and a copy ABPP will be kept on-site throughout operations of the Project.

7.2 Annual Audits

EDF will, by March 15 following each complete or partial calendar year of operation, file with the PUC an annual report detailing findings of its annual audit of ABPP practices. The annual report will include summarized and raw data of bird and bat fatalities and injuries and will include bird and bat fatality estimates for the Project using agreed-upon estimators from the prior calendar year. The annual report will also identify any deficiencies or recommended changes in the operation of the Project or in the ABPP to reduce avian and bat fatalities and will provide a schedule for implementing the corrective or modified actions. EDF will provide a copy of the report to the MDNR and the USFWS at the time of filing with the PUC.

7.3 Reporting

EDF will provide quarterly wildlife incident reports (a summary of the WIRS) to the PUC, DNR, and USFWS for the life of the Site Permit. Additionally, the Project owner and the PUC, MNDNR, and the USFWS will be notified within twenty-four (24) hours of the discovery of any of the following:

(a) five or more dead or injured non-listed or migratory avian or bat species within a five-day period; or
(b) an incident of one or more dead or injured state threatened, endangered, or species of special concern; or
(c) one or more dead or injured federally listed species; or
(d) one or more dead or injured bald or golden eagles.

7.4 Primary Contact

Key resource personnel associated with this ABPP include the following:

- EDF Renewable Energy: Alyssa Edwards, Shanelle Montana.
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    - Office:
    - Cell:
    - Email:

- U. S. Fish and Wildlife Service: Lisa Mandell, Acting Project Leader
    - Office: (612) 725-3548 ext. 2201
    - Email: Lisa_Mandell@fws.gov

- US Fish and Wildlife Service Law Enforcement:
    - Office: USFWS Law Enforcement – St. Paul Station
    - Contact: Contact: (651) 778-8360

- Minnesota Department of Natural Resources: Jamie Schrenzel, MDNR
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- Minnesota Department of Commerce: Rich Davis
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Appendix A. Agency Meeting Notes and Comment Letters

Appendix B. Survey Results 2010-2016

Appendix C. Eagle Conservation Plan