

Passerine Migration, Republic Wind Farm, Seneca County, Ohio



Photo 21. Point K, facing north.



Photo 22. Point K, facing south.



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**RESULTS OF THE  
DIURNAL BIRD/RAPTOR MIGRATION SURVEY  
REPUBLIC WIND FARM  
SENECA AND SANDUSKY COUNTIES, OHIO**

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## EXECUTIVE SUMMARY

BHE Environmental, Inc. (BHE) was contracted to complete diurnal bird/raptor migration surveys following methods described in the *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio* issued by the Ohio Department of Natural Resources, Division of Wildlife. This report provides data and analysis of results of the diurnal bird/raptor migration surveys conducted by BHE in spring (March 17 through April 30) and fall (September 4 through October 28) 2011. Surveys were conducted by BHE at the proposed Republic Wind Farm project in Seneca and Sandusky counties, Ohio.

A total of 52 species were identified during the migration surveys, including the state-listed endangered northern harrier (*Circus cyaneus*) and sandhill crane (*Grus canadensis*); state threatened osprey (*Pandion haliaetus*) and bald eagle (*Haliaeetus leucocephalus*); and state species of special interest northern pintail (*Anas acuta*). Northern harriers were observed multiple times (13) during the course of the diurnal bird/raptor migration survey; bald eagles were observed four times, and several (18) northern pintails were observed. The remaining two species were observed a single time each.

Due to the limited size of woodlots, wetlands, open water, and potential stopover sites present, and due to an availability of similar habitat in northwestern Ohio, the Project Area does not represent a unique resource for large numbers of diurnal birds and raptors during migration. Diurnal bird/raptor migration monitoring confirmed limited avian migrant use.

The bald eagle was observed during the migration survey. This species is protected by the Bald and Golden Eagle Protection Act. Three bald eagle nests are located within 2.25 miles of the Project Area. The only successful nest in 2011 was located near the proposed power line and is more than 5 miles from the nearest proposed turbine location. In addition, the US Fish and Wildlife Service records indicate 20 bald eagle nests have been documented within 10 miles of the Project boundary. Additional studies on eagle use of the Project Area are ongoing.

## 1.0 INTRODUCTION

Republic Wind Farm, LLC, a subsidiary of Nordex USA, Inc. (Nordex), proposes construction of the Republic Wind Farm (RWF or Project Area) wind energy generation facility in Seneca and Sandusky counties, Ohio. The Project Area spans approximately 39,627 acres (ac; 16,036 hectares [ha]) northeast of the town of Republic, Ohio (Figure 1). The Project Area represents the maximum area considered for placement of turbines and facility infrastructure. The layout and number of turbines has not yet been selected; however, the actual area disturbed by the turbines and access roads that will comprise the facility will be a very small percentage of the Project Area (less than 1 percent).

BHE Environmental, Inc. (BHE) was contracted by Nordex to conduct diurnal bird/raptor migration surveys at the proposed RWF according to specifications outlined in the Ohio Department of Natural Resources (ODNR) *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio, An Addendum to the Ohio Department of Natural Resource's Voluntary Cooperative Agreement* ("Ohio Protocol"). The purpose of this report is to document the results of the survey.

Raptor collision rates at modern wind farms outside of California are small (NAS 2007; NWCC 2010). Raptors may be affected by wind power development in several ways, including: a) collisions with operating turbine rotors or blades; b) habitat disturbance resulting from construction or new infrastructure on site; and c) disturbance from increased human activity in the vicinity of the turbines. Collision mortality risk on raptor populations are often evaluated because raptors are not numerous and typically reproduce and mature slowly; thus, in contrast to passerine species, raptors cannot absorb mortalities and recover from losses on an annual basis as easily (Kuvlesky et al. 2007).

## 2.0 METHODS

### 2.1 DIURNAL BIRD / RAPTOR MIGRATION SURVEY

In order to gauge the rate at which diurnal birds and raptors could potentially come into conflict with wind turbines at RWF, BHE conducted day-long (9:00 a.m. to 4:00 p.m.) diurnal bird/raptor migration surveys three times a week during seasonally favorable weather for migration (northerly winds in fall, southerly winds in spring). The surveys were made from three observation points that afforded largely unobstructed views and were placed in the north, central, and south portions of the Project Area (Figure 1). Point 2 was moved during the spring of 2011 to a location between the Project area and the bald eagle nest south of the Project Area to better determine whether bald eagles from this nest were using the Project Area (Figure 1). Due to species-specific differences in migration, 20 days of surveys were conducted in spring (March 17 through April 30) and 22 days of surveys were completed during fall (September 4 through October 28) 2011. During surveys, migrants were identified to species, and whenever possible, the sex and age class of individuals was recorded. Using the data sheet provided in the Ohio Protocol, the surveyor also recorded the number of individuals, the approximate height of flight, whether the migrant(s) entered the Project Area, an estimate of the time they spent in the rotor-swept zone (between 40 and 180 meters above ground), and general behaviors observed (e.g., foraging, circling in updraft).

## 3.0 RESULTS

### 3.1 BIRD MIGRATION

Land use of the Project Area is dominated by cropland (Table 1). The types of birds observed were consistent with the agricultural uses. A total of 12,337 birds were observed from 52 species during migration surveys (Table 2). Forty-six percent of birds were observed during spring surveys (5,725 individuals from 40 species) and 54 percent were observed during fall surveys (6,612 individuals from 40 species; Appendix A).

Red-winged blackbirds (*Agelaius phoeniceus*), European starlings (*Sturnus vulgaris*), and common grackles (*Quiscalus quiscula*) comprised over half of the birds observed. Red-winged blackbirds were the most numerous birds, observed at an average of 119 birds per day for a total of 4,986 birds. European starlings were recorded at an average of 47 birds per day and common grackles at an average of 33 birds per day; 1,974 and 1,376 total birds, respectively. The majority (80 percent [6,614]) of blackbirds, starlings, and grackles observed were at low heights (0 to 40 meters above ground), with 20 percent (1,725) observed between 40 and 180 meters above ground. A flock of Bonaparte's gulls (*Chroicocephalus philadelphia*; 62 birds) observed between 40 and 180 meters on April 7, 2011 was the only other large flock of birds outside of blackbirds, starlings, and grackles.

### 3.2 SENSITIVE SPECIES AND RAPTOR MIGRATION

Results of the diurnal bird/raptor migration surveys showed limited use of the Project Area by avian species of conservation concern. Two flocks of northern pintails (*Anas acuta*; 18 total birds) were observed during the spring surveys, both flocks were observed between 40 and 180 meters above ground level. A single sandhill crane (*Grus canadensis*) was observed during spring surveys, and a single osprey (*Pandion haliaetus*) was observed during autumn surveys. The sandhill crane was observed low to the ground (less than 40 meters above ground level) and the osprey was observed above the rotor-swept zone (higher than 180 meters above ground level). Northern harriers were observed using the Project Area multiple times during both the spring (10 observations) and autumn (three observations) surveys, averaging 0.30 birds per day. Northern harriers were frequently observed flying in their characteristically close-to-the-ground manner. Out of the 13 total observations, only one bird was observed flying within the rotor-swept zone. Four bald eagles were observed during the spring migration surveys. Three of the observations occurred in the northwestern portion of the Project Area, each of these observations were of a juvenile bird flying between 40 and 180 meters above the ground. A single observation of an adult bird occurred in the southern portion of the Project Area flying between 40 and 180 meters above the ground (Table 3; Appendix A). The average observations per day during the survey were 0.10 birds per day.

Five other species of raptor were observed during the migration surveys. The most common species observed was the turkey vulture (*Cathartes aura*). The highest count in a single day was 16 turkey vultures observed on April 11, 2011. Sightings of turkey vultures averaged 12.55 birds per day for a total of 527 birds. The second most common species observed was the red-tailed hawk (*Buteo jamaicensis*). Red-tailed hawks were observed an average of 1.7 birds per day for a total of 71 birds. Red-tailed hawks were observed soaring at heights ranging from just about the ground to higher than 180 meters above ground. They were also observed perched on telephone poles and in the few trees located on the Project Area. Other raptor species observed include: Cooper's hawk (*Accipiter cooperii*; 28 birds, 0.66

Table 1. National land use/land cover acreages in the Republic Wind, LLC Project Area, Seneca and Sandusky Counties Ohio.

Land Use	Acres	Percent
Cultivated Crops	33,571.5	84.7%
Deciduous Forest	3,012.7	7.6%
Developed, Open Space	2,101.0	5.3%
Hay/Pasture	425.0	1.1%
Herbaceous	209.96	0.5%
Developed, Low Intensity	136.6	0.3%
Open Water	116.1	0.3%
Woody Wetlands	32.0	0.1%
Emergent Herbaceous Wetlands	10.5	<0.1%
Developed, Medium Intensity	8.3	<0.1%
Evergreen Forest	3.2	<0.1%
<b>Total</b>	<b>39,626.6</b>	<b>100.0%</b>

Table 2. Bird species observed during the Republic Wind Farm Diurnal Bird/Raptor Migration Survey.

Common Name	Species Name	Birds Observed			
		Spring	Autumn	Birds/Day^	Total
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	1212	3774	118.71	4986
European Starling	<i>Sturnus vulgaris</i>	1094	880	47.00	1974
Common Grackle	<i>Quiscalus quiscula</i>	1183	196	32.83	1379
American Crow	<i>Corvus brachyrhynchos</i>	256	498	17.95	754
American Robin	<i>Turdus migratorius</i>	478	67	12.98	545
Turkey Vulture	<i>Cathartes aura</i>	407	120	12.55	527
Horned Lark	<i>Eremophila alpestris</i>	228	69	7.07	297
House Sparrow	<i>Passer domesticus</i>	0	225	5.36	225
Canada Goose	<i>Branta canadensis</i>	66	156	5.29	222
Killdeer	<i>Charadrius vociferus</i>	166	49	5.12	215
Brown-headed Cowbird	<i>Molothrus ater</i>	182	19	4.79	201
Mourning Dove	<i>Zenaida macroura</i>	35	164	4.74	199
Eastern Bluebird	<i>Sialia sialis</i>	21	93	2.71	114
Bonaparte's Gull	<i>Chroicocephalus philadelphia</i>	81	0	1.93	81
American Goldfinch	<i>Spinus tristis</i>	12	61	1.74	73
Red-tailed Hawk	<i>Buteo jamaicensis</i>	60	11	1.69	71
Duck sp.	N/A	60	0	1.43	60
Blue Jay	<i>Cyanocitta cristata</i>	5	52	1.36	57
Song Sparrow	<i>Melospiza melodia</i>	11	35	1.10	46
Ring-billed Gull	<i>Larus delawarensis</i>	0	34	0.81	34



Table 2. Bird species observed during the Republic Wind Farm Diurnal Bird/Raptor Migration Survey.

Common Name	Species Name	Birds Observed			
		Spring	Autumn	Birds/Day <sup>^</sup>	Total
Cedar Waxwing	<i>Bombycilla cedrorum</i>	0	32	0.76	32
Cooper's Hawk	<i>Accipiter cooperii</i>	26	2	0.67	28
Mallard	<i>Anas platyrhynchos</i>	19	8	0.64	27
Pectoral Sandpiper	<i>Calidris melanotos</i>	23	0	0.55	23
Barn Swallow	<i>Hirundo rustica</i>	20	0	0.48	20
Northern Pintail*	<i>Anas acuta</i>	18	0	0.43	18
Northern Harrier*	<i>Circus cyaneus</i>	10	3	0.31	13
Great Blue Heron	<i>Ardea herodias</i>	5	7	0.29	12
Northern Flicker	<i>Colaptes auratus</i>	2	10	0.29	12
American Kestrel	<i>Falco sparverius</i>	5	5	0.24	10
Eastern Meadowlark	<i>Sturnella magna</i>	10	0	0.24	10
Northern Cardinal	<i>Cardinalis cardinalis</i>	0	10	0.24	10
American Pipit	<i>Anthus rubescens</i>	3	6	0.21	9
Tree Swallow	<i>Tachycineta bicolor</i>	1	7	0.19	8
Wood Duck	<i>Aix sponsa</i>	8	0	0.19	8
Rock Pigeon	<i>Columba livia</i>	3	3	0.14	6
Bald Eagle*	<i>Haliaeetus leucocephalus</i>	4	0	0.10	4
Chipping Sparrow	<i>Spizella passerina</i>	4	0	0.10	4
Savannah Sparrow	<i>Passerculus sandwichensis</i>	1	3	0.10	4
Wild Turkey	<i>Meleagris gallopavo</i>	2	2	0.10	4
Belted Kingfisher	<i>Ceryle alcyon</i>	0	2	0.05	2
Pileated Woodpecker	<i>Dryocopus pileatus</i>	1	1	0.05	2
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	0	2	0.05	2
Downy Woodpecker	<i>Picoides pubescens</i>	0	1	0.02	1
Field Sparrow	<i>Spizella pusilla</i>	1	0	0.02	1
Osprey*	<i>Pandion haliaetus</i>	0	1	0.02	1
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	0	1	0.02	1
Red-shouldered Hawk	<i>Buteo lineatus</i>	1	0	0.02	1
Sandhill Crane*	<i>Grus canadensis</i>	1	0	0.02	1
Short-billed Dowitcher	<i>Limnodromus griseus</i>	0	1	0.02	1
Tufted Titmouse	<i>Baeolophus bicolor</i>	0	1	0.02	1
White-breasted Nuthatch	<i>Sitta carolinensis</i>	0	1	0.02	1
<b>Total</b>		<b>5,725</b>	<b>6,612</b>	<b>n/a</b>	<b>12,337</b>

<sup>^</sup>42 observation days

\*Listed by the State of Ohio, see Table 3.

Table 3. Bird species listed by the State of Ohio and recorded during the Republic Wind Farm Diurnal Bird/Raptor Migration Survey.

Common Name	Ohio Listed Species Classification	Total Number of Birds Observed
Northern Pintail	Species of Special Interest	18
Bald Eagle	Threatened	4
Osprey	Threatened	1
Northern Harrier	Endangered	13
Sandhill Crane	Endangered	1

birds/day); American kestrel (*Falco sparverius*; 10 birds, 0.23 birds/day); and red-shouldered hawk (*Buteo lineatus*; 1 bird, 0.02 birds/day).

All data collected during the spring and fall migration surveys are in Appendix A.

#### 4.0 DISCUSSION

Bird migration is commonly perceived as involving north-south movements of populations on a large scale, typically associated with seasons. However, there are many types of migratory behavior; some are simple, others more complex. Most seasonal movement between northern and southern climes follows a system of flyways and these flyways are loosely defined by geographical features. These physical features include coasts, river valleys, and mountain ranges, and together form the four major North American migratory corridors: the Atlantic, Mississippi, Central, and Pacific flyways. The Project Area lies along the eastern edge of the Mississippi flyway which also includes, although to a lesser extent, the Ohio River Valley and tributaries. The Project Area also lies along known pathways of raptor migration both in the spring and the fall (Appendix B).

The Project Area is largely covered with row crops and does not contain features known to attract large concentrations of migrating birds, i.e., lakes, rivers, large streams, large wetlands, topographic ridges, large forests, or large grasslands (see Appendix C for site photos). However, several woodlots and tree lines of various sizes are interspersed throughout the Project Area. Based upon observations of diurnally-migrating birds and raptors, the Project Area does not appear to be an important diurnal bird and raptor migratory pathway. Large flocks observed using the area consisted of common species (blackbirds, grackles, and starlings) and listed species were not recorded in large numbers.

Several (18) northern pintails were observed flying within the rotor-swept zone during the spring migration surveys. Northern harriers were observed using the Project Area multiple times during spring (10 observations) and autumn (three observations) surveys, but their low-to-the-ground flight pattern largely avoids the rotor-swept zone, suggesting that collision risk is low. Four bald eagles were observed during the spring migration surveys. Additional studies on potential eagle use of the Project Area are ongoing through March 2013 to further evaluate risk.

Mortality studies at operational wind farms outside of California have shown relatively low raptor fatality rates (NRC 2007; NWCC 2010). Of the studies reviewed by the National

Research Council (NRC 2007), 14 were conducted using a survey protocol for all seasons of occupancy for a one-year period and incorporated scavenging and searcher-efficiency biases into estimates. The combined average raptor mortality for the 14 studies was 0.03 raptors/turbine/year and 0.04 raptors/megawatt/year. In a review of bird collisions documented in 31 studies at wind-energy facilities outside California, Erickson et al. (2001) reported that diurnal raptors comprised 2.7 percent of avian fatalities, while 78 percent of birds killed were protected songbirds. In a 3-year study conducted at a 354-turbine facility in Buffalo Ridge, Minnesota, Johnson et al. (2002) found that of 55 documented fatalities, only one was a raptor (red-tailed hawk; 1.8 percent of fatalities; 0.0009/turbine/year). When examined by region (East, Midwest, Pacific Northwest, and Rocky Mountain), raptor fatalities resulting from collision with wind turbines were found to be lowest in the Midwest (NRC 2007).

## **5.0 CONCLUSIONS**

Due to the limited size of woodlots, wetlands, open water, and potential stopover sites present, and due to an availability of similar habitat in northwestern Ohio, the Project Area does not appear to represent a unique resource for large numbers of migratory diurnal birds and raptors. Diurnal bird/raptor migration monitoring and raptor nest searches confirmed limited avian migrant use.

## 6.0 LITERATURE CITED

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## FIGURES



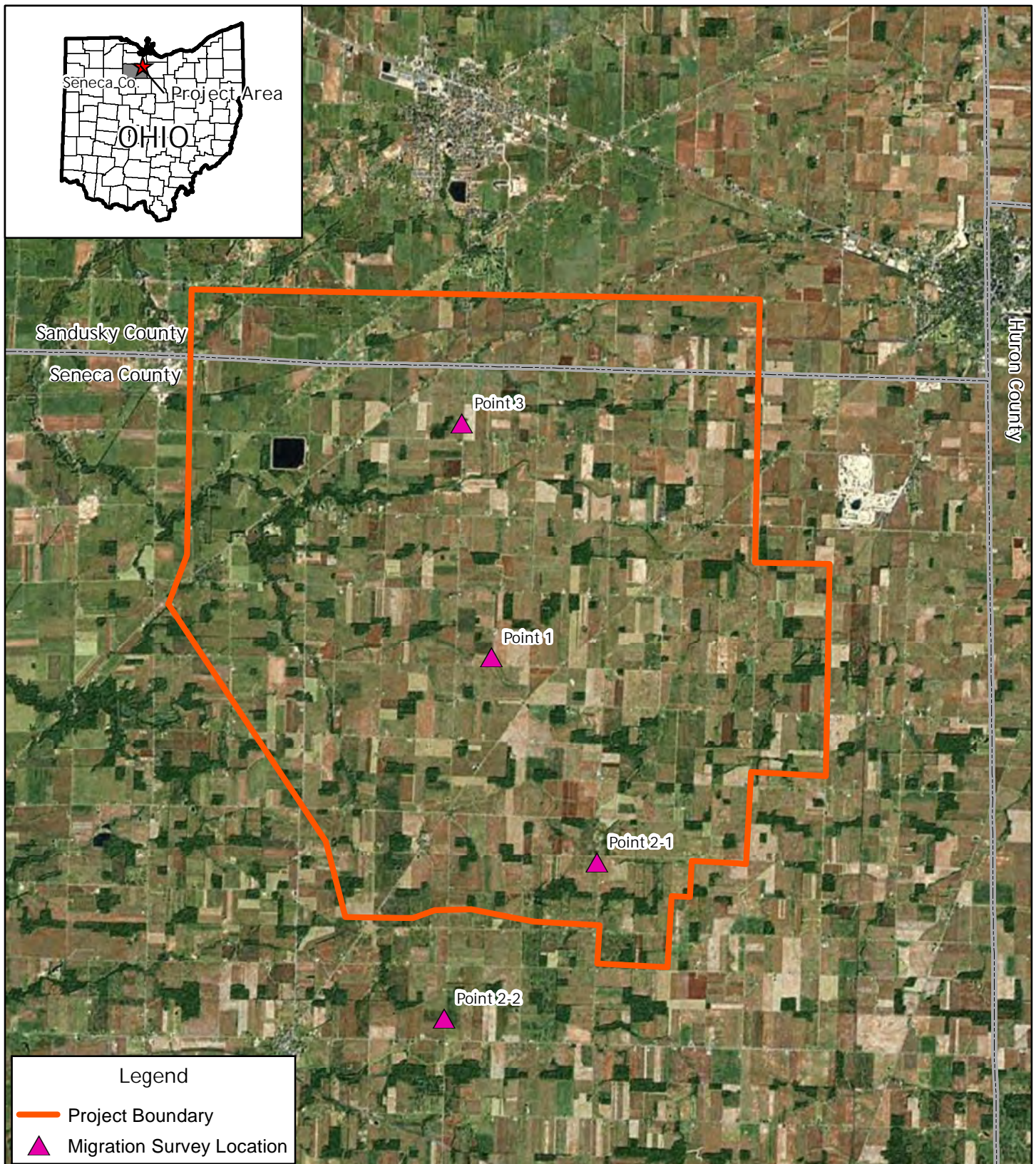


Figure 1. Diurnal Bird/Raptor Migration Survey Locations for the Republic Wind Farm Project Area, Seneca and Sandusky counties, Ohio.

## **APPENDIX A**

### **Diurnal Bird/Raptor Migration Survey Observations**

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
17-Mar-11	1	Spring	COGR	Common Grackle	8		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	East	no	yes	-
		Spring	AMRO	American Robin	7		0 - 40 m	South	no	yes	-
		Spring	MODO	Mourning Dove	1		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	West	no	yes	15 min
		Spring	EUST	European Starling	7		40 - 180 m	West	no	yes	5 min
		Spring	AMCR	American Crow	1		0 - 40 m	Southwest	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	Northwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Northwest	yes	yes	-
		Spring	AMRO	American Robin	12		0 - 40 m	South	no	yes	-
		Spring	RWBL	Red-winged Blackbird	30		0 - 40 m	West	no	yes	-
		Spring	EUST	European Starling	6		0 - 40 m	Southeast	no	yes	-
		Spring	COGR	Common Grackle	4		40 - 180 m	East	no	yes	2 min
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	-
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	Northwest	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	30		0 - 40 m	Southeast	yes	yes	-
		Spring	RWBL	Red-winged Blackbird	30		0 - 40 m	Southeast	yes	yes	-
		Spring	COGR	Common Grackle	7		0 - 40 m	Southeast	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	-
		Spring	RWBL	Red-winged Blackbird	14		0 - 40 m	Southeast	no	yes	-
		Spring	HOLA	Horned Lark	5		0 - 40 m	South	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	Northwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	6		0 - 40 m	East/Southeast	no	yes	-
		Spring	NOHA	Northern Harrier	1	Adult	0 - 40 m	Northwest	yes	yes	hunting
		Spring	COGR	Common Grackle	2		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	8		0 - 40 m	Southwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1	Adult	0 - 40 m	Northeast	yes	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1	Adult	40 - 180 m	Northeast	yes	yes	8 min
		Spring	AMCR	American Crow	2		0 - 40 m	West	no	yes	-
		Spring	AMCR	American Crow	8		0 - 40 m	Northwest	no	yes	-
		Spring	AMRO	American Robin	20		40 - 180 m	Northeast	no	yes	2 min
		Spring	AMCR	American Crow	4		0 - 40 m	Southwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1	Adult	0 - 40 m	East/Northeast	yes	yes	3 min
		Spring	TUVU	Turkey Vulture	1	Adult	0 - 40 m	South/Southeast	no	yes	-
		Spring	COGR	Common Grackle	10		40 - 180 m	West/Northwest	no	yes	1 min
		Spring	RWBL	Red-winged Blackbird	10		40 - 180 m	West/Northwest	no	yes	1 min
		Spring	GBHE	Great Blue Heron	1		40 - 180 m	North	no	yes	3 min
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	East/Southeast	yes	yes	-
		Spring	EUST	European Starling	6		0 - 40 m	South	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North/Northeast	yes	yes	2 min
		Spring	EUST	European Starling	5		0 - 40 m	-	-	-	-
		Spring	HOLA	Horned Lark	3		0 - 40 m	South	no	yes	-
		Spring	RWBL	Red-winged Blackbird	10		40 - 180 m	East/Northeast	yes	yes	2 min
		Spring	COGR	Common Grackle	10		40 - 180 m	East/Northeast	yes	yes	2 min
		Spring	EUST	European Starling	6		40 - 180 m	East	no	yes	1 min



Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
17-Mar-11	1	Spring	TUVU	Turkey Vulture	1		0 - 40 m	East/Northeast	yes	yes	2 min
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	-
		Spring	KILL	Killdeer	8		0 - 40 m	East	yes	yes	-
		Spring	TUVU	Turkey Vulture	3		0 - 40 m	North/Northeast	yes	yes	-
		Spring	TUVU	Turkey Vulture	2		>180 m	Southwest	yes	yes	4 min
		Spring	HOLA	Horned Lark	1		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	South/Southeast	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	North/Northeast	yes	yes	3 min
		Spring	AMCR	American Crow	2		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	South	no	yes	-
		Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northeast	no	yes	2 min
		Spring	NOHA	Northern Harrier	1		40 - 180 m	North/Northwest	yes	yes	1 min
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	East/Northeast	yes	yes	-
		Spring	TUVU	Turkey Vulture	4		40 - 180 m	South	yes	yes	4 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	North	yes	yes	2 min
		Spring	COGR	Common Grackle	15		40 - 180 m	Southwest	no	yes	1 min
		Spring	EUST	European Starling	12		0 - 40 m	West	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	North/Northeast	no	yes	-
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	West	yes	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	West	yes	yes	2 min
		Spring	KILL	Killdeer	1		0 - 40 m	North/Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	West/Southwest	yes	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	West	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	North/Northwest	yes	yes	2 min
		Spring	KILL	Killdeer	1		0 - 40 m	South/Southwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	East/Northeast	yes	yes	1 min
		Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	-
		Spring	EUST	European Starling	60		0 - 40 m	West/Northwest	yes	yes	-
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	East	yes	yes	-
		Spring	EUST	European Starling	15		0 - 40 m	West/Southwest	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	6		0 - 40 m	South/Southwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	10		0 - 40 m	Northeast	no	yes	-
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	Northeast	yes	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North	yes	yes	2 min
		Spring	AMCR	American Crow	1		40 - 180 m	South	no	yes	1 min
		Spring	AMCR	American Crow	1		0 - 40 m	West/Northwest	no	yes	-
		Spring	BHCO	Brown-headed Cowbird	25		40 - 180 m	Northeast	no	yes	2 min
		Spring	COGR	Common Grackle	25		40 - 180 m	Northeast	no	yes	2 min
		Spring	EUST	European Starling	25		40 - 180 m	Northeast	no	yes	2 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Northeast	yes	yes	1 min
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	Northeast	yes	yes	2 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	yes	3 min

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
17-Mar-11	1	Spring	KILL	Killdeer	2		0 - 40 m	East	yes	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	3 min
		Spring	RWBL	Red-winged Blackbird	15		40 - 180 m	East/Northeast	no	yes	1 min
		Spring	COGR	Common Grackle	15		40 - 180 m	East/Northeast	no	yes	1 min
		Spring	RWBL	Red-winged Blackbird	7		40 - 180 m	East	no	yes	2 min
		Spring	COGR	Common Grackle	12		0 - 40 m	East	no	yes	-
		Spring	EUST	European Starling	50		0 - 40 m	Northeast	yes	yes	3 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Northeast	yes	yes	4 min
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	Northeast	yes	yes	3 min
		Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North/Northeast	yes	yes	2 min
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	North/Northwest	yes	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	West/Southwest	yes	yes	2 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	West/Southwest	yes	yes	3 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	East/Southeast	yes	yes	4 min
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	South	yes	yes	-
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	East	yes	yes	-
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	North/Northeast	yes	yes	-
18-Mar-11	1	Spring	COGR	Common Grackle	15		0 - 40 m	North/Northwest	no	yes	-
		Spring	EUST	European Starling	15		0 - 40 m	North/Northwest	no	yes	-
		Spring	AMRO	American Robin	2		40 - 180 m	East/Northeast	no	yes	-
		Spring	COGR	Common Grackle	12		40 - 180 m	East	no	yes	1 min
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	5		0 - 40 m	East/Northeast	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	-
		Spring	CAGO	Canada Goose	9		40 - 180 m	West	no	yes	2 min
		Spring	CAGO	Canada Goose	4		40 - 180 m	North/Northeast	no	yes	2 min
		Spring	KILL	Killdeer	2		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	-
		Spring	EUST	European Starling	4		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	7		0 - 40 m	Northeast	no	yes	-
		Spring	AMRO	American Robin	3		0 - 40 m	West	no	yes	-
		Spring	KILL	Killdeer	1		40 - 180 m	West	no	yes	2 min
		Spring	COGR	Common Grackle	3		40 - 180 m	Southwest	no	yes	1 min
		Spring	COGR	Common Grackle	5		0 - 40 m	South	no	yes	-
		Spring	SOSP	Song Sparrow	1		0 - 40 m	Southeast	no	yes	-
		Spring	AMRO	American Robin	4		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	3		40 - 180 m	East/Northeast	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	North/Northeast	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	North	no	yes	-
		Spring	MODO	Mourning Dove	2		0 - 40 m	North/Northwest	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	2		40 - 180 m	West/Northwest	no	yes	1 min
		Spring	HOLA	Horned Lark	4		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	4		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	East	no	yes	-
		Spring	EUST	European Starling	1		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	4		0 - 40 m	North/Northwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	7		0 - 40 m	Northwest	no	yes	-

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
18-Mar-11	1	Spring	COGR	Common Grackle	3		40 - 180 m	Northwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	2		40 - 180 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	West	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Southeast	no	yes	-
		Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	North/Northwest	no	yes	1 min
		Spring	COGR	Common Grackle	1		40 - 180 m	West/Northwest	no	yes	1 min
		Spring	COGR	Common Grackle	1		40 - 180 m	East/Southeast	no	yes	2 min
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	-
		Spring	EUST	European Starling	2		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	Northeast	yes	yes	3 min
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	North	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	South/Southeast	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	8		40 - 180 m	Northwest	no	yes	1 min
		Spring	RWBL	Red-winged Blackbird	10		40 - 180 m	South	no	yes	2 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	East	yes	yes	2 min
		Spring	HOLA	Horned Lark	7		0 - 40 m	North	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	North	no	yes	-
		Spring	COGR	Common Grackle	6		40 - 180 m	South	no	yes	3 min
		Spring	KILL	Killdeer	1		0 - 40 m	Southeast	no	yes	-
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	Northeast	yes	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	50		0 - 40 m	South	yes	yes	-
		Spring	EUST	European Starling	50		0 - 40 m	South	yes	yes	-
		Spring	BHCO	Brown-headed Cowbird	20		0 - 40 m	South	yes	yes	-
		Spring	EUST	European Starling	12		0 - 40 m	Northwest	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	-
		Spring	EUST	European Starling	8		40 - 180 m	West	no	yes	1 min
		Spring	RWBL	Red-winged Blackbird	10		0 - 40 m	Northwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	8		0 - 40 m	North	no	yes	-
		Spring	NOFL	Northern Flicker	2		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	West	yes	yes	2 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southeast	yes	no	3 min
		Spring	KILL	Killdeer	1		0 - 40 m	Northeast	no	yes	-
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	East/Northeast	yes	yes	2 min
		Spring	WODU	Wood Duck	2		40 - 180 m	West/Southwest	no	yes	1 min
		Spring	TUVU	Turkey Vulture	4		40 - 180 m	East	yes	no	2 min
		Spring	COGR	Common Grackle	20		40 - 180 m	North/Northeast	no	yes	2 min
		Spring	EUST	European Starling	20		40 - 180 m	North/Northeast	no	yes	2 min
		Spring	AMGO	American Goldfinch	1		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	12		40 - 180 m	West	no	yes	2 min
		Spring	EUST	European Starling	2		0 - 40 m	Northwest	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southwest	yes	yes	2 min
		Spring	AMCR	American Crow	1		40 - 180 m	East/Southeast	no	yes	1 min
		Spring	COGR	Common Grackle	50		40 - 180 m	East/Northeast	yes	yes	2 min
		Spring	EUST	European Starling	50		40 - 180 m	East/Northeast	yes	yes	2 min

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
18-Mar-11	1	Spring	EUST	European Starling	4		0 - 40 m	West	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	South/Southwest	no	yes	-
		Spring	EUST	European Starling	10		0 - 40 m	North/Northwest	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	-
		Spring	EUST	European Starling	4		0 - 40 m	West/Southwest	no	yes	-
		Spring	EUST	European Starling	40		40 - 180 m	West/Northwest	no	yes	1 min
		Spring	COGR	Common Grackle	15		40 - 180 m	Southeast	no	yes	2 min
		Spring	RWBL	Red-winged Blackbird	10		40 - 180 m	Southeast	no	yes	2 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southeast	yes	yes	1 min
		Spring	AMCR	American Crow	2		0 - 40 m	North	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	West	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North	yes	no	2 min
		Spring	KILL	Killdeer	2		40 - 180 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	2 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southwest	yes	yes	1 min
		Spring	COGR	Common Grackle	14		0 - 40 m	Northeast	no	yes	-
		Spring	RWBL	Red-winged Blackbird	12		40 - 180 m	East	no	yes	1 min
		Spring	AMRO	American Robin	10		0 - 40 m	Northeast	no	yes	-
		Spring	EUST	European Starling	22		0 - 40 m	East	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	East	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	-
		Spring	COGR	Common Grackle	15		40 - 180 m	Northeast	no	yes	1 min
		Spring	RWBL	Red-winged Blackbird	6		40 - 180 m	Northeast	no	yes	1 min
		Spring	KILL	Killdeer	1		0 - 40 m	North/Northeast	no	yes	-
		Spring	AMCR	American Crow	2		40 - 180 m	East/Southeast	no	yes	1 min
		Spring	COGR	Common Grackle	1		0 - 40 m	Southeast	no	yes	-
		Spring	AMCR	American Crow	1		40 - 180 m	Northwest	no	yes	2 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Northeast	yes	yes	2 min
		Spring	MODO	Mourning Dove	1		0 - 40 m	East	no	yes	-
22-Mar-11	1	Spring	KILL	Killdeer	2		40 - 180 m	Northeast	yes	yes	48 min
		Spring	AMRO	American Robin	4		0 - 40 m	North	no	yes	-
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	4		40 - 180 m	Northwest	no	yes	1 min
		Spring	AMRO	American Robin	2		0 - 40 m	East	no	yes	-
		Spring	AMRO	American Robin	5		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	yes	3 min
		Spring	COGR	Common Grackle	1		40 - 180 m	Northwest	no	yes	2 min
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	South	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Northwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	Northwest	no	yes	-
		Spring	EUST	European Starling	4		40 - 180 m	West	no	yes	2 min
		Spring	COGR	Common Grackle	6		40 - 180 m	East/Southeast	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	Northeast	yes	yes	2 min
		Spring	CAGO	Canada Goose	2		40 - 180 m	East/Northeast	no	yes	2 min
		Spring	COGR	Common Grackle	3		40 - 180 m	Northwest	no	yes	2 min

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
22-Mar-11	1	Spring	AMRO	American Robin	1		40 - 180 m	Northeast	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	yes	3 min
		Spring	AMCR	American Crow	2		0 - 40 m	West	no	yes	-
		Spring	EUST	European Starling	1		0 - 40 m	North	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northwest	yes	yes	1 min
		Spring	COGR	Common Grackle	2		0 - 40 m	North	no	yes	-
		Spring	MALL	Mallard	8		40 - 180 m	Northwest	no	yes	2 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	East	yes	yes	3 min
22-Mar-11	2	Spring	EABL	Eastern Bluebird	2		0 - 40 m	East	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	South/Southeast	yes	yes	3 min
		Spring	COGR	Common Grackle	6		0 - 40 m	Northwest	no	yes	-
		Spring	KILL	Killdeer	1		40 - 180 m	East	no	yes	1 min
		Spring	COGR	Common Grackle	4		40 - 180 m	Southeast	no	yes	2 min
		Spring	PIWO	Pileated Woodpecker	1		0 - 40 m	North	no	yes	1 min
		Spring	RTHA	Red-tailed Hawk	2		40 - 180 m	East	yes	yes	3 min
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	East	yes	yes	3 min
		Spring	AMCR	American Crow	2		0 - 40 m	Southeast	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	Southwest	no	yes	1 min
		Spring	AMCR	American Crow	3		0 - 40 m	West/Southwest	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	West	no	yes	-
		Spring	AMCR	American Crow	1		40 - 180 m	West	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	East	yes	yes	2 min
		Spring	KILL	Killdeer	1		40 - 180 m	East	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southwest	yes	yes	1 min
		Spring	KILL	Killdeer	1		0 - 40 m	East	yes	yes	1 min
		Spring	AMCR	American Crow	3		0 - 40 m	North/Northwest	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Northeast	no	yes	-
		Spring	COHA	Cooper's Hawk	1		40 - 180 m	South	no	yes	1 min
		Spring	NOHA	Northern Harrier	1		0 - 40 m	Northwest	no	yes	-
		Spring	AMCR	American Crow	3		0 - 40 m	Northeast	no	yes	-
		Spring	AMCR	American Crow	5		40 - 180 m	South	no	yes	2 min
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	Northeast	no	yes	-
		Spring	KILL	Killdeer	2		40 - 180 m	Southeast	no	yes	2 min
22-Mar-11	3	Spring	AMCR	American Crow	3		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	4		40 - 180 m	Northwest	no	yes	2 min
		Spring	RWBL	Red-winged Blackbird	6		0 - 40 m	North	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	Southwest	no	yes	1 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Southwest	yes	yes	2 min
		Spring	COHA	Cooper's Hawk	1		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	2		40 - 180 m	North	no	yes	1 min
		Spring	HOLA	Horned Lark	1		0 - 40 m	South	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	East	yes	yes	2 min
		Spring	AMRO	American Robin	1		40 - 180 m	Northwest	no	yes	1 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southwest	yes	yes	3 min
		Spring	AMCR	American Crow	2		40 - 180 m	Southwest	yes	yes	2 min
		Spring	BAEA	Bald Eagle	1	3 yrs	40 - 180 m	West	no	yes	2 min
		Spring	HOLA	Horned Lark	1		0 - 40 m	North	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	2 min
		Spring	COGR	Common Grackle	4		0 - 40 m	East	no	yes	-

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
22-Mar-11	3	Spring	TUVU	Turkey Vulture	2		40 - 180 m	West	yes	yes	1 min
		Spring	COGR	Common Grackle	1		0 - 40 m	Southeast	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	West	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	4		0 - 40 m	Northeast	no	yes	-
		Spring	AMRO	American Robin	14		0 - 40 m	South/Southwest	no	yes	-
24-Mar-11	1	Spring	KILL	Killdeer	3		40 - 180 m	Northeast	no	yes	2 min
		Spring	COGR	Common Grackle	7		40 - 180 m	North/Northwest	no	yes	1 min
		Spring	AMRO	American Robin	4		0 - 40 m	Northwest	no	yes	-
		Spring	EUST	European Starling	15		0 - 40 m	West/Southwest	no	yes	-
		Spring	BHCO	Brown-headed Cowbird	15		0 - 40 m	West/Southwest	no	yes	-
		Spring	COGR	Common Grackle	10		0 - 40 m	West/Southwest	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southeast	yes	yes	2 min
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	South	yes	yes	3 min
		Spring	AMCR	American Crow	2		0 - 40 m	East	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	-
		Spring	EUST	European Starling	4		40 - 180 m	Northeast	no	yes	1 min
		Spring	COGR	Common Grackle	3		0 - 40 m	Northeast	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	-
		Spring	KILL	Killdeer	3		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	5		40 - 180 m	South/Southwest	no	yes	1 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Northeast	yes	yes	2 min
		Spring	COGR	Common Grackle	4		0 - 40 m	Northwest	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	East/Southeast	yes	yes	2 min
		Spring	HOLA	Horned Lark	2		0 - 40 m	Northwest	no	yes	-
		Spring	BHCO	Brown-headed Cowbird	7		0 - 40 m	Northwest	no	yes	-
		Spring	AMCR	American Crow	2		40 - 180 m	North	no	yes	1 min
		Spring	COGR	Common Grackle	1		0 - 40 m	Southeast	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	no	2 min
		Spring	CAGO	Canada Goose	2		40 - 180 m	North/Northeast	no	yes	2 min
		Spring	AMCR	American Crow	3		0 - 40 m	Southeast	no	yes	-
24-Mar-11	2	Spring	AMCR	American Crow	4		40 - 180 m	Northeast	no	yes	1 min
		Spring	EAME	Eastern Meadowlark	1		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	5		40 - 180 m	South	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northwest	yes	yes	2 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	West/Northwest	yes	yes	2 min
		Spring	COGR	Common Grackle	14		40 - 180 m	Northwest	no	yes	1 min
		Spring	EABL	Eastern Bluebird	3		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	5		40 - 180 m	Northwest	no	yes	1 min
		Spring	KILL	Killdeer	2		40 - 180 m	Northeast	yes	yes	10 min
		Spring	COGR	Common Grackle	7		40 - 180 m	North	no	yes	1 min
		Spring	NOHA	Northern Harrier	1		0 - 40 m	Southeast	yes	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northwest	yes	yes	2 min
		Spring	COHA	Cooper's Hawk	1		0 - 40 m	East	no	yes	-
		Spring	WODU	Wood Duck	2		40 - 180 m	South	no	yes	1 min
		Spring	EUST	European Starling	30		0 - 40 m	East	no	yes	-
		Spring	CAGO	Canada Goose	4		40 - 180 m	Southeast	no	yes	2 min
		Spring	EUST	European Starling	20		40 - 180 m	South	no	yes	1 min

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
24-Mar-11	2	Spring	N/A	Duck sp.	30		0 - 40 m	Northwest	yes	yes	-
		Spring	HOLA	Horned Lark	5		0 - 40 m	East	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southeast	yes	yes	2 min
		Spring	AMCR	American Crow	3		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	6		0 - 40 m	Southwest	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Northwest	yes	yes	2 min
24-Mar-11	3	Spring	BHCO	Brown-headed Cowbird	10		0 - 40 m	Northeast	no	yes	-
		Spring	EUST	European Starling	10		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	6		40 - 180 m	North	no	yes	1 min
		Spring	AMRO	American Robin	5		40 - 180 m	East/Southeast	no	yes	1 min
		Spring	KILL	Killdeer	3		0 - 40 m	East	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	West/Northwest	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	South	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	West	no	yes	-
		Spring	HOLA	Horned Lark	3		0 - 40 m	Southeast	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	Northwest	no	yes	1 min
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	North	no	yes	-
		Spring	COHA	Cooper's Hawk	1		0 - 40 m	West	no	yes	-
		Spring	BHCO	Brown-headed Cowbird	5		0 - 40 m	North/Northeast	no	yes	-
		Spring	AMRO	American Robin	1		40 - 180 m	Northwest	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	yes	3 min
		Spring	COGR	Common Grackle	7		40 - 180 m	East	no	yes	1 min
		Spring	CAGO	Canada Goose	5		40 - 180 m	South	no	yes	1 min
		Spring	HOLA	Horned Lark	3		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	4		40 - 180 m	Northwest	no	yes	1 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	North	yes	yes	2 min
25-Mar-11	1	Spring	KILL	Killdeer	2		40 - 180 m	Northwest	no	yes	1 min
		Spring	SOSP	Song Sparrow	1		0 - 40 m	South	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	South	no	yes	-
		Spring	AMCR	American Crow	1		40 - 180 m	Northeast	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northeast	yes	yes	2 min
		Spring	COGR	Common Grackle	6		40 - 180 m	Northwest	no	yes	1 min
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	-
		Spring	KILL	Killdeer	3		0 - 40 m	Southwest	yes	yes	-
		Spring	EUST	European Starling	25		0 - 40 m	Northwest	no	yes	-
		Spring	AMCR	American Crow	1		40 - 180 m	West	no	yes	1 min
		Spring	COGR	Common Grackle	3		0 - 40 m	East	no	yes	-
		Spring	AMRO	American Robin	8		40 - 180 m	West/Southwest	no	yes	1 min
		Spring	COGR	Common Grackle	1		40 - 180 m	Southwest	no	yes	1 min
		Spring	AMCR	American Crow	2		40 - 180 m	East	no	yes	1 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	West/Southwest	yes	yes	2 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	1 min
		Spring	TUVU	Turkey Vulture	2		>180 m	South	yes	yes	-
		Spring	AMRO	American Robin	11		0 - 40 m	West	no	yes	-
		Spring	HOLA	Horned Lark	4		0 - 40 m	South	no	yes	-
		Spring	AMCR	American Crow	3		40 - 180 m	North/Northwest	no	yes	1 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	South/Southeast	yes	yes	2 min
		Spring	COGR	Common Grackle	6		40 - 180 m	Northwest	no	yes	1 min

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
25-Mar-11	1	Spring	KILL	Killdeer	2		0 - 40 m	East	no	yes	-
		Spring	EUST	European Starling	20		0 - 40 m	West/Southwest	no	yes	-
		Spring	BHCO	Brown-headed Cowbird	20		0 - 40 m	West/Southwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northeast	yes	yes	2 min
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Southeast	no	yes	-
		Spring	AMCR	American Crow	3		0 - 40 m	West	no	yes	-
		Spring	NOHA	Northern Harrier	1		0 - 40 m	West	no	yes	hunting
		Spring	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	-
		Spring	CAGO	Canada Goose	4		40 - 180 m	Northeast	no	yes	1 min
		Spring	GBHE	Great Blue Heron	1		40 - 180 m	North/Northeast	no	yes	1 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southeast	yes	yes	1 min
		Spring	COGR	Common Grackle	1		0 - 40 m	West	no	yes	-
		Spring	EUST	European Starling	4		0 - 40 m	East	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	North/Northwest	no	yes	-
		Spring	EUST	European Starling	5		0 - 40 m	North	no	yes	-
25-Mar-11	2	Spring	COGR	Common Grackle	2		0 - 40 m	Northwest	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	West/Northwest	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	South	no	yes	-
		Spring	AMRO	American Robin	6		40 - 180 m	Northeast	no	yes	2 min
		Spring	EUST	European Starling	50		40 - 180 m	South	no	yes	1 min
		Spring	HOLA	Horned Lark	4		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	12		40 - 180 m	East/Southeast	no	yes	1 min
		Spring	COGR	Common Grackle	2		40 - 180 m	East/Southeast	no	yes	1 min
		Spring	COGR	Common Grackle	4		0 - 40 m	West	no	yes	-
		Spring	RWBL	Red-winged Blackbird	5		40 - 180 m	East/Northeast	no	yes	1 min
		Spring	BLJA	Blue Jay	3		40 - 180 m	South	no	yes	1 min
		Spring	COGR	Common Grackle	4		40 - 180 m	Northwest	no	yes	1 min
		Spring	COGR	Common Grackle	5		40 - 180 m	East	no	yes	1 min
		Spring	AMRO	American Robin	3		0 - 40 m	Southeast	no	yes	-
		Spring	COGR	Common Grackle	7		40 - 180 m	West	no	yes	1 min
		Spring	COGR	Common Grackle	20		40 - 180 m	South	no	yes	2 min
		Spring	COGR	Common Grackle	14		40 - 180 m	South	no	yes	1 min
		Spring	NOPI	Northern Pintail	12		40 - 180 m	Southeast	no	yes	1 min
		Spring	N/A	Duck sp.	30		40 - 180 m	Southeast	yes	yes	2 min
		Spring	COGR	Common Grackle	10		40 - 180 m	Southwest	no	yes	2 min
		Spring	RWBL	Red-winged Blackbird	10		40 - 180 m	Southwest	no	yes	2 min
		Spring	COGR	Common Grackle	12		40 - 180 m	South	no	yes	1 min
		Spring	EUST	European Starling	20		40 - 180 m	Southeast	no	yes	-
		Spring	EUST	European Starling	50		40 - 180 m	South	no	yes	2 min
		Spring	COGR	Common Grackle	2		0 - 40 m	East	no	yes	-
		Spring	AMCR	American Crow	3		40 - 180 m	East/Southeast	no	yes	1 min
		Spring	HOLA	Horned Lark	4		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	Southwest	no	yes	-
25-Mar-11	3	Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Northeast	yes	yes	2 min
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	North	yes	yes	3 min
		Spring	AMRO	American Robin	4		40 - 180 m	Southwest	no	yes	1 min
		Spring	COGR	Common Grackle	6		0 - 40 m	North/Northeast	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	West	no	yes	-



Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
25-Mar-11	3	Spring	KILL	Killdeer	2		40 - 180 m	South	no	yes	1 min
		Spring	EABL	Eastern Bluebird	2		0 - 40 m	East	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southwest	yes	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	2 min
		Spring	COGR	Common Grackle	2		0 - 40 m	Northeast	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	4		40 - 180 m	Southeast	no	yes	1 min
		Spring	COGR	Common Grackle	1		0 - 40 m	Northwest	no	yes	-
		Spring	EUST	European Starling	3		0 - 40 m	North/Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northeast	yes	yes	2 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	East/Northeast	yes	yes	1 min
		Spring	COGR	Common Grackle	5		40 - 180 m	Southwest	no	yes	1 min
		Spring	AMCR	American Crow	4		0 - 40 m	South	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	-
		Spring	COHA	Cooper's Hawk	1		0 - 40 m	East	no	yes	-
		Spring	HOLA	Horned Lark	2		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	3		40 - 180 m	North	no	yes	1 min
		Spring	AMRO	American Robin	6		40 - 180 m	Southeast	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	East/Southeast	yes	yes	2 min
		Spring	KILL	Killdeer	2		0 - 40 m	West	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	6		0 - 40 m	Southwest	no	yes	-
		Spring	AMCR	American Crow	1		40 - 180 m	Northeast	no	yes	1 min
27-Mar-11	1	Spring	COGR	Common Grackle	1		40 - 180 m	Northeast	no	yes	1 min
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	-
		Spring	AMCR	American Crow	5		0 - 40 m	East	no	yes	-
		Spring	TUVU	Turkey Vulture	6		40 - 180 m	Southeast	yes	yes	2 min
		Spring	AMCR	American Crow	2		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	East	no	yes	1 min
		Spring	AMRO	American Robin	1		0 - 40 m	North/Northeast	no	yes	-
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	North	no	yes	-
		Spring	BHCO	Brown-headed Cowbird	15		0 - 40 m	West/Northwest	no	yes	-
		Spring	EUST	European Starling	15		0 - 40 m	West/Northwest	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Northwest	no	yes	-
		Spring	HOLA	Horned Lark	3		0 - 40 m	North	no	yes	-
		Spring	CAGO	Canada Goose	2		40 - 180 m	Southwest	no	yes	1 min
		Spring	COGR	Common Grackle	1		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	4		40 - 180 m	East/Northeast	no	yes	2 min
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	-
		Spring	AMCR	American Crow	3		0 - 40 m	North/Northwest	no	yes	-
		Spring	COGR	Common Grackle	2		40 - 180 m	East	no	yes	1 min
		Spring	COGR	Common Grackle	1		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	South	no	yes	1 min
		Spring	AMRO	American Robin	1		0 - 40 m	East/Southeast	no	yes	-
		Spring	COGR	Common Grackle	8		0 - 40 m	South/Southwest	no	yes	-
		Spring	EUST	European Starling	2		0 - 40 m	South/Southeast	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	-
		Spring	HOLA	Horned Lark	2		0 - 40 m	West/Northwest	no	yes	-

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
27-Mar-11	1	Spring	EUST	European Starling	3		40 - 180 m	East/Northeast	no	yes	1 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	South	yes	yes	2 min
		Spring	COGR	Common Grackle	1		0 - 40 m	East	no	yes	-
		Spring	HOLA	Horned Lark	1		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	3		40 - 180 m	North/Northwest	no	yes	1 min
		Spring	AMRO	American Robin	4		0 - 40 m	Northwest	no	yes	-
27-Mar-11	2	Spring	COGR	Common Grackle	2		40 - 180 m	South/Southwest	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northwest	yes	yes	2 min
		Spring	AMCR	American Crow	3		0 - 40 m	Northwest	no	yes	-
		Spring	AMRO	American Robin	1		40 - 180 m	Northeast	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Southeast	yes	yes	2 min
		Spring	EUST	European Starling	10		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Southeast	no	yes	-
		Spring	AMRO	American Robin	4		0 - 40 m	Northwest	no	yes	-
		Spring	HOLA	Horned Lark	4		0 - 40 m	East	no	yes	-
		Spring	CAGO	Canada Goose	6		40 - 180 m	East/Southeast	no	yes	1 min
		Spring	COGR	Common Grackle	6		40 - 180 m	Northeast	no	yes	1 min
		Spring	AMRO	American Robin	3		0 - 40 m	Northeast	no	yes	-
		Spring	EAME	Eastern Meadowlark	1		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	3		40 - 180 m	North	no	yes	1 min
		Spring	AMCR	American Crow	2		0 - 40 m	Southeast	no	yes	-
		Spring	AMCR	American Crow	1		40 - 180 m	Northwest	no	yes	2 min
		Spring	AMRO	American Robin	3		0 - 40 m	East	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northeast	yes	yes	1 min
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Southwest	no	yes	-
		Spring	BHCO	Brown-headed Cowbird	2		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	East	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	West/Southwest	yes	yes	2 min
		Spring	AMCR	American Crow	2		0 - 40 m	West	no	yes	-
		Spring	HOLA	Horned Lark	4		0 - 40 m	West	no	yes	-
		Spring	AMCR	American Crow	3		40 - 180 m	Southwest	no	yes	1 min
		Spring	EUST	European Starling	20		0 - 40 m	South	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southeast	yes	yes	3 min
		Spring	AMRO	American Robin	3		40 - 180 m	Southwest	no	yes	1 min
		Spring	NOHA	Northern Harrier	1		0 - 40 m	East/Southeast	no	yes	-
27-Mar-11	3	Spring	TUVU	Turkey Vulture	2		40 - 180 m	Northwest	yes	yes	2 min
		Spring	AMRO	American Robin	4		40 - 180 m	North/Northeast	no	yes	1 min
		Spring	COGR	Common Grackle	3		0 - 40 m	Southwest	no	yes	-
		Spring	KILL	Killdeer	2		0 - 40 m	West	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Northwest	yes	yes	2 min
		Spring	COGR	Common Grackle	2		0 - 40 m	Northeast	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	5		40 - 180 m	Southeast	no	yes	1 min
		Spring	AMRO	American Robin	6		40 - 180 m	Southwest	no	yes	1 min
		Spring	AMCR	American Crow	1		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North/Northwest	yes	yes	2 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Northeast	yes	yes	1 min
		Spring	COGR	Common Grackle	2		0 - 40 m	Northwest	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	-
		Spring									

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
27-Mar-11	3	Spring	AMCR	American Crow	2		40 - 180 m	East/Northeast	no	yes	1 min
		Spring	AMRO	American Robin	3		40 - 180 m	Southwest	no	yes	1 min
		Spring	COGR	Common Grackle	3		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North/Northeast	yes	yes	2 min
		Spring	KILL	Killdeer	2		0 - 40 m	West/Southwest	no	yes	-
		Spring	AMRO	American Robin	10		40 - 180 m	East	no	yes	1 min
		Spring	AMCR	American Crow	1		0 - 40 m	Northeast	no	yes	-
		Spring	EUST	European Starling	15		0 - 40 m	Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	West	yes	yes	2 min
		Spring	AMRO	American Robin	2		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	7		40 - 180 m	East/Southeast	no	yes	1 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southwest	yes	yes	2 min
		Spring	AMRO	American Robin	6		40 - 180 m	West/Southwest	no	yes	2 min
		Spring	AMCR	American Crow	4		40 - 180 m	Northeast	no	yes	1 min
29-Mar-11	1	Spring	TUVU	Turkey Vulture	2		40 - 180 m	Northeast	yes	yes	2 min
		Spring	COGR	Common Grackle	4		0 - 40 m	North	no	yes	-
		Spring	AMCR	American Crow	3		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	South	yes	yes	3 min
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	Northwest	no	yes	1 min
		Spring	HOLA	Horned Lark	4		0 - 40 m	South	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	East/Northeast	no	yes	-
		Spring	HOLA	Horned Lark	20		0 - 40 m	West/Southwest	no	yes	-
		Spring	HOLA	Horned Lark	1		0 - 40 m	West/Northwest	no	yes	-
		Spring	HOLA	Horned Lark	2		0 - 40 m	West	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northwest	yes	yes	2 min
		Spring	COGR	Common Grackle	4		40 - 180 m	East	no	yes	1 min
		Spring	AMCR	American Crow	1		0 - 40 m	South	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North/Northwest	yes	yes	3 min
		Spring	TUVU	Turkey Vulture	4		40 - 180 m	North/Northeast	yes	yes	5 min
		Spring	KILL	Killdeer	1		0 - 40 m	Southeast	no	yes	-
		Spring	AMCR	American Crow	3		0 - 40 m	West	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Northwest	yes	yes	2 min
		Spring	AMCR	American Crow	1		0 - 40 m	West	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	West	no	yes	-
		Spring	AMCR	American Crow	2		40 - 180 m	West/Southwest	no	yes	1 min
		Spring	COGR	Common Grackle	3		0 - 40 m	Northeast	no	yes	-
29-Mar-11	2	Spring	EUST	European Starling	15		0 - 40 m	North/Northwest	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	West/Northwest	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	Southwest	no	yes	1 min
		Spring	HOLA	Horned Lark	3		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	6		40 - 180 m	South/Southwest	no	yes	1 min
		Spring	AMRO	American Robin	2		0 - 40 m	Northeast	no	yes	-
		Spring	CAGO	Canada Goose	4		40 - 180 m	North/Northeast	no	yes	1 min
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	-
		Spring									

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
29-Mar-11	2	Spring	KILL	Killdeer	2		0 - 40 m	Northwest	no	yes	-
		Spring	MODO	Mourning Dove	3		0 - 40 m	East	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	Northeast	no	yes	-
		Spring	HOLA	Horned Lark	4		0 - 40 m	West/Southwest	no	yes	-
		Spring	EUST	European Starling	8		0 - 40 m	Northwest	no	yes	-
		Spring	AMCR	American Crow	3		40 - 180 m	Northeast	no	yes	1 min
		Spring	COGR	Common Grackle	7		0 - 40 m	South	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	Northeast	no	yes	-
		Spring	KILL	Killdeer	3		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	South	no	yes	-
		Spring	HOLA	Horned Lark	2		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	4		40 - 180 m	Southwest	yes	yes	3 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Southeast	yes	yes	2 min
29-Mar-11	3	Spring	AMRO	American Robin	3		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	West	no	yes	1 min
		Spring	KILL	Killdeer	1		0 - 40 m	Southwest	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Southeast	yes	yes	2 min
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	4		40 - 180 m	Northwest	no	yes	1 min
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Southwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	East/Southeast	no	yes	2 min
		Spring	AMCR	American Crow	4		40 - 180 m	North/Northeast	no	yes	1 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Northwest	yes	yes	1 min
		Spring	COGR	Common Grackle	3		0 - 40 m	Southwest	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	3		40 - 180 m	Southeast	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North	yes	yes	2 min
		Spring	AMCR	American Crow	1		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	West	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southeast	yes	yes	1 min
		Spring	HOLA	Horned Lark	10		0 - 40 m	East/Northeast	no	yes	-
		Spring	AMRO	American Robin	6		40 - 180 m	Northwest	no	yes	1 min
		Spring	COGR	Common Grackle	6		0 - 40 m	South	no	yes	-
31-Mar-11	1	Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northeast	yes	yes	3 min
		Spring	HOLA	Horned Lark	1		0 - 40 m	East/Southeast	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	Southwest	no	yes	1 min
		Spring	HOLA	Horned Lark	1		0 - 40 m	South/Southwest	no	yes	-
		Spring	AMCR	American Crow	1		40 - 180 m	Southeast	no	yes	1 min
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	Northeast	no	yes	-
		Spring	EUST	European Starling	5		0 - 40 m	West/Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North/Northeast	yes	yes	2 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South/Southeast	yes	yes	2 min
		Spring	AMRO	American Robin	3		0 - 40 m	Northeast	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	yes	2 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	East/Northeast	yes	yes	4 min
		Spring	COGR	Common Grackle	1		0 - 40 m	Northwest	no	yes	-

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
31-Mar-11	1	Spring	TUVU	Turkey Vulture	3		40 - 180 m	South	yes	yes	3 min
		Spring	KILL	Killdeer	1		0 - 40 m	South/Southwest	no	yes	-
		Spring	AMRO	American Robin	25		40 - 180 m	North	no	yes	2 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southeast	yes	yes	1 min
		Spring	TUVU	Turkey Vulture	1		>180 m	Southeast	yes	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	-
		Spring	EUST	European Starling	30		40 - 180 m	West/Northwest	no	yes	2 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Northwest	yes	yes	3 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northwest	yes	yes	2 min
		Spring	AMCR	American Crow	2		0 - 40 m	South	no	yes	-
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	Northeast	yes	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	yes	2 min
		Spring	AMCR	American Crow	3		0 - 40 m	Southeast	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	North/Northeast	yes	yes	1 min
		Spring	HOLA	Horned Lark	2		0 - 40 m	Southeast	no	yes	-
31-Mar-11	2	Spring	TUVU	Turkey Vulture	1		0 - 40 m	East	yes	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northeast	yes	yes	2 min
		Spring	AMCR	American Crow	2		0 - 40 m	South	no	yes	-
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	South/Southeast	yes	yes	3 min
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	South	yes	yes	-
		Spring	HOLA	Horned Lark	7		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Northeast	no	yes	-
		Spring	EUST	European Starling	1		0 - 40 m	West	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	4		0 - 40 m	West/Northwest	yes	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northwest	yes	yes	3 min
		Spring	AMCR	American Crow	1		0 - 40 m	East	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	East	yes	yes	2 min
		Spring	AMRO	American Robin	3		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	4		0 - 40 m	North/Northeast	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	South/Southwest	yes	yes	2 min
		Spring	KILL	Killdeer	2		0 - 40 m	East/Northeast	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	2 min
		Spring	AMCR	American Crow	3		0 - 40 m	Southeast	no	yes	-
		Spring	GBHE	Great Blue Heron	1		0 - 40 m	North	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southeast	yes	yes	2 min
		Spring	AMCR	American Crow	3		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	4		0 - 40 m	East/Northeast	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	East	no	yes	-
31-Mar-11	3	Spring	COGR	Common Grackle	2		0 - 40 m	North/Northeast	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	4		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	5		40 - 180 m	South/Southwest	no	yes	1 min
		Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	-
		Spring	EAME	Eastern Meadowlark	1		0 - 40 m	South/Southwest	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	South	no	yes	-

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
31-Mar-11	3	Spring	HOLA	Horned Lark	2		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	-
		Spring	KILL	Killdeer	24		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	South	no	yes	-
		Spring	RWBL	Red-winged Blackbird	6		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	West	no	yes	-
		Spring	MODO	Mourning Dove	1		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	South	no	yes	-
		Spring	EUST	European Starling	1		0 - 40 m	North/Northwest	no	yes	-
		Spring	COGR	Common Grackle	10		0 - 40 m	North/Northwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	10		0 - 40 m	North/Northwest	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	Northwest	no	yes	-
		Spring	MODO	Mourning Dove	4		0 - 40 m	North	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	West	yes	yes	1 min
		Spring	COGR	Common Grackle	3		40 - 180 m	South	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	North/Northeast	no	yes	-
		Spring	KILL	Killdeer	3		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	North	no	yes	-
		Spring	MODO	Mourning Dove	2		0 - 40 m	South/Southwest	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	West/Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	2 min
		Spring	COGR	Common Grackle	6		0 - 40 m	South	no	yes	-
		Spring	AMRO	American Robin	4		40 - 180 m	Southeast	no	yes	1 min
		Spring	COGR	Common Grackle	3		0 - 40 m	East	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northeast	yes	yes	1 min
		Spring	COGR	Common Grackle	4		0 - 40 m	Southwest	no	yes	-
7-Apr-11	1	Spring	HOLA	Horned Lark	3		0 - 40 m	North	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	South	no		
		Spring	AMCR	American Crow	1		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	13		0 - 40 m	Northwest	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	
		Spring	EAME	Eastern Meadowlark	1		0 - 40 m	Southeast	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Spring	SOSP	Song Sparrow	1		0 - 40 m	Southwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	
		Spring	EUST	European Starling	4		0 - 40 m	Northeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	7		0 - 40 m	Southeast	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Northeast	yes	yes	3 Minutes
		Spring	AMCR	American Crow	1		0 - 40 m	Southwest	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	North	no	yes	
		Spring	AMCR	American Crow	2		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	3		0 - 40 m	Northeast	no	yes	
		Spring	EUST	European Starling	6		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	11		0 - 40 m	Southwest	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	South	no	yes	
		Spring	RWBL	Red-winged Blackbird	8		0 - 40 m	South	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
7-Apr-11	1	Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	Northwest	no	yes	
		Spring	EUST	European Starling	1		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
7-Apr-11	2	Spring	EUST	European Starling	2		0 - 40 m	North	no	yes	
		Spring	TUVU	Turkey Vulture	4		0 - 40 m	South	yes	yes	
		Spring	CAGO	Canada Goose	6		40 - 180 m	Northeast	no	yes	1 Minute
		Spring	RWBL	Red-winged Blackbird	12		0 - 40 m	South	no	yes	
		Spring	TUVU	Turkey Vulture	4		0 - 40 m	West	yes	yes	
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	272		40 - 180 m	North	no	yes	1 Minute
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	
		Spring	RWBL	Red-winged Blackbird	27		0 - 40 m	North	no	yes	
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	North	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North	yes	yes	2 Minutes
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	North	yes	yes	5 Minutes
		Spring	AMCR	American Crow	2		0 - 40 m	South	no	yes	
7-Apr-11	3	Spring	COGR	Common Grackle	2		0 - 40 m	South	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	COGR	Common Grackle	4		0 - 40 m	Southwest	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	South	no	yes	
		Spring	NOHA	Northern Harrier	1		0 - 40 m	South/North	yes	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	North	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	East/Northeast	no	yes	1 Minute
		Spring	KILL	Killdeer	1		40 - 180 m	North	yes	yes	1 Minute
		Spring	NOPI	Northern Pintail	6		40 - 180 m	Northeast	no	yes	1 Minute
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	West	no	yes	
		Spring	BOGU	Bonaparte's Gull	62		40 - 180 m	Northeast	no	yes	1 Minute
		Spring	COHA	Cooper's Hawk	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Northeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	North	no	yes	
		Spring	COHA	Cooper's Hawk	1		0 - 40 m	Southwest	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	Southwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	1		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	2		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	20		40 - 180 m	South	no	yes	1 Minute
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	
		Spring	SACR	Sandhill Crane	1		0 - 40 m	North	no	yes	
		Spring	RWBL	Red-winged Blackbird	34		0 - 40 m	South	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
7-Apr-11	3	Spring	BHCO	Brown-headed Cowbird	6		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	South	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	
		Spring	EUST	European Starling	1		0 - 40 m	North	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	North	no	yes	
		Spring	EAME	Eastern Meadowlark	1		0 - 40 m	Northwest	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	Southeast	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	1		40 - 180 m	Southeast	no	yes	1 Minute
		Spring	COHA	Cooper's Hawk	1		0 - 40 m	Southeast	yes	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	South	no	yes	
		Spring	MODO	Mourning Dove	1		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	18		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	4		0 - 40 m	North	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	Northwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	North	no	yes	
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	North	yes	yes	
		Spring	TUVU	Turkey Vulture	11		40 - 180 m	North	yes	yes	3 Minutes
		Spring	RWBL	Red-winged Blackbird	56		0 - 40 m	Southwest	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	Northeast	no	yes	
8-Apr-11	1	Spring	HOLA	Horned Lark	1		40 - 180 m	North	no	yes	1 Minute
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	East	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	South	no	yes	
		Spring	AMRO	American Robin	3		0 - 40 m	South	no	yes	
		Spring	AMCR	American Crow	1		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	1		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	34		0 - 40 m	Northwest	no	yes	
		Spring	BOGU	Bonaparte's Gull	3		0 - 40 m	East	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	East	no	yes	
		Spring	EAME	Eastern Meadowlark	1		0 - 40 m	Northeast	no	yes	
		Spring	AMCR	American Crow	1		0 - 40 m	South	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	AMCR	American Crow	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
8-Apr-11	2	Spring	AMCR	American Crow	1		0 - 40 m	East	no	yes	
		Spring	HOLA	Horned Lark	23		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	
		Spring	EUST	European Starling	1		0 - 40 m	Southwest	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	Southeast	no	yes	
		Spring	AMRO	American Robin	8		40 - 180 m	Southeast	no	yes	1 Minute
		Spring	KILL	Killdeer	2		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	South	no	yes	
		Spring	RWBL	Red-winged Blackbird	98		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	5		40 - 180 m	Southeast	no	yes	1 Minute



Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
8-Apr-11	2	Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	Southwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	Northwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	8		0 - 40 m	Northwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	1		0 - 40 m	Northwest	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	9		0 - 40 m	North	no	yes	
		Spring	BOGU	Bonaparte's Gull	16		40 - 180 m	North	no	yes	1 Minute
		Spring	EUST	European Starling	2		0 - 40 m	South	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	North	no	yes	
		Spring	MODO	Mourning Dove	2		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	3		0 - 40 m	Northeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	Northwest	no	yes	
8-Apr-11	3	Spring	COHA	Cooper's Hawk	1		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	18		0 - 40 m	South	yes	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	18		40 - 180 m	North	no	yes	1 Minute
		Spring	AMRO	American Robin	1		40 - 180 m	Southwest	no	yes	1 Minute
		Spring	RWBL	Red-winged Blackbird	7		40 - 180 m	Southeast	no	yes	1 Minute
		Spring	AMCR	American Crow	2		0 - 40 m	North	no	yes	
		Spring	TUVU	Turkey Vulture	14		40 - 180 m	North	yes	yes	3.5 Minutes
		Spring	AMRO	American Robin	2		0 - 40 m	South	no	yes	
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	North	no	yes	
11-Apr-11	1	Spring	KILL	Killdeer	3		0 - 40 m	Southeast	no	yes	
		Spring	COGR	Common Grackle	3		0 - 40 m	South	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	South	no	yes	
		Spring	EUST	European Starling	2		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	Southwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Northwest	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	7		0 - 40 m	West	no	yes	
		Spring	BHCO	Brown-headed Cowbird	2		0 - 40 m	Southwest	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	6		0 - 40 m	North	no	yes	
		Spring	SOSP	Song Sparrow	1		0 - 40 m	East	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	West	no	yes	
		Spring	HOLA	Horned Lark	1		40 - 180 m	North	no	yes	1 Minute
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	East	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	South	no	yes	
		Spring	AMRO	American Robin	3		0 - 40 m	South	no	yes	
		Spring	AMCR	American Crow	2		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	22		0 - 40 m	Northwest	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
11-Apr-11	2	Spring	TUVU	Turkey Vulture	2		40 - 180 m	North	yes	yes	2 Minutes
		Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	South	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	Northeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	12		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	3		0 - 40 m	West	no	yes	
		Spring	BHCO	Brown-headed Cowbird	4		0 - 40 m	West	no	yes	
		Spring	AMCR	American Crow	2		0 - 40 m	Southeast	no	yes	
		Spring	AMKE	American Kestrel	1		0 - 40 m	East	no	yes	
		Spring	NOHA	Northern Harrier	1		0 - 40 m	Northwest	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	South	no	yes	5 Minutes
		Spring	AMRO	American Robin	6		0 - 40 m	North	no	yes	
		Spring	TUVU	Turkey Vulture	8		>180 m	North	yes	yes	8 Minutes
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Northeast	no	yes	
		Spring	COGR	Common Grackle	6		0 - 40 m	Northwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	
		Spring	BHCO	Brown-headed Cowbird	3		0 - 40 m	Northwest	no	yes	
		Spring	EUST	European Starling	8		0 - 40 m	Southwest	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	North	yes	yes	3 Minutes
		Spring	AMRO	American Robin	3		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	AMCR	American Crow	2		0 - 40 m	Southeast	no	yes	
		Spring	BLJA	Blue Jay	2		0 - 40 m	North	no	yes	
		Spring	EABL	Eastern Bluebird	1		0 - 40 m	South	no	yes	
11-Apr-11	3	Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Northeast	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	4		0 - 40 m	East	no	yes	
		Spring	BHCO	Brown-headed Cowbird	7		0 - 40 m	West	no	yes	
		Spring	EUST	European Starling	1		0 - 40 m	South	no	yes	
		Spring	NOHA	Northern Harrier	1		0 - 40 m	Northeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	8		0 - 40 m	Southeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	Southwest	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	North	yes	yes	2 Minutes
		Spring	TUVU	Turkey Vulture	16		40 - 180 m	Northwest	yes	yes	5 Minutes
		Spring	COGR	Common Grackle	3		0 - 40 m	North	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	Northeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	Southwest	no	yes	
		Spring	SOSP	Song Sparrow	1		0 - 40 m	South	no	yes	
		Spring	AMRO	American Robin	3		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Northeast	no	yes	
		Spring	MALL	Mallard	2		40 - 180 m	North	no	yes	1 Minute
		Spring	TUVU	Turkey Vulture	5		40 - 180 m	North	no	yes	1 Minute
		Spring	RWBL	Red-winged Blackbird	7		0 - 40 m	Southwest	no	yes	
		Spring	COGR	Common Grackle	4		0 - 40 m	Northeast	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
11-Apr-11	3	Spring	EUST	European Starling	12		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	East	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	South	no	yes	
14-Apr-11	1	Spring	HOLA	Horned Lark	1		0 - 40 m	Northeast	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	
		Spring	AMCR	American Crow	3		0 - 40 m	Southeast	no	yes	
		Spring	BHCO	Brown-headed Cowbird	2		0 - 40 m	Southwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	North	no	yes	
		Spring	TUVU	Turkey Vulture	4		40 - 180 m	Northwest	yes	yes	4 Minutes
		Spring	AMKE	American Kestrel	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	East	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	West	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	Northwest	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	Northeast	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	North	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	Northeast	no	yes	
		Spring	CHSP	Chipping Sparrow	1		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	
		Spring	AMCR	American Crow	4		0 - 40 m	Southeast	no	yes	
		Spring	TUVU	Turkey Vulture	5		40 - 180 m	Southwest	yes	yes	3 Minutes
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	
		Spring	KILL	Killdeer	2		0 - 40 m	East	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	Northwest	no	yes	
		Spring	BHCO	Brown-headed Cowbird	4		0 - 40 m	South	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North	yes	yes	5 Minutes
		Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	Northeast	no	yes	
		Spring	BHCO	Brown-headed Cowbird	1		0 - 40 m	Southeast	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	Southwest	no	yes	
		Spring	AMCR	American Crow	1		0 - 40 m	West	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	Southwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	West	yes	yes	2 Minutes
14-Apr-11	2	Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Spring	EABL	Eastern Bluebird	1		0 - 40 m	East	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	West	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North	yes	yes	3 Minutes
		Spring	SAVS	Savannah Sparrow	1		0 - 40 m	South	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North	yes	yes	5 Minutes
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	East	no	yes	1 Minute
		Spring	COGR	Common Grackle	4		0 - 40 m	Northwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	7		0 - 40 m	Southeast	no	yes	
		Spring	AMKE	American Kestrel	1		0 - 40 m	Southwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	Northeast	no	yes	
		Spring	COGR	Common Grackle	6		0 - 40 m	Southwest	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
14-Apr-11	2	Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	Southeast	no	yes	
		Spring	AMCR	American Crow	2		0 - 40 m	East	no	yes	
		Spring	TUVU	Turkey Vulture	8		40 - 180 m	West	yes	yes	8 Minutes
		Spring	BHCO	Brown-headed Cowbird	2		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	South	no	yes	
		Spring	MALL	Mallard	2		0 - 40 m	Southwest	no	yes	
14-Apr-11	3	Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Spring	FISP	Field Sparrow	1		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	3		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	7		0 - 40 m	Northeast	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	Southeast	no	yes	
		Spring	KILL	Killdeer	2		0 - 40 m	Northwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	8		0 - 40 m	North	no	yes	
		Spring	BHCO	Brown-headed Cowbird	3		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	4		0 - 40 m	North	no	yes	
		Spring	AMCR	American Crow	1		0 - 40 m	South	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	West	no	yes	
		Spring	EAME	Eastern Meadowlark	1		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	Southeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Northeast	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	Southeast	no	yes	
		Spring	TUVU	Turkey Vulture	8		40 - 180 m	Northeast	yes	yes	4 Minutes
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	
		Spring	EUST	European Starling	7		0 - 40 m	Northeast	no	yes	
		Spring	BHCO	Brown-headed Cowbird	2		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	3		0 - 40 m	Southeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	Northwest	no	yes	
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	South	no	yes	
		Spring	AMCR	American Crow	2		40 - 180 m	East	no	yes	1 Minute
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	East	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	East	no	yes	
		Spring	AMCR	American Crow	1		40 - 180 m	Northwest	no	yes	1 Minute
		Spring	EUST	European Starling	2		0 - 40 m	South	no	yes	
		Spring	EABL	Eastern Bluebird	2		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	TRES	Tree Swallow	1		0 - 40 m	North	yes	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	West	yes	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	2 Minutes
15-Apr-11	1	Spring	AMCR	American Crow	2		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	3		0 - 40 m	West	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	North	yes	yes	
		Spring	HOLA	Horned Lark	3		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	
		Spring	MALL	Mallard	2		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	CHSP	Chipping Sparrow	1		0 - 40 m	West	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
15-Apr-11	1	Spring	BHCO	Brown-headed Cowbird	1		0 - 40 m	East	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	North	no	yes	
		Spring	BHCO	Brown-headed Cowbird	2		0 - 40 m	Northeast	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	Northeast	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	East	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	South	no	yes	
		Spring	CHSP	Chipping Sparrow	1		0 - 40 m	East	no	yes	
		Spring	CHSP	Chipping Sparrow	1		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southeast	yes	yes	6 Minutes
		Spring	AMCR	American Crow	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Spring	TUVU	Turkey Vulture	1		0 - 40 m	Northeast	yes	yes	
		Spring	TUVU	Turkey Vulture	7		0 - 40 m	Southeast	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	East	no	yes	
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Southeast	yes	yes	5 Minutes
		Spring	RSHA	Red-shouldered Hawk	1		0 - 40 m	North	no	yes	
		Spring	TUVU	Turkey Vulture	4		40 - 180 m	North	yes	yes	7 Minutes
		Spring	BRNS	Barn Swallow	1		0 - 40 m	Northwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
15-Apr-11	2	Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	Southeast	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	Northwest	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	Southwest	no	yes	
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	Southeast	yes	yes	12 Minutes
		Spring	EUST	European Starling	2		0 - 40 m	South	no	yes	
		Spring	EUST	European Starling	8		0 - 40 m	East	no	yes	
		Spring	BAEA	Bald Eagle	1	Adult	40 - 180 m	Northeast	yes	yes	2 Minutes
		Spring	RWBL	Red-winged Blackbird	18		0 - 40 m	North	no	yes	
		Spring	COHA	Cooper's Hawk	1		0 - 40 m	North	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	West	no	yes	
		Spring	EUST	European Starling	6		0 - 40 m	Northeast	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Southeast	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	Northeast	no	yes	
		Spring	COHA	Cooper's Hawk	1		0 - 40 m	North	no	yes	
		Spring	AMKE	American Kestrel	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	
		Spring	COGR	Common Grackle	3		0 - 40 m	Southeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	7		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	North	no	yes	
		Spring	BHCO	Brown-headed Cowbird	2		0 - 40 m	West	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	
		Spring	TUVU	Turkey Vulture	4		40 - 180 m	Southeast	yes	yes	6 Minutes
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
15-Apr-11	3	Spring	EUST	European Starling	4		0 - 40 m	West	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	East	no	yes	1 Minute
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	South	no	yes	
		Spring	WITU	Wild Turkey	1		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	Northeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	East	no	yes	
		Spring	TUVU	Turkey Vulture	4		40 - 180 m	Southeast	yes	yes	2 Minutes
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	3		0 - 40 m	Southeast	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	Southwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	
		Spring	AMCR	American Crow	3		0 - 40 m	Northeast	no	yes	
		Spring	COGR	Common Grackle	4		0 - 40 m	Northwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	7		0 - 40 m	North	no	yes	
20-Apr-11	1	Spring	RWBL	Red-winged Blackbird	25		40 - 180 m	Southeast	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	yes	3 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	NORtheast	yes	yes	2 min
		Spring	HOLA	Horned Lark	5		0 - 40 m	South	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southeast	yes	yes	2 min
		Spring	WODU	Wood Duck	1		40 - 180 m	West/Northwest	no	yes	1 min
		Spring	COGR	Common Grackle	1		40 - 180 m	South/Southeast	no	yes	1 min
		Spring	MODO	Mourning Dove	1		0 - 40 m	North/Northeast	no	yes	-
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	South/Southwest	no	yes	-
		Spring	KILL	Killdeer	2		0 - 40 m	East	no	yes	-
		Spring	HOLA	Horned Lark	2		0 - 40 m	East	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	2 min
		Spring	EUST	European Starling	2		0 - 40 m	North	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North	yes	yes	8 min
		Spring	AMCR	American Crow	1		0 - 40 m	West/Northwest	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	East	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	North	no	yes	-
		Spring	HOLA	Horned Lark	1		0 - 40 m	Southeast	no	yes	-
		Spring	KILL	Killdeer	1		40 - 180 m	South/Southwest	no	yes	1 min
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	North/Northeast	yes	yes	5 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northeast	yes	yes	3 min
		Spring	HOLA	Horned Lark	1		0 - 40 m	Southeast	no	yes	-
		Spring	EUST	European Starling	5		0 - 40 m	Northwest	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southeast	yes	yes	3 min
		Spring	EUST	European Starling	3		0 - 40 m	North/Northeast	no	yes	-
		Spring	AMRO	American Robin	2		40 - 180 m	North/Northwest	no	yes	-
		Spring	AMKE	American Kestrel	1		40 - 180 m	North	yes	yes	1 min
		Spring	COGR	Common Grackle	2		0 - 40 m	Northeast	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	West	yes	yes	5 min
		Spring	HOLA	Horned Lark	3		0 - 40 m	Northwest	no	yes	-
		Spring	GBHE	Great Blue Heron	1		40 - 180 m	North/Northeast	no	yes	1 min

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
20-Apr-11	2	Spring	EUST	European Starling	4		0 - 40 m	Southwest	no	yes	-
		Spring	TUVU	Turkey Vulture	5		0 - 40 m	West	no	yes	-
		Spring	CAGO	Canada Goose	6		0 - 40 m	North/Northeast	no	yes	-
		Spring	COGR	Common Grackle	5		0 - 40 m	North	no	yes	-
		Spring	TUVU	Turkey Vulture	4		40 - 180 m	South	yes	yes	2 min
		Spring	AMCR	American Crow	1		0 - 40 m	East	no	yes	-
		Spring	EUST	European Starling	3		0 - 40 m	West	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	North/Northwest	no	yes	1 min
		Spring	AMCR	American Crow	1		0 - 40 m	Northeast	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	3 min
		Spring	NOHA	Northern Harrier	1		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	3		40 - 180 m	North/Northeast	no	yes	1 min
		Spring	AMCR	American Crow	1		0 - 40 m	North	no	yes	-
		Spring	EUST	European Starling	1		0 - 40 m	North/Northwest	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	North/Northeast	yes	yes	3 min
		Spring	RWBL	Red-winged Blackbird	5		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	West	no	yes	-
		Spring	EUST	European Starling	6		0 - 40 m	West/Northwest	no	yes	-
		Spring	AMPI	American Pipit	3		40 - 180 m	North	no	yes	1 min
		Spring	AMRO	American Robin	4		0 - 40 m	North/Northeast	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	West/Southwest	yes	yes	3 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	East	yes	yes	2 min
		Spring	COGR	Common Grackle	3		0 - 40 m	Northwest	no	yes	-
20-Apr-11	3	Spring	TUVU	Turkey Vulture	1		40 - 180 m	North/Northeast	no	yes	2 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	yes	3 min
		Spring	COGR	Common Grackle	3		0 - 40 m	West	no	yes	-
		Spring	EUST	European Starling	5		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	East	yes	yes	2 min
		Spring	BAEA	Bald Eagle	1	3 yrs	40 - 180 m	East/Southeast	no	yes	1 min
		Spring	AMRO	American Robin	3		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	4		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	7		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Northeast	yes	yes	2 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southwest	yes	yes	2 min
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	-
		Spring	KILL	Killdeer	2		0 - 40 m	East	no	yes	-
		Spring	EUST	European Starling	3		0 - 40 m	West	no	yes	-
		Spring	BHCO	Brown-headed Cowbird	5		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	3		40 - 180 m	North	no	yes	1 min
		Spring	AMCR	American Crow	2		0 - 40 m	East	no	yes	-
		Spring	MODO	Mourning Dove	2		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southeast	yes	yes	2 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northwest	yes	yes	2 min
		Spring	EUST	European Starling	4		0 - 40 m	West	no	yes	-
		Spring	AMCR	American Crow	3		0 - 40 m	Southwest	no	yes	-

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
20-Apr-11	3	Spring	EUST	European Starling	6		0 - 40 m	East	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North	yes	yes	2 min
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	-
21-Apr-11	1	Spring	COGR	Common Grackle	3		0 - 40 m	Southwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Northeast	yes	yes	2 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southwest	yes	yes	4 min
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	West	no	yes	-
		Spring	EUST	European Starling	6		40 - 180 m	Southeast	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	yes	3 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southeast	yes	yes	2 min
		Spring	COGR	Common Grackle	1		40 - 180 m	South	no	yes	1 min
		Spring	CAGO	Canada Goose	4		40 - 180 m	Northwest	no	yes	1 min
		Spring	AMRO	American Robin	2		0 - 40 m	East	no	yes	-
		Spring	KILL	Killdeer	2		0 - 40 m	East	no	yes	-
		Spring	EUST	European Starling	3		40 - 180 m	Northeast	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North/Northwest	yes	yes	3 min
		Spring	COGR	Common Grackle	3		0 - 40 m	South	no	yes	-
		Spring	AMCR	American Crow	4		0 - 40 m	West	no	yes	-
		Spring	EUST	European Starling	2		0 - 40 m	North	no	yes	-
		Spring	HOLA	Horned Lark	3		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	Northwest	no	yes	-
		Spring	MODO	Mourning Dove	2		0 - 40 m	North	no	yes	-
		Spring	AMCR	American Crow	1		40 - 180 m	North	no	yes	1 min
		Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	North/Northeast	no	yes	-
		Spring	BHCO	Brown-headed Cowbird	8		40 - 180 m	West	no	yes	1 min
		Spring	COGR	Common Grackle	5		40 - 180 m	Northwest	no	yes	1 min
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	West	yes	yes	2 min
		Spring	AMRO	American Robin	3		0 - 40 m	North	no	yes	-
		Spring	HOLA	Horned Lark	2		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	North/Northeast	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	Northeast	no	yes	-
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	South	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southeast	yes	yes	3 min
		Spring	KILL	Killdeer	2		0 - 40 m	East	no	yes	-
21-Apr-11	2	Spring	TUVU	Turkey Vulture	2		40 - 180 m	Northwest	yes	yes	2 min
		Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	West	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	West	no	yes	-
		Spring	MODO	Mourning Dove	3		0 - 40 m	North	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	Southwest	no	yes	-
		Spring	AMRO	American Robin	1		40 - 180 m	Northeast	no	yes	1 min
		Spring	GBHE	Great Blue Heron	1		40 - 180 m	North	no	yes	1 min
		Spring	COGR	Common Grackle	3		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southwest	yes	yes	3 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Northwest	yes	yes	2 min
		Spring	CAGO	Canada Goose	4		40 - 180 m	North/Northeast	no	yes	1 min
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Northwest	no	yes	-
		Spring	AMCR	American Crow	1		0 - 40 m	North	no	yes	-



Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
21-Apr-11	2	Spring	TUVU	Turkey Vulture	1		40 - 180 m	East	yes	yes	2 min
		Spring	SOSP	Song Sparrow	1		0 - 40 m	West	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	Northeast	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	Southwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Southeast	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	Northwest	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	-
		Spring	RWBL	Red-winged Blackbird	6		0 - 40 m	South	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	North	no	yes	-
21-Apr-11	3	Spring	COGR	Common Grackle	7		0 - 40 m	West/Southwest	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	West	yes	yes	4 min
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	East/Southeast	yes	yes	2 min
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	North	no	yes	1 min
		Spring	EUST	European Starling	2		0 - 40 m	West	no	yes	-
		Spring	EUST	European Starling	4		0 - 40 m	Northeast	no	yes	-
		Spring	AMCR	American Crow	1		40 - 180 m	Southeast	no	yes	1 min
		Spring	AMCR	American Crow	3		0 - 40 m	North	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	West	no	yes	-
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	West	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	North	yes	yes	2 min
		Spring	MODO	Mourning Dove	2		0 - 40 m	Northeast	no	yes	-
		Spring	EUST	European Starling	5		0 - 40 m	East/Northeast	no	yes	-
		Spring	AMCR	American Crow	1		40 - 180 m	North	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	West/Southwest	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	West/Southwest	no	yes	-
		Spring	COGR	Common Grackle	9		0 - 40 m	East	no	yes	-
		Spring	EUST	European Starling	2		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	12		0 - 40 m	East	no	yes	-
		Spring	RWBL	Red-winged Blackbird	10		40 - 180 m	East/Northeast	no	yes	1 min
		Spring	BAEA	Bald Eagle	1	3 yrs	40 - 180 m	West/Southwest	no	yes	2 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	North	yes	yes	1 min
		Spring	COGR	Common Grackle	1		0 - 40 m	North	yes	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	West	no	yes	-
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	West	no	yes	-
		Spring	COHA	Cooper's Hawk	1		40 - 180 m	West/Northwest	no	yes	1 min
		Spring	COGR	Common Grackle	6		0 - 40 m	East	no	yes	-
		Spring	EUST	European Starling	3		0 - 40 m	North	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	East	yes	yes	2 min
22-Apr-11	1	Spring	TUVU	Turkey Vulture	2		40 - 180 m	Northeast	yes	yes	2 min
		Spring	COGR	Common Grackle	1		0 - 40 m	NOOrthwest	no	yes	-
		Spring	AMRO	American Robin	2		40 - 180 m	North/Northwest	no	yes	1 min
		Spring	AMCR	American Crow	1		0 - 40 m	South	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	Southeast	no	yes	-
		Spring	EUST	European Starling	4		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Southwest	yes	yes	2 min
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	-

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
22-Apr-11	1	Spring	EUST	European Starling	3		0 - 40 m	Southeast	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	-
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Southeast	yes	yes	2 min
		Spring	COGR	Common Grackle	1		0 - 40 m	Northwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	West	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Northeast	yes	yes	3 min
		Spring	COGR	Common Grackle	3		0 - 40 m	Northwest	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	North	no	yes	-
		Spring	COGR	Common Grackle	3		0 - 40 m	Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	2 min
22-Apr-11	2	Spring	ROPI	Rock Pigeon	3		0 - 40 m	Northeast	no	yes	-
		Spring	KILL	Killdeer	1		0 - 40 m	Southwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	North/Northwest	no	yes	-
		Spring	EUST	European Starling	4		0 - 40 m	North/Northwest	no	yes	-
		Spring	COGR	Common Grackle	2		0 - 40 m	Southeast	no	yes	-
		Spring	COGR	Common Grackle	2		40 - 180 m	East	no	yes	-
		Spring	MALL	Mallard	2		0 - 40 m	Southeast	no	yes	-
		Spring	COGR	Common Grackle	1		40 - 180 m	East	no	yes	1 min
		Spring	AMCR	American Crow	1		0 - 40 m	North	no	yes	-
		Spring	COGR	Common Grackle	2		40 - 180 m	South	no	yes	1 min
		Spring	HOLA	Horned Lark	1		0 - 40 m	East	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	South	no	yes	-
		Spring	RWBL	Red-winged Blackbird	5		40 - 180 m	South	no	yes	1 min
		Spring	EUST	European Starling	5		40 - 180 m	South	no	yes	1 min
		Spring	COGR	Common Grackle	3		0 - 40 m	North	no	yes	-
		Spring	COGR	Common Grackle	2		40 - 180 m	Northeast	no	yes	1 min
		Spring	AMCR	American Crow	2		0 - 40 m	North	no	yes	-
		Spring	HOLA	Horned Lark	1		0 - 40 m	Southwest	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	-
		Spring	AMRO	American Robin	2		0 - 40 m	Northwest	no	yes	-
22-Apr-11	3	Spring	COGR	Common Grackle	3		0 - 40 m	West	no	yes	-
		Spring	RWBL	Red-winged Blackbird	6		0 - 40 m	Northwest	no	yes	-
		Spring	AMRO	American Robin	3		40 - 180 m	North	no	yes	1 min
		Spring	KILL	Killdeer	2		0 - 40 m	East	no	yes	-
		Spring	COGR	Common Grackle	1		0 - 40 m	South	no	yes	-
		Spring	MODO	Mourning Dove	2		0 - 40 m	North	no	yes	-
		Spring	EUST	European Starling	5		0 - 40 m	Southwest	no	yes	-
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	East	no	yes	-
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	-
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	Southwest	yes	yes	2 min
		Spring	RTHA	Red-tailed Hawk	1		40 - 180 m	Northeast	yes	yes	1 min
		Spring	COGR	Common Grackle	3		0 - 40 m	Northwest	no	yes	-
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	yes	yes	2 min
		Spring	CAGO	Canada Goose	2		40 - 180 m	Northwest	no	yes	1 min
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	-
		Spring	AMCR	American Crow	2		0 - 40 m	Northeast	no	yes	-

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
24-Apr-11	1	Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	West	no	yes	
		Spring	PESA	Pectoral Sandpiper	23		0 - 40 m	East/Northeast	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	North	no	yes	
		Spring	AMCR	American Crow	1		0 - 40 m	South	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	West	no	yes	
		Spring	CAGO	Canada Goose	2		40 - 180 m	Southeast	no	yes	1 Minute
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	West	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	East	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	South	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	North	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	East/Northeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	2		0 - 40 m	East	no	yes	
		Spring	BRNS	Barn Swallow	6		0 - 40 m	North	yes	yes	
		Spring	AMCR	American Crow	1		0 - 40 m	East/Northeast	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	South	no	yes	1 Minute
24-Apr-11	2	Spring	BRNS	Barn Swallow	1		0 - 40 m	Northwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	West	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	South	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	Southeast	no	yes	
		Spring	EUST	European Starling	3		0 - 40 m	North	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	East	no	yes	
		Spring	EAME	Eastern Meadowlark	1		0 - 40 m	East	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southeast	yes	yes	2 Minutes
		Spring	KILL	Killdeer	1		0 - 40 m	Southwest	no	yes	
		Spring	TUVU	Turkey Vulture	2		40 - 180 m	South	yes	yes	4 Minutesa
		Spring	EABL	Eastern Bluebird	2		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	
		Spring	RWBL	Red-winged Blackbird	9		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	West	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	2		0 - 40 m	Southwest	no	yes	
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	North	yes	yes	2 Minutes
24-Apr-11	3	Spring	WODU	Wood Duck	1		0 - 40 m	West/Southwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
		Spring	MODO	Mourning Dove	3		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	South	no	yes	
		Spring	AMGO	American Goldfinch	1		0 - 40 m	Southeast	no	yes	
		Spring	MALL	Mallard	2		0 - 40 m	East/Northsouth	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	South	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	
		Spring	SOSP	Song Sparrow	2		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	5		0 - 40 m	West	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
27-Apr-11	1	Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	North	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	Northwest	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	East	no	yes	
		Spring	COGR	Common Grackle	4		0 - 40 m	South	no	yes	
		Spring	AMCR	American Crow	8		0 - 40 m	Southwest	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	West/Northwest	no	yes	
		Spring	RWBL	Red-winged Blackbird	6		0 - 40 m	South/Southeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	4		0 - 40 m	West/Northeast	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	Southwest	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	Southwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	Northeast	no	yes	
		Spring	HOLA	Horned Lark	3		0 - 40 m	Northeast	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	Northwest	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	4		40 - 180 m	West	yes	yes	3 MINUTES
		Spring	EABL	Eastern Bluebird	1		0 - 40 m	East	no	no	
27-Apr-11	2	Spring	EABL	Eastern Bluebird	2		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	47		0 - 40 m	Southwest	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	Southeast	no	yes	
		Spring	TUVU	Turkey Vulture	6		40 - 180 m	South	yes	yes	5 MINUTES
		Spring	EUST	European Starling	4		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	5		0 - 40 m	Northwest	no	yes	
		Spring	EAME	Eastern Meadowlark	1		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	Northeast	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	
		Spring	BHCO	Brown-headed Cowbird	3		0 - 40 m	South	no	yes	
		Spring	EABL	Eastern Bluebird	2		0 - 40 m	West	no	yes	
		Spring	EUST	European Starling	1		0 - 40 m	North/Northeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	West	no	yes	
		Spring	RTHA	Red-tailed Hawk	1		0 - 40 m	South	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	Southeast	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southwest	no	yes	
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	North	yes	yes	2 MINUTES
27-Apr-11	3	Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	East	yes	yes	2 Minutes
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	EUST	European Starling	2		0 - 40 m	Southeast	no	yes	
		Spring	AMGO	American Goldfinch	4		0 - 40 m	Southwest	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	South	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	West	no	yes	
27-Apr-11	3	Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	
		Spring	AMRO	American Robin	2		0 - 40 m	West	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	West	no	yes	
		Spring	SOSP	Song Sparrow	1		0 - 40 m	Southwest	no	yes	
		Spring	COGR	Common Grackle	3		0 - 40 m	Southwest	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
29-Apr-11	1	Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	Southeast	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	West	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	West	no	yes	
		Spring	EUST	European Starling	6		0 - 40 m	East	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	
		Spring	BHCO	Brown-headed Cowbird	2		0 - 40 m	North	no	yes	
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Southeast	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	East	no	yes	
		Spring	TUVU	Turkey Vulture	7		40 - 180 m	East/Northeast	yes	yes	7 Minutes
		Spring	COHA	Cooper's Hawk	14		0 - 40 m	West	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	Southeast	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	6		0 - 40 m	West	no	yes	
29-Apr-11	2	Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	RWBL	Red-winged Blackbird	3		0 - 40 m	Southwest	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	Southeast	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	North	no	yes	
		Spring	EUST	European Starling	3		0 - 40 m	Northwest	no	yes	
		Spring	COGR	Common Grackle	4		0 - 40 m	Northeast	no	yes	
		Spring	TUVU	Turkey Vulture	3		40 - 180 m	West	yes	yes	3 Minutes
		Spring	TUVU	Turkey Vulture	5		40 - 180 m	West	yes	yes	5 minutes
		Spring	KILL	Killdeer	2		0 - 40 m	Southeast	no	yes	
		Spring	TUVU	Turkey Vulture	5		40 - 180 m	West	yes	yes	2 Minutes
		Spring	EABL	Eastern Bluebird	2		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	South	no	yes	
		Spring	BHCO	Brown-headed Cowbird	2		0 - 40 m	North	no	yes	
		Spring	WITU	Wild Turkey	1		0 - 40 m	Southeast	no	yes	
29-Apr-11	3	Spring	WODU	Wood Duck	2		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	
		Spring	MODO	Mourning Dove	2		0 - 40 m	South	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
		Spring	COGR	Common Grackle	3		0 - 40 m	Southwest	no	yes	
		Spring	AMGO	American Goldfinch	3		0 - 40 m	West	no	yes	
		Spring	MALL	Mallard	1		0 - 40 m	Southeast	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	West	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	
		Spring	SOSP	Song Sparrow	1		0 - 40 m	North	no	yes	
		Spring	COGR	Common Grackle	2		0 - 40 m	Southeast	no	yes	
30-Apr-11	1	Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	East	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	South	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	North	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	West	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
30-Apr-11	1	Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	Southeast	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	West	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	West	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	North	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	Southeast	no	yes	7 Minutes
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	East	no	yes	
		Spring	BRNS	Barn Swallow	1		0 - 40 m	East/Northeast	no	yes	
		Spring	AMCR	American Crow	1		0 - 40 m	West	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	Southeast	no	yes	
30-Apr-11	2	Spring	BRNS	Barn Swallow	1		0 - 40 m	North	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	Southeast	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	East	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East/Northeast	no	yes	
		Spring	EUST	European Starling	1		0 - 40 m	West	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	Southeast	no	yes	
		Spring	EAME	Eastern Meadowlark	1		0 - 40 m	Southeast	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	East	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East/Northeast	no	yes	
		Spring	TUVU	Turkey Vulture	1		40 - 180 m	West	no	yes	6 Minutes
		Spring	EABL	Eastern Bluebird	1		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
		Spring	RWBL	Red-winged Blackbird	1		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	West	no	yes	
		Spring	KILL	Killdeer	1		0 - 40 m	East	no	yes	
		Spring	EUST	European Starling	1		0 - 40 m	South	no	yes	
30-Apr-11	3	Spring	BHCO	Brown-headed Cowbird	2		0 - 40 m	South	no	yes	
		Spring	COGR	Common Grackle	3		0 - 40 m	North	no	yes	
		Spring	HOLA	Horned Lark	2		0 - 40 m	Southeast	no	yes	
		Spring	MODO	Mourning Dove	1		0 - 40 m	West	no	yes	
		Spring	COGR	Common Grackle	1		0 - 40 m	Southeast	no	yes	
		Spring	AMGO	American Goldfinch	3		0 - 40 m	West	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	West	no	yes	
		Spring	TUVU	Turkey Vulture	4		40 - 180 m	East	yes	yes	5 Minutes
		Spring	KILL	Killdeer	1		0 - 40 m	South	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	Southeast	no	yes	
		Spring	SOSP	Song Sparrow	1		0 - 40 m	East	no	yes	
		Spring	AMRO	American Robin	1		0 - 40 m	East/Northeast	no	yes	
		Spring	AMCR	American Crow	2		0 - 40 m	South	no	yes	
		Spring	HOLA	Horned Lark	1		0 - 40 m	West	no	yes	
4-Sep-11	1	Autumn	SBDO	Short-billed Dowitcher	1		0 - 40 m	North	no	yes	
		Autumn	AMCR	American Crow	7		0 - 40 m	West	no	yes	
		Autumn	AMCR	American Crow	3		0 - 40 m	North	no	yes	
4-Sep-11	2	Autumn	AMCR	American Crow	3		0 - 40 m	West	no	yes	
		Autumn	AMGO	American Goldfinch	1		0 - 40 m	East	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	South	no	yes	
		Autumn	AMCR	American Crow	3		0 - 40 m	Southwest	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
4-Sep-11	3	Autumn	AMCR	American Crow	3		0 - 40 m	Southwest	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	North/Northwest	no	yes	
		Autumn	HOSP	House Sparrow	5		0 - 40 m	Southwest	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	North/Northeast	no	yes	
		Autumn	AMGO	American Goldfinch	1		0 - 40 m	Southwest	no	yes	
		Autumn	HOSP	House Sparrow	3		0 - 40 m	East	no	yes	
7-Sep-11	1	Autumn	SOSP	Song Sparrow	1		0 - 40 m	North	no	yes	
		Autumn	TUVU	Turkey Vulture	2		40 - 180 m	Southeast	yes	yes	2 Minutes
7-Sep-11	2	Autumn		No Observations							
7-Sep-11	3	Autumn	MODO	Mourning Dove	3		0 - 40 m	Southeast	no	yes	
		Autumn	AMCR	American Crow	5		40 - 180 m	Southwest	no	yes	1 Minute
		Autumn	TUVU	Turkey Vulture	4		40 - 180 m	South	yes	yes	3 Minutes
9-Sep-11	1	Autumn	AMCR	American Crow	6		0 - 40 m	South/Southeast	no	yes	
		Autumn	EABL	Eastern Bluebird	2		0 - 40 m	East	no	yes	
		Autumn	RBGU	Ring-billed Gull	2		0 - 40 m	North	no	yes	
9-Sep-11	2	Autumn	TUVU	Turkey Vulture	3		40 - 180 m	North	yes	yes	5 Minutes
		Autumn	AMCR	American Crow	7		0 - 40 m	East	no	yes	
9-Sep-11	3	Autumn	HOSP	House Sparrow	12		0 - 40 m	East	no	yes	
		Autumn	AMCR	American Crow	1		0 - 40 m	South	no	yes	
11-Sep-11	1	Autumn	HOLA	Horned Lark	2		0 - 40 m	North	no	yes	
		Autumn	AMGO	American Goldfinch	3		0 - 40 m	North	no	yes	
		Autumn	NOFL	Northern Flicker	1		0 - 40 m	North	no	yes	
11-Sep-11	2	Autumn	AMCR	American Crow	3		0 - 40 m	East	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	North	no	yes	
11-Sep-11	3	Autumn	AMCR	American Crow	2		0 - 40 m	Southwest	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	North/Northeast	no	yes	
		Autumn	AMCR	American Crow	3		>180 m	Northeast	no	yes	
		Autumn	MODO	Mourning Dove	5		0 - 40 m	North/Northwest	no	yes	
		Autumn	CAGO	Canada Goose	7		0 - 40 m	South/Southeast	no	yes	
		Autumn	MODO	Mourning Dove	1		0 - 40 m	South	no	yes	
		Autumn	BLJA	Blue Jay	2		0 - 40 m	North	no	yes	
		Autumn	HOSP	House Sparrow	4		0 - 40 m	West	no	yes	
		Autumn	KILL	Killdeer	2		0 - 40 m	North	no	yes	
		Autumn	BLJA	Blue Jay	3		0 - 40 m	East	no	yes	
18-Sep-11	1	Autumn	AMCR	American Crow	3		0 - 40 m	Northeast	no	yes	
		Autumn	HOSP	House Sparrow	7		0 - 40 m	Northwest	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	Southeast	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	South/Southeast	no	yes	
		Autumn	AMCR	American Crow	3		0 - 40 m	East/Northeast	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	East	no	yes	
		Autumn	CAGO	Canada Goose	18		40 - 180 m	West	no	yes	1 Minute
		Autumn	MODO	Mourning Dove	4		0 - 40 m	Southwest	no	yes	
		Autumn	BLJA	Blue Jay	2		0 - 40 m	Northeast	no	yes	
		Autumn	HOSP	House Sparrow	3		0 - 40 m	West	no	yes	
		Autumn	KILL	Killdeer	2		0 - 40 m	West/Southwest	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	Southwest	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
18-Sep-11	2	Autumn	TUVU	Turkey Vulture	2		40 - 180 m	Northwest	no	yes	1 Minute
		Autumn	BLJA	Blue Jay	1		0 - 40 m	Northeast	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	South	no	yes	
		Autumn	AMCR	American Crow	9		0 - 40 m	North	no	yes	
18-Sep-11	3	Autumn	RTHA	Red-tailed Hawk	1		>180 m	North	yes	yes	
		Autumn	TUVU	Turkey Vulture	3		40 - 180 m	Northeast	yes	yes	4 Minutes
		Autumn	AMCR	American Crow	4		0 - 40 m	Southwest	no	yes	
		Autumn	AMCR	American Crow	6		0 - 40 m	South/Southeast	no	yes	
		Autumn	BLJA	Blue Jay	2		0 - 40 m	East	no	yes	
		Autumn	EABL	Eastern Bluebird	3		0 - 40 m	West	no	yes	
		Autumn	EUST	European Starling	7		0 - 40 m	West/Southwest	no	yes	
20-Sep-11	1	Autumn	MODO	Mourning Dove	2		0 - 40 m	North	no	yes	
		Autumn	CAGO	Canada Goose	5		>180 m	Northeast	no	yes	
		Autumn	MODO	Mourning Dove	1		0 - 40 m	Southeast	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	Southwest	no	yes	
		Autumn	HOSP	House Sparrow	3		0 - 40 m	West	no	yes	
		Autumn	KILL	Killdeer	7		0 - 40 m	East/Northeast	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	West	no	yes	
20-Sep-11	2	Autumn	AMCR	American Crow	4		0 - 40 m	North	no	yes	
		Autumn	KILL	Killdeer	1		0 - 40 m	North/Northeast	no	yes	
		Autumn	EUST	European Starling	7		0 - 40 m	West	no	yes	
		Autumn	COGR	Common Grackle	5		0 - 40 m	East	no	yes	
		Autumn	EABL	Eastern Bluebird	1		0 - 40 m	Southeast	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	South	no	yes	
20-Sep-11	3	Autumn	GBHE	Great Blue Heron	1		40 - 180 m	North/Northeast	no	yes	1 Minute
		Autumn	AMCR	American Crow	7		0 - 40 m	South	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	Southeast	no	yes	
		Autumn	AMCR	American Crow	1		0 - 40 m	Northeast	no	yes	
		Autumn	MODO	Mourning Dove	4		0 - 40 m	North/Northeast	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	West	no	yes	
21-Sep-11	1	Autumn	AMCR	American Crow	2		0 - 40 m	North	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	North/Northeast	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	West	no	yes	
		Autumn	MODO	Mourning Dove	5		0 - 40 m	South	no	yes	
		Autumn	TUVU	Turkey Vulture	2		40 - 180 m	Southeast	yes	yes	2Minutes
		Autumn	KILL	Killdeer	1		0 - 40 m	Southeast	no	yes	
		Autumn	EABL	Eastern Bluebird	3		0 - 40 m	Southwest	no	yes	
		Autumn	EUST	European Starling	9		0 - 40 m	North/Northeast	no	yes	
		Autumn	COGR	Common Grackle	2		0 - 40 m	Northwest	no	yes	
21-Sep-11	2	Autumn	EUST	European Starling	6		0 - 40 m	North	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Southeast	no	yes	
		Autumn	AMCR	American Crow	5		0 - 40 m	Northeast	no	yes	
		Autumn	AMCR	American Crow	7		0 - 40 m	North/Northwest	no	yes	
		Autumn	CEDW	Cedar Waxwing	11		0 - 40 m	Southwest	no	yes	
		Autumn	WITU	Wild Turkey	1		0 - 40 m	South/Southeast	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	West	no	yes	



Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
21-Sep-11	3	Autumn	AMCR	American Crow	6		0 - 40 m	North	no	yes	
		Autumn	GBHE	Great Blue Heron	1		40 - 180 m	Southwest	no	yes	1 Minute
		Autumn	TUVU	Turkey Vulture	3		40 - 180 m	North/Northeast	yes	yes	4 MinuteS
		Autumn	RTHA	Red-tailed Hawk	1		40 - 180 m	West	yes	yes	8 Minutes
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Southeast	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	North/Northwest	no	yes	
		Autumn	EABL	Eastern Bluebird	3		0 - 40 m	East	no	yes	
		Autumn	EUST	European Starling	9		0 - 40 m	West/Southwest	no	yes	
		Autumn	MODO	Mourning Dove	3		0 - 40 m	South	no	yes	
		Autumn	MODO	Mourning Dove	7		0 - 40 m	South/Southwest	no	yes	
25-Sep-11	1	Autumn	AMCR	American Crow	3		0 - 40 m	North/Northeast	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	Southeast	no	yes	
		Autumn	AMKE	American Kestrel	1		0 - 40 m	East	no	yes	
		Autumn	AMCR	American Crow	7		0 - 40 m	South	no	yes	
		Autumn	TUVU	Turkey Vulture	1		0 - 40 m	Southwest	no	yes	
25-Sep-11	2	Autumn	AMPI	American Pipit	4		0 - 40 m	Southeast	no	yes	
		Autumn	AMCR	American Crow	11		40 - 180 m	Southwest	yes	yes	6 Minutes
		Autumn	HOLA	Horned Lark	2		0 - 40 m	North	no	yes	
		Autumn	TUVU	Turkey Vulture	7		40 - 180 m	South	no	yes	1 Minute
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Northwest	no	yes	
		Autumn	HOSP	House Sparrow	8		0 - 40 m	South/Southwest	no	yes	
		Autumn	EUST	European Starling	42		0 - 40 m	Southwest	yes	yes	
25-Sep-11	3	Autumn	BLJA	Blue Jay	3		0 - 40 m	Southwest	no	yes	
		Autumn	HOSP	House Sparrow	5		0 - 40 m	Southeast	no	yes	
		Autumn	TUVU	Turkey Vulture	4		40 - 180 m	South/Southwest	yes	yes	8 Minutes
		Autumn	COHA	Cooper's Hawk	1		0 - 40 m	West	no	yes	
		Autumn	AMCR	American Crow	6		0 - 40 m	East	no	yes	
		Autumn	HOSP	House Sparrow	7		0 - 40 m	East/Northeast	no	yes	
28-Sep-11	1	Autumn	TUVU	Turkey Vulture	3		40 - 180 m	North	yes	yes	4 Minutes
		Autumn	AMCR	American Crow	4		0 - 40 m	Southeast	no	yes	
		Autumn	MODO	Mourning Dove	5		0 - 40 m	Southwest	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	East	no	yes	
		Autumn	EUST	European Starling	7		0 - 40 m	East/Northeast	no	yes	
		Autumn	KILL	Killdeer	2		0 - 40 m	East	no	yes	
		Autumn	AMRO	American Robin	4		0 - 40 m	Southeast	no	yes	
		Autumn	AMCR	American Crow	8		0 - 40 m	South/Southwest	no	yes	
28-Sep-11	2	Autumn	SAVS	Savannah Sparrow	1		0 - 40 m	Southwest	no	yes	
		Autumn	BLJA	Blue Jay	2		0 - 40 m	South/Southwest	no	yes	
		Autumn	AMCR	American Crow	6		0 - 40 m	Southeast	no	yes	
		Autumn	AMGO	American Goldfinch	4		0 - 40 m	Southeast	no	yes	
		Autumn	EUST	European Starling	1		0 - 40 m	South	no	yes	
		Autumn	AMPI	American Pipit	2		0 - 40 m	Northwest	no	yes	
		Autumn	HOLA	Horned Lark	3		0 - 40 m	West	no	yes	
		Autumn	RWBL	Red-winged Blackbird	1		0 - 40 m	South/Southwest	no	yes	
		Autumn	EUST	European Starling	8		0 - 40 m	Northwest	no	yes	
		Autumn	KILL	Killdeer	2		0 - 40 m	West/Southwest	no	yes	
		Autumn	KILL	Killdeer	1		0 - 40 m	Northeast	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
28-Sep-11	3	Autumn	AMGO	American Goldfinch	1		0 - 40 m	South	no	yes	
		Autumn	HOSP	House Sparrow	3		0 - 40 m	Southeast	no	yes	
		Autumn	AMCR	American Crow	1		0 - 40 m	North	no	yes	
		Autumn	CAGO	Canada Goose	18		40 - 180 m	Northeast	no	yes	2 Minutes
		Autumn	EUST	European Starling	7		0 - 40 m	North/Northeast	no	yes	
		Autumn	HOSP	House Sparrow	5		0 - 40 m	Southwest	no	yes	
		Autumn	RWBL	Red-winged Blackbird	32		40 - 180 m	Northwest	no	yes	2 Minutes
		Autumn	BHCO	Brown-headed Cowbird	7		40 - 180 m	Northwest	no	yes	2 Minutes
		Autumn	COGR	Common Grackle	9		40 - 180 m	Northwest	no	yes	2 Minutes
		Autumn	AMCR	American Crow	7		0 - 40 m	North/Northeast	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	Northeast	no	yes	
30-Sep-11	1	Autumn	AMCR	American Crow	3		0 - 40 m	North	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	Southeast	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	Southwest	no	yes	
30-Sep-11	2	Autumn	TUVU	Turkey Vulture	3		40 - 180 m	South/Southeast	yes	yes	3 Minutes
		Autumn	AMCR	American Crow	7		0 - 40 m	North/Northeast	no	yes	
		Autumn	HOSP	House Sparrow	2		0 - 40 m	North	no	yes	
		Autumn	EUST	European Starling	14		0 - 40 m	Northwest	no	yes	
30-Sep-11	3	Autumn	TUVU	Turkey Vulture	2		0 - 40 m	Northeast	no	yes	
		Autumn	AMCR	American Crow	6		40 - 180 m	Southwest	yes	yes	2 Minutes
2-Oct-11	1	Autumn	AMCR	American Crow	3		0 - 40 m	Northwest	no	yes	
		Autumn	MODO	Mourning Dove	4		0 - 40 m	Southeast	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	
		Autumn	HOSP	House Sparrow	6		0 - 40 m	West	no	yes	
		Autumn	TUVU	Turkey Vulture	3		40 - 180 m	Southeast	yes	yes	8 Minutes
		Autumn	TUVU	Turkey Vulture	5		>180 m	Southeast	yes	yes	
		Autumn	KILL	Killdeer	2		0 - 40 m	South/Southwest	no	yes	
		Autumn	AMCR	American Crow	1		40 - 180 m	South/Southeast	no	yes	2 Minutes
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Northwest	no	yes	
		Autumn	CAGO	Canada Goose	24		40 - 180 m	North	no	yes	2 Minutes
		Autumn	HOLA	Horned Lark	2		0 - 40 m	Northwest	no	yes	
		Autumn	EABL	Eastern Bluebird	5		0 - 40 m	Northeast	no	yes	
		Autumn	TRES	Tree Swallow	4		0 - 40 m	South	yes	yes	
		Autumn	AMCR	American Crow	7		0 - 40 m	Northwest	no	yes	
		Autumn	GBHE	Great Blue Heron	1		40 - 180 m	South/Southeast	no	yes	1 Minutes
2-Oct-11	2	Autumn	AMCR	American Crow	18		40 - 180 m	Southwest	yes	yes	11 Minutes
		Autumn	BLJA	Blue Jay	3		0 - 40 m	North	no	yes	
		Autumn	RWBL	Red-winged Blackbird	14		0 - 40 m	South/Southeast	no	yes	
		Autumn	COGR	Common Grackle	8		0 - 40 m	South/Southeast	no	yes	
		Autumn	BHCO	Brown-headed Cowbird	2		0 - 40 m	South/Southeast	no	yes	
		Autumn	EUST	European Starling	32		0 - 40 m	Southwest	yes	no	
		Autumn	EABL	Eastern Bluebird	2		0 - 40 m	North/Northeast	no	yes	
		Autumn	HOLA	Horned Lark	5		0 - 40 m	Southeast	no	yes	
		Autumn	TUVU	Turkey Vulture	7		40 - 180 m	North/Northeast	yes	no	
		Autumn	SOSP	Song Sparrow	2		0 - 40 m	North/Northwest	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	North	no	yes	
		Autumn	AMGO	American Goldfinch	7		0 - 40 m	Northwest	no	yes	
		Autumn	AMCR	American Crow	2		40 - 180 m	North/Northwest	no	yes	2 Minutes

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
2-Oct-11	3	Autumn	RTHA	Red-tailed Hawk	1		0 - 40 m	East/Northeast	no	yes	
		Autumn	HOSP	House Sparrow	8		0 - 40 m	East/Southeast	no	yes	
		Autumn	AMCR	American Crow	4		40 - 180 m	North	no	yes	1 Minute
		Autumn	TUVU	Turkey Vulture	7		40 - 180 m	South/Southwest	yes	yes	4 Minutes
4-Oct-11	1	Autumn	EABL	Eastern Bluebird	3		0 - 40 m	Northeast	no	yes	
		Autumn	AMCR	American Crow	6		0 - 40 m	North	no	yes	
		Autumn	NOFL	Northern Flicker	1		0 - 40 m	South	no	yes	
		Autumn	AMCR	American Crow	3		40 - 180 m	Southwest	no	yes	2 Minutes
		Autumn	SOSP	Song Sparrow	2		0 - 40 m	West	no	yes	
4-Oct-11	2	Autumn	TUVU	Turkey Vulture	4		40 - 180 m	South/Southwest	yes	yes	5 Minutes
		Autumn	AMKE	American Kestrel	1		0 - 40 m	North/Northwest	no	yes	
		Autumn	EUST	European Starling	9		0 - 40 m	Northeast	no	yes	
		Autumn	AMCR	American Crow	3		0 - 40 m	Southeast	no	yes	
		Autumn	AMGO	American Goldfinch	6		0 - 40 m	South/Southwest	no	yes	
		Autumn	AMCR	American Crow	5		0 - 40 m	South/Southeast	no	yes	
4-Oct-11	3	Autumn	KILL	Killdeer	4		0 - 40 m	North/Northwest	no	yes	
		Autumn	HOSP	House Sparrow	9		0 - 40 m	West	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	North	no	yes	
		Autumn	TUVU	Turkey Vulture	4		40 - 180 m	Northeast	yes	yes	5 Minutes
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	East	no	yes	
		Autumn	HOSP	House Sparrow	6		0 - 40 m	Southeast	no	yes	
		Autumn	EUST	European Starling	18		0 - 40 m	South/Southwest	no	yes	
		Autumn	COGR	Common Grackle	2		0 - 40 m	West/Southwest	no	yes	
		Autumn	EABL	Eastern Bluebird	5		0 - 40 m	Northwest	no	yes	
		Autumn	KILL	Killdeer	4		0 - 40 m	North/Northwest	no	yes	
		Autumn	HOSP	House Sparrow	8		0 - 40 m	East	no	yes	
7-Oct-11	1	Autumn	KILL	Killdeer	3		0 - 40 m	Southwest	yes	yes	
		Autumn	COGR	Common Grackle	2		0 - 40 m	Southwest	no	yes	
		Autumn	AMCR	American Crow	1		0 - 40 m	Southwest	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	South	no	yes	
		Autumn	HOLA	Horned Lark	2		0 - 40 m	South	no	yes	
		Autumn	KILL	Killdeer	7		0 - 40 m	Northwest	yes	yes	
		Autumn	WBNU	White-breasted Nuthatch	1		0 - 40 m	East	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	North	no	yes	
		Autumn	KILL	Killdeer	2		0 - 40 m	North	no	yes	
		Autumn	NOHA	Northern Harrier	1		0 - 40 m	Northeast	yes	yes	
		Autumn	MODO	Mourning Dove	1		0 - 40 m	Southwest	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	Southeast	no	yes	
		Autumn	HOLA	Horned Lark	1		0 - 40 m	North/Northeast	no	yes	
		Autumn	TUTI	Tufted Titmouse	1		0 - 40 m	West	no	yes	
		Autumn	TUVU	Turkey Vulture	5		40 - 180 m	Southwest	yes	yes	7 Minutes
		Autumn	AMCR	American Crow	2		0 - 40 m	North/Northwest	no	yes	
7-Oct-11	2	Autumn	HOLA	Horned Lark	2		0 - 40 m	North	no	yes	
		Autumn	AMCR	American Crow	7		0 - 40 m	Northwest	no	yes	
		Autumn	BLJA	Blue Jay	3		0 - 40 m	Southeast	no	yes	
		Autumn	TUVU	Turkey Vulture	5		40 - 180 m	South/Southeast	yes	yes	4 Minutes
		Autumn	AMRO	American Robin	2		0 - 40 m	West	no	yes	
		Autumn	EUST	European Starling	19		0 - 40 m	East/Northeast	no	yes	
		Autumn	RWBL	Red-winged Blackbird	6		0 - 40 m	North/Northeast	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	East	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
7-Oct-11	3	Autumn	AMRO	American Robin	2		0 - 40 m	North	no	yes	
		Autumn	HOSP	House Sparrow	3		0 - 40 m	Northeast	no	yes	
		Autumn	EUST	European Starling	5		0 - 40 m	East/Southeast	no	yes	
		Autumn	KILL	Killdeer	2		0 - 40 m	South	no	yes	
		Autumn	RTHA	Red-tailed Hawk	1		0 - 40 m	Southeast	no	yes	
		Autumn	RWBL	Red-winged Blackbird	8		0 - 40 m	Southwest	no	yes	
		Autumn	HOLA	Horned Lark	1		0 - 40 m	South/Southwest	no	yes	
		Autumn	TUVU	Turkey Vulture	6		40 - 180 m	East	no	yes	1 Minute
		Autumn	HOSP	House Sparrow	4		0 - 40 m	East/Southeast	no	yes	
		Autumn	AMCR	American Crow	1		0 - 40 m	North	no	yes	
		Autumn	BLJA	Blue Jay	2		0 - 40 m	Northwest	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Southwest	no	yes	
9-Oct-11	1	Autumn	AMCR	American Crow	3		0 - 40 m	North	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	South	no	yes	
		Autumn	KILL	Killdeer	1		0 - 40 m	South/Southeast	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	Northwest	no	yes	
		Autumn	EUST	European Starling	18		0 - 40 m	East	no	yes	
		Autumn	BLJA	Blue Jay	2		0 - 40 m	West/Northwest	no	yes	
		Autumn	EABL	Eastern Bluebird	3		0 - 40 m	North	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Northeast	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
		Autumn	AMCR	American Crow	5		0 - 40 m	South/Southwest	no	yes	
		Autumn	RWBL	Red-winged Blackbird	18		40 - 180 m	South	no	yes	1 Minute
		Autumn	COGR	Common Grackle	3		40 - 180 m	South	no	yes	1 Minute
9-Oct-11	2	Autumn	AMCR	American Crow	8		0 - 40 m	North/Northeast	no	yes	
		Autumn	AMCR	American Crow	5		0 - 40 m	Southeast	no	yes	
		Autumn	CAGO	Canada Goose	17		40 - 180 m	West	no	yes	
		Autumn	HOLA	Horned Lark	2		0 - 40 m	Northeast	no	yes	
		Autumn	EABL	Eastern Bluebird	6		0 - 40 m	West	no	yes	
		Autumn	EUST	European Starling	19		0 - 40 m	West	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	East	no	yes	
		Autumn	HOSP	House Sparrow	7		0 - 40 m	North	no	yes	
		Autumn	AMKE	American Kestrel	1		0 - 40 m	Southwest	no	yes	
		Autumn	TUVU	Turkey Vulture	4		40 - 180 m	South	yes	yes	3 Minutes
		Autumn	EUST	European Starling	5		0 - 40 m	East/Northeast	no	yes	
		Autumn	RWBL	Red-winged Blackbird	29		0 - 40 m	West/Northwest	no	yes	
		Autumn	COGR	Common Grackle	7		0 - 40 m	West/Northwest	no	yes	
		Autumn	AMGO	American Goldfinch	4		0 - 40 m	Southeast	no	yes	
		Autumn	AMRO	American Robin	4		0 - 40 m	North	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	Northeast	no	yes	
9-Oct-11	3	Autumn	HOSP	House Sparrow	8		0 - 40 m	Northwest	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	North	no	yes	
		Autumn	MODO	Mourning Dove	5		0 - 40 m	South/Southeast	no	yes	
		Autumn	AMRO	American Robin	2		0 - 40 m	South	no	yes	
		Autumn	RTHA	Red-tailed Hawk	1		0 - 40 m	West	no	yes	
		Autumn	AMCR	American Crow	6		0 - 40 m	Northwest	no	yes	
		Autumn	AMCR	American Crow	7		0 - 40 m	South/Southwest	no	yes	
		Autumn	RTHA	Red-tailed Hawk	1		40 - 180 m	Southeast	yes	yes	4 Minutes
		Autumn	AMGO	American Goldfinch	5		0 - 40 m	West	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Autumn									

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
9-Oct-11	3	Autumn	SOSP	Song Sparrow	1		0 - 40 m	Southeast	no	yes	
		Autumn	KILL	Killdeer	1		0 - 40 m	Southwest	no	yes	
		Autumn	RBGU	Ring-billed Gull	9		40 - 180 m	North/Northeast	yes	yes	11 Minutes
		Autumn	TUVU	Turkey Vulture	3		40 - 180 m	West	yes	yes	4 Minutes
		Autumn	GBHE	Great Blue Heron	1		40 - 180 m	Southwest	no	yes	
		Autumn	MODO	Mourning Dove	4		0 - 40 m	South/Southwest	no	yes	
11-Oct-11	1	Autumn	MODO	Mourning Dove	7		0 - 40 m	North	no	yes	
		Autumn	RTHA	Red-tailed Hawk	1		40 - 180 m	Northeast	no	yes	1 Minute
		Autumn	AMRO	American Robin	2		0 - 40 m	Southeast	no	yes	
		Autumn	BLJA	Blue Jay	3		0 - 40 m	South/Southwest	no	yes	
		Autumn	AMCR	American Crow	5		0 - 40 m	Southwest	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	South	no	yes	
		Autumn	KILL	Killdeer	1		0 - 40 m	East	no	yes	
		Autumn	MALL	Mallard	2		0 - 40 m	West/Southeast	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	East/Southeast	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Southeast	no	yes	
		Autumn	HOLA	Horned Lark	6		0 - 40 m	West	no	yes	
		Autumn	MODO	Mourning Dove	1		0 - 40 m	Northeast	no	yes	
11-Oct-11	2	Autumn	AMRO	American Robin	1		0 - 40 m	Northeast	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	South/Southeast	no	yes	
		Autumn	HOSP	House Sparrow	4		0 - 40 m	Southwest	no	yes	
		Autumn	TUVU	Turkey Vulture	2		40 - 180 m	West	yes	yes	5 Minutes
		Autumn	HOLA	Horned Lark	2		0 - 40 m	East/Northeast	no	yes	
		Autumn	SAVS	Savannah Sparrow	1		0 - 40 m	North/Northeast	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	North	no	yes	
		Autumn	AMGO	American Goldfinch	6		0 - 40 m	Southwest	no	yes	
		Autumn	RWBL	Red-winged Blackbird	45		0 - 40 m	East	no	yes	
		Autumn	COGR	Common Grackle	12		0 - 40 m	West/Southwest	no	yes	
		Autumn	AMCR	American Crow	1		0 - 40 m	West	no	yes	
		Autumn	EABL	Eastern Bluebird	3		0 - 40 m	Northwest	no	yes	
11-Oct-11	3	Autumn	SOSP	Song Sparrow	1		0 - 40 m	Southeast	no	yes	
		Autumn	HOSP	House Sparrow	6		0 - 40 m	South/Southwest	no	yes	
		Autumn	AMCR	American Crow	3		0 - 40 m	North	no	yes	
		Autumn	NOCA	Northern Cardinal	1		0 - 40 m	East	no	yes	
		Autumn	MODO	Mourning Dove	4		0 - 40 m	Northeast	no	yes	
		Autumn	AMCR	American Crow	5		0 - 40 m	North/Northwest	no	yes	
		Autumn	HOSP	House Sparrow	9		0 - 40 m	Northwest	no	yes	
		Autumn	COGR	Common Grackle	3		0 - 40 m	Southeast	no	yes	
		Autumn	EUST	European Starling	18		0 - 40 m	South/Southeast	no	yes	
		Autumn	ROPI	Rock Pigeon	3		0 - 40 m	West	yes	yes	
		Autumn	HOLA	Horned Lark	2		0 - 40 m	East/Northeast	no	yes	
		Autumn	NOFL	Northern Flicker	1		0 - 40 m	Northwest	no	yes	
		Autumn	TUVU	Turkey Vulture	2		40 - 180 m	South	yes	yes	6 Minutes
14-Oct-11	1	Autumn	HOLA	Horned Lark	2		0 - 40 m	Northwest	no	yes	
		Autumn	MODO	Mourning Dove	3		0 - 40 m	Southwest	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	South	no	yes	
		Autumn	AMCR	American Crow	5		0 - 40 m	North/Northeast	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Autumn	AMRO	American Robin	3		0 - 40 m	West	no	yes	
		Autumn	HOLA	Horned Lark	3		0 - 40 m	Southwest	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
14-Oct-11	1	Autumn	BEKI	Belted Kingfisher	1		0 - 40 m	West	no	yes	
		Autumn	NOFL	Northern Flicker	1		0 - 40 m	Northwest	no	yes	
		Autumn	DOWO	Downy Woodpecker	1		0 - 40 m	Southeast	no	yes	
		Autumn	MODO	Mourning Dove	6		0 - 40 m	North	no	yes	
		Autumn	KILL	Killdeer	2		0 - 40 m	Southeast	no	yes	
		Autumn	MALL	Mallard	4		0 - 40 m	South/Southeast	no	yes	
		Autumn	RWBL	Red-winged Blackbird	22		0 - 40 m	North	no	yes	
14-Oct-11	2	Autumn	RWBL	Red-winged Blackbird	120		0 - 40 m	Northeast	no	yes	
		Autumn	BHCO	Brown-headed Cowbird	4		0 - 40 m	Northeast	no	yes	
		Autumn	COGR	Common Grackle	16		0 - 40 m	Northeast	no	yes	
		Autumn	HOLA	Horned Lark	1		0 - 40 m	Southeast	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Northwest	no	yes	
		Autumn	AMCR	American Crow	6		0 - 40 m	East	no	yes	
		Autumn	TUVU	Turkey Vulture	5		40 - 180 m	Southeast	yes	yes	3 Minutes
		Autumn	EABL	Eastern Bluebird	1		0 - 40 m	East/Northeast	no	yes	
		Autumn	MODO	Mourning Dove	4		0 - 40 m	Southwest	no	yes	
		Autumn	AMGO	American Goldfinch	3		0 - 40 m	Northwest	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	North	no	yes	
		Autumn	EUST	European Starling	82		0 - 40 m	South	no	yes	
		Autumn	EUST	European Starling	44		0 - 40 m	West	no	yes	
14-Oct-11	3	Autumn	AMCR	American Crow	3		0 - 40 m	Northwest	no	yes	
		Autumn	NOFL	Northern Flicker	1		0 - 40 m	South/Southeast	no	yes	
		Autumn	MODO	Mourning Dove	5		0 - 40 m	North	no	yes	
		Autumn	MODO	Mourning Dove	3		0 - 40 m	East	no	yes	
		Autumn	AMCR	American Crow	13		0 - 40 m	East/Southeast	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	West	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Northwest	no	yes	
		Autumn	HOSP	House Sparrow	9		0 - 40 m	Southwest	no	yes	
		Autumn	TUVU	Turkey Vulture	2		40 - 180 m	South/Southeast	yes	yes	3 Minutes
		Autumn	EUST	European Starling	15		0 - 40 m	East	no	yes	
		Autumn	RWBL	Red-winged Blackbird	27		0 - 40 m	West	no	yes	
		Autumn	RTHA	Red-tailed Hawk	1		40 - 180 m	North	yes	yes	1 Minutes
16-Oct-11	1	Autumn	MODO	Mourning Dove	3		0 - 40 m	North	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	Southwest	no	yes	
		Autumn	MODO	Mourning Dove	5		0 - 40 m	South/Southeast	no	yes	
		Autumn	AMRO	American Robin	6		0 - 40 m	East	no	yes	
		Autumn	EUST	European Starling	82		0 - 40 m	West	yes	yes	
		Autumn	RWBL	Red-winged Blackbird	150		0 - 40 m	North/Northeast	no	yes	
		Autumn	COGR	Common Grackle	12		0 - 40 m	North/Northeast	no	yes	
16-Oct-11	2	Autumn	EUST	European Starling	8		0 - 40 m	North/Northwest	no	yes	
		Autumn	RTHA	Red-tailed Hawk	1		0 - 40 m	North	no	yes	
		Autumn	AMCR	American Crow	6		0 - 40 m	South	no	yes	
		Autumn	AMCR	American Crow	9		0 - 40 m	East/Southeast	no	yes	
		Autumn	HOLA	Horned Lark	2		0 - 40 m	Southwest	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Northwest	no	yes	
		Autumn	OSPR	Osprey	1		>180 m	South	no	yes	
		Autumn	AMGO	American Goldfinch	5		0 - 40 m	East	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
16-Oct-11	3	Autumn	SOSP	Song Sparrow	1		0 - 40 m	Southeast	no	yes	
		Autumn	HOSP	House Sparrow	9		0 - 40 m	South	no	yes	
		Autumn	AMCR	American Crow	3		0 - 40 m	Northwest	no	yes	
		Autumn	BLJA	Blue Jay	2		0 - 40 m	North/Northwest	no	yes	
		Autumn	HOLA	Horned Lark	1		0 - 40 m	South	no	yes	
		Autumn	AMRO	American Robin	5		0 - 40 m	East	no	yes	
		Autumn	EUST	European Starling	48		0 - 40 m	East/Northeast	no	yes	
		Autumn	EUST	European Starling	2		0 - 40 m	West/Northwest	no	yes	
		Autumn	RWBL	Red-winged Blackbird	52		0 - 40 m	North	no	yes	
18-Oct-11	1	Autumn	AMGO	American Goldfinch	5		0 - 40 m	East	no	yes	
		Autumn	RWBL	Red-winged Blackbird	81		0 - 40 m	Northeast	no	yes	
		Autumn	COGR	Common Grackle	18		0 - 40 m	Northeast	no	yes	
		Autumn	AMCR	American Crow	5		0 - 40 m	Southwest	no	yes	
		Autumn	AMCR	American Crow	9		0 - 40 m	South/Southeast	no	yes	
		Autumn	RHWO	Red-headed Woodpecker	2		0 - 40 m	East	no	yes	
		Autumn	KILL	Killdeer	1		0 - 40 m	Southwest	no	yes	
		Autumn	MALL	Mallard	2		0 - 40 m	West	no	yes	
		Autumn	HOLA	Horned Lark	3		0 - 40 m	South	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	
		Autumn	RWBL	Red-winged Blackbird	64		0 - 40 m	North/Northeast	no	yes	
		Autumn	AMCR	American Crow	3		0 - 40 m	East/Southeast	no	yes	
		Autumn	TUVU	Turkey Vulture	1		>180 m	South	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	West	no	yes	
18-Oct-11	2	Autumn	TUVU	Turkey Vulture	2		40 - 180 m	South	yes	yes	5 Minutes
		Autumn	AMCR	American Crow	1		0 - 40 m	Southwest	no	yes	
		Autumn	EUST	European Starling	7		0 - 40 m	East	no	yes	
		Autumn	HOLA	Horned Lark	2		0 - 40 m	Northwest	no	yes	
		Autumn	EUST	European Starling	4		0 - 40 m	Northeast	no	yes	
		Autumn	CAGO	Canada Goose	8		40 - 180 m	South/Southwest	no	yes	
18-Oct-11	3	Autumn	GBHE	Great Blue Heron	2		40 - 180 m	Northeast	no	yes	2 Minutes
		Autumn	HOLA	Horned Lark	3		0 - 40 m	Northwest	no	yes	
		Autumn	HOSP	House Sparrow	12		0 - 40 m	Southeast	no	yes	
		Autumn	EUST	European Starling	55		0 - 40 m	South/Southwest	no	yes	
		Autumn	BLJA	Blue Jay	3		0 - 40 m	Southeast	no	yes	
		Autumn	EABL	Eastern Bluebird	6		0 - 40 m	West/Northwest	no	yes	
		Autumn	HOSP	House Sparrow	5		0 - 40 m	East	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	West	no	yes	
		Autumn	CEDW	Cedar Waxwing	7		0 - 40 m	Northwest	no	yes	
		Autumn	RBWO	Red-bellied Woodpecker	1		0 - 40 m	West/Northwest	no	yes	
		Autumn	AMCR	American Crow	6		0 - 40 m	Southeast	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	North	no	yes	
21-Oct-11	1	Autumn	RTHA	Red-tailed Hawk	1		40 - 180 m	Northwest	yes	yes	3 Minutes
		Autumn	NOFL	Northern Flicker	1		0 - 40 m	South/Southeast	no	yes	
		Autumn	HOLA	Horned Lark	4		0 - 40 m	Southwest	no	yes	
		Autumn	MODO	Mourning Dove	7		0 - 40 m	Northeast	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	East	no	yes	
		Autumn	AMCR	American Crow	3		0 - 40 m	West/Southwest	no	yes	
		Autumn	HOSP	House Sparrow	5		0 - 40 m	North	no	yes	
		Autumn	KILL	Killdeer	1		40 - 180 m	Southwest	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	North/Northwest	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
21-Oct-11	2	Autumn	EUST	European Starling	7		0 - 40 m	Northwest	no	yes	
		Autumn	AMRO	American Robin	2		0 - 40 m	South/Southeast	no	yes	
		Autumn	CEDW	Cedar Waxwing	9		0 - 40 m	South	no	yes	
		Autumn	NOCA	Northern Cardinal	1		0 - 40 m	Southwest	no	yes	
		Autumn	MODO	Mourning Dove	8		0 - 40 m	East	no	yes	
		Autumn	MODO	Mourning Dove	1		0 - 40 m	East/Northeast	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	West	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	West/Northwest	no	yes	
		Autumn	EABL	Eastern Bluebird	6		0 - 40 m	Southeast	no	yes	
		Autumn	AMKE	American Kestrel	1		40 - 180 m	South/Southeast	no	yes	1 Minute
		Autumn	AMRO	American Robin	2		0 - 40 m	West	no	yes	
		Autumn	BLJA	Blue Jay	4		0 - 40 m	West/Southwest	no	yes	
		Autumn	NOHA	Northern Harrier	1		0 - 40 m	Northeast	no	yes	
21-Oct-11	3	Autumn	AMCR	American Crow	5		0 - 40 m	Southeast	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	South/Southeast	no	yes	
		Autumn	HOLA	Horned Lark	1		0 - 40 m	East	no	yes	
		Autumn	HOSP	House Sparrow	6		0 - 40 m	West	no	yes	
		Autumn	EABL	Eastern Bluebird	4		0 - 40 m	Northwest	no	yes	
		Autumn	CAGO	Canada Goose	22		0 - 40 m	East/Northeast	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Northeast	no	yes	
		Autumn	RWBL	Red-winged Blackbird	250		0 - 40 m	North	no	yes	
		Autumn	COGR	Common Grackle	18		0 - 40 m	North	no	yes	
		Autumn	RWBL	Red-winged Blackbird	122		40 - 180 m	Southeast	no	yes	2 Minutes
		Autumn	BHCO	Brown-headed Cowbird	6		40 - 180 m	Southeast	no	yes	2 Minutes
		Autumn	MODO	Mourning Dove	1		0 - 40 m	South/Southwest	no	yes	
		Autumn	RBGU	Ring-billed Gull	15		0 - 40 m	Northwest	no	yes	
		Autumn	BEKI	Belted Kingfisher	1		40 - 180 m	North/Northwest	no	yes	1 Minute
		Autumn	AMRO	American Robin	5		0 - 40 m	North	no	yes	
		Autumn	EABL	Eastern Bluebird	8		0 - 40 m	East	no	yes	
23-Oct-11	1	Autumn	NOCA	Northern Cardinal	1		0 - 40 m	Northwest	no	yes	
		Autumn	BLJA	Blue Jay	2		0 - 40 m	Northeast	no	yes	
		Autumn	AMRO	American Robin	3		0 - 40 m	South/Southwest	no	yes	
		Autumn	MODO	Mourning Dove	5		0 - 40 m	Southeast	no	yes	
		Autumn	AMCR	American Crow	7		0 - 40 m	East	no	yes	
		Autumn	EABL	Eastern Bluebird	4		0 - 40 m	West/Southwest	no	yes	
		Autumn	HOSP	House Sparrow	9		0 - 40 m	East	no	yes	
		Autumn	TUVU	Turkey Vulture	5		40 - 180 m	South	yes	yes	8 Minutes
		Autumn	RWBL	Red-winged Blackbird	207		0 - 40 m	Southeast	no	yes	
		Autumn	COGR	Common Grackle	5		0 - 40 m	Southeast	no	yes	
		Autumn	SAVS	Savannah Sparrow	1		0 - 40 m	West	no	yes	
23-Oct-11	2	Autumn	CAGO	Canada Goose	13		0 - 40 m	Northwest	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	North/Northeast	no	yes	
		Autumn	RTHA	Red-tailed Hawk	1		40 - 180 m	South	yes	yes	4 Minutes
		Autumn	HOLA	Horned Lark	1		0 - 40 m	Southwest	no	yes	
		Autumn	CEDW	Cedar Waxwing	5		0 - 40 m	East	no	yes	
		Autumn	EABL	Eastern Bluebird	3		0 - 40 m	East/Southeast	no	yes	
		Autumn	AMRO	American Robin	7		0 - 40 m	West	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	West/Northwest	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	North	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	North	no	yes	
		Autumn									



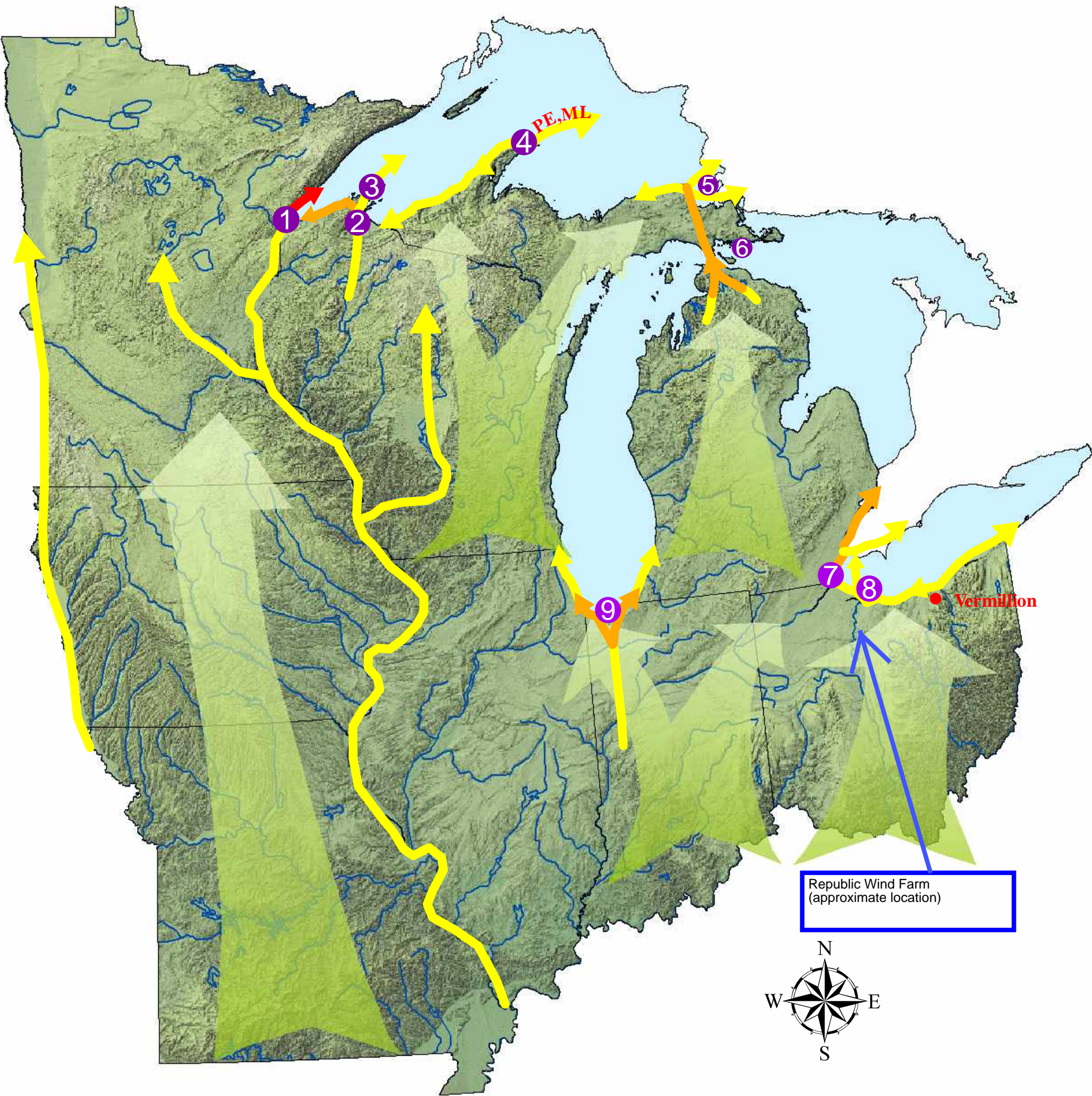
Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
23-Oct-11	3	Autumn	COHA	Cooper's Hawk	1		40 - 180 m	South	yes	yes	2 Minutes
		Autumn	NOFL	Northern Flicker	1		0 - 40 m	Northwest	no	yes	
		Autumn	HOSP	House Sparrow	6		0 - 40 m	North/Northwest	no	yes	
		Autumn	NOCA	Northern Cardinal	2		0 - 40 m	South/Southwest	no	yes	
		Autumn	AMRO	American Robin	3		0 - 40 m	North	no	yes	
		Autumn	AMCR	American Crow	16		0 - 40 m	East	no	yes	
		Autumn	EABL	Eastern Bluebird	2		0 - 40 m	West	no	yes	
		Autumn	EUST	European Starling	98		0 - 40 m	Southwest	no	yes	
		Autumn	RWBL	Red-winged Blackbird	160		0 - 40 m	Southwest	no	yes	
		Autumn	RWBL	Red-winged Blackbird	49		0 - 40 m	South/Southwest	no	yes	
		Autumn	COGR	Common Grackle	3		0 - 40 m	South/Southwest	no	yes	
23-Oct-11	3	Autumn	AMRO	American Robin	1		0 - 40 m	Northeast	no	yes	
		Autumn	MODO	Mourning Dove	3		0 - 40 m	Northwest	no	yes	
		Autumn	AMCR	American Crow	4		0 - 40 m	South	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	South/Southwest	no	yes	
		Autumn	WITU	Wild Turkey	1		0 - 40 m	East/Southeast	no	yes	
		Autumn	HOLA	Horned Lark	2		0 - 40 m	East	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	West	no	yes	
		Autumn	EABL	Eastern Bluebird	5		0 - 40 m	West	no	yes	
		Autumn	HOSP	House Sparrow	7		0 - 40 m	West/Southwest	no	yes	
		Autumn	HOSP	House Sparrow	4		0 - 40 m	Southwest	no	yes	
		Autumn	NOCA	Northern Cardinal	1		0 - 40 m	Southeast	no	yes	
		Autumn	RWBL	Red-winged Blackbird	350		0 - 40 m	North/Northwest	no	yes	
		Autumn	COGR	Common Grackle	14		0 - 40 m	North/Northwest	no	yes	
		Autumn	RWBL	Red-winged Blackbird	700		0 - 40 m	North	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	Southeast	no	yes	
25-Oct-11	1	Autumn	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	North/Northeast	no	yes	
		Autumn	AMCR	American Crow	4		40 - 180 m	South	no	yes	1 Minute
		Autumn	HOLA	Horned Lark	1		0 - 40 m	West	no	yes	
		Autumn	TUVU	Turkey Vulture	7		40 - 180 m	West	yes	yes	8 Minutes
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Northeast	no	yes	
		Autumn	HOLA	Horned Lark	3		0 - 40 m	Southeast	no	yes	
		Autumn	CAGO	Canada Goose	15		40 - 180 m	South/Southeast	no	yes	1 Minute
		Autumn	NOFL	Northern Flicker	1		0 - 40 m	South	no	yes	
		Autumn	MODO	Mourning Dove	2		0 - 40 m	West	no	yes	
		Autumn	AMCR	American Crow	9		0 - 40 m	East	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	East/Southeast	no	yes	
		Autumn	NOCA	Northern Cardinal	1		0 - 40 m	North	no	yes	
		Autumn	RWBL	Red-winged Blackbird	500		0 - 40 m	West	no	yes	
25-Oct-11	2	Autumn	NOCA	Northern Cardinal	1		0 - 40 m	Northwest	no	yes	
		Autumn	HOLA	Horned Lark	2		0 - 40 m	Northeast	no	yes	
		Autumn	CAGO	Canada Goose	9		0 - 40 m	South	no	yes	
		Autumn	HOLA	Horned Lark	2		0 - 40 m	Southwest	no	yes	
		Autumn	RWBL	Red-winged Blackbird	220		40 - 180 m	West	no	yes	2 Minutes
		Autumn	EUST	European Starling	105		40 - 180 m	West	no	yes	
		Autumn	RWBL	Red-winged Blackbird	250		0 - 40 m	Southwest	no	yes	
		Autumn	COGR	Common Grackle	18		0 - 40 m	Southwest	no	yes	
		Autumn	AMCR	American Crow	6		0 - 40 m	North	no	yes	
		Autumn	EUST	European Starling	25		0 - 40 m	Northeast	no	yes	
		Autumn	EABL	Eastern Bluebird	2		0 - 40 m	South/Southeast	no	yes	

Date	Point	Season	Code	Species	#	Age	Observation		Circling (yes/no)	Entered Project Area (yes/no)	Estimated time within rooter area
							Height	Direction			
25-Oct-11	3	Autumn	AMCR	American Crow	5		0 - 40 m	Northwest	no	yes	
		Autumn	HOLA	Horned Lark	1		0 - 40 m	North/Northeast	no	yes	
		Autumn	NOHA	Northern Harrier	1		0 - 40 m	South	no	yes	
		Autumn	RWBL	Red-winged Blackbird	45		0 - 40 m	East/Southeast	no	yes	
		Autumn	COGR	Common Grackle	12		0 - 40 m	Southwest	no	yes	
		Autumn	PIWO	Pileated Woodpecker	1		0 - 40 m	South/Southwest	no	yes	
		Autumn	NOFL	Northern Flicker	1		0 - 40 m	Northeast	no	yes	
		Autumn	RBGU	Ring-billed Gull	8		40 - 180 m	South	yes	yes	6 Minutes
		Autumn	AMCR	American Crow	3		0 - 40 m	North	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	East/Northeast	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	East	no	yes	
		Autumn	EABL	Eastern Bluebird	5		0 - 40 m	West	no	yes	
		Autumn	EUST	European Starling	7		0 - 40 m	Northwest	no	yes	
		Autumn	HOSP	House Sparrow	4		0 - 40 m	East/Southeast	no	yes	
28-Oct-11	1	Autumn	EABL	Eastern Bluebird	2		0 - 40 m	Northeast	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	Northwest	no	yes	
		Autumn	AMCR	American Crow	5		0 - 40 m	South	no	yes	
		Autumn	HOLA	Horned Lark	3		0 - 40 m	South/Southwest	no	yes	
		Autumn	EUST	European Starling	22		0 - 40 m	East	no	yes	
		Autumn	RWBL	Red-winged Blackbird	125		0 - 40 m	East	no	yes	
		Autumn	COGR	Common Grackle	18		0 - 40 m	East	no	yes	
		Autumn	COGR	Common Grackle	7		40 - 180 m	Southeast	no	yes	1 Minute
		Autumn	MODO	Mourning Dove	3		0 - 40 m	Northwest	no	yes	
		Autumn	MODO	Mourning Dove	6		0 - 40 m	South/Southwest	no	yes	
		Autumn	AMKE	American Kestrel	1		0 - 40 m	North	no	yes	
		Autumn	HOSP	House Sparrow	3		0 - 40 m	Northeast	no	yes	
		Autumn	SOSP	Song Sparrow	1		0 - 40 m	Northwest	no	yes	
28-Oct-11	2	Autumn	AMCR	American Crow	2		0 - 40 m	East	no	yes	
		Autumn	EUST	European Starling	1		0 - 40 m	Southwest	no	yes	
		Autumn	AMGO	American Goldfinch	1		0 - 40 m	Northwest	no	yes	
		Autumn	GBHE	Great Blue Heron	1		40 - 180 m	South	no	yes	1 Minute
		Autumn	TUVU	Turkey Vulture	1		40 - 180 m	East	yes	yes	3 Minutes
		Autumn	TRES	Tree Swallow	3		0 - 40 m	East	no	yes	
		Autumn	AMCR	American Crow	2		0 - 40 m	South	no	yes	
		Autumn	BLJA	Blue Jay	1		0 - 40 m	Northeast	no	yes	
		Autumn	EUST	European Starling	8		0 - 40 m	Northwest	no	yes	
		Autumn	EABL	Eastern Bluebird	3		0 - 40 m	East/Southeast	no	yes	
		Autumn	NOCA	Northern Cardinal	1		0 - 40 m	West	no	yes	
		Autumn	HOSP	House Sparrow	1		0 - 40 m	West	no	yes	
28-Oct-11	3	Autumn	RWBL	Red-winged Blackbird	100		0 - 40 m	Northeast	no	yes	
		Autumn	AMCR	American Crow	6		0 - 40 m	Southwest	no	yes	
		Autumn	TUVU	Turkey Vulture	1		40 - 180 m	South/Southwest	yes	yes	3 Minutes
		Autumn	AMGO	American Goldfinch	9		0 - 40 m	North	no	yes	
		Autumn	AMRO	American Robin	1		0 - 40 m	East	no	yes	
		Autumn	RWBL	Red-winged Blackbird	27		0 - 40 m	East	no	yes	
		Autumn	COGR	Common Grackle	2		0 - 40 m	East	no	yes	
		Autumn	MODO	Mourning Dove	13		0 - 40 m	Southwest	no	yes	
		Autumn	NOCA	Northern Cardinal	1		0 - 40 m	South	no	yes	
		Autumn	EABL	Eastern Bluebird	3		0 - 40 m	South/Southwest	no	yes	
		Autumn	AMCR	American Crow	1		0 - 40 m	West	no	yes	
		Autumn	NOFL	Northern Flicker	1		0 - 40 m	West	no	yes	

## **APPENDIX B**

### **Ohio Raptor Migration Maps**





# SPRING RAPTOR MIGRATION ROUTES

SYMBOL	COMMON NAME
AK	American Kestrel
BE	Bald Eagle
BO	Boreal Owl
BW	Broadwing
CH	Cooper's Hawk
GE	Golden Eagle
LEO	Long-eared Owl
ML	Merlin
NG	Northern Goshawk
NH	Northern Harrier
NSWO	Northern Saw-whet Owl
OS	Osprey
PG	Peregrine Falcon
RL	Rough-legged Hawk
RS	Red-shouldered Hawk
RT	Red-tailed Hawk
SEO	Short-eared Owl
SS	Sharp-shinned Hawk
TV	Turkey Vulture

## Major Raptor Migration Observation Sites

- 1 West Skyline Observatory, Duluth (TV,OS,BE,SS,BW,RT,RL,GE)
- 2 Chequamegon Bay, Ashland (TV,SS,BW,RT,GE,BE)
- 3 Apostle Islands (AK,ML,PG)
- 4 Manitou Island/Keewenaw Peninsula (OS,SS,RL,NH,BE,PE,ML)
- 5 Whitefish Point (TV,BE,NH,SS,RS,BW,RT,RL,GE,AK,ML,PG,NSWO,BO,LEO)
- 6 Straits of Mackinac (TV,BE,SS,CH,RS,RT,RL,BW,GE)
- 7 Port Huron (TV,SS,RS,RT,BW)
- 8 Lake Erie Islands (TV,SS,BE,NH,OS,ML,PG)
- 9 Indiana Dunes NL (OS,NH,SS,RS,BW,RT,AK)

Legend

Number of Birds

2,500 - 5,000

5,000 - 10,000

10,000 - 20,000

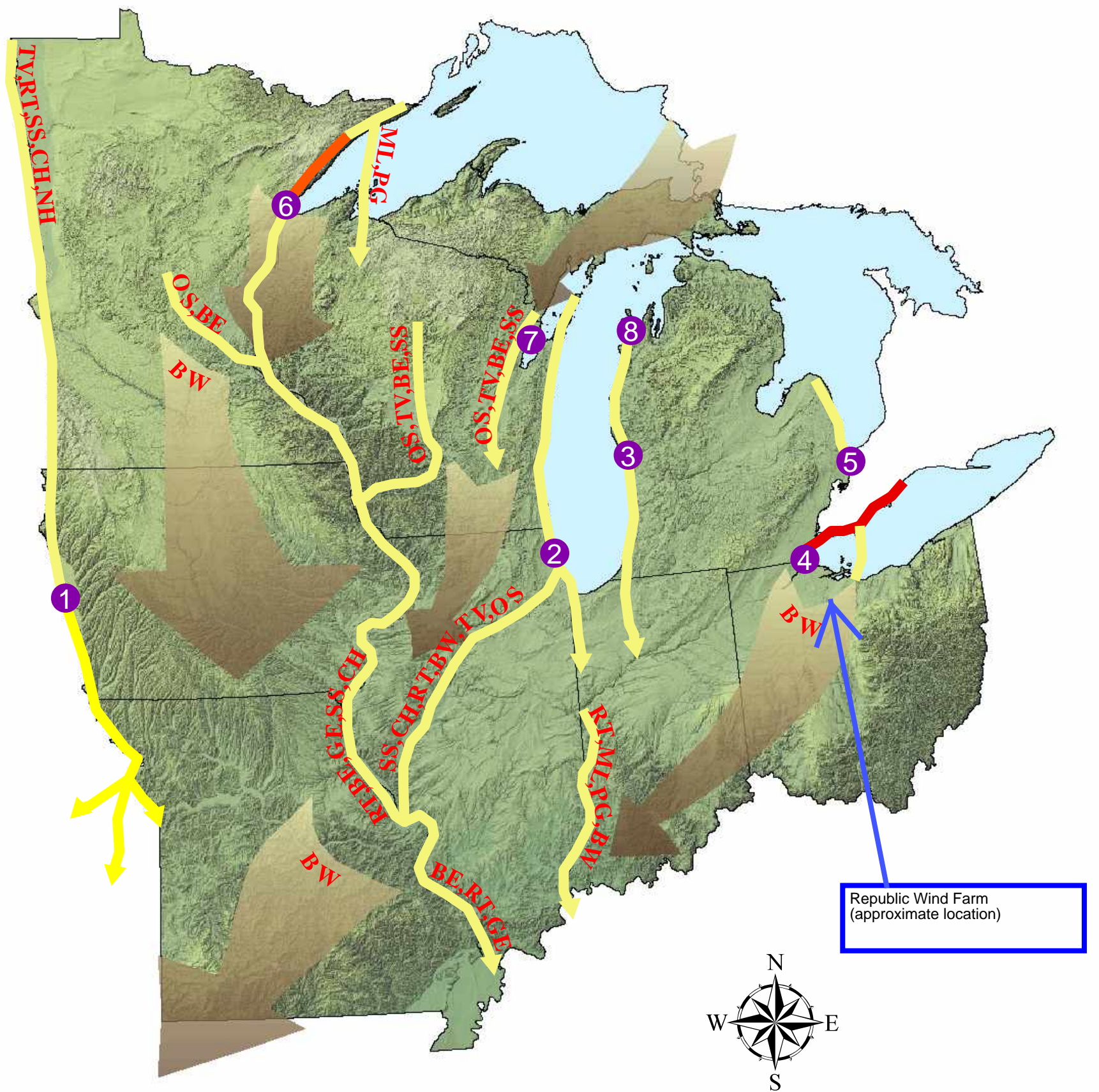
>20,000

Map Created for: Division of Migratory Birds  
October, 2006  
Fall Migratory Bird Information provided by  
USFWS Migratory Bird Biologist Bob Russell



U.S. Fish & Wildlife Service  
Region 3 NWRS  
Division of Conservation Planning  
Twin Cities, Minnesota 55111





# FALL RAPTOR MIGRATION ROUTES

SYMBOL	COMMON NAME
AK	American Kestrel
BE	Bald Eagle
BO	Boreal Owl
BW	Broadwing
CH	Cooper's Hawk
GE	Golden Eagle
LEO	Long-eared Owl
ML	Merlin
NG	Northern Goshawk
NH	Northern Harrier
NSWO	Northern Saw-whet Owl
OS	Osprey
PG	Peregrine Falcon
RL	Rough-legged Hawk
RS	Red-shouldered Hawk
RT	Red-tailed Hawk
SEO	Short-eared Owl
SS	Sharp-shinned Hawk
TV	Turkey Vulture

## Major Raptor Migration Observation Sites

- 1 Hitchcock Nature Area (CH,RT,SS,TV,SW,NH)
- 2 Illinois Dunes State Park (ML,NH,PG,SEO)
- 3 Muskegon State Park (SS,RL,RT)
- 4 Lake Erie Metropark (TV,OS,BE,NH,SS,CH,RT,RL,GE,AK,ME,PG)
- 5 Port Huron (PG,ML)
- 6 Hawk Ridge, Duluth (TV,OS,BE,NH,SS,BW,NG,RT,RL,AK,ML,PG,BO,NSWO,LEO)
- 7 Little Suemico (SS,BW,NSWO)
- 8 Sleeping Bear Dunes NL (RL,RT,SS)

Legend

Number of Birds

2,500 - 25,000

25,000 - 50,000

50,000 - 100,000

>100,000

Map Created for: Division of Migratory Birds  
October, 2006  
Fall Migratory Bird Information provided by  
USFWS Migratory Bird Biologist Bob Russell

## **APPENDIX C**

### **Photographs of Diurnal Bird/Raptor Migration Survey Locations**



Diurnal Raptor Migration, Republic Wind Farm, Seneca County, Ohio

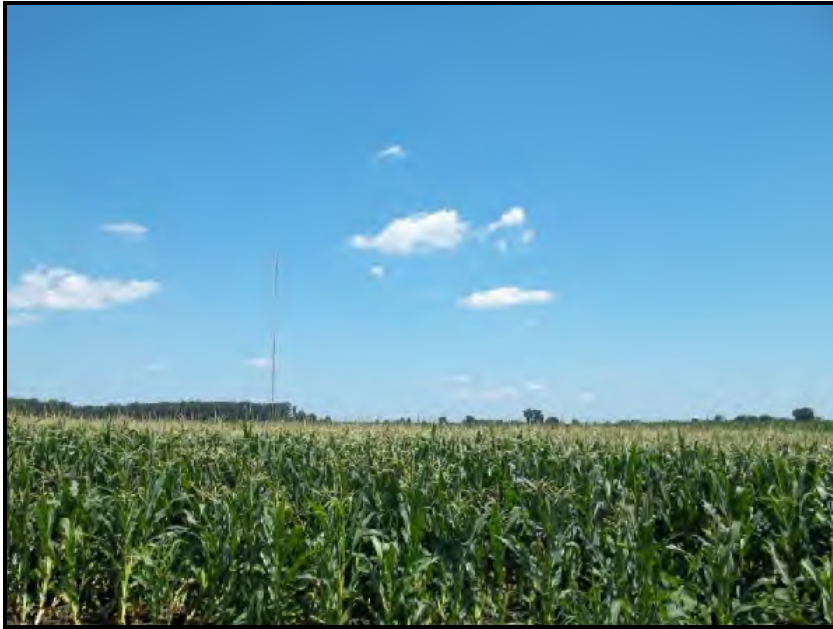


Photo 1. Point 1, facing east.

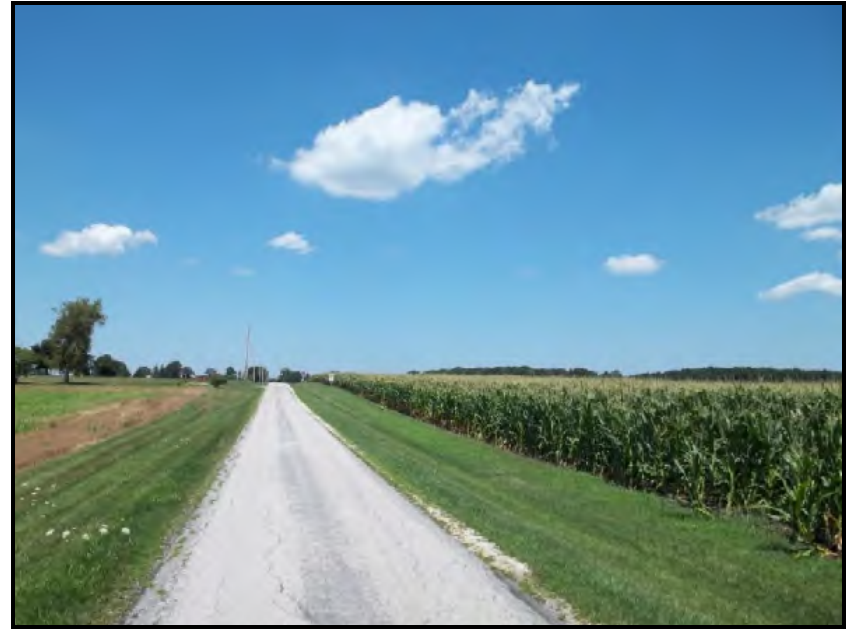


Photo 2. Point 1, facing north.



Photo 3. Point 1, facing west.



Photo 4. Point 2, facing east.

Diurnal Raptor Migration, Republic Wind Farm, Seneca County, Ohio



Photo 5. Point 2, facing north.



Photo 6. Point 2, facing south.



Photo 7. Point 3, facing east.



Photo 8. Point 3, facing south.





Photo 9. Point 3, facing west.



November 2012

**FINAL RESULTS FOR THE  
BALD EAGLE SURVEY EFFORT  
REPUBLIC WIND FARM,  
SENECA AND SANDUSKY COUNTIES, OHIO**

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## 1.0 INTRODUCTION

Republic Wind Farm, LLC, a subsidiary of Nordex USA, Inc. (Nordex), proposes construction of the Republic Wind Farm (RWF or Project Area) wind energy generation facility in Seneca and Sandusky counties, Ohio. The Project Area spans approximately 39,627 acres (ac; 16,036 hectares [ha]) northeast of the town of Republic, Ohio (Figure 1). The Project Area represents the maximum area considered for placement of turbines and facility infrastructure. Nordex anticipates the nameplate capacity of the RWF will be 200 megawatts (MW) with an anticipated 83 turbines allocated throughout the Project Area. At this time, the layout and final number of turbines has not yet been selected; however, Nordex anticipates that the actual area disturbed by the turbines and access roads will comprise less than 1 percent of the Project Area (less than 1 percent).

BHE Environmental, Inc. (BHE) was contracted by Nordex to conduct Bald Eagle point count monitoring at the proposed RWF according to specifications outlined in the US Fish and Wildlife Service (USFWS) Draft Eagle Conservation Plan Guidance (ECP) point count methodology, with some modifications discussed and approved by USFWS on August 23, 2011. Additionally, BHE conducted raptor/diurnal bird monitoring and raptor nest searches in accordance with the Ohio Department of Natural Resources (ODNR) *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio, An Addendum to the Ohio Department of Natural Resource's Voluntary Cooperative Agreement* (Ohio Protocol) during the 2011 and 2012 survey seasons. The purpose of this interim report is to document the results of the Bald Eagle survey effort to date and provide supplemental information from the raptor/diurnal bird and raptor nest search surveys. This information has been provided to USFWS in order to assist in the preliminary assessment of the potential risk to Bald Eagles posed by the proposed RWF wind energy facility.

### Regional Context

The Project Area is heavily influenced by agricultural practices; BHE has calculated utilizing ArcGIS resources that 84.7 percent of the Project Area is devoted to intensive row crop (i.e., corn, soybean, wheat) agricultural production with fragmented woodlots that comprise only 7.6 percent of the Project Area (Table 1). The Project Area lies along the eastern edge of the Mississippi flyway which also includes, although to a lesser extent, the Ohio River Valley and tributaries. The Project Area is approximately 18 miles south of Lake Erie.

## 2.0 BALD EAGLE AND RAPTOR NEST SURVEY

In accordance with specifications of the Ohio Protocol, a survey for raptor nests was conducted March 17 - 25, 2011. Observed species and locations of nests were marked on US Geological Survey (USGS) 1:24,000 topographic quadrangles. The survey focused on the location of stick nests. The Ohio Protocol specifies raptor nest surveys should occur between February 1 and March 31 because the majority of deciduous trees are without leaves and nests can be most easily seen at this time. The survey included the proposed Project Area and a 2-mile buffer surrounding the Project Area boundaries. In addition to marking the locations of nest sites on USGS 1:24,000 topographic quadrangles, the BHE biologist recorded the nest location on a global positioning system (GPS) device (if access to the nest location



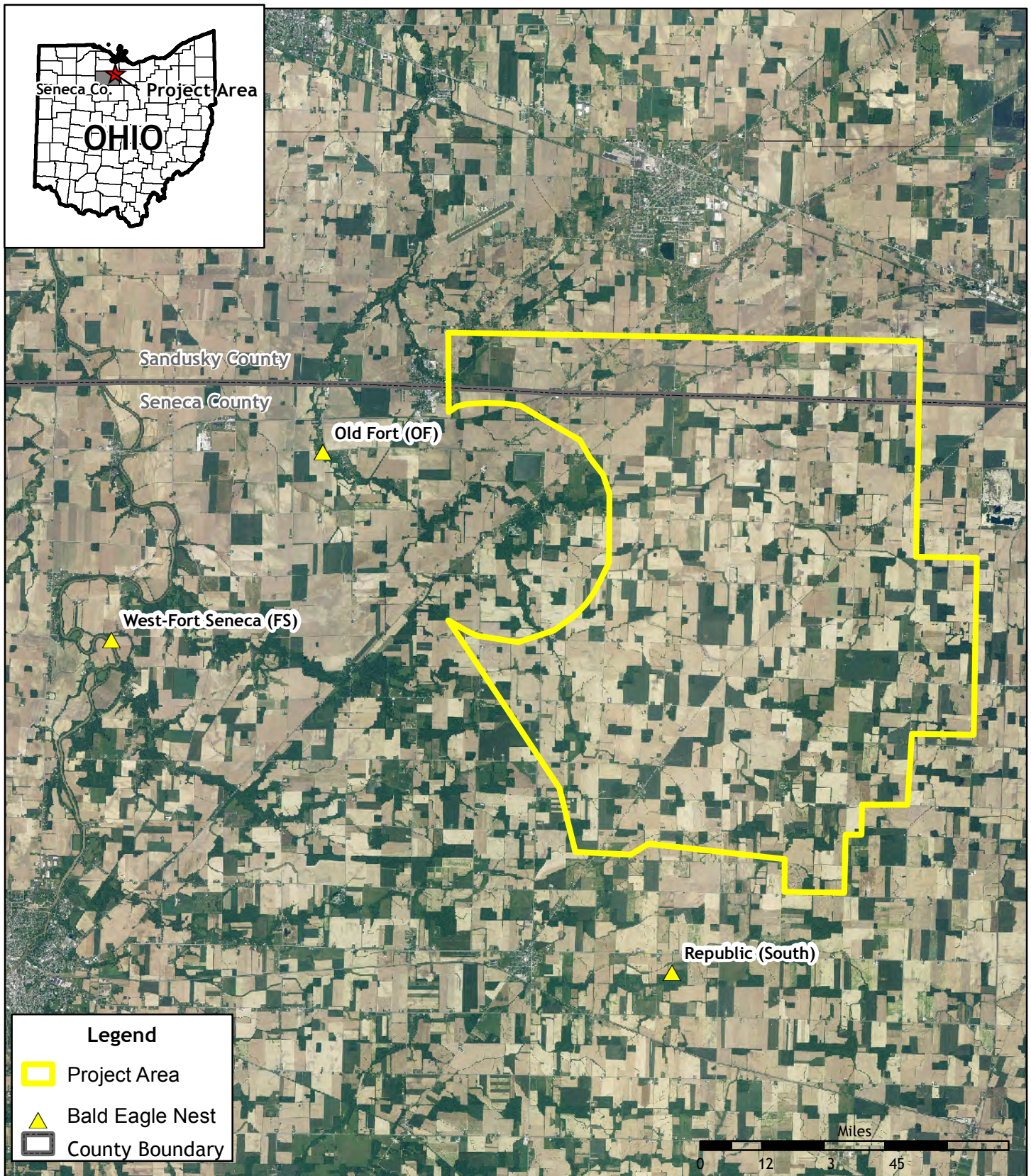


Figure 1. Site location and Bald Eagle Nest locations.

	Republic Wind, LLC Project Area, Seneca and Sandusky Counties, Ohio.		
	Basemap: NAIP Imagery - Seneca and Sandusky Counties, OH (2010)	Project No. 1993.001.002 July 2012	

Table 1. National land use/land cover acreages in the Republic Wind, LLC Project Area, Seneca and Sandusky counties, Ohio.

Land Use	Acres	Percent
Cultivated Crops	33,571.5	84.7%
Deciduous Forest	3,012.7	7.6%
Developed, Open Space	2,101.0	5.3%
Hay/Pasture	425.0	1.1%
Herbaceous	209.96	0.5%
Developed, Low Intensity	136.6	0.3%
Open Water	116.1	0.3%
Woody Wetlands	32.0	0.1%
Emergent Herbaceous Wetlands	10.5	<0.1%
Developed, Medium Intensity	8.3	<0.1%
Evergreen Forest	3.2	<0.1%
<b>Total</b>	<b>39,626.6</b>	<b>100.0%</b>

Source: National Land Cover Database – 2006 (<http://www.mrlc.gov/nlcd2006.php>)

was available) for mapping and potential future nest visits. If access to the nest was not available, the BHE biologist used a GPS to record the location from the nearest publically accessible area and then estimated the distance and bearing to the nest for mapping. At the time of the survey, access had been secured for three woodlots in the southern portion of the Project Area, which were searched on foot. The remainder of the survey was conducted by automobile from public roads.

### 3.0 BALD EAGLE NEST MONITORING AND RESULTS

During the nest survey, BHE identified three Bald Eagle nests within close proximity (approximately 6 miles) to the Project Area (Figure 1). BHE identified each of the Bald Eagle nests by their given ODNR/USFWS nest location name: Old Fort (OF), Fort Seneca (FS), and Republic (known as South). Figure 1 depicts their location with proximity to the Project Area and their general habitat matrices. BHE biologists monitored each of identified nests during the incubation and rearing stages to assess the daily movement patterns of each breeding pair of adults and in order to attempt to identify the productivity success of each nest location during the 2011 and 2012 breeding/nesting seasons (Table 2).

Each Bald Eagle nest was monitored from a vehicle (serving as a blind) positioned at best point for observation. All eagle movements to and from the nest were recorded and a diagram was produced depicting estimated heights, direction of travel, and flight paths used. The location and behavior of the adult Bald Eagles within the near nest territory were documented for at least four hours, twice per week, during the 2011 and 2012 breeding and nesting seasons. The data collected for each of the nest monitoring events will be provided as an appendix to the final report.

The FS nest produced two eaglets that fledged in 2011. Observations showed the birds used the Sandusky River and its environs almost exclusively. Few observations documented



Table 2. Bald Eagle Nest Monitoring Dates during the 2011/2012 breeding/nesting seasons.

Bald Eagle Nest	2011 Breeding/Nesting Season Observation Dates*	2012 Breeding/Nesting Season Observation Dates **
Old Fort	Inactive/Abandoned	January 18, February 16, March 15, April 15, May 18, June 17, and July TBD
Fort Seneca	March 23 through July 19 (2 times weekly)	January 18, February 16, March 15, April 15, May 18, June 17, and July TBD
Republic	Inactive/Abandoned	January 19, February 15, March 14, April 16, May 16, June 15, and July TBD

\*Bald Eagle nest monitoring in accordance with Ohio Protocol.

\*\*Bald Eagle nest monitoring in accordance with modified study plan to incorporate the USFWS Draft ECP guidance.

the birds flying to or from the east where the Project Area lies. The birds using the nest did not appear to be using the Project Area based on these observations.

Due to limited visibility from the observation points and site access constraints at each of the nest locations, BHE biologists were unable to determine the productivity status of any of the observed Bald Eagle nests in the 2012 survey period. One more observation period of the nests is scheduled for July, and should BHE be able to identify the productivity status of the nests, BHE will report the results. Should USFWS and/or ODNR know the productivity status of these nests in 2012, BHE and Nordex request they be provided the productivity status and number of fledglings documented in order to incorporate those items in to the overall risk assessment for the Republic Wind Farm.

#### 4.0 EAGLE POINT COUNT SURVEY AND RESULTS

Using GIS, a random or random-systematic approach was used to distribute twenty points (Figure 2) across the Project Area (approximately one plot per 3.0 square miles) such that suitable habitat was represented in proportion to their extent within the Project Area. Points in the field were marked using a GPS. Points were separated by at least 1,600 meters (m) to avoid overlap among the 800-m radius plots that are centered on the points. When the plots were established, existing natural or man-made landmarks at the perimeter of the 800-m plot were noted to assist observers with distance estimates, where available.

Using best professional judgment, the BHE biologist moved plots from the GIS random-generated point locations up to 800 m to maximize visibility within the plots, to align with access to sites, and to assure all habitats are appropriately represented. After establishment of the plots in the field, Republic sent the map to the USFWS and the ODNR for concurrence of the final plot locations. Points were moved at the request of the USFWS to be more representative of all habitats and compass directions within the RWF project boundary.

Surveys were completed under all weather conditions unless visibility approached 0 (blinding snow or fog) or where visibility was less than 800 m horizontally and 200 m vertically. Surveys

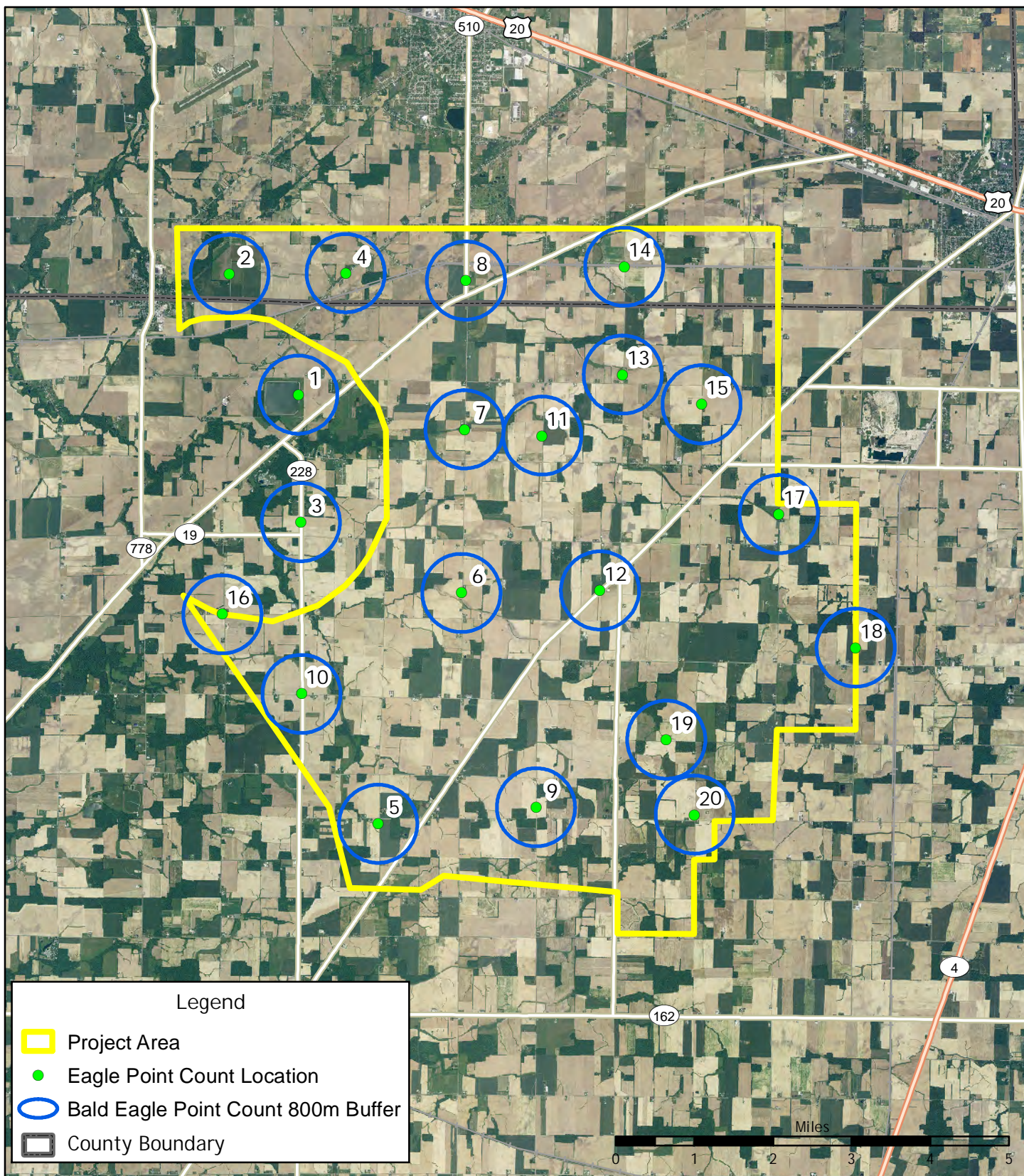


Figure 2. Random Bald Eagle Point Count Locations and 800m buffer

	<p>Republic Wind, LLC Project Area, Seneca and Sandusky Counties, Ohio.</p> <p>Basemap: NAIP Imagery - Seneca and Sandusky Counties, OH (2010)</p>	<p>Project No. 1953.001.002</p> <p>July 2012</p>	
--	----------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------	--



were conducted during daylight hours and employed a temporally stratified sampling approach. Survey start times varied throughout the course of the study, such that each point was surveyed during a range of daylight hours.

During each survey visit, an observer remained at each point for 20 minutes. The observer recorded the total number of minutes, if any, of eagle flight activity within 800 m. The total 20-minute sample interval was divided into 1-minute intervals during which the observer noted the number of birds in flight within the plot in each interval (such that one eagle in flight in the observation area in a given minute = 1 exposure minute; two eagles in flight in the observation area in a given minute [or the same eagle in flight continuing into a second minute interval] = 2 exposure minutes). One exposure minute was assigned to an eagle perched within a plot during the entire 20-minute survey, but perched birds will be noted as such so perching can be taken into account in the analyses. Incidental observations of eagles outside of survey plots were also recorded, but not included in statistical analysis.

Field data forms included a large circle representing the point count observation area on which the observer can record approximate flight paths and heights of eagles plus ancillary notes on general behavior and activity. Behavior prevalent during each 1-minute interval was recorded as soaring flight (circling broadly with wings outstretched), flapping-gliding, kiting-hovering, stooping or diving at prey, stooping or diving, being mobbed, undulating/territorial flight, or perched.

The age of each eagle was categorized as juvenile (recently fledged or fledged the previous year), subadult, adult, or unknown. An eagle's above-ground height was estimated in 50 m increments for each 1-minute interval record, using broad categories relevant to the height of the rotor-swept zone and other risk-specific considerations. Standard weather data was recorded at each point, i.e., temperature, wind speed, wind direction, precipitation, and cloud cover. In addition, incidental observations of other large birds of conservation interest (raptors, sandhill cranes, and waterfowl) were recorded during the course of this study, however, they are not included in this report.

The point count surveys were conducted from August 2011 through July 2012, with each established point surveyed two times per month.

## Results

BHE biologists observed Bald Eagle activity on two occasions within the study area on November 9, 2011 and March 13, 2012 at point count location 19. A total of seven minutes of Bald Eagle exposure was documented with 1 minute on November 9, 2011 and six minutes on March 13, 2012 at heights ranging from 1 to 50 m above ground surface. During each observation period, an adult Bald Eagle was observed in direct flight either flapping or gliding through the point count location and 800-m buffer area (Appendix A).

A total of 9,220 minutes of observation were conducted by BHE biologists. Of the 9,220 minutes, a total of 7 minutes contained Bald Eagle observations. Based on these results, the overall mean Bald Eagle exposure rate (ER) as defined in the USFWS ECP, can be calculated as the number of Bald Eagle observations per minute (7) divided by the total number survey minutes (9,220) across all of the point count locations over the entire survey period. Therefore, the mean Bald Eagle ER for the RWF Project Area was found to be 0.00076. This means that on average, one Bald Eagle was observed during every 1,317 minutes (21 hours and 54 minutes) of survey time across the entire Project Area.

Of the observed 20 point count locations, only one (Point Count Location 19) had any eagle observations documented during the entire survey period. Therefore, 19 of the 20 point count locations exhibited an eagle exposure rate of zero (0). The eagle exposure for point count location 19 can be calculated by dividing the number of Bald Eagle Observation minutes (7) by the total number of survey minutes at Point Count Location 19, which was 460 minutes. Therefore, the eagle exposure rate at Point Count Location 19 can be determined as 0.01521 (approximately 0.015) over the entire survey period. Of the seven eagle minutes observed, none of them were within the assumed rotor swept zone (40 to 120 m) of the proposed wind turbines for the RWF Project Area.

BHE and Nordex's intent is to provide this eagle exposure rate for the entire survey period and Point Count Location 19, in order to assist the USFWS in determining the preliminary collision probability (risk) and annual fatality rate of the proposed Republic Wind Farm based on the results of this survey effort.

## 5.0 BALD EAGLE OBSERVATIONS DURING DIURNAL BIRD/RAPTOR MIGRATION

During the course of the spring and fall diurnal bird/raptor migration surveys, results were detailed and reported to Nordex in the BHE report, *Results of the Diurnal Bird/Raptor Migration Survey, Republic Wind Farm, Seneca and Sandusky Counties, Ohio*, dated December 2011.

### Results

A total of four Bald Eagles were observed during the point counts for a total of 7 minutes of eagle exposure, all during the spring migration period (Table 3).

Three of the observations occurred in the northwestern portion of the Project Area and each of these observations were of a juvenile bird flying between 40 and 180 m above the ground. A single observation of an adult bird occurred in the southern portion of the Project Area flying between 40 and 180 m above the ground.

A total of 17,640 minutes of observation were conducted by BHE biologists during the diurnal bird/raptor migration. Of the 17,640 minutes of observation, a total of 7 minutes contained Bald Eagle observations.

Based on these results, the overall mean Bald Eagle ER as defined in the USFWS ECP, can be calculated as the number of Bald Eagle observations per minute (7) divided by the total number survey minutes (17,640) across all of the diurnal bird/raptor observation points over the entire survey period. Therefore, the mean Bald Eagle ER for the RWF Project Area during the diurnal bird/raptor migration period was found to be 0.00039. This means that on average, one Bald Eagle was observed during every 2,520 minutes (42 hours) of survey time during the diurnal bird/raptor migration survey.

Table 3. Bald Eagles Observed During the Diurnal Bird/Raptor Migration.

Date	Species	#	Time	Age	Observation Height	Estimated time within rooter area
3/22/2011	Bald Eagle	1	2:46 PM	3 yrs	40 - 180 m	2 min
4/15/2011	Bald Eagle	1	12:01 PM	Adult	2	2 min
4/20/2011	Bald Eagle	1	2:21 PM	3 yrs	40 - 180 m	1 min
4/21/2011	Bald Eagle	1	12:47 PM	3 yrs	40 - 180 m	2 min

## **APPENDIX A**

### **Bald Eagle Point Count Data**

## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
1	8/28/2011	0:20	0	-	-	-	30	N/A	0	N/A	0
2	8/28/2011	0:20	0	-	-	-	22	N/A	0	N/A	0
3	8/28/2011	0:20	0	-	-	-	30	N/A	0	N/A	0
4	8/28/2011	0:20	0	-	-	-	22	N/A	0	N/A	0
5	8/28/2011	0:20	0	-	-	-	29	N/A	0	N/A	0
6	8/28/2011	0:20	0	-	-	-	30	N/A	0	N/A	0
7	8/28/2011	0:20	0	-	-	-	23	N/A	0	N/A	0
8	8/28/2011	0:20	0	-	-	-	23	N/A	0	N/A	0
9	8/28/2011	0:20	0	-	-	-	28	N/A	0	N/A	0
10	8/28/2011	0:20	0	-	-	-	30	N/A	0	N/A	0
11	8/28/2011	0:20	0	-	-	-	24	N/A	0	N/A	0
12	8/28/2011	0:20	0	-	-	-	29	N/A	0	N/A	0
13	8/28/2011	0:20	0	-	-	-	25	N/A	0	N/A	0
14	8/28/2011	0:20	0	-	-	-	26	N/A	0	N/A	0
15	8/28/2011	0:20	0	-	-	-	25	N/A	0	N/A	0
16	8/28/2011	0:20	0	-	-	-	26	N/A	0	N/A	0
17	8/28/2011	0:20	0	-	-	-	26	N/A	0	N/A	0
18	8/28/2011	0:20	0	-	-	-	27	N/A	0	N/A	0
19	8/28/2011	0:20	0	-	-	-	27	N/A	0	N/A	0
20	8/28/2011	0:20	0	-	-	-	28	N/A	0	N/A	0
1	8/31/2011	0:20	0	-	-	-	19	N/A	0	N/A	0
2	8/31/2011	0:20	0	-	-	-	18	N/A	0	N/A	0
3	8/31/2011	0:20	0	-	-	-	19	N/A	0	N/A	0
4	8/31/2011	0:20	0	-	-	-	18	N/A	0	N/A	0
5	8/31/2011	0:20	0	-	-	-	22	N/A	0	N/A	0
6	8/31/2011	0:20	0	-	-	-	26	N/A	0	N/A	0
7	8/31/2011	0:20	0	-	-	-	27	N/A	0	N/A	0
8	8/31/2011	0:20	0	-	-	-	17	N/A	0	N/A	0
9	8/31/2011	0:20	0	-	-	-	23	N/A	0	N/A	0
10	8/31/2011	0:20	0	-	-	-	21	N/A	0	N/A	0
11	8/31/2011	0:20	0	-	-	-	27	N/A	0	N/A	0
12	8/31/2011	0:20	0	-	-	-	26	N/A	0	N/A	0
13	8/31/2011	0:20	0	-	-	-	28	N/A	0	N/A	0
14	8/31/2011	0:20	0	-	-	-	17	N/A	0	N/A	0
15	8/31/2011	0:20	0	-	-	-	28	N/A	0	N/A	0
16	8/31/2011	0:20	0	-	-	-	21	N/A	0	N/A	0
17	8/31/2011	0:20	0	-	-	-	25	N/A	0	N/A	0
18	8/31/2011	0:20	0	-	-	-	25	N/A	0	N/A	0
19	8/31/2011	0:20	0	-	-	-	25	N/A	0	N/A	0
20	8/31/2011	0:20	0	-	-	-	23	N/A	0	N/A	0
1	9/15/2011	0:20	0	-	-	-	12	N/A	7	north	40
2	9/15/2011	0:20	0	-	-	-	14	N/A	2	north	40

## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
3	9/15/2011	0:20	0	-	-	-	12	N/A	7	north	45
4	9/15/2011	0:20	0	-	-	-	14	N/A	7	north	30
5	9/15/2011	0:20	0	-	-	-	11	N/A	5	N/A	10
6	9/15/2011	0:20	0	-	-	-	24	N/A	0	N/A	10
7	9/15/2011	0:20	0	-	-	-	23	0	2	Northwest	10
8	9/15/2011	0:20	0	-	-	-	18	0	2	West/Northwest	35
9	9/15/2011	0:20	0	-	-	-	11	0	2	Norh/Northwest	10
10	9/15/2011	0:20	0	-	-	-	12	0	2	Northwest	15
11	9/15/2011	0:20	0	-	-	-	24	0	0	N/A	10
12	9/15/2011	0:20	0	-	-	-	23	0	7	Northwest	10
13	9/15/2011	0:20	0	-	-	-	19	0	7	North/Northwest	30
14	9/15/2011	0:20	0	-	-	-	19	0	2	North/Northwest	40
15	9/15/2011	0:20	0	-	-	-	21	0	7	Northwest	20
16	9/15/2011	0:20	0	-	-	-	12	0	2	Northwest	45
17	9/15/2011	0:20	0	-	-	-	22	0	2	Northwest	15
18	9/15/2011	0:20	0	-	-	-	23	0	2	Northwest	10
19	9/15/2011	0:20	0	-	-	-	10	0	2	North	10
20	9/15/2011	0:20	0	-	-	-	10	0	2	North	10
1	9/22/2011	0:20	0	-	-	-	19	0	0	N/A	70
2	9/22/2011	0:20	0	-	-	-	19	0	0	N/A	95
3	9/22/2011	0:20	0	-	-	-	17	0	0	N/A	70
4	9/22/2011	0:20	0	-	-	-	19	0	0	N/A	100
5	9/22/2011	0:20	0	-	-	-	14	0	0	N/A	30
6	9/22/2011	0:20	0	-	-	-	23	0	0	N/A	50
7	9/22/2011	0:20	0	-	-	-	22	0	0	N/A	70
8	9/22/2011	0:20	0	-	-	-	20	0	0	N/A	95
9	9/22/2011	0:20	0	-	-	-	14	0	0	N/A	50
10	9/22/2011	0:20	0	-	-	-	15	0	0	N/A	70

## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
11	9/22/2011	0:20	0	-	-	-	22	0	0	N/A	95
12	9/22/2011	0:20	0	-	-	-	22	0	0	N/A	90
13	9/22/2011	0:20	0	-	-	-	21	0	0	N/A	85
14	9/22/2011	0:20	0	-	-	-	21	0	0	N/A	95
15	9/22/2011	0:20	0	-	-	-	21	0	0	N/A	75
16	9/22/2011	0:20	0	-	-	-	16	0	0	N/A	60
17	9/22/2011	0:20	0	-	-	-	22	0	0	N/A	90
18	9/22/2011	0:20	0	-	-	-	12	0	0	N/A	5
19	9/22/2011	0:20	0	-	-	-	13	0	0	N/A	40
20	9/22/2011	0:20	0	-	-	-	13	0	0	N/A	30
1	10/13/2011	0:20	0	-	-	-	11	0	1 to 3	East	99
2	10/13/2011	0:20	0	-	-	-	10	0	0	N/A	85
3	10/13/2011	0:20	0	-	-	-	17	0	1 to 3	Southeast	75
4	10/13/2011	0:20	0	-	-	-	7	0	0	N/A	90
5	10/13/2011	0:20	0	-	-	-	18	0	1 to 3	South/Southeast	85
6	10/13/2011	0:20	0	-	-	-	17	0	1 to 3	Southeast	70
7	10/13/2011	0:20	0	-	-	-	12	0	0	N/A	90
8	10/13/2011	0:20	0	-	-	-	9	0	0	N/A	85
9	10/13/2011	0:20	0	-	-	-	17	0	0	N/A	80
10	10/13/2011	0:20	0	-	-	-	18	0	0	N/A	85
11	10/13/2011	0:20	0	-	-	-	12	0	1 to 3	Southeast	75
12	10/13/2011	0:20	0	-	-	-	13	0	0	N/A	80
13	10/13/2011	0:20	0	-	-	-	9	0	0	N/A	90
14	10/13/2011	0:20	0	-	-	-	9	0	0	N/A	90
15	10/13/2011	0:20	0	-	-	-	9	0	1 to 3	East	95
16	10/13/2011	0:20	0	-	-	-	17	0	0	N/A	80
17	10/13/2011	0:20	0	-	-	-	12	0	1 to 3	Southeast	80
18	10/13/2011	0:20	0	-	-	-	14	0	0	N/A	80
19	10/13/2011	0:20	0	-	-	-	14	0	1 to 3	South/Southeast	80
20	10/13/2011	0:20	0	-	-	-	15	0	0	N/A	80
1	10/26/2011	0:20	0	-	-	-	17	0	7	Southwest	90
2	10/26/2011	0:20	0	-	-	-	18	0	5	Southwest	80
3	10/26/2011	0:20	0	-	-	-	11	0	2	North	100
4	10/26/2011	0:20	0	-	-	-	21	0	5	Southwest	100
5	10/26/2011	0:20	0	-	-	-	12	0	5	East/Northeast	100
6	10/26/2011	0:20	0	-	-	-	11	0	5	East	100
7	10/26/2011	0:20	0	-	-	-	17	0	2	South/Southwest	95
8	10/26/2011	0:20	0	-	-	-	21	0	5	Southwest	100
9	10/26/2011	0:20	0	-	-	-	11	0	2	Northeast	100
10	10/26/2011	0:20	0	-	-	-	11	0	5	East	100
11	10/26/2011	0:20	0	-	-	-	16	0	0	N/A	90
12	10/26/2011	0:20	0	-	-	-	12	0	2	Southeast	100

## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
13	10/26/2011	0:20	0	-	-	-	12	0	5	East	55
14	10/26/2011	0:20	0	-	-	-	14	0	5	Southwest	45
15	10/26/2011	0:20	0	-	-	-	13	0	5	South	100
16	10/26/2011	0:20	0	-	-	-	11	0	7	North	100
17	10/26/2011	0:20	0	-	-	-	10	0	0	N/A	100
18	10/26/2011	0:20	0	-	-	-	10	0	2	Northeast	100
19	10/26/2011	0:20	0	-	-	-	11	0	5	North	100
20	10/26/2011	0:20	0	-	-	-	10	0	5	Northeast	100
1	11/9/2011	0:20	0	-	-	-	5	0	2	Southeast	55
2	11/9/2011	0:20	0	-	-	-	5	0	2	Southeast	60
3	11/9/2011	0:20	0	-	-	-	6	0	0	N/A	70
4	11/9/2011	0:20	0	-	-	-	5	0	0	N/A	65
5	11/9/2011	0:20	0	-	-	-	6	0	5	South	70
6	11/9/2011	0:20	0	-	-	-	8	0	2	South/Southwest	80
7	11/9/2011	0:20	0	-	-	-	8	0	2	Southwest	85
8	11/9/2011	0:20	0	-	-	-	9	0	2	South/Southwest	90
9	11/9/2011	0:20	0	-	-	-	6	0	0	N/A	60
10	11/9/2011	0:20	0	-	-	-	6	2	0	South	85
11	11/9/2011	0:20	0	-	-	-	9	0	2	Southwest	95
12	11/9/2011	0:20	0	-	-	-	7	0	2	South	75
13	11/9/2011	0:20	0	-	-	-	9	0	2	South/Southwest	95
14	11/9/2011	0:20	0	-	-	-	11	0	5	Southwest	80
15	11/9/2011	0:20	0	-	-	-	10	0	2	Southwest	85
16	11/9/2011	0:20	0	-	-	-	5	0	0	N/A	80
17	11/9/2011	0:20	0	-	-	-	7	0	2	South/Southwest	75
18	11/9/2011	0:20	0	-	-	-	6	0	2	South/Southwest	60
19	11/9/2011	0:20	1	Adult	1 - 25 m	Flapping/Gliding; north out of woodlot and across the field	7	0	2	South/Southwest	45
20	11/9/2011	0:20	0	-	-	-	7	0	0	N/A	50
1	11/27/2011	0:20	0	-	-	-	12	0	0	N/A	0
2	11/27/2011	0:20	0	-	-	-	12	0	1 to 3	South/Southwest	0
3	11/27/2011	0:20	-	-	-	-	12	0	0	N/A	0
4	11/27/2011	0:20	0	-	-	-	13	0	4 to 7	Southwest	0
5	11/27/2011	0:20	0	-	-	-	6	0	3	South	5
6	11/27/2011	0:20	0	-	-	-	12	0	0	N/A	0
7	11/27/2011	0:20	0	-	-	-	13	0	1 to 3	Southwest	0
8	11/27/2011	0:20	0	-	-	-	14	0	0	N/A	0
9	11/27/2011	0:20	0	-	-	-	7	0	0	N/A	5
10	11/27/2011	0:20	0	-	-	-	6	0	1 to 3	South	5
11	11/27/2011	0:20	0	-	-	-	15	0	0	N/A	0
12	11/27/2011	0:20	0	-	-	-	11	0	4 to 7	South/Southeast	0
13	11/27/2011	0:20	0	-	-	-	11	0	4 to 7	South	0



## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
14	11/27/2011	0:20	0	-	-	-	14	0	1 to 3	Southwest	0
15	11/27/2011	0:20	0	-	-	-	10	0	0	N/A	0
16	11/27/2011	0:20	0	-	-	-	12	0	0	N/A	0
17	11/27/2011	0:20	0	-	-	-	9	0	1 to 3	South	0
18	11/27/2011	0:20	0	-	-	-	9	0	0	N/A	0
19	11/27/2011	0:20	0	-	-	-	8	0	0	N/A	0
20	11/27/2011	0:20	0	-	-	-	7	0	0	N/A	0
1	12/15/2011	0:20	0	-	-	-	9	0	5	West/Northwest	25
2	12/15/2011	0:20	0	-	-	-	9	0	0	N/A	25
3	12/15/2011	0:20	0	-	-	-	10	0	0	N/A	20
4	12/15/2011	0:20	0	-	-	-	8	0	0	N/A	30
5	12/15/2011	0:20	0	-	-	-	10	0	0	N/A	10
6	12/15/2011	0:20	0	-	-	-	15	0	0	N/A	0
7	12/15/2011	0:20	0	-	-	-	15	0	0	N/A	0
8	12/15/2011	0:20	0	-	-	-	8	0	<1	West	30
9	12/15/2011	0:20	0	-	-	-	11	0	0	N/A	10
10	12/15/2011	0:20	0	-	-	-	9	0	0	N/A	25
11	12/15/2011	0:20	0	-	-	-	14	0	0	N/A	0
12	12/15/2011	0:20	0	-	-	-	16	0	0	N/A	0
13	12/15/2011	0:20	0	-	-	-	14	0	0	N/A	0
14	12/15/2011	0:20	0	-	-	-	14	0	0	N/A	0
15	12/15/2011	0:20	0	-	-	-	13	0	0	N/A	0
16	12/15/2011	0:20	0	-	-	-	10	0	0	N/A	20
17	12/15/2011	0:20	0	-	-	-	12	0	0	N/A	0
18	12/15/2011	0:20	0	-	-	-	12	0	0	N/A	0
19	12/15/2011	0:20	0	-	-	-	11	0	2	N/A	10
20	12/15/2011	0:20	0	-	-	-	11	0	0	N/A	10
1	1/6/2012	0:20	0	-	-	-	7	0	0	N/A	0
2	1/6/2012	0:20	0	-	-	-	9	0	1 to 3	Southwest	0
3	1/6/2012	0:20	0	-	-	-	9	0	1 to 3	Southeast	0
4	1/6/2012	0:20	0	-	-	-	10	0	1 to 3	South	0
5	1/6/2012	0:20	0	-	-	-	6	0	4 to 7	Southeast	5
6	1/6/2012	0:20	0	-	-	-	9	0	0	N/A	0
7	1/6/2012	0:20	0	-	-	-	8	0	0	N/A	0
8	1/6/2012	0:20	0	-	-	-	10	0	1 to 3	Southwest	0
9	1/6/2012	0:20	0	-	-	-	5	0	0	N/A	5
10	1/6/2012	0:20	0	-	-	-	6	0	4 to 7	Southeast	0
11	1/6/2012	0:20	0	-	-	-	9	0	0	N/A	0
12	1/6/2012	0:20	0	-	-	-	9	0	1 to 3	South	0
13	1/6/2012	0:20	0	-	-	-	9	0	4 to 7	South	0
14	1/6/2012	0:20	0	-	-	-	9	0	1 to 3	Southwest	0
15	1/6/2012	0:20	0	-	-	-	8	0	1 to 3	South	0

## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
16	1/6/2012	0:20	0	-	-	-	7	0	1 to 3	Southeast	0
17	1/6/2012	0:20	0	-	-	-	8	0	1 to 3	Southeast	0
18	1/6/2012	0:20	0	-	-	-	8	0	4 to 7	South/Southeast	0
19	1/6/2012	0:20	0	-	-	-	5	0	1 to 3	Souh/Southeast	10
20	1/6/2012	0:20	0	-	-	-	4	0	4 to 7	South/Southeast	5
1	1/18/2012	0:20	0	-	-	-	-4	0	4 to 7	North	95
2	1/18/2012	0:20	0	-	-	-	-7	0	8 to 12	North	95
3	1/18/2012	0:20	0	-	-	-	-3	0	1 to 3	North	95
4	1/18/2012	0:20	0	-	-	-	-6	0	8 to 12	North	95
5	1/18/2012	0:20	0	-	-	-	-3	0	1 to 3	North	95
6	1/18/2012	0:20	0	-	-	-	-2	0	1 to 3	North/Northeast	95
7	1/18/2012	0:20	0	-	-	-	-4	0	1 to 3	North	95
8	1/18/2012	0:20	0	-	-	-	-5	0	4 to 7	North	95
9	1/18/2012	0:20	0	-	-	-	-2	0	1 to 3	North	95
10	1/18/2012	0:20	0	-	-	-	-3	0	4 to 7	North	95

## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
11	1/18/2012	0:20	0	-	-	-	-4	0	4 to 7	North	95
12	1/18/2012	0:20	0	-	-	-	-2	0	4 to 7	North	95
13	1/18/2012	0:20	0	-	-	-	1	0	8 to 12	North/Northeast	95
14	1/18/2012	0:20	0	-	-	-	-4	0	8 to 12	North	95
15	1/18/2012	0:20	0	-	-	-	1	0	8 to 12	North/Northeast	95
16	1/18/2012	0:20	0	-	-	-	-3	0	4 to 7	North	95
17	1/18/2012	0:20	0	-	-	-	0	0	4 to 7	North	95
18	1/18/2012	0:20	0	-	-	-	-1	0	4 to 7	North/Northeast	95
19	1/18/2012	0:20	0	-	-	-	-2	0	4 to 7	North	95
20	1/18/2012	0:20	0	-	-	-	-1	0	4 to 7	North/Northeast	95
1	2/1/2012	0:20	0	-	-	-	4	0	0	N/A	35
2	2/1/2012	0:20	0	-	-	-	5	0	0	N/A	30
3	2/1/2012	0:20	0	-	-	-	4	0	0	N/A	40
4	2/1/2012	0:20	0	-	-	-	4	0	0	N/A	30
5	2/1/2012	0:20	0	-	-	-	3	0	0	N/A	85
6	2/1/2012	0:20	0	-	-	-	3	0	0	N/A	45
7	2/1/2012	0:20	0	-	-	-	5	0	0	N/A	35
8	2/1/2012	0:20	0	-	-	-	4	0	0	N/A	25
9	2/1/2012	0:20	0	-	-	-	3	0	0	N/A	95
10	2/1/2012	0:20	0	-	-	-	4	0	0	N/A	50
11	2/1/2012	0:20	0	-	-	-	4	0	0	N/A	40
12	2/1/2012	0:20	0	-	-	-	3	0	0	N/A	50
13	2/1/2012	0:20	0	-	-	-	1	0	4 to 7	West	95
14	2/1/2012	0:20	0	-	-	-	2	0	4 to 7	West	90
15	2/1/2012	0:20	0	-	-	-	2	0	0	N/A	90
16	2/1/2012	0:20	0	-	-	-	3	0	0	N/A	45
17	2/1/2012	0:20	0	-	-	-	3	0	0	N/A	95
18	2/1/2012	0:20	0	-	-	-	3	0	5	West	85
19	2/1/2012	0:20	0	-	-	-	3	0	0	N/A	90
20	2/1/2012	0:20	0	-	-	-	3	0	0	N/A	95
1	2/15/2012	0:20	0	-	-	-	4	0	0	N/A	100
2	2/15/2012	0:20	0	-	-	-	4	0	0	N/A	100
3	2/15/2012	0:20	0	-	-	-	4	0	0	N/A	100
4	2/15/2012	0:20	0	-	-	-	4	0	1 to 3	West	100
5	2/15/2012	0:20	0	-	-	-	5	0	0	N/A	50
6	2/15/2012	0:20	0	-	-	-	5	0	0	N/A	40
7	2/15/2012	0:20	0	-	-	-	4	0	0	N/A	100
8	2/15/2012	0:20	0	-	-	-	3	0	0	N/A	100
9	2/15/2012	0:20	0	-	-	-	6	0	0	N/A	50
10	2/15/2012	0:20	0	-	-	-	5	0	0	N/A	60
11	2/15/2012	0:20	0	-	-	-	3	0	0	N/A	100
12	2/15/2012	0:20	0	-	-	-	6	0	0	N/A	45

## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
13	2/15/2012	0:20	0	-	-	-	2	0	0	N/A	100
14	2/15/2012	0:20	0	-	-	-	3	0	0	N/A	100
15	2/15/2012	0:20	0	-	-	-	2	0	0	N/A	100
16	2/15/2012	0:20	0	-	-	-	4	0	0	N/A	100
17	2/15/2012	0:20	0	-	-	-	2	0	0	N/A	100
18	2/15/2012	0:20	0	-	-	-	4	Light Mist	0	N/A	100
19	2/15/2012	0:20	0	-	-	-	3	Light Mist	0	N/A	100
20	2/15/2012	0:20	0	-	-	-	4	Light Mist	0	N/A	100
1	3/2/2012	0:20	0	-	-	-	5	0	0	N/A	85
2	3/2/2012	0:20	0	-	-	-	6	0	0	N/A	70
3	3/2/2012	0:20	0	-	-	-	4	Light Drizzle	1 to 3	West	100
4	3/2/2012	0:20	0	-	-	-	6	0	0	N/A	50
5	3/2/2012	0:20	0	-	-	-	3	0	0	N/A	100
6	3/2/2012	0:20	0	-	-	-	6	0	1 to 3	West	100
7	3/2/2012	0:20	0	-	-	-	5	Light Rain	1 to 3	West/Northwest	100
8	3/2/2012	0:20	0	-	-	-	4	0	0	N/A	90
9	3/2/2012	0:20	0	-	-	-	2	0	0	N/A	100
10	3/2/2012	0:20	0	-	-	-	3	0	0	N/A	100
11	3/2/2012	0:20	0	-	-	-	5	Light Rain	4 to 7	West/Northwest	100
12	3/2/2012	0:20	0	-	-	-	1	0	0	N/A	100
13	3/2/2012	0:20	0	-	-	-	5	0	0	N/A	0
14	3/2/2012	0:20	0	-	-	-	6	0	0	N/a	20
15	3/2/2012	0:20	0	-	-	-	5	0	0	N/A	0
16	3/2/2012	0:20	0	-	-	-	4	Light Drizzle	0	N/A	100
17	3/2/2012	0:20	0	-	-	-	1	0	1 to 3	Northwest	95
18	3/2/2012	0:20	0	-	-	-	1	0	1 to 3	Northwest	100
19	3/2/2012	0:20	0	-	-	-	1	0	2	Northwest	95
20	3/2/2012	0:20	0	-	-	-	0	0	2	Northwest	95

## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
1	3/13/2012	0:20	0	-	-	-	13	0	<1	South/Southwest	0
2	3/13/2012	0:20	0	-	-	-	13	0	1 to 3	South/Southwest	0
3	3/13/2012	0:20	0	-	-	-	13	0	4 to 7	South/Southwest	0
4	3/13/2012	0:20	0	-	-	-	13	0	1 to 3	South/Southwest	0
5	3/13/2012	0:20	0	-	-	-	11	0	0	N/A	0
6	3/13/2012	0:20	0	-	-	-	7	0	1 to 3	South/Southwest	0
7	3/13/2012	0:20	0	-	-	-	6	0	4 to 7	South/Southwest	0
8	3/13/2012	0:20	0	-	-	-	14	0	0	N/A	0
9	3/13/2012	0:20	0	-	-	-	10	0	0	N/A	0
10	3/13/2012	0:20	0	-	-	-	13	0	1 to 3	South	0
11	3/13/2012	0:20	0	-	-	-	5	0	1 to 3	Southwest	0
12	3/13/2012	0:20	0	-	-	-	7	0	0	N/A	0
13	3/13/2012	0:20	0	-	-	-	6	0	4 to 7	South/Southwest	0
14	3/13/2012	0:20	0	-	-	-	13	0	1 to 3	South/Southwest	0
15	3/13/2012	0:20	0	-	-	-	6	0	4 to 7	South/Southwest	0
16	3/13/2012	0:20	0	-	-	-	12	0	1 to 3	South/Southwest	0
17	3/13/2012	0:20	0	-	-	-	8	0	0	N/A	0
18	3/13/2012	0:20	0	-	-	-	8	0	0	N/A	0
19	3/13/2012	0:20	6	Adult	1 - 50 m	Flapping/Gliding	8	0	0	N/A	0
20	3/13/2012	0:20	0	-	-	-	9	0	0	N/A	0
1	4/3/2012	0:20	0	-	-	-	7	Rain	0	N/A	100
2	4/3/2012	0:20	0	-	-	-	7	Light Drizzle	1 to 3	Northwest	100
3	4/3/2012	0:20	0	-	-	-	8	0	0	N/A	80
4	4/3/2012	0:20	0	-	-	-	6	Light Drizzle	1 to 3	North	100
5	4/3/2012	0:20	0	-	-	-	10	0	1 to 3	Northwest	60
6	4/3/2012	0:20	0	-	-	-	7	0	1 to 3	Northeast	80
7	4/3/2012	0:20	0	-	-	-	7	0	1 to 3	Northeast	85
8	4/3/2012	0:20	0	-	-	-	7	izzle/ Thunder/	1 to 3	North	100
9	4/3/2012	0:20	0	-	-	-	10	0	0	N/A	50
10	4/3/2012	0:20	0	-	-	-	9	0	1 to 3	Northwest	50
11	4/3/2012	0:20	0	-	-	-	7	0	1 to 3	Northeast	90
12	4/3/2012	0:20	0	-	-	-	7	0	1 to 3	Northeast	80
13	4/3/2012	0:20	0	-	-	-	7	0	1 to 3	Northeast	90
14	4/3/2012	0:20	0	-	-	-	7	0	1 to 3	Northeast	100
15	4/3/2012	0:20	0	-	-	-	7	0	0	N/A	100
16	4/3/2012	0:20	0	-	-	-	8	0	1 to 3	Northwest	75
17	4/3/2012	0:20	0	-	-	-	11	0	0	N/A	40
18	4/3/2012	0:20	0	-	-	-	11	0	0	N/A	45
19	4/3/2012	0:20	0	-	-	-	11	0	0	N/A	50
20	4/3/2012	0:20	0	-	-	-	10	0	1 to 3	Northwest	50
TR80Pond	4/3/2012	0:20	0	-	-	-	7	0	1 to 3	Northeast	100
1	4/18/2012	0:20	0	-	-	-	14	0	1 to 3	Southwest	0

## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
2	4/18/2012	0:20	0	-	-	-	14	0	0	N/A	0
3	4/18/2012	0:20	0	-	-	-	13	0	1 to 3	Southwest	0
4	4/18/2012	0:20	0	-	-	-	15	0	0	N/A	0
5	4/18/2012	0:20	0	-	-	-	12	0	4 to 7	Southwest	0
6	4/18/2012	0:20	0	-	-	-	4	0	4 to 7	Southwest	0
7	4/18/2012	0:20	0	-	-	-	4	0	4 to 7	Southwest	0
8	4/18/2012	0:20	0	-	-	-	16	0	0	N/A	0
9	4/18/2012	0:20	0	-	-	-	12	0	4 to 7	Southwest	0
10	4/18/2012	0:20	0	-	-	-	12	0	0	N/A	0
11	4/18/2012	0:20	0	-	-	-	5	0	4 to 7	Southwest	0
12	4/18/2012	0:20	0	-	-	-	12	0	4 to 7	Southwest	0
13	4/18/2012	0:20	0	-	-	-	6	0	4 to 7	Southwest	0
14	4/18/2012	0:20	0	-	-	-	7	0	4 to 7	Southwest	0
15	4/18/2012	0:20	0	-	-	-	8	0	1 to 3	Southwest	0
16	4/18/2012	0:20	0	-	-	-	13	0	1 to 3	Southwest	0
17	4/18/2012	0:20	0	-	-	-	8	0	1 to 3	Southwest	0
18	4/18/2012	0:20	0	-	-	-	9	0	4 to 7	Southwest	0
19	4/18/2012	0:20	0	-	-	-	11	0	0	N/A	0
20	4/18/2012	0:20	0	-	-	-	11	0	1 to 3	Southwest	0
1	5/3/2012	0:20	0	-	-	-	21	0	8 to 12	West/Southwest	20
2	5/3/2012	0:20	0	-	-	-	20	0	1 to 3	South/Southwest	15
3	5/3/2012	0:20	0	-	-	-	22	0	1 to 3	South/Southwest	20
4	5/3/2012	0:20	0	-	-	-	19	0	1 to 3	South/Southwest	10
5	5/3/2012	0:20	0	-	-	-	25	0	4 to 7	South/Southwest	40
6	5/3/2012	0:20	0	-	-	-	25	0	4 to 7	West/Southwest	45
7	5/3/2012	0:20	0	-	-	-	28	0	1 to 3	South/Southwest	50
8	5/3/2012	0:20	0	-	-	-	19	0	4 to 7	South	10
9	5/3/2012	0:20	0	-	-	-	26	0	1 to 3	South/Southwest	45
10	5/3/2012	0:20	0	-	-	-	24	0	1 to 3	Southwest	40

BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
11	5/3/2012	0:20	0	-	-	-	28	0	1 to 3	South/Southwest	0
12	5/3/2012	0:20	0	-	-	-	29	0	1 to 3	Southwest	45
13	5/3/2012	0:20	0	-	-	-	18	0	1 to 3	South/Southwest	5
14	5/3/2012	0:20	0	-	-	-	18	0	4 to 7	South/Southwest	5
15	5/3/2012	0:20	0	-	-	-	17	0	1 to 3	South/Southwest	5
16	5/3/2012	0:20	0	-	-	-	24	0	1 to 3	Southwest	40
17	5/3/2012	0:20	0	-	-	-	29	0	1 to 3	South/Southwest	40
18	5/3/2012	0:20	0	-	-	-	28	0	4 to 7	South/Southwest	50
19	5/3/2012	0:20	0	-	-	-	26	0	1 to 3	Southwest	50
20	5/3/2012	0:20	0	-	-	-	26	0	1 to 3	Southwest	45
1	5/17/2012	0:20	0	-	-	-	18	0	0	N/A	0
2	5/17/2012	0:20	0	-	-	-	20	0	0	N/A	0
3	5/17/2012	0:20	0	-	-	-	16	0	1 to 3	East	0
4	5/17/2012	0:20	0	-	-	-	21	0	1 to 3	East/Southeast	0
5	5/17/2012	0:20	0	-	-	-	11	0	1 to 3	East	0
6	5/17/2012	0:20	0	-	-	-	23	0	0	N/A	0
7	5/17/2012	0:20	0	-	-	-	23	0	1 to 3	East	0
8	5/17/2012	0:20	0	-	-	-	22	0	0	N/A	0
9	5/17/2012	0:20	0	-	-	-	11	0	1 to 3	East	0
10	5/17/2012	0:20	0	-	-	-	12	0	0	N/A	0
11	5/17/2012	0:20	0	-	-	-	24	0	1 to 3	East/Southeast	0
12	5/17/2012	0:20	0	-	-	-	24	0	0	N/A	0
13	5/17/2012	0:20	0	-	-	-	24	0	1 to 3	East/Southeast	0
14	5/17/2012	0:20	0	-	-	-	22	0	0	N/A	0
15	5/17/2012	0:20	0	-	-	-	22	0	0	N/A	0
16	5/17/2012	0:20	0	-	-	-	14	0	0	N/A	0
17	5/17/2012	0:20	0	-	-	-	7	0	1 to 3	East/Northeast	0
18	5/17/2012	0:20	0	-	-	-	7	0	1 to 3	East/Northeast	0
19	5/17/2012	0:20	0	-	-	-	9	0	0	N/A	0
20	5/17/2012	0:20	0	-	-	-	8	0	0	N/A	0
1	6/10/2012	0:20	0	-	-	-	28	0	< 1	South	0
2	6/10/2012	0:20	0	-	-	-	28	0	< 1	South	0
3	6/10/2012	0:20	0	-	-	-	29	0	<1	South	0
4	6/10/2012	0:20	0	-	-	-	27	0	< 1	South	0
5	6/10/2012	0:20	0	-	-	-	30	0	0	N/A	0
6	6/10/2012	0:20	0	-	-	-	33	0	< 1	South	0
7	6/10/2012	0:20	0	-	-	-	22	0	< 1	South	0
8	6/10/2012	0:20	0	-	-	-	26	0	< 1	South	0
9	6/10/2012	0:20	0	-	-	-	31	0	0	N/A	0
10	6/10/2012	0:20	0	-	-	-	30	0	0	N/A	0
11	6/10/2012	0:20	0	-	-	-	22	0	< 1	South	0
12	6/10/2012	0:20	0	-	-	-	33	0	< 1	South	0

## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
13	6/10/2012	0:20	0	-	-	-	23	0	< 1	South	0
14	6/10/2012	0:20	0	-	-	-	26	0	< 1	South	0
15	6/10/2012	0:20	0	-	-	-	24	0	< 1	South	0
16	6/10/2012	0:20	0	-	-	-	30	0	< 1	South	0
17	6/10/2012	0:20	0	-	-	-	33	0	< 1	South	10
18	6/10/2012	0:20	0	-	-	-	32	0	< 1	South	0
19	6/10/2012	0:20	0	-	-	-	31	0	< 1	South	0
20	6/10/2012	0:20	0	-	-	-	31	0	0	N/A	0
1	6/25/2012	0:20	0	-	-	-	21	0	0	N/A	0
2	6/25/2012	0:20	0	-	-	-	22	0	< 1	Northwest	5
3	6/25/2012	0:20	0	-	-	-	17	0	4 to 7	Northwest	0
4	6/25/2012	0:20	0	-	-	-	23	0	< 1	West/Northwest	5
5	6/25/2012	0:20	0	-	-	-	15	0	1 to 3	Northwest	0
6	6/25/2012	0:20	0	-	-	-	18	0	4 to 7	Northwest	5
7	6/25/2012	0:20	0	-	-	-	20	0	0	N/A	0
8	6/25/2012	0:20	0	-	-	-	23	0	1 to 3	Northwest	0
9	6/25/2012	0:20	0	-	-	-	14	0	1 to 3	Northwest	0
10	6/25/2012	0:20	0	-	-	-	15	0	< 1	North/Northwest	0
11	6/25/2012	0:20	0	-	-	-	19	0	0	N/A	0
12	6/25/2012	0:20	0	-	-	-	18	0	1 to 3	Northwest	10
13	6/25/2012	0:20	0	-	-	-	20	0	< 1	West/Northwest	15
14	6/25/2012	0:20	0	-	-	-	24	0	1 to 3	North/Northwest	0
15	6/25/2012	0:20	0	-	-	-	19	0	< 1	West/Northwest	15
16	6/25/2012	0:20	0	-	-	-	16	0	1 to 3	Northwest	0
17	6/25/2012	0:20	0	-	-	-	19	0	1 to 3	Northwest	5
18	6/25/2012	0:20	0	-	-	-	19	0	1 to 3	North/Northwest	10
19	6/25/2012	0:20	0	-	-	-	12	0	1 to 3	North/Northwest	0
20	6/25/2012	0:20	0	-	-	-	11	0	< 1	West/Northwest	0



## BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
1	7/6/2012	0:20	0	-	-	-	33	0	< 1	West	0
2	7/6/2012	0:20	0	-	-	-	31	0	0	N/A	0
3	7/6/2012	0:20	0	-	-	-	24	0	0	N/A	0
4	7/6/2012	0:20	0	-	-	-	30	0	0	N/A	0
5	7/6/2012	0:20	0	-	-	-	25	0	0	N/A	0
6	7/6/2012	0:20	0	-	-	-	22	0	0	N/A	0
7	7/6/2012	0:20	0	-	-	-	33	0	0	N/A	0
8	7/6/2012	0:20	0	-	-	-	29	0	0	N/A	0
9	7/6/2012	0:20	0	-	-	-	25	0	< 1	West	0
10	7/6/2012	0:20	0	-	-	-	24	0	0	N/A	0
11	7/6/2012	0:20	0	-	-	-	34	0	0	N/A	0
12	7/6/2012	0:20	0	-	-	-	21	0	< 1	West	0
13	7/6/2012	0:20	0	-	-	-	28	0	0	N/A	0
14	7/6/2012	0:20	0	-	-	-					
15	7/6/2012	0:20	0	-	-	-	27	0	0	N/A	0
16	7/6/2012	0:20	0	-	-	-	24	0	0	N/A	0
17	7/6/2012	0:20	0	-	-	-	27	0	< 1	West	0
18	7/6/2012	0:20	0	-	-	-	26	0	0	N/A	0
19	7/6/2012	0:20	0	-	-	-	25	0	0	N/A	0
20	7/6/2012	0:20	0	-	-	-	26	0	0	N/A	0
1	7/27/2012	0:20	0	-	-	-	28	0	3 to 5	West	20
2	7/27/2012	0:20	0	-	-	-	25	0	1 to 3	West/Northwest	0
3	7/27/2012	0:20	0	-	-	-	28	0	< 1	N/A	20
4	7/27/2012	0:20	0	-	-	-	25	0	1 to 3	West/Northwest	0
5	7/27/2012	0:20	0	-	-	-	31	0	1 to 3	West/Northwest	60
6	7/27/2012	0:20	0	-	-	-	30	0	< 1	N/A	30
7	7/27/2012	0:20	0	-	-	-	28	0	1 to 3	West	20
8	7/27/2012	0:20	0	-	-	-	25	0	< 1	N/A	0
9	7/27/2012	0:20	0	-	-	-	31	0	1 to 3	West	60
10	7/27/2012	0:20	0	-	-	-	31	0	1 to 3	West/Northwest	60
11	7/27/2012	0:20	0	-	-	-	28	0	< 1	N/A	15
12	7/27/2012	0:20	0	-	-	-	30	0	< 1	N/A	30
13	7/27/2012	0:20	0	-	-	-	27	0	< 1	N/A	15
14	7/27/2012	0:20	0	-	-	-	27	0	< 1	N/A	0
15	7/27/2012	0:20	0	-	-	-	27	0	1 to 3	West	0
16	7/27/2012	0:20	0	-	-	-	29	0	1 to 3	West	20
17	7/27/2012	0:20	0	-	-	-	30	0	1 to 3	West	30
18	7/27/2012	0:20	0	-	-	-	30	0	1 to 3	West	40
19	7/27/2012	0:20	0	-	-	-	31	0	< 1	N/A	60
20	7/27/2012	0:20	0	-	-	-	31	0	<1	N/A	60
	Total:	6:09:40	days/hours/minutes								

BAEA Point Count Data

Point Count Location	Survey Date	Time Duration	Minutes of Exposure	Age	Height	Behavior	Temp (Celsius)	Precipitation	Wind		Cloud Cover (%)
									Speed (mph)	Direction	
	Total:	9220	minutes								

**Raptor Nest Surveys for the  
Emerson West Wind Project  
Seneca County, Ohio**

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**Report  
Spring 2016**

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**Prepared by:**

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**June 30, 2016**



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## **INTRODUCTION**

Emerson West, LLC, an affiliate of Apex Clean Energy, Inc. (Apex), is developing the Emerson West Wind Project (Project) in Seneca County, Ohio. Western Ecosystems Technology, Inc. (WEST) conducted raptor nest surveys in and near the Project (Figure 1). The purpose of the survey was to identify raptor nests of stick nesting species within the Project area and one-mile (1.6 kilometer) buffer. Known bald eagle (*Haliaeetus leucocephalus*) nests within 4 miles of the project were also visited to confirm presence and annual status of known nest locations.

## **PROJECT AREA DESCRIPTION**

The Project area is located in Seneca County, Ohio and is characterized by flat to gently rolling topography dominated by cultivated crops (Figure 1). The Project is located within the Huron/ Erie Lake Plain level III ecoregion, which is a broad, flat, fertile plain with some relic sand dunes, beach ridges and end moraines. Today, most of the forests have been cleared and the swamps artificially drained to make way for highly productive farms producing corn (*Zea mays*), soybean (*Glycine max*), livestock, and urban and industrialized areas (EPA 2016).

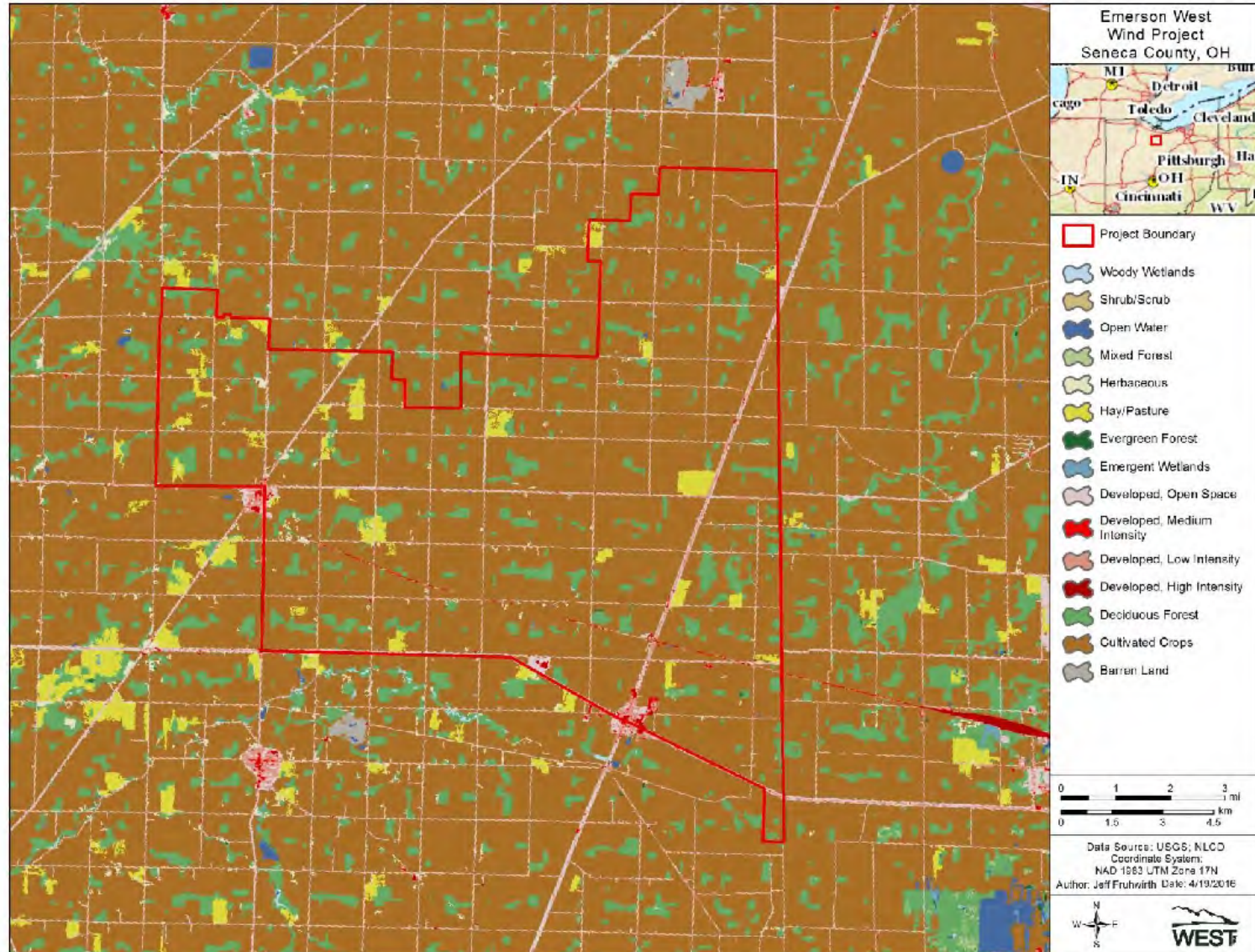


Figure 1. A land cover and land use map of the Emerson West Wind Project (Homer et al. 2015).

## METHODS

The surveys were conducted between March 25 and April 13, 2016 and included two components: 1) a survey for raptor and eagle nests within one mile (mi; 1.6 kilometers [km]) of the proposed Project, and 2) assessment of four known eagle nest locations within 4 miles of the Project.

Surveys were completed prior to leaf-out and entailed driving along public roads while looking for raptor nest structures within areas of suitable habitat, such as riparian forested areas, shelterbelts, woodlots, and artificial nest structures. One of the eagle nests identified by USFWS (Nest E-39) had low visibility from public roads and was searched from the ground after obtaining landowner permission (Table 1).

Raptor nest structures were defined as stick nest structures large enough to accommodate *Buteo*-sized raptors or larger. Other species that nest on the ground (i.e., northern harrier [*Circus cyaneus*]) or species that nest in cavities (e.g., American kestrel [*Falco sparverius*]) were recorded if observed, but were not the focus of surveys. Areas with potentially suitable habitat were viewed with binoculars and spotting scopes, and searched for potential raptor nest structures. Nest locations were mapped on recent aerial photographs and digitized into ArcGIS; therefore, locations are estimated to be accurate to within 30 meters (m; 98 feet [ft]) of the coordinate.

Known eagle nest locations were compiled from past correspondence between Apex the U.S. Fish and Wildlife Service (USFWS) and the Ohio Department of Natural Resources (ODNR) regarding eagle nest locations for nearby APEX wind-energy Projects. Bald eagle nest locations in past correspondence were provided as general locations on coarse scale maps. WEST digitized approximate locations from previous correspondence into GIS. WEST biologists searched all suitable habitat for bald eagles within 0.5 mile (800 m) of approximate nest locations to determine current nest status.

Data recorded for each nest site included species, nest status (active or inactive), number of adults and young present, behavior of adults at the nest, nest condition (poor, fair, good), observation location (Universal Transverse Mercator [UTM] coordinates), and nest substrate details. The greatest possible distance at which the species could be identified was maintained, with distances varying depending upon nest location and wind conditions, in order to minimize disturbance to nesting raptors.

## RESULTS

### *Eagles*

Four active and no inactive eagle nests were recorded within 4 miles of the Project. Three of these nests were new or previously undocumented. Of the four known nest locations, one (38) was confirmed active and three (39, 40, 41) were not located despite extensive searching in each location and are presumed gone (Figure 2).

*Other Raptors*

Fourteen active red-tailed hawk (*Buteo jamaicensis*) nests and 21 inactive non-eagle raptor nests were observed within the Project area and 1-mile buffer (Figure 3; Table 2). The inactive raptor nests were most likely constructed by red-tailed hawks, based on the abundance of this species in the Project area and 1-mi buffer, the size of the nests, and the habitat surrounding each nest; however, the nests could also be used by other raptor species common to the region, such as Cooper's hawk (*Accipiter cooperii*) or great horned owl (*Bubo virginianus*).



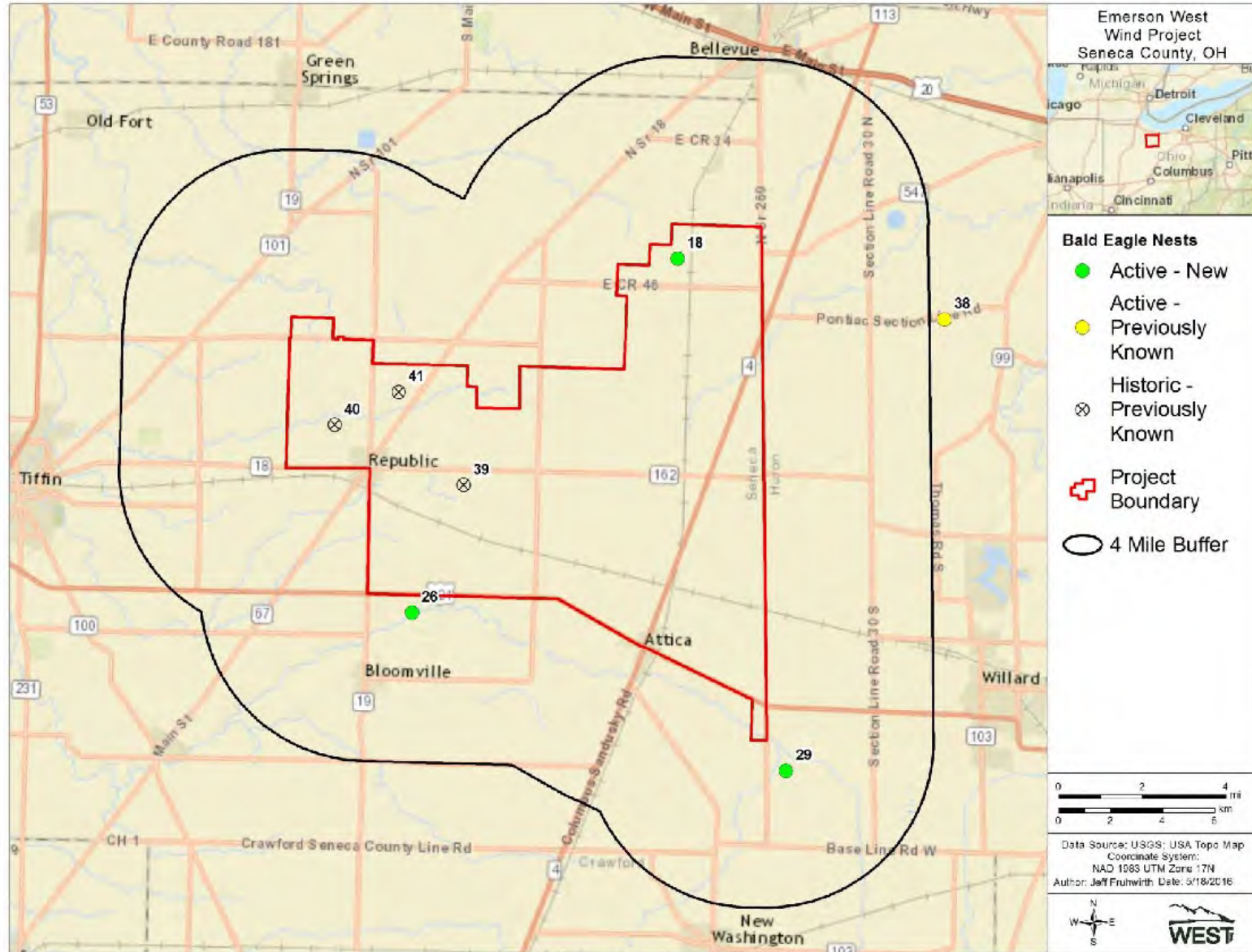


Figure 2. A map depicting the location of bald eagle nests found within 4 miles of the Emerson West Wind Project.



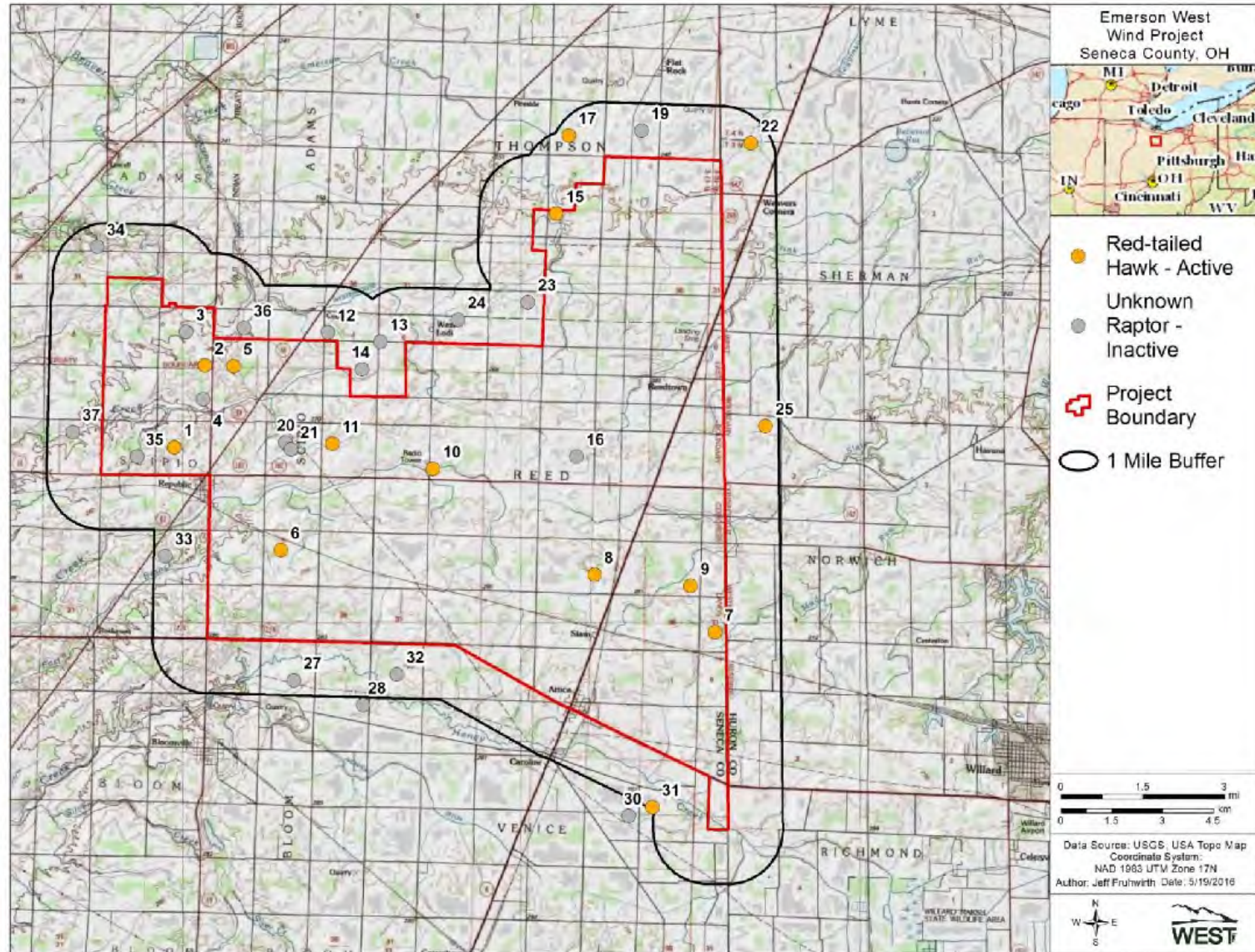


Figure 3. A map depicting the location of non-eagle raptor nests found within 1 mile of the Emerson West Wind Project.

**Table 1. Eagle nest records and nest status within four miles (6.4 kilometers) of the Emerson West Wind Project from March 25-26, March 28-29 and April 13, 2016.**

Nest ID #	Species	Nest Status	Nest condition	Nest Substrate	Substrate Height (m)	Nest Height (m)	UTM <sup>1</sup> Easting	UTM <sup>1</sup> Northing
18	Bald Eagle	Active	Good	Tree	14	12	342791	4562675
26	Bald eagle	Active	Good	Tree	21	18	332452	4549001
29	Bald Eagle	Active	Good	Tree	24	21	346859	4542908
38*	Bald Eagle	Active	Good	Tree	14	12	352967	4560292
39*	Bald Eagle	Not located	-	-	-	-	334433	4553912
40*	Bald Eagle	Not located	-	-	-	-	329468	4556229
41*	Bald Eagle	Not located	-	-	-	-	331939	4557500

<sup>1</sup> NAD 83 Zone 17

\*Previously known nests provided from USFWS or ODNR

**Table 2. Other raptor nests found within one mile (1.6 kilometers) of the Emerson West Wind Project from March 25-26 and 28-29, 2016.**

Nest ID #	Species	Nest Status	Nest condition	Nest Substrate	Substrate Height (m)	Nest Height (m)	UTM <sup>1</sup> Easting	UTM <sup>1</sup> Northing
1	Red-tailed hawk	Active	Good	Tree	16	13	329759	4555376
2	Red-tailed hawk	Active	Good	Tree	17	14	330659	4557801
3	Unknown raptor	Inactive	Good	Tree	17	15	330109	4558790
4	Unknown raptor	Inactive	Good	Tree	17	14	330613	4556792
5	Red-tailed hawk	Active	Good	Tree	16	14	331512	4557768
6	Red-tailed hawk	Active	Good	Tree	18	17	332905	4552335
7	Red-tailed hawk	Active	Good	Tree	18	15	345724	4549917
8	Red-tailed hawk	Active	Good	Tree	16	15	342167	4551611
9	Red-tailed hawk	Active	Good	Tree	16	15	345003	4551278
10	Red-tailed hawk	Active	Good	Tree	14	12	337398	4554733
11	Red-tailed hawk	Active	Good	Tree	17	13	334438	4555487
12	Unknown raptor	Inactive	Good	Tree	14	13	334295	4558781
13	Unknown raptor	Inactive	Good	Tree	16	13	335838	4558494
14	Unknown raptor	Inactive	Good	Tree	16	13	335295	4557681
15	Red-tailed hawk	Active	Good	Tree	17	13	341038	4562279
16	Unknown raptor	Inactive	Good	Tree	15	13	341636	4555099
17	Red-tailed hawk	Active	Good	Tree	17	13	341407	4564593
19	Unknown raptor	Inactive	Good	Tree	17	14	343553	4564728
20	Unknown raptor	Inactive	Good	Tree	16	14	333034	4555521
21	Unknown raptor	Inactive	Good	Tree	16	15	333203	4555315
22	Red-tailed hawk	Active	Good	Tree	17	15	346783	4564361

**Table 2. Other raptor nests found within one mile (1.6 kilometers) of the Emerson West Wind Project from March 25-26 and 28-29, 2016.**

<b>Nest ID #</b>	<b>Species</b>	<b>Nest Status</b>	<b>Nest condition</b>	<b>Nest Substrate</b>	<b>Substrate Height (m)</b>	<b>Nest Height (m)</b>	<b>UTM<sup>1</sup> Easting</b>	<b>UTM<sup>1</sup> Northing</b>
23	Unknown raptor	Inactive	Good	Tree	16	15	340206	4559669
24	Unknown raptor	Inactive	Good	Tree	16	10	338140	4559143
25	Red-tailed hawk	Active	Good	Tree	15	13	347217	4556003
27	Unknown raptor	Inactive	Good	Tree	24	21	333285	4548488
28	Unknown raptor	Inactive	Good	Tree	20	15	335331	4547760
30	Unknown raptor	Inactive	Good	Tree	21	20	343166	4544490
31	Red-tailed hawk	Active	Good	Tree	23	17	343870	4544740
32	Unknown raptor	Inactive	Good	Tree	21	20	336321	4548669
33	Unknown raptor	Inactive	Good	Tree	24	23	329494	4552159
34	Unknown raptor	Inactive	Good	Tree	21	19	327485	4561306
35	Unknown raptor	Inactive	Good	Tree	21	18	328673	4555100
36	Unknown raptor	Inactive	Good	Tree	18	15	331819	4558899
37	Unknown raptor	Inactive	Good	Tree	18	15	326759	4555826

<sup>1</sup> NAD 83 Zone 17

## **CONCLUSION**

The majority of nests found in the project area were red-tailed hawk nests or similar sized nests that were likely used by red-tailed hawks or other common species found in the region such as Cooper's hawk or great horned owls. In addition, four active bald eagle nests were identified within 4 miles of the project area, including one nest within the Project boundary. Three other previously known bald eagle nests that were reported by USFWS or ODNr were not located after extensive searches and are presumed to no longer be there.

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# **Eagle Nest Monitoring Surveys for the Emerson West Wind Project in Seneca County, Ohio**

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## **Final Report**



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**January 25, 2017**



## EXECUTIVE SUMMARY

In June 2016, Western EcoSystems Technology, Inc. conducted eagle nest monitoring surveys for the proposed Emerson West Wind Project (Project) located in Seneca County, Ohio. Surveys were conducted at three known bald eagle (*Haliaeetus leucocephalus*) nests within two miles of the Project in accordance with the Ohio Department of Natural Resources *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio* (ODNR 2009). The objective of the surveys was to gain more information about how the bald eagles approach and leave the nest location and how they utilize the area in or near the Project.

Eagle nest monitoring consisted of point count surveys conducted at six survey points per nest, totaling 18 fixed-point locations. Nests 1 and 2 were monitored between June 1 and June 29, 2016, and nest 3 was monitored between June 6 and June 30, 2016, for a total of 84 point-count surveys (126 survey hours). Thirty-seven bald eagle observations were recorded during the surveys.

Nest 2, located within the Project boundary, is thought to have been unsuccessful and abandoned due to the lack of eagle activity observed. Nests 1 and 3, which are both located south of the Project boundary, had the highest eagle activity. Most eagles recorded at these nests were observed flying toward the north toward the Project boundary, but only five out of 23 flying bald eagle observations were observed crossing into the Project. Use by nesting bald eagles is expected to occur near these nests and within the Project if these nests continue to remain active.

## **STUDY PARTICIPANTS**

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## INTRODUCTION

Western EcoSystems Technology, Inc. (WEST) conducted eagle nest monitoring surveys for the proposed Emerson West Wind Project (Project) located in Seneca County, Ohio, during 2016. The eagle nest monitoring surveys were conducted at three bald eagle (*Haliaeetus leucocephalus*) nests in the Project and 2-mile (mi; 3 kilometer [km]) buffer. Surveys were conducted in accordance with Ohio Department of Natural Resources (ODNR) *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio* (ODNR 2009). The objective of the surveys was to gain more information about how bald eagles approach and leave the nest locations and how they utilize the area within two miles (3.2 km) of the nest locations.

## PROJECT AREA

The Project is located in Seneca County, Ohio, and is characterized by flat to gently rolling topography dominated by cultivated crops (Figure 1). The Project is located within the Huron/Erie Lake Plain ecoregion, which is a broad, flat, fertile plain with some relic sand dunes, beach ridges and end moraines. Today, most of the forests have been cleared and the swamps artificially drained to make way for highly productive farms which produce corn (*Zea mays*), soybean (*Glycine max*), and livestock; and developed areas (US Environmental Protection Agency [USEPA] 2013).

Approximately 81.3% of the nearly 48,110-acre (ac; 198-square kilometer (km<sup>2</sup>)) Project is composed of cultivated cropland (Table 1). The next most common landcover is deciduous forest, which composes 8.9% of the Project and consists primarily of shelterbelts and woodlots associated with homesteads. Developed areas (e.g., farmsteads) compose approximately 5% of the Project, and all other landcover types compose less than 3% of the Project area individually (USGS 2011, Homer et al. 2015).

**Table 1. Land cover types and composition at the Emerson West Wind Project.**

<b>Habitat</b>	<b>Acres</b>	<b>% Composition</b>
Cultivated Crops	39,130.5	81.3
Deciduous Forest	4,302.5	8.9
Developed, Open Space	2,252.1	4.7
Hay/Pasture	1,288.8	2.7
Developed, Low Intensity	699.8	1.9
Herbaceous	210.1	0.4
Developed, Medium Intensity	136.1	0.3
Developed, High Intensity	34.0	0.1
Open Water	15.6	<0.1
Mixed Forest	12.7	<0.1
Barren Land	9.6	<0.1
Evergreen Forest	7.3	<0.1
Emergent Herbaceous Wetlands	6.5	<0.1
Woody Wetlands	3.1	<0.1
Shrub/Scrub	1.3	<0.1
<b>Total</b>	<b>48,109.9</b>	<b>100</b>

Data from USGS NLCD 2011, Homer et al. 2015

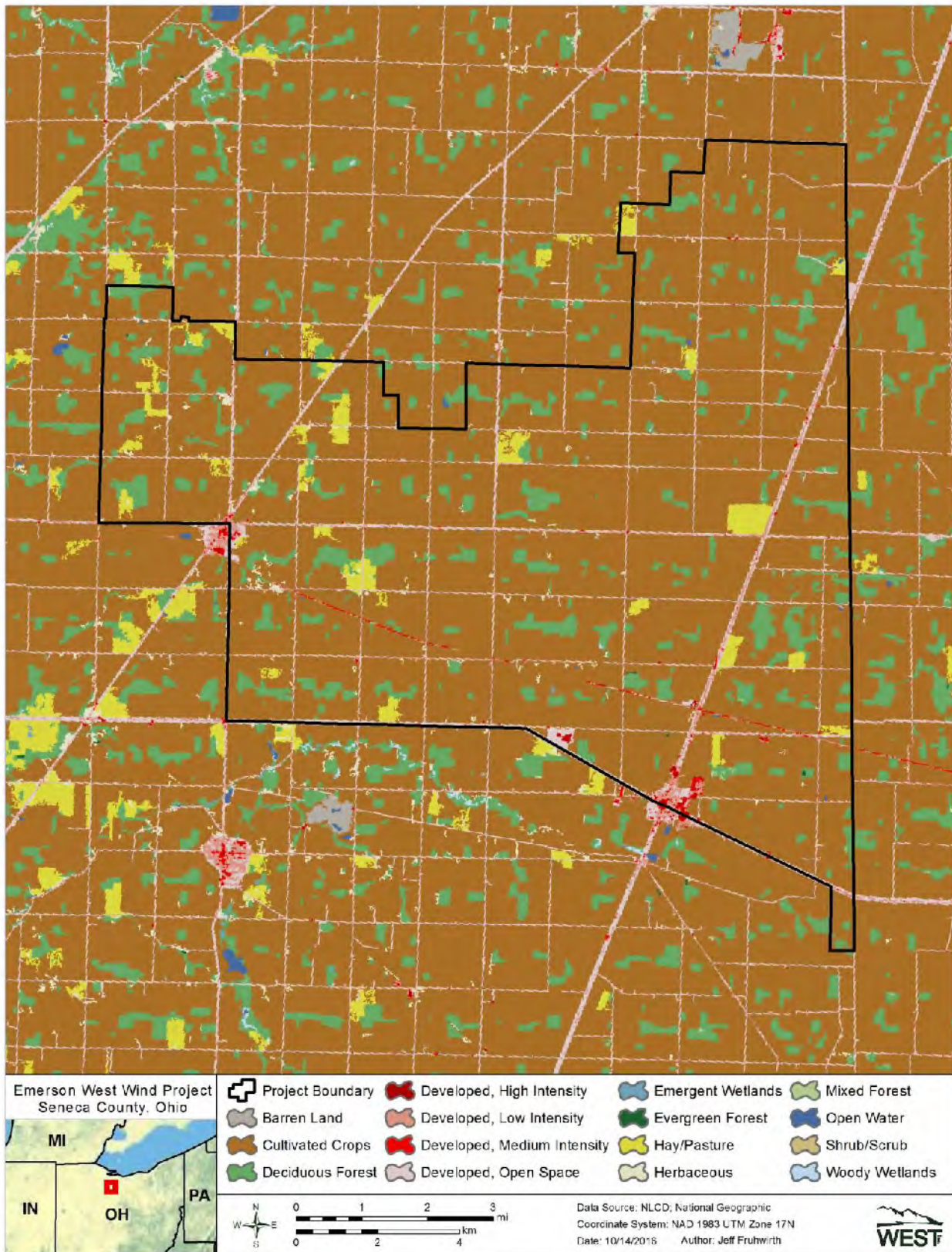


Figure 1. Land cover at the Emerson West Wind Project.

## **METHODS**

The ODNR recommends that nest monitoring “be conducted to assess the daily movement patterns of any species of protected raptor whose nest is located within two miles of the proposed site” (ODNR 2009). The ODNR also recommends that “during the incubation (May 1 to June 30) and rearing stage, the location of adult birds should be tracked for at least four hours twice per week until consistent activity patterns are established.” Three known bald eagle nests are located within 3 miles of the Project area and therefore warrant evaluation (Figure 2). These nests were observed during raptor nest surveys that were conducted within the Project and one mile buffer in the spring of 2016. Two of these nests were previously known to the USFWS and WEST checked their status during the raptor nest surveys, and one nest was discovered during the raptor nest surveys conducted by WEST in the spring of 2016.

In order to satisfy the ODNR recommendation, six fixed-point count locations were placed at each of the three nests (18 point locations total). Surveys were conducted between June 1 and June 29, 2016 at Nests 1 and 2, and between June 6 and June 30, 2016 for Nest 3 (Figure 2). Each survey was conducted for 90 minutes once per week, for a total of 27 hours of survey effort over three days per week. Each point count survey consisted of an 800-m fixed observation radius for eagles, with the following data recorded for each survey:

- Date
- Time (start and end)
- Point number
- Observer
- Weather (temperature, wind speed and direction, precipitation, and cloud cover)

For each bird or flock of birds observed during a point count survey, the following information was recorded:

- Species or best possible identification
- Number of individuals
- Distance of bird/flock to observer (initial, and nearest)
- Sex and age class
- Height above ground (if flying)
- Behavior
- Habitat

For each eagle observed during a point count survey, the flight path was hand-drawn by the observer on a map figure printed on a field data sheet, and subsequently digitized for analysis of movement patterns. For each eagle observed during a point count survey, the observer recorded the flight altitude, distance to observer, and behavior of the bird once per minute for the entire portion of the survey during which the eagle was present within the 800-m observation radius. Federally and state listed species were also to be recorded and mapped if observed.



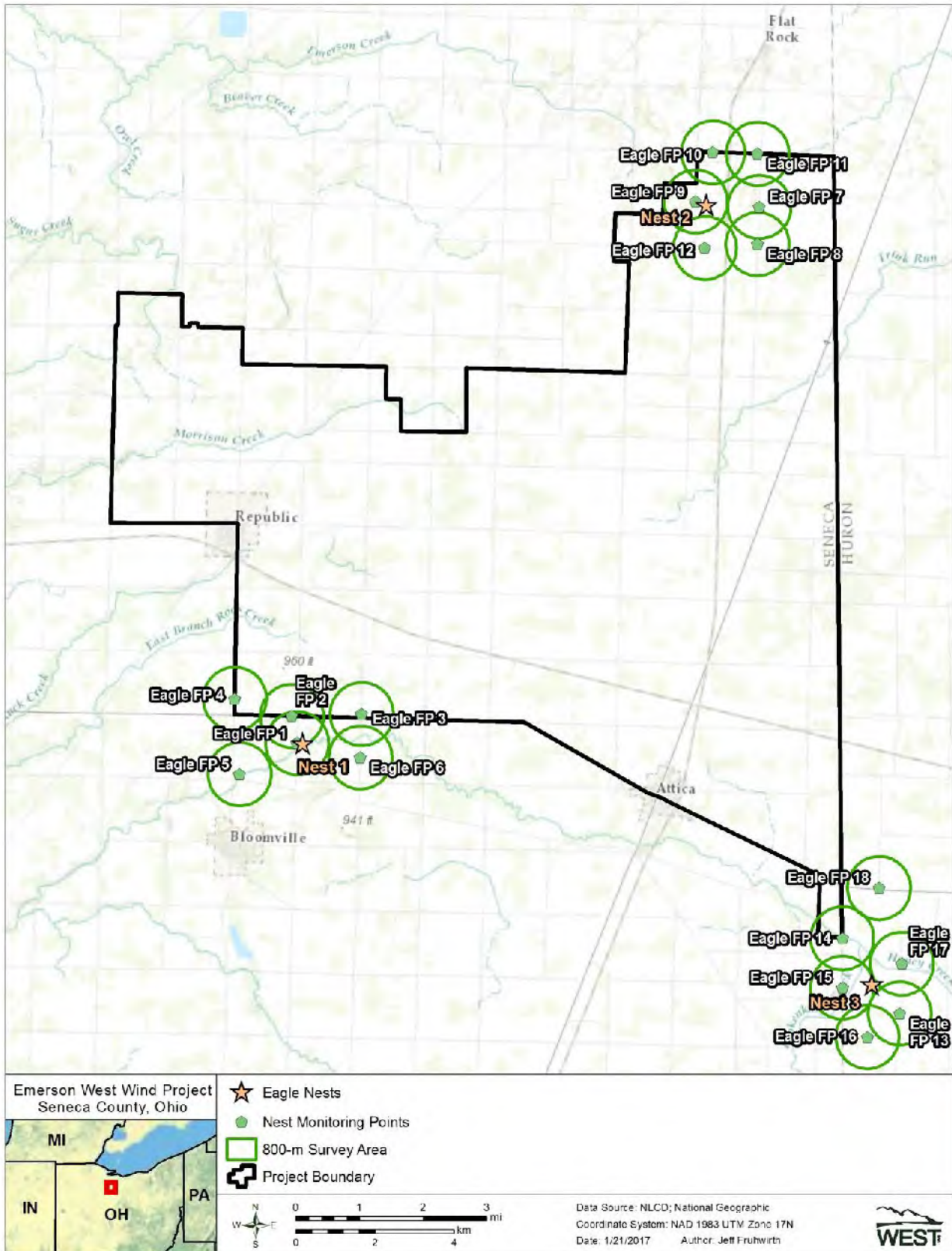


Figure 2. Eagle nest locations and nest survey locations in the Emerson West Wind Project.

## RESULTS

A total of 37 eagle observations were recorded during 126 hours of the fixed-point eagle nest monitoring surveys. The majority of the eagles recorded were adults, followed by sub-adults; no juvenile eagles were observed during the surveys (Table 2). Of the 37 observations, 23 were within the 800-m radius survey area. Overall, 23 of the eagles were observed flying, the majority of which were observed flying within the rotor-swept area (RSA; Table 3). Eagles were most commonly observed in cropland habitat, followed by riparian habitat and forest habitat (Table 4).

Eagle activity observed during the surveys was notably concentrated around nests 1 and 3. Only one observation of two eagles occurred at a fixed-point near nest 2, and this observation was beyond the 800-m plot area and above the RSA. Nest 2 is suspected to have become abandoned and inactive prior to or early in the survey period. Eagle activity near nest 1 was concentrated around the nest with bald eagles approaching or leaving the nest and most commonly flying northeast or northwest. Bald eagles from nest 1 were observed flying into the Project area during 4 out of 16 total observations of flying birds. The activity from nest 3 was also concentrated around the nest with most eagles flying north, but only one eagle observation was recorded crossing the boundary of the Project (Figures 3a-c).

No federal- or state-listed species were observed during the surveys.

**Table 2. Summary of bald eagle sightings by age group at the Emerson West Wind Project during eagle nest monitoring surveys from June 1 to 30, 2016.**

Nest ID	Number of Individuals	Number of Groups	Number of Adults	Number of Sub-Adults	Number of Juveniles	Number of Unknown Age
Nest 1	19	19	15	3	0	1*
Nest 2	2	1	0	2	0	0
Nest 3	16	16	15	0	0	1**
<b>Total</b>	<b>37</b>	<b>36</b>	<b>30</b>	<b>5</b>	<b>0</b>	<b>2</b>

\* observation auditory only

\*\*observation too far to determine age

**Table 3. Summary of bald eagle activity at the Emerson West Wind Project during eagle nest monitoring surveys from June 1 to 30, 2016.**

Nest ID	Number of Eagles Observed Perched*	Number of Eagles Observed Auditory Only*	Number of Eagles Observed Flying <sup>a</sup> *	% within Flight Height Categories		
				0 - 25 m	25 - 200 m <sup>b</sup>	> 200 m
Nest 1	1	2	16	0	68.8%	31.2%
Nest 2	0	0	2	0	0	100%
Nest 3	11	0	5	20%	80%	0%
<b>Total</b>	<b>12</b>	<b>2</b>	<b>23</b>	<b>4.3%</b>	<b>43.5%</b>	<b>52.2%</b>

\*Results based on first activity observed

<sup>a</sup> Activities summarized as "flying" also include soaring and stooping or diving antagonistically.

<sup>b</sup> The likely RSA for potential collision with a turbine blade, or 25 to 150 m (82 to 652 ft) above ground level. These observations are based on first flight height records of all flying eagle observations.

**Table 4. Summary of bald eagle observations by habitat type at the Emerson West Wind Project during eagle nest monitoring surveys from June 1 to 30, 2016.**

<b>Nest ID</b>	<b>Forest</b>	<b>Cropland</b>	<b>Riparian</b>	<b>Unknown*</b>
Nest 1	1	16	0	2
Nest 2	0	2	0	0
Nest 3	3	6	6	0
<b>Total</b>	<b>4</b>	<b>25</b>	<b>6</b>	<b>2</b>

\*auditory observations only



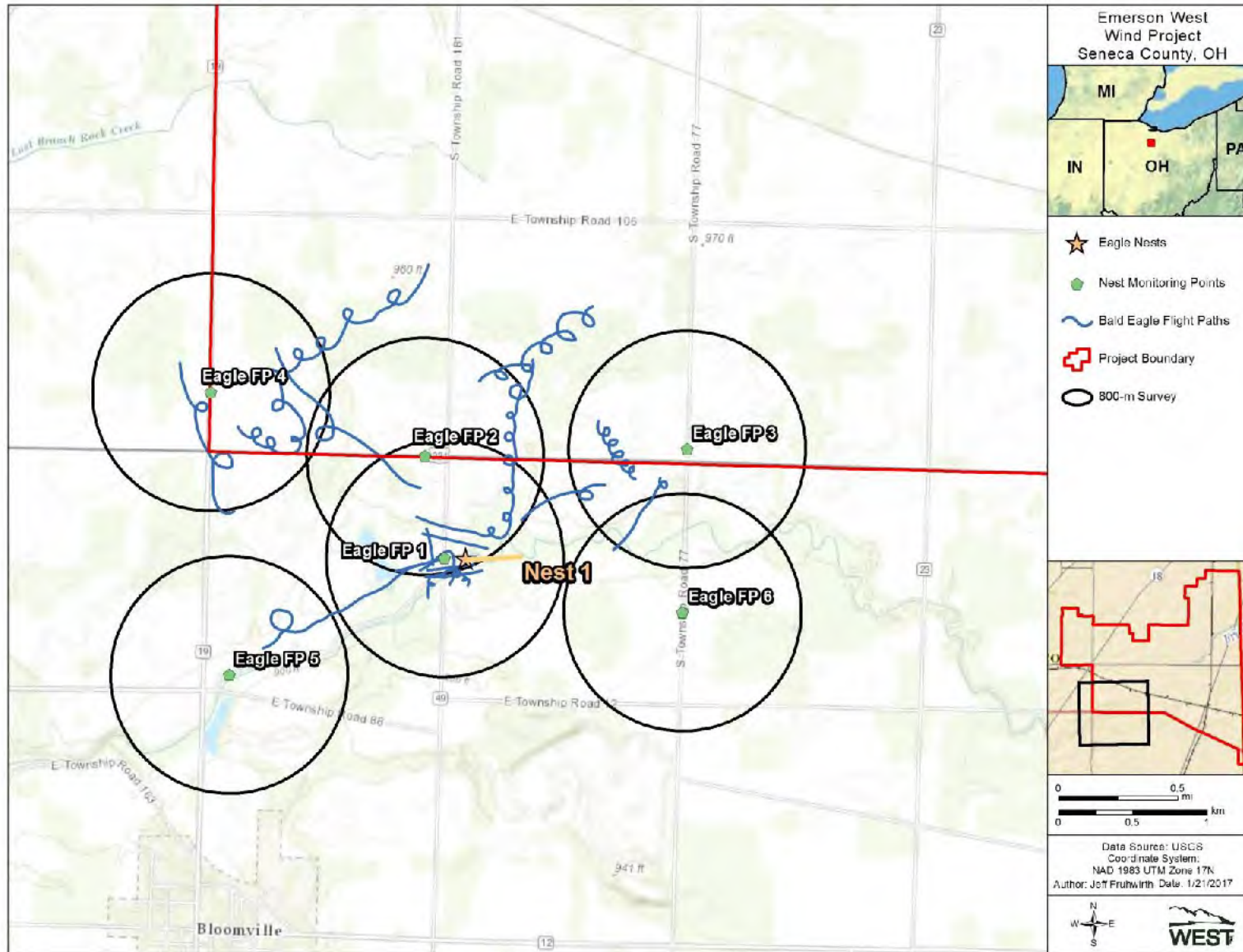
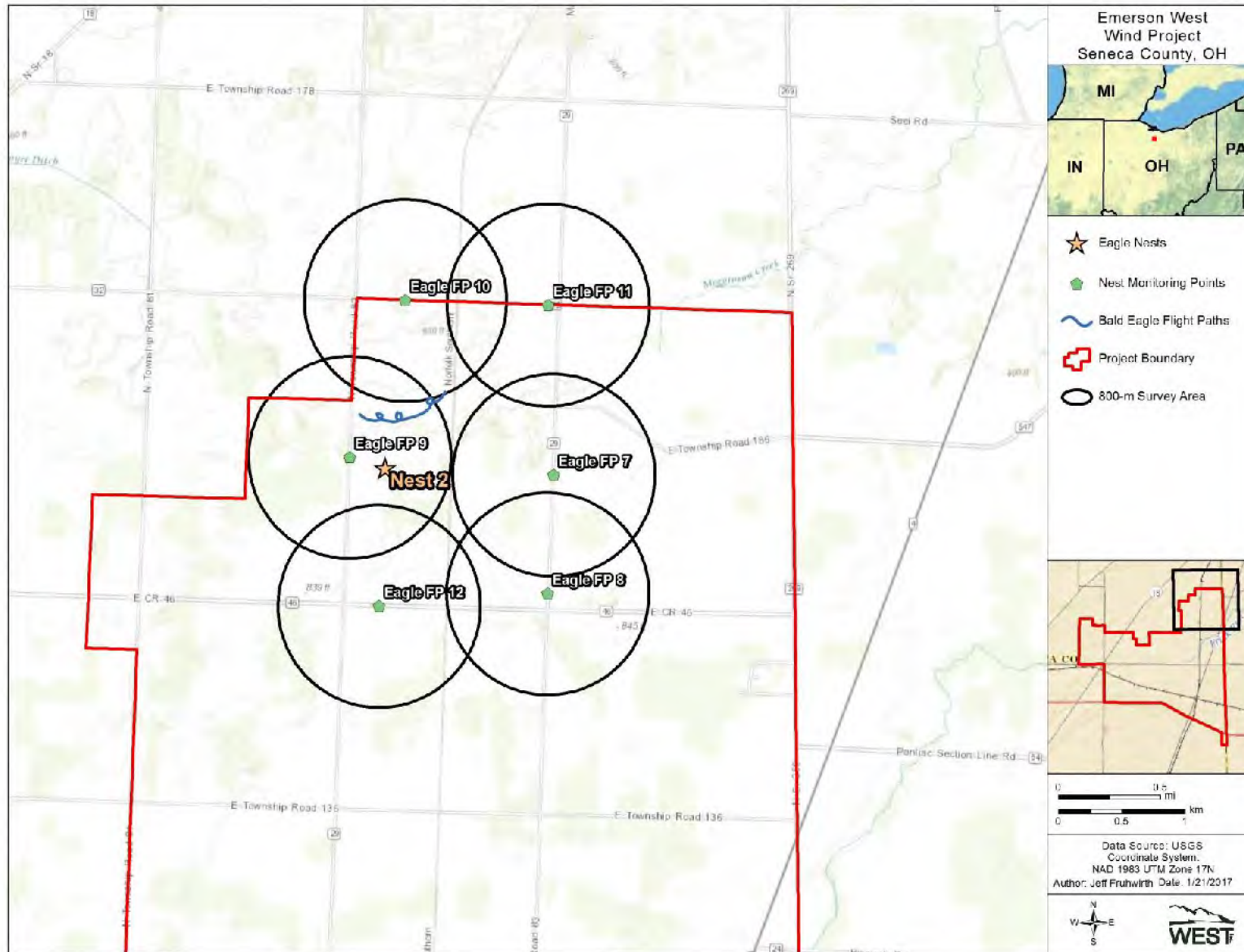


Figure 3a. Eagle nest activity near Nest 1 during eagle nest monitoring surveys at the Emerson West Wind Project.



**Figure 3b. Eagle nest activity near Nest 2 during eagle nest monitoring surveys at the Emerson West Wind Project.**



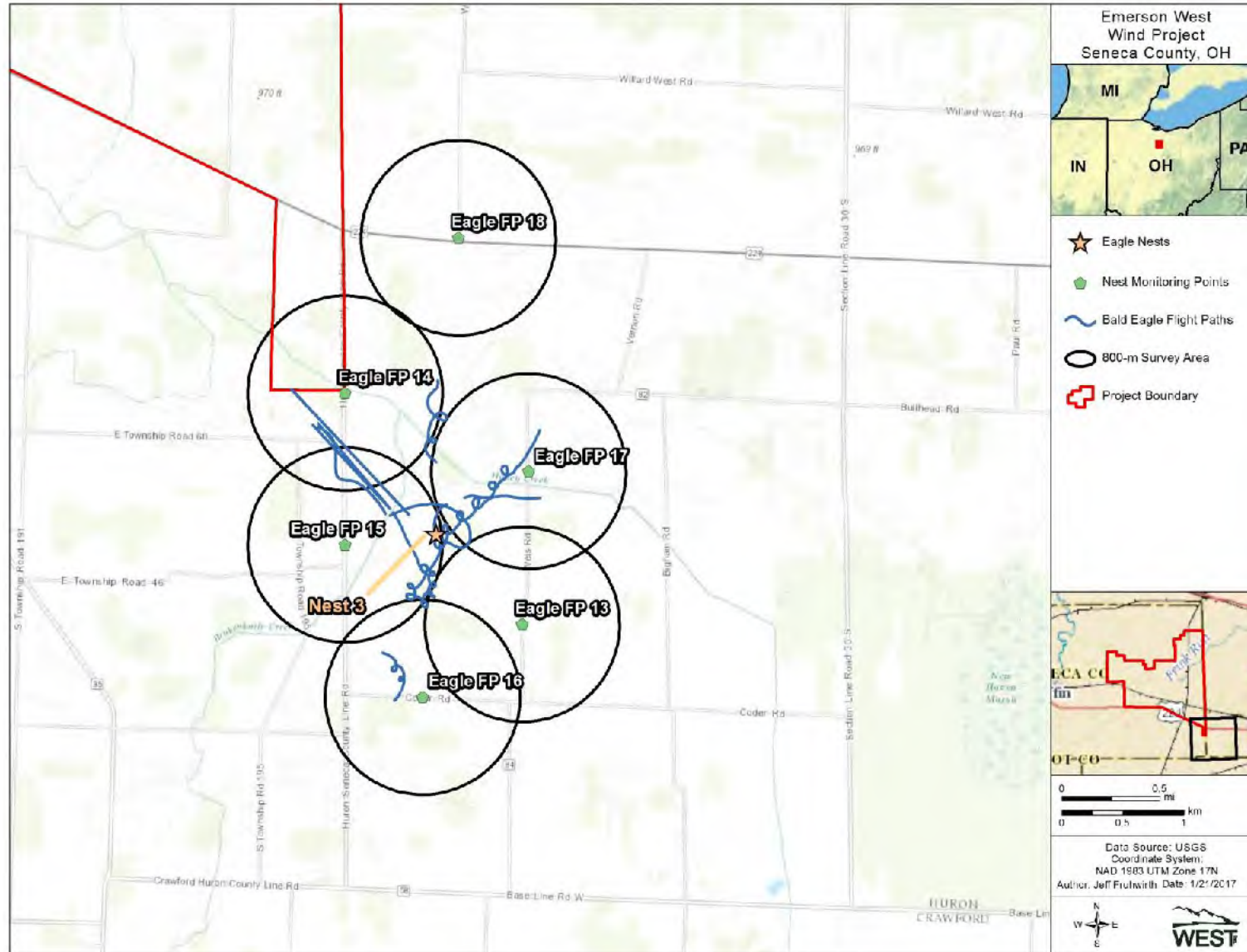


Figure 3c. Eagle nest activity near Nest 3 during eagle nest monitoring surveys at the Emerson West Wind Project.

## **CONCLUSIONS**

Eagle activity observed during the eagle nest monitoring surveys was concentrated around nests 1 and 3, which are both located south of the Project boundary. Nest 2 was the only nest located within the Project boundary, but this nest appeared to have been unsuccessful or abandoned this year due to the lack of eagle activity. Because eagles typically reuse their nests and the territory may remain occupied, eagle use may become higher in subsequent years near this nest (USFWS 2016). Nests 1 and 3 are located south of the Project boundary and some eagles were observed to fly north from the nest, at times crossing into the Project boundary. Bald eagle use is expected to continue during the nesting period near nests 1 and 3 if these nests continue to remain active.

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# **Breeding Bird Surveys for the Emerson West Wind Project in Seneca County, Ohio**

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**Final Report  
May – June 2016**



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**May 12, 2017**



**CONFIDENTIAL**

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## EXECUTIVE SUMMARY

Western EcoSystems Technology, Inc. conducted breeding bird surveys for the proposed Emerson West Wind Project (Project) located in Seneca County, Ohio in accordance with the Ohio Department of Natural Resources (ODNR) *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio* (ODNR 2009). The objectives of the surveys were to document the type and number of bird species observed within the Project area during the breeding season.

A total of 15 fixed-point breeding bird surveys were conducted throughout the Project area over a three year period as follows: two points from May 31 - June 28, 2011; eleven points from May 10 - June 7, 2012; and two points from May 18 - June 22, 2016. An additional two points within potentially suitable habitat for sedge wren (*Cistothorus platensis*) were surveyed on July 19, 2012.

A total of 895 individual observations of 69 known and two unknown species were recorded over all surveys. Four species (approximately 6% of all species observed) composed 27% of bird observations: American robin (*Turdus migratorius*), red-winged-blackbird (*Agelaius phoeniceus*), song sparrow (*Melospiza melodia*), and indigo bunting (*Passerina cyanea*). No federally listed species were observed, and only one state-listed species (northern harrier [*Circus cyaneus*], state endangered, n=1) was observed during the course of the surveys. In addition, three state species of concern (bobolink [*Dolichonyx oryzivorus*], n=11; Henslow's sparrow [*Ammodramus henslowii*], n=1; black-throated blue warbler [*Setophaga caerulescens*], n=1) were observed.

Bird species occurring within the Project are typical of primarily agricultural landscapes in the Midwest and Ohio. No federally listed species and only one state listed species were recorded.

## **STUDY PARTICIPANTS**

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Rebecca Schmitt	Technical Editor
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## **REPORT REFERENCE**

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## INTRODUCTION

Western EcoSystems Technology, Inc. (WEST) conducted breeding bird surveys for the proposed Emerson West Wind Project (Project) located in Seneca County, Ohio, following the Ohio Department of Natural Resources (ODNR) *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio* (ODNR 2009). The objectives of the surveys were to document the type and number of bird species observed within the Project area during the breeding season.

## PROJECT AREA

The Project is located in Seneca County, Ohio, and is characterized by flat to gently rolling topography dominated by cultivated crops (Figure 1). The majority of the Project is located within the Huron/Erie Lake Plain ecoregion, which is a broad, flat, fertile plain with some relic sand dunes, beach ridges, and end moraines. The southern area of the Project is located in the Eastern Corn Belt ecoregion, which contains more fertile soil than the Huron/Erie Lake Plain ecoregion. Today, most of the forests in the area have been cleared and the swamps artificially drained to make way for highly productive farms which produce corn (*Zea mays*), soybean (*Glycine max*), and livestock (US Environmental Protection Agency [USEPA] 2013).

Approximately 81.3% of the nearly 195 square kilometers (48,110 acres) in the Project area is composed of cultivated cropland (US Geological Survey [USGS] National Land Cover Database [NLCD] 2011; Homer et al. 2015). The next most common land cover type is deciduous forest that composes 8.9% of the Project area and consists primarily of shelterbelts and woodlots associated with homesteads. Developed areas (e.g., farmsteads) compose approximately 5% of the Project area, and all other land cover types compose less than 3% of the Project area individually (Table 1, Figure 1).

**Table 1. Land cover types and composition at the Emerson West Wind Project.**

Habitat	Acres	% Composition
Cultivated Crops	31,338.8	83.1%
Deciduous Forest	3,089.9	8.2%
Developed	2,334.1	6.2%
Hay/Pasture	792.0	2.1%
Herbaceous	93.0	0.2%
Open Water	13.6	<0.01%
Mixed Forest	12.7	<0.01%
Barren Land	8.5	<0.01%
Evergreen Forest	6.7	<0.01%
Emergent Herbaceous Wetlands	6.2	<0.01%
Woody Wetlands	3.6	<0.01%
Shrub/Scrub	1.1	<0.01%
<b>Total</b>	<b>37,700.0</b>	<b>100.0%</b>

Data from USGS NLCD 2011, Homer et al. 2015

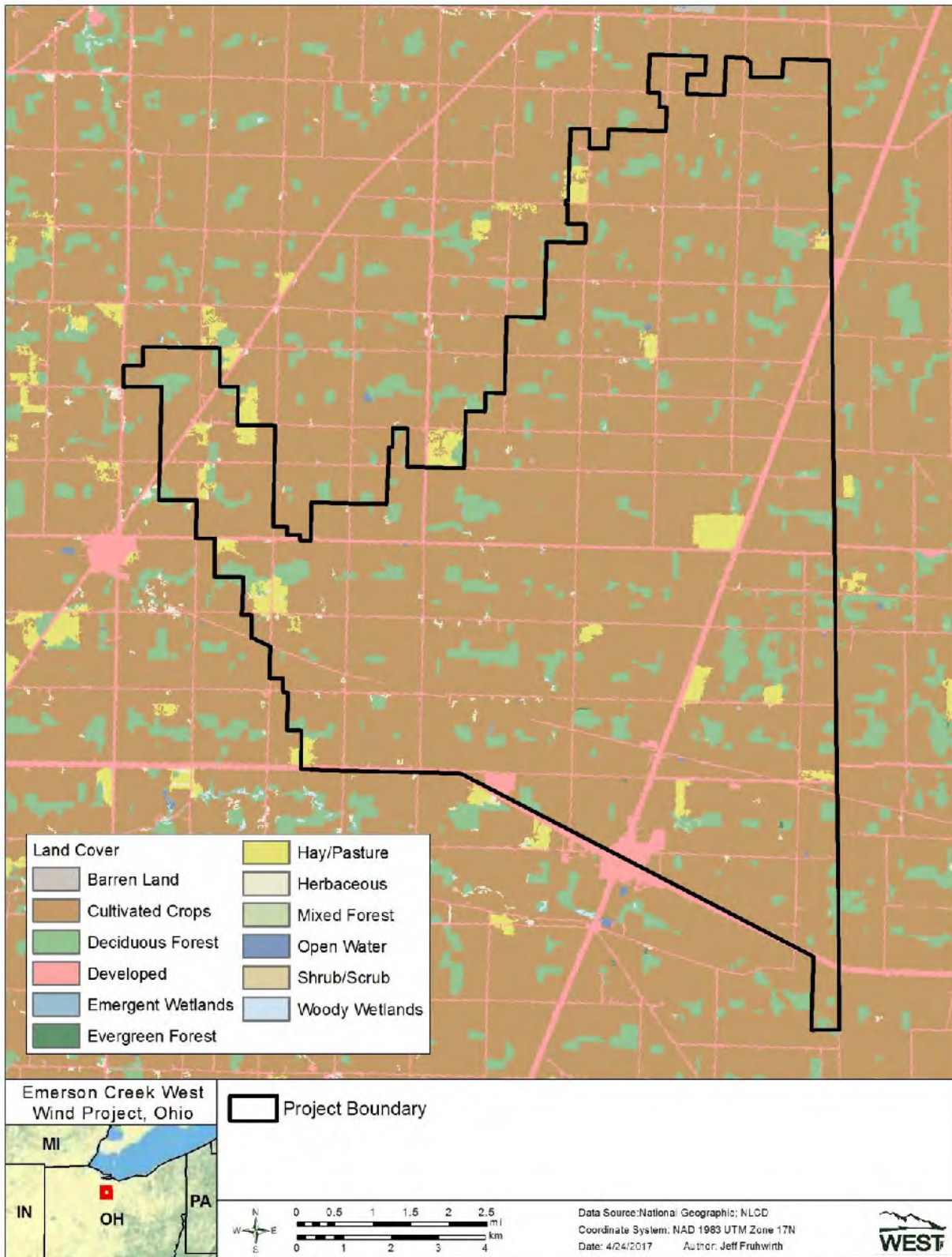


Figure 1. Land cover at the Emerson West Wind Project (USGS NLCD 2011, Homer et al. 2015).

## METHODS

ODNR guidelines recommend that breeding bird surveys be conducted at all proposed turbine locations within non-cropland habitats and that two points be established for each turbine (ODNR 2009). Since Project turbine locations are unknown at this time, the number of breeding bird survey points was based on the maximum expected number of turbines (67), for a total of 134 potential fixed-point count locations. Based on land use/land cover data, approximately 10.6% of the Project is located within areas of potential breeding bird habitat (forests, wetlands, shrub/scrub, and hay/pasture), thus 15 fixed-point count locations were recommended for the Project (Table 1, Figure 1).

Three 10-minute surveys (one in May and two surveys in June) were conducted at 15 fixed-points with a 200-m radius: two in 2011, 11 in 2012 and two in 2016 (Figure 2; BHE 2011, Ritzert 2012). In accordance with ODNR guidelines, additional fixed-point surveys are to be conducted in July in areas with suitable habitat for Henslow's sparrow (*Ammodramus henslowii*), dickcissel (*Spiza americana*), and/or sedge wren (*Cistothorus platensis*) because these species may not sing until later in the breeding season. In 2012, WEST surveyed an additional 2 locations within the current Project boundary for sedge wren ("July 1" and "July 2" in Figure 2; Ritzert 2012, ODNR 2009).

Surveys were conducted by personnel able to distinguish bird species by sight and sound. Surveys began at approximately dawn and did not extend past 1000 hours. Surveys were not conducted on mornings with winds exceeding five meters per second (11 miles per hour), periods of rain lasting more than 20 minutes, or heavy fog due to reduced detectability of birds.

All birds observed during fixed-point counts were identified to species, or best possible identification. The distance to each bird was estimated to the nearest one meter (m; three feet [ft]). The flight direction (bearing) of observed birds was recorded, and flight characteristics at first observation, lowest observation, and highest observation above-ground-level were recorded to the nearest meter (three feet). Birds that flew over the point and did not originate from or land within 200 m of the center of the plot were recorded as a "fly over".

General bird behavior categories recorded during surveys included: perched, soaring, flapping, foraging, gliding, hovering, auditory, and other (noted in comments). Additional Ohio breeding bird atlas codes were also recorded to describe indications of breeding activity (Ohio Breeding Birds Atlas 2011). Weather information, including temperature, wind speed, wind direction, and cloud cover, were recorded for each survey. Any comments or unusual observations were noted in the comments section, and incidental observations of federally or state listed species were recorded regardless of whether they were detected within the survey time or while away from a fixed-point count location.



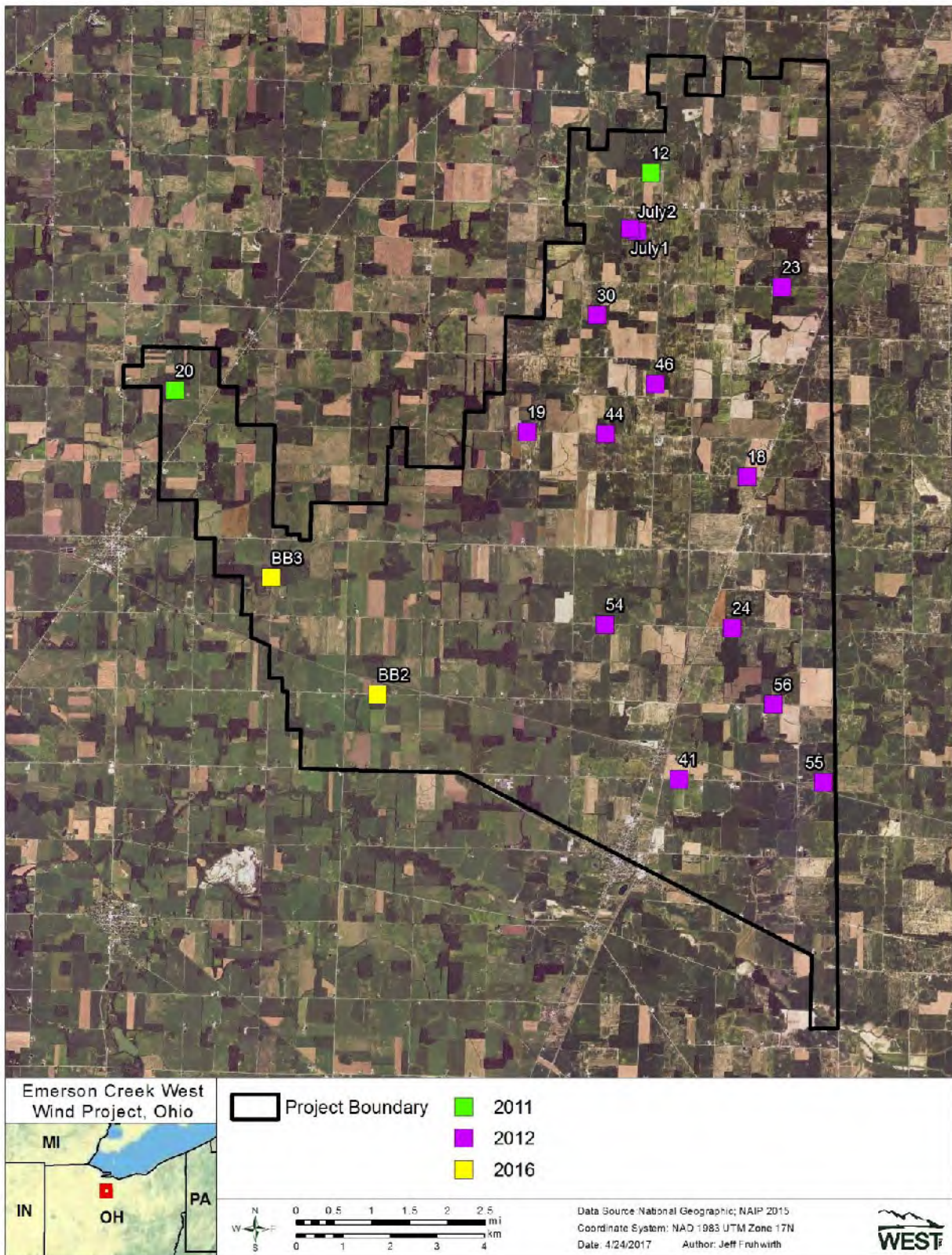


Figure 2. Fixed-point count locations surveyed during breeding bird surveys from 2011 to 2016 at the Emerson West Wind Project.

## RESULTS

A total of 115 individual bird observations comprising 33 identified species and one unknown thrush were documented during the 6 fixed-point count surveys conducted from May 18 – June 22, 2016. Six species (18% of all species) composed 49% of bird observations: American robin (*Turdus migratorius*), red-winged blackbird (*Agelaius phoeniceus*), American goldfinch (*Spinus tristis*), and blue jay (*Cyanocitta cristata*; Table 2).

A total of 740 individual bird observations comprising 66 species were detected during the 2011 and 2012 surveys combined. The most commonly observed species in 2011 included horned lark (*Eremophila alpestris*), American crow (*Corvus brachyrhynchos*), American robin and savannah sparrow (*Passerculus sandwichensis*; Table 4). The most commonly observed species in 2012 included American robin, red-winged blackbird, indigo bunting (*Passerina cyanea*) and song sparrow (*Melospiza melodia*; Table 3; BHE 2011, Ritzert 2012).

**Table 2. Total number of groups and individuals for each species recorded during breeding bird surveys in the Emerson West Wind Project from May 18 – June 22, 2016.**

Bird Type / Species	Scientific Name	Total Observations	
		# grps	# obs
American crow	<i>Corvus brachyrhynchos</i>	2	2
American goldfinch	<i>Spinus tristis</i>	5	10
American robin	<i>Turdus migratorius</i>	8	11
Baltimore oriole	<i>Icterus galbula</i>	1	1
barn swallow	<i>Hirundo rustica</i>	3	4
black-capped chickadee	<i>Poecile atricapillus</i>	1	1
blue jay	<i>Cyanocitta cristata</i>	5	8
brown thrasher	<i>Toxostoma rufum</i>	2	2
brown-headed cowbird	<i>Molothrus ater</i>	1	1
chimney swift	<i>Chaetura pelagica</i>	1	2
chipping sparrow	<i>Spizella passerina</i>	2	2
common grackle	<i>Quiscalus quiscula</i>	3	9
common yellowthroat	<i>Geothlypis trichas</i>	1	1
dowry woodpecker	<i>Picoides pubescens</i>	2	2
eastern bluebird	<i>Sialia sialis</i>	2	3
eastern meadowlark	<i>Sturnella magna</i>	1	1
eastern phoebe	<i>Sayornis phoebe</i>	1	1
eastern wood-pewee	<i>Contopus virens</i>	1	1
European starling	<i>Sturnus vulgaris</i>	3	8
field sparrow	<i>Spizella pusilla</i>	4	4
gray catbird	<i>Dumetella carolinensis</i>	1	1
great blue heron	<i>Ardea herodias</i>	1	1
house sparrow	<i>Passer domesticus</i>	4	7
house wren	<i>Troglodytes aedon</i>	4	4
killdeer	<i>Charadrius vociferus</i>	1	1
mourning dove	<i>Zenaida macroura</i>	2	2
northern cardinal	<i>Cardinalis cardinalis</i>	3	3
red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	1	1

**Table 2. Total number of groups and individuals for each species recorded during breeding bird surveys in the Emerson West Wind Project from May 18 – June 22, 2016.**

Bird Type / Species	Scientific Name	Total Observations	
		# grps	# obs
red-wing blackbird	<i>Agelaius phoeniceus</i>	7	9
song sparrow	<i>Melospiza melodia</i>	7	7
tree swallow	<i>Tachycineta bicolor</i>	1	2
white-breasted nuthatch	<i>Sitta carolinensis</i>	1	1
willow flycatcher	<i>Empidonax traillii</i>	1	1
unknown thrush		1	1
<b>Total</b>	<b>33 identified species</b>	<b>84</b>	<b>115</b>

**Table 3. Total number of groups and individuals for each species in the Emerson West Wind Project from May 10, 2012 – July 19, 2012.**

Bird Type / Species	Scientific Name	Total Observations	
		# grps	# obs
Acadian flycatcher	<i>Empidonax virescens</i>	1	1
American crow	<i>Corvus brachyrhynchos</i>	3	4
American goldfinch	<i>Spinus tristis</i>	19	25
American redstart	<i>Setophaga ruticilla</i>	4	4
American robin	<i>Turdus migratorius</i>	36	40
Baltimore oriole	<i>Icterus galbula</i>	2	2
barn swallow	<i>Hirundo rustica</i>	8	31
blackburnian warbler	<i>Setophaga fusca</i>	1	1
black-capped chickadee	<i>Poecile atricapillus</i>	2	2
blackpoll warbler	<i>Setophaga striata</i>	3	3
black-throated blue warbler	<i>Setophaga caerulescens</i>	1	1
black-throated green warbler	<i>Setophaga virens</i>	1	1
blue jay	<i>Cyanocitta cristata</i>	4	4
blue-gray gnatcatcher	<i>Poliophtila caerulea</i>	8	10
bobolink	<i>Dolichonyx oryzivorus</i>	8	11
brown-headed cowbird	<i>Molothrus ater</i>	10	18
Canada goose	<i>Branta canadensis</i>	1	1
cedar waxwing	<i>Bombycilla cedrorum</i>	1	2
chimney swift	<i>Chaetura pelagica</i>	3	6
chipping sparrow	<i>Spizella passerina</i>	18	18
common grackle	<i>Quiscalus quiscula</i>	9	31
common yellowthroat	<i>Geothlypis trichas</i>	8	8
dickcissel	<i>Spiza americana</i>	1	1
downy woodpecker	<i>Picoides pubescens</i>	6	6
eastern bluebird	<i>Sialia sialis</i>	3	3
eastern meadowlark	<i>Sturnella magna</i>	13	13
eastern towhee	<i>Pipilo erythrophthalmus</i>	1	1
eastern wood-pewee	<i>Contopus virens</i>	19	20
European starling	<i>Sturnus vulgaris</i>	10	59
field sparrow	<i>Spizella pusilla</i>	8	8
grasshopper sparrow	<i>Ammodramus savannarum</i>	1	1
gray catbird	<i>Dumetella carolinensis</i>	10	10

**Table 3. Total number of groups and individuals for each species in the Emerson West Wind Project from May 10, 2012 – July 19, 2012.**

Bird Type / Species	Scientific Name	Total Observations	
		# grps	# obs
great-crested flycatcher	<i>Myiarchus crinitus</i>	2	2
hairy woodpecker	<i>Leuconotopicus villosus</i>	1	1
Henslow's sparrow	<i>Ammodramus henslowii</i>	1	1
horned lark	<i>Eremophila alpestris</i>	11	12
house sparrow	<i>Passer domesticus</i>	2	8
house wren	<i>Troglodytes aedon</i>	7	7
indigo bunting	<i>Passerina cyanea</i>	32	32
killdeer	<i>Charadrius vociferus</i>	6	7
mallard	<i>Anas platyrhynchos</i>	2	4
mourning dove	<i>Zenaida macroura</i>	6	7
northern cardinal	<i>Cardinalis cardinalis</i>	9	9
northern flicker	<i>Colaptes auratus</i>	2	2
northern harrier	<i>Circus cyaneus</i>	1	1
northern mockingbird	<i>Mimus polyglottos</i>	1	1
northern parula	<i>Setophaga americana</i>	1	1
northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	1	1
ovenbird	<i>Seiurus aurocapilla</i>	5	5
red-bellied woodpecker	<i>Melanerpes carolinus</i>	8	8
red-eyed vireo	<i>Vireo olivaceus</i>	23	25
red-winged blackbird	<i>Agelaius phoeniceus</i>	1	1
rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	1	1
savannah sparrow	<i>Passerculus sandwichensis</i>	36	48
scarlet tanager	<i>Piranga olivacea</i>	10	10
song sparrow	<i>Melospiza melodia</i>	4	4
Swainson's thrush	<i>Catharus ustulatus</i>	30	31
tree swallow	<i>Tachycineta bicolor</i>	1	2
tufted titmouse	<i>Baeolophus bicolor</i>	9	9
turkey vulture	<i>Cathartes aura</i>	4	5
vesper sparrow	<i>Pooecetes gramineus</i>	4	4
white-breasted nuthatch	<i>Sitta carolinensis</i>	4	5
white-eyed vireo	<i>Vireo griseus</i>	1	1
wood thrush	<i>Hylocichla mustelina</i>	8	8
yellow warbler	<i>Setophaga petechia</i>	4	4
yellow-throated vireo	<i>Vireo flavifrons</i>	6	6
unknown sparrow		2	2
<b>Total</b>	<b>66 identified species</b>	<b>469</b>	<b>621</b>

**Table 4. Total number of groups and individuals for each species in the Emerson West Wind Project from May 31 – June 28, 2011.**

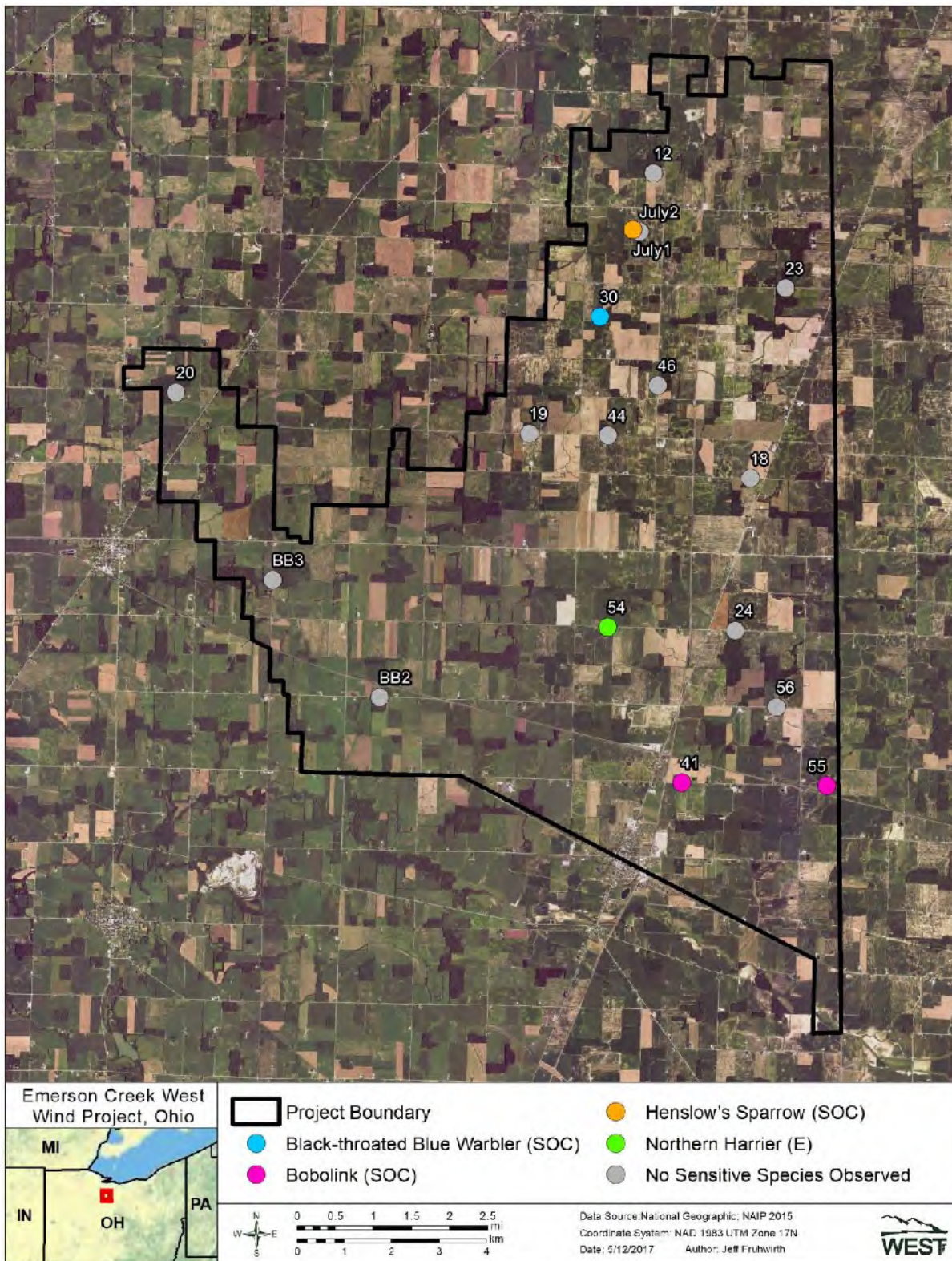
Bird Type / Species	Scientific Name	Total Observations	
		# grps	# obs
American crow	<i>Corvus brachyrhynchos</i>	4	52
American robin	<i>Turdus migratorius</i>	4	6
blue jay	<i>Cyanocitta cristata</i>	3	4



**Table 3. Total number of groups and individuals for each species in the Emerson West Wind Project from May 10, 2012 – July 19, 2012.**

Bird Type / Species	Scientific Name	Total Observations	
		# grps	# obs
chipping sparrow	<i>Spizella passerina</i>	3	3
common grackle	<i>Quiscalus quiscula</i>	1	1
eastern bluebird	<i>Sialia sialis</i>	2	2
field sparrow	<i>Spizella pusilla</i>	3	3
great-crested flycatcher	<i>Myiarchus crinitus</i>	1	1
horned lark	<i>Eremophila alpestris</i>	5	5
house sparrow	<i>Passer domesticus</i>	3	18
indigo bunting	<i>Passerina cyanea</i>	1	1
mourning dove	<i>Zenaida macroura</i>	3	13
red-bellied woodpecker	<i>Melanerpes carolinus</i>	2	2
red-eyed vireo	<i>Vireo olivaceus</i>	1	1
rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	1	1
savannah sparrow	<i>Passerculus sandwichensis</i>	4	4
tufted titmouse	<i>Baeolophus bicolor</i>	1	1
wood thrush	<i>Hylocichla mustelina</i>	1	1
<b>Total</b>	<b>18 identified species</b>	<b>43</b>	<b>119</b>

No federally listed species were observed over the course of all breeding bird surveys. One state endangered species (northern harrier [*Circus cyaneus*], n=1) and three state species of concern (bobolink [*Dolichonyx oryzivorus*], n=11; Henslow's sparrow [*Ammodramus henslowii*], n=1; black-throated blue warbler [*Setophaga caerulescens*], n=1) were observed during the 2012 surveys (Figure 3).



**Figure 3. Observations of state-listed species and species of concern recorded within the Emerson West Wind Project.**

SOC=species of concern, E=state endangered

## **CONCLUSIONS**

Bird species occurring within the Project are typical of primarily agricultural landscapes in the Midwest and Ohio. No federally listed species and only one state listed species (northern harrier; n=1) were recorded over multiple seasons of surveys within the current Project area. Impacts are likely to be similar to those at currently operating projects in similar habitats.

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# **Large Bird and Eagle Use Surveys for the Emerson West Wind Project Seneca County, Ohio**

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**Final Report  
May 13, 2016 – April 20, 2017**



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**January 8, 2018**



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## **EXECUTIVE SUMMARY**

Western EcoSystems Technology, Inc. completed year-round large bird and eagle use surveys for the proposed Emerson West Wind Project (Project) in Seneca County, Ohio. The objectives of the surveys were to: 1) provide estimates of large bird use throughout the year; and 2) estimate the potential impacts of Project construction and operations on large birds, federally and state-listed bird species, and eagles. The surveys were completed in accordance with the tiered process outlined in the US Fish and Wildlife Service (USFWS) Final *Land-Based Wind Energy Guidelines*, USFWS *Eagle Conservation Plan Guidance* (ECPG), and were approved by the Ohio Department of Natural Resources.

Surveys were completed monthly from May 13, 2016 through April 20, 2017, at 29 points established throughout the Project area. Surveys were 60 minutes (min) in duration and consisted of large bird and eagle use surveys. The large bird use survey was conducted during the first 20 mins, during which all large birds within 800 meters (m) were recorded. The eagle use survey was completed for the entire 60 min period, during which all eagles within 800 m of the observer were recorded. Federal- and state-listed species and eagles were also recorded beyond the 800-m (2,625-ft) survey plot and while in-transit between survey points, if observed.

A total of 18 species (1,770 individuals) were observed during the large bird survey, of which eight species were diurnal raptors. Diurnal raptor use was highest during the summer and winter (0.5 bird/800-m plot/20-min survey), followed by fall (0.4), and spring (0.3). Diurnal raptor use rates were low compared to other projects with publicly-available data. The most commonly observed raptor was red-tailed hawk (n=80).

A total of 15 bald eagles in 14 groups were observed during the eagle use surveys, for a total of 38 risk minutes as defined by the ECPG. The eagle use documented was generally at low levels throughout the Project during all seasons compared to use by other raptors, but slightly elevated use was evident to the north of the Project near a known bald eagle nest located within the Project. The presence of an active bald eagle nest within the Project and two other bald eagle nests near the Project boundary may warrant management consideration, such as avoiding siting turbines in close proximity to the nests to reduce risk associated with these higher use areas.

No federally listed threatened or endangered species were observed during the surveys. One state-listed endangered species (northern harrier) was recorded during the large bird survey (n=7), with additional sightings recorded incidentally (n=15). The majority of the northern harrier observations were recorded in the winter and none were observed during the summer breeding season. In addition, one peregrine falcon, a Bird of Conservation Concern, was observed incidentally in the fall.

## **STUDY PARTICIPANTS**

### **Western EcoSystems Technology, Inc.**

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## **REPORT REFERENCE**

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## INTRODUCTION

This report presents the results of the 2016-2017 large bird and eagle use surveys completed by Western EcoSystems Technology, Inc. (WEST) for the Emerson West Wind Project (Project) located in Seneca County, Ohio. Survey protocols were developed in coordination with the US Fish and Wildlife Service (USFWS) and Ohio Department of Natural Resources (ODNR), and were consistent with recommendations within the Final *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012) and the USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013 and 2016). The objectives of the large bird and eagle use point count surveys were to: 1) provide estimates of large bird use throughout the year, and 2) estimate the potential impacts of Project construction and operations on large birds, federally and state-listed species and eagles.

## PROJECT AREA

The proposed 48,110.8 acre (ac; 194.7-square kilometer) Project is located 1.6 kilometer (km; less than one mile [mi]) north of Attica, Ohio. According to the US Geological Survey (USGS) National Land Cover Database (NLCD), the Project area is dominated by croplands (81.6%; Table 1, Figure 2; USGS NLCD 2011, Homer et al. 2015), including corn (*Zea mays*) and soybeans (*Glycine max*). Deciduous forests (8.8%), developed areas (6.4%), and pasture and hay fields (2.7%) are the next most common land cover types within the Project area (Table 1). All other land cover types combined compose less than 1.0% of the Project (Table 1, Figure 1).

**Table 1. Land cover types and composition at the Emerson West Wind Project.**

Habitat	Acres	% Composition
Cultivated Crops	39,242.1	81.6
Deciduous Forest	4,254.7	8.8
Developed	3,082.0	6.4
Hay/Pasture	1,288.2	2.7
Herbaceous	194.3	0.4
Open Water	14.3	<0.1
Mixed Forest	11.0	<0.1
Barren Land	7.9	<0.1
Evergreen Forest	6.3	<0.1
Emergent Herbaceous Wetlands	5.9	<0.1
Woody Wetlands	2.8	<0.1
Shrub/Scrub	1.2	<0.1
<b>Total*</b>	<b>48,110.8</b>	<b>100</b>

Data from US Geological Survey National Land Cover Database 2011, Homer et al. 2015

\* Totals may not equal values listed due to rounding.

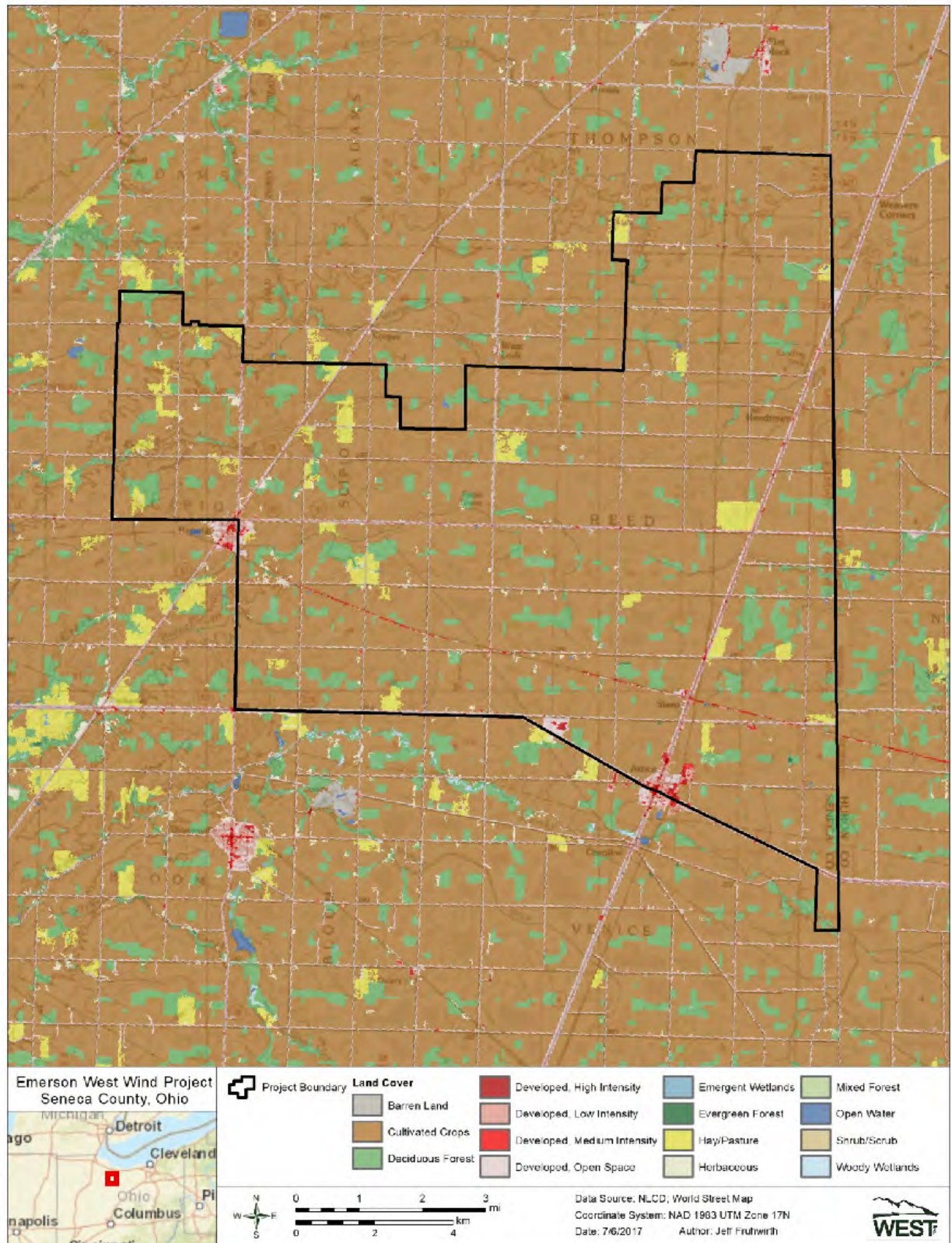


Figure 1. Land cover within the Emerson West Wind Project (US Geological Survey National Land Cover Database 2011, Homer et al. 2015) in Seneca County, Ohio.

## METHODS

Large bird and eagle use surveys were completed monthly at 29 points throughout the Project from May 13, 2016 to April 20, 2017, in accordance with methods described by Reynolds et al. (1980). Each survey point was located to maximize viewshed for the observer and to enable evaluation of representative habitats within and near the Project. The plots used in this evaluation were representative of potential development areas and encompassed approximately 30% of the Project as currently proposed (Figure 2).

Each survey point was surveyed for a total of 60 minutes (min). The large bird use survey was conducted during the first 20 mins, during which all large birds within 800 meters (m) were recorded and risk minutes documented per the ECPG (i.e., minutes of eagles flying within 800-m [2,625 ft] and below 200 m [656 ft]). The eagle use survey was completed for the entire 60 min period during which all eagles within 800 m of the observer were recorded. For purposes of this study, large birds were defined as waterbirds, waterfowl, shorebirds, diurnal raptors (kites, accipiters, buteos, eagles, falcons, northern harrier, and osprey), vultures, upland game birds, doves and pigeons, large corvids, and goatsuckers. The large bird survey allowed for standardization and comparison of data with other wind energy facilities throughout the region, while the eagle use surveys allowed for more robust evaluation of bald (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) use of the site in accordance with the USFWS ECPG (USFWS 2013).

Observations of sensitive species (defined as species afforded protection under the Endangered Species Act [1973], Bald and Golden Eagle Protection Act [1940], listed as threatened or endangered by the State of Ohio [ODNR; 2016], or Birds of Special Conservation Concern [USFWS 2017]) were recorded throughout the surveys. Observations of sensitive species beyond the 800-m (2,625-ft) radius plot and in-transit were recorded as incidental observations to document occurrence on site, but were excluded from statistical analyses of mean use.

At each survey point, the date, start and end time of the survey period, and weather information (e.g., temperature, wind speed and direction, and cloud cover) were recorded. Species or best possible identification, number of individuals, sex and age class (if identifiable), distance from plot center when first observed, closest distance, flight height or altitude above ground, activity (behavior), and habitat(s) were recorded for each observation. Approximate flight height and distance from plot center at first observation were recorded to the nearest meter (3-ft) interval. Locations of sensitive species were identified on field maps by unique observation number.



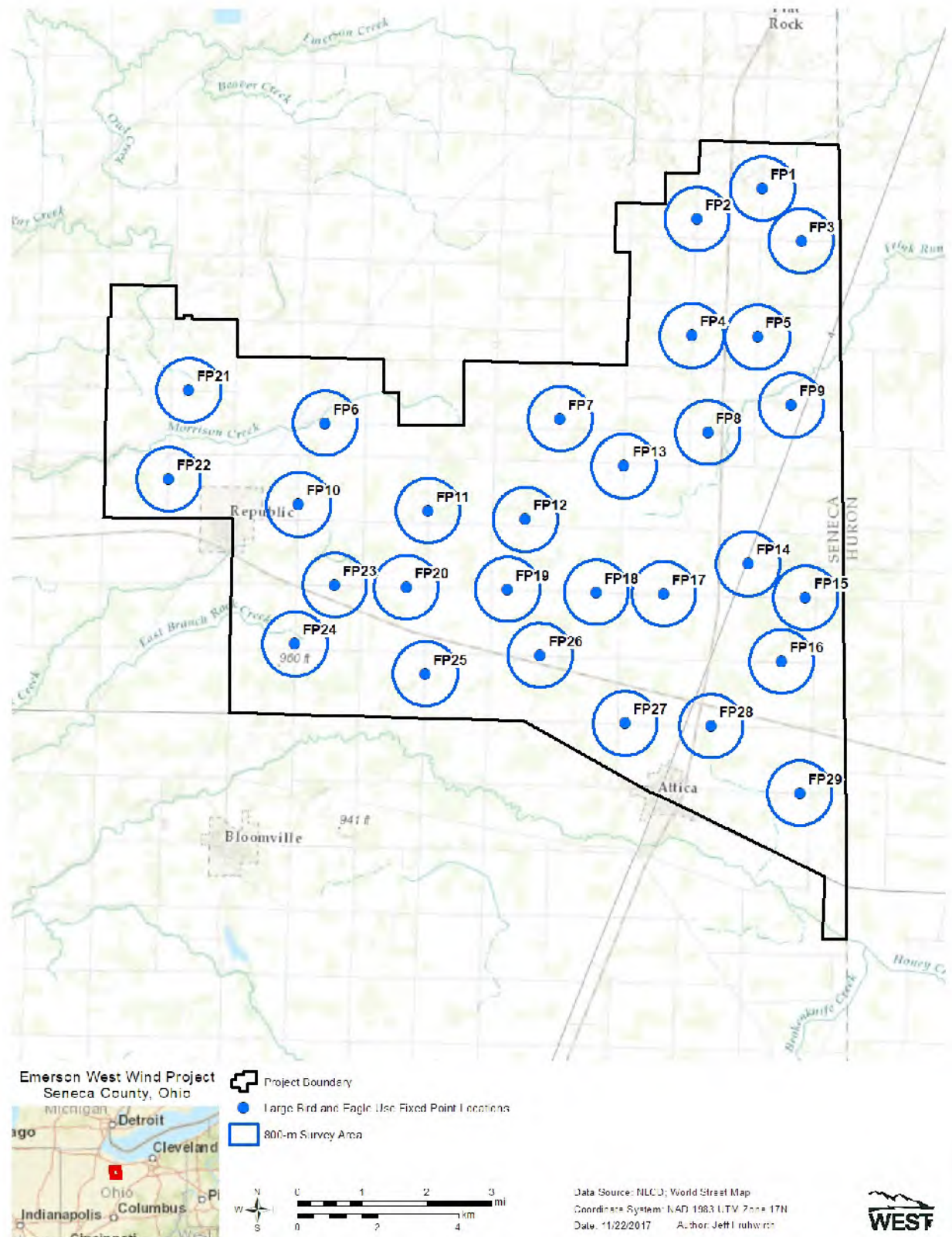


Figure 2. Observation point locations used during large bird and eagle use surveys at the Emerson West Wind Project from May 13, 2016, through April 20, 2017.

## **Statistical Analysis**

For analysis purposes, a visit was defined as the required length of time, in days, to survey all of the plots once within the Project. Seasons were defined as spring (March 1 to May 31), summer (June 1 to August 30), fall (September 1 to November 30) and winter (December 1 to February 28).

### *Bird Diversity and Species Richness*

Bird diversity for all large bird use surveys was illustrated by the total number of species identified. Species lists and counts, with the number of observations and the number of groups, were generated by season and included all observations of birds detected within 800 m. In some cases, the tally of observations may represent repeated sightings of the same individual. Species richness was calculated as the mean number of species observed per plot per survey, and was compared between seasons.

### *Mean Use, Seasonal Variations, and Frequency of Occurrence*

Large birds detected within the 800-m radius plots were used to calculate mean use and frequency of occurrence. The metric used to measure mean large bird use was number of birds per plot per 20-min survey. Seasonal large bird mean use was calculated by first averaging the total number of birds seen within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within the season. Overall mean use was calculated as a weighted average of seasonal values by the number of days in each season. Frequency of occurrence provides a relative measure of species exposure to the proposed facility and was calculated as the percent of surveys in which a particular bird type or species was observed.

### *Bird Flight Height and Behavior*

The flight height recorded during the initial observation was used to calculate the percentage of birds flying within the rotor swept height (RSH; estimated to be between 25 and 200 m [82 to 656 ft] above ground level) and mean flight height during the fixed-point count large bird use surveys. The percentage of birds flying within the RSH at any time was calculated using the lowest and highest flight heights recorded. Auditory only observations were excluded from flight height calculations.

### *Spatial Use and Mapping*

Spatial use in the Project was evaluated by comparing mean use by point location and qualitative review of flight paths. Flight paths of all eagle and sensitive species were digitized and mapped in order to examine spatial patterns of use within the Project.

## **RESULTS**

A total of 348 large bird and eagle use surveys were completed between May 13, 2016 and April 20, 2017, resulting in 116 hours of 20-min large bird use surveys and 348 hours of ECPG-level eagle use surveys. Details on the number of observations and groups recorded by species within



the survey plots are presented in Appendix A, and details on mean use, percent of use, and frequency of occurrence are presented in Appendices B and C.

### Large Birds

A total of 18 large bird species (1,770 observations) were recorded during the large bird surveys (Appendix A). Large bird diversity was consistent across all seasons with spring (n=13) having slightly more species than fall (n=12,) summer (n=11), and winter (n=11). Large bird species richness per plot per survey was greater during the summer (1.6 species/800-m plot/20-min survey) and spring (1.6) compared to the fall (1.0) and winter (0.8). Overall large bird species richness was 1.3 bird species/800-m plot/20-min survey.

Four species composed 74.9% of all large bird observations: Canada goose (*Branta canadensis*; 25.9%), turkey vulture (*Cathartes aura*; 22.9%), killdeer (*Charadrius vociferus*; 15.6%), and mourning dove (*Zenaida macroura*; 10.7%). All other species each accounted for approximately 7.0% or fewer of the observations (Appendix A). Overall bird use was highest during the winter (6.3 birds/800-m plot/20-min survey), followed by summer (5.2), fall (4.8), and spring (4.0; Table 2).

No federally threatened or endangered large bird species were observed during the 20-min counts or incidentally. One state endangered species, northern harrier (*Circus cyaneus*) was documented (seven observations during surveys). Northern harrier use was low overall, with mean use highest during winter (0.06 bird/800-m plot/20-min survey), lowest during spring and fall (0.01), with no use documented in summer.

### Diurnal Raptors

A total of eight diurnal raptor species (148 observations) were documented during the large bird surveys. Diurnal raptor use was highest during the summer and winter (0.5 bird/800-m plot/20-min survey), followed by fall (0.4), and spring (0.3; Table 2). Higher use during the summer was primarily attributable to use of the area by red-tailed hawk (*Buteo jamaicensis*; 0.3 bird/800-m plot/20-min survey), which had the highest overall use of any diurnal raptor (Appendix B). Diurnal raptors accounted for 8.8% of all large bird use (8.0% of large bird use in spring, 9.7% in summer, 7.9% in fall, and 7.8% in winter). Diurnal raptor use ranged from 0.1 bird/800-m plot/20-min survey (points 9 and 14) to 0.8 bird/800-m plot/20-min survey (Point 19; Appendix C).

**Table 2. Mean large bird use (number of birds/800-m plot/20-min survey), percent of total use (%), and frequency of occurrence (%) for each bird type and species by season during large bird use surveys at the Emerson West Wind Project from May 13, 2016 to April 20, 2017.**

Type/Species	Mean Use				% of Use				% Frequency			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Waterbirds	<0.1	<0.1	0.3	0	0.6	1.3	6.5	0	2.3	3.4	1.1	0
Waterfowl	0.46	<0.1	0.7	4.3	11.5	0.4	13.7	67.9	9.2	1.1	1.1	8
Shorebirds	0.7	1.3	1.2	0	16.6	24.7	25.5	0	29.9	29.9	19.5	0
Diurnal Raptors	0.3	0.5	0.4	0.5	8.0	9.7	7.9	7.8	25.3	29.9	26.4	33.3
Vultures	1.5	2.1	1.1	0	38.1	39.4	22.6	0	51.7	57.5	35.6	0
Doves/Pigeons	0.4	1.1	1.1	0.9	9.7	20.5	23.8	13.6	10.3	28.7	13.8	8.0
Large Corvids	0.6	0.2	0	0.7	15.5	4.0	0	10.7	28.7	8.0	0	20.7
<b>Overall*</b>	<b>4.0</b>	<b>5.2</b>	<b>4.8</b>	<b>6.3</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>				

\* Totals may not equal values listed due to rounding.

### Large Bird Flight Height and Behavior

During the large bird surveys, 408 groups of large birds were observed flying, totaling 1,272 individuals (Table 3). Overall, 71.5% of flying large birds were recorded within the RSH, 21.1% were below the RSH, and 7.5% were flying above the RSH (Table 3). Waterfowl had the highest percentage of flying birds recorded within the RSH (99.5%), followed by vultures (76.7%) and diurnal raptors (55.7%; Table 3).

**Table 3. Flight height characteristics by large bird type and raptor subtype within 800-meters (m) and observed during large bird use surveys at the Emerson Wind Project from May 13, 2016 to April 20, 2017.**

Bird Type	# Groups Flying	# Ind Flying	Mean Flight Height (m)	% Obs Flying	% within Flight Height Categories		
					0 - 25 m	25 - 200 m <sup>a</sup>	> 200 m
Waterbirds	5	34	188.0	97.1	2.9	2.9	94.1
Waterfowl	17	365	66.4	77.2	0.5	99.5	0
Shorebirds	60	137	22.1	49.6	46.7	53.3	0
Diurnal Raptors	77	88	74.5	59.5	35.2	55.7	9.1
Vultures	166	386	115.4	95.1	9.1	76.7	14.2
Doves/Pigeons	41	163	21.8	54.2	54.6	45.4	0
Large Corvids	42	99	30.5	75.6	46.5	53.5	0
<b>Large Birds Overall</b>	<b>408</b>	<b>1,272</b>	<b>74.7</b>	<b>71.9</b>	<b>21.1</b>	<b>71.5</b>	<b>7.5</b>

<sup>a</sup> The likely "rotor-swept height" for potential collision with a turbine blade above ground level

### Eagles

A total of 15 bald eagles in 14 groups were recorded in the survey plots during 348 hours of study across the entire year (Table 4). Seven were observed during fall, six in spring, two in winter and zero in summer (Table 4), resulting in a total of 38 bald eagle risk minutes. Eagles were observed at nine of the 29 survey points, with mean eagle use ranging from 0.1 to 0.4 eagle/60-min survey at each of the points and the highest use recorded at points 2, 6 and 15 (Figures 3 and 4). Approximately 69.2% of eagles were recorded flying within the RSH during the eagle use surveys. The highest proportion (46.7%) of eagles flying within the RSH was recorded during the fall (Table 4). One golden eagle was observed incidentally on November 7, 2016, near survey Point 24. A total of 26 incidental observations of bald eagles were recorded and the majority were concentrated in the northwest of the Project near various tributaries of the Sandusky River.

**Table 4. Number of bald eagle observations and associated risk minutes within 800 m of the observer and below 200 m flight height observed during eagle use surveys at Emerson West Wind Project from May 13, 2016 to April 20, 2017.**

Season	Bald Eagle Observations	Bald Eagle Risk Minutes	Survey Effort (hours)	Bald Eagle Observations/Hour
Spring	6	13	87	0.07
Summer	0	0	87	0
Fall	7	17	87	0.08
Winter	2	8	87	0.02
<b>Total</b>	<b>15</b>	<b>38</b>	<b>348</b>	<b>0.04</b>

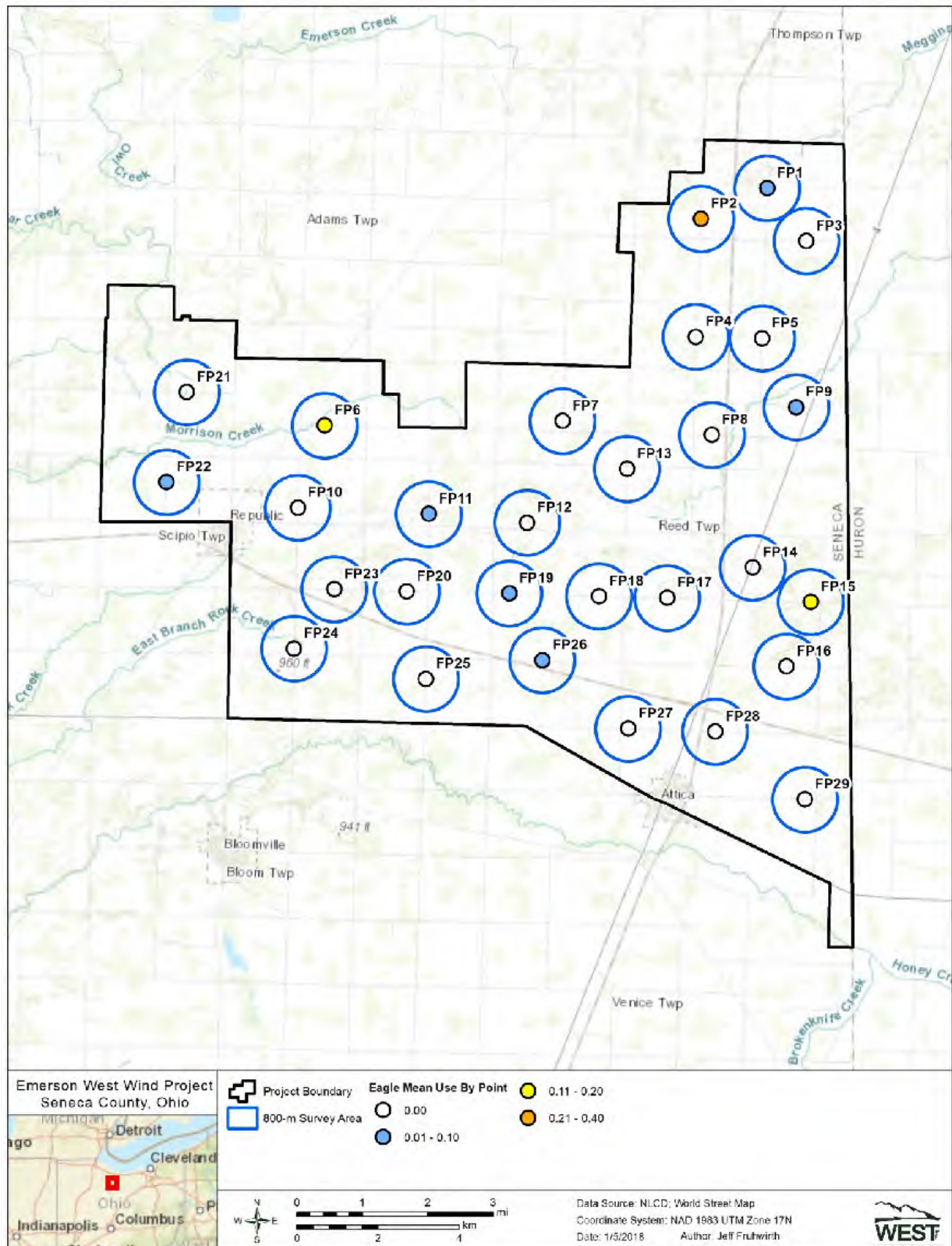


Figure 3. Eagle observations within 800 m per hour by observation point during eagle use surveys completed at Emerson West Wind Project from May 13, 2016 to April 20, 2017.

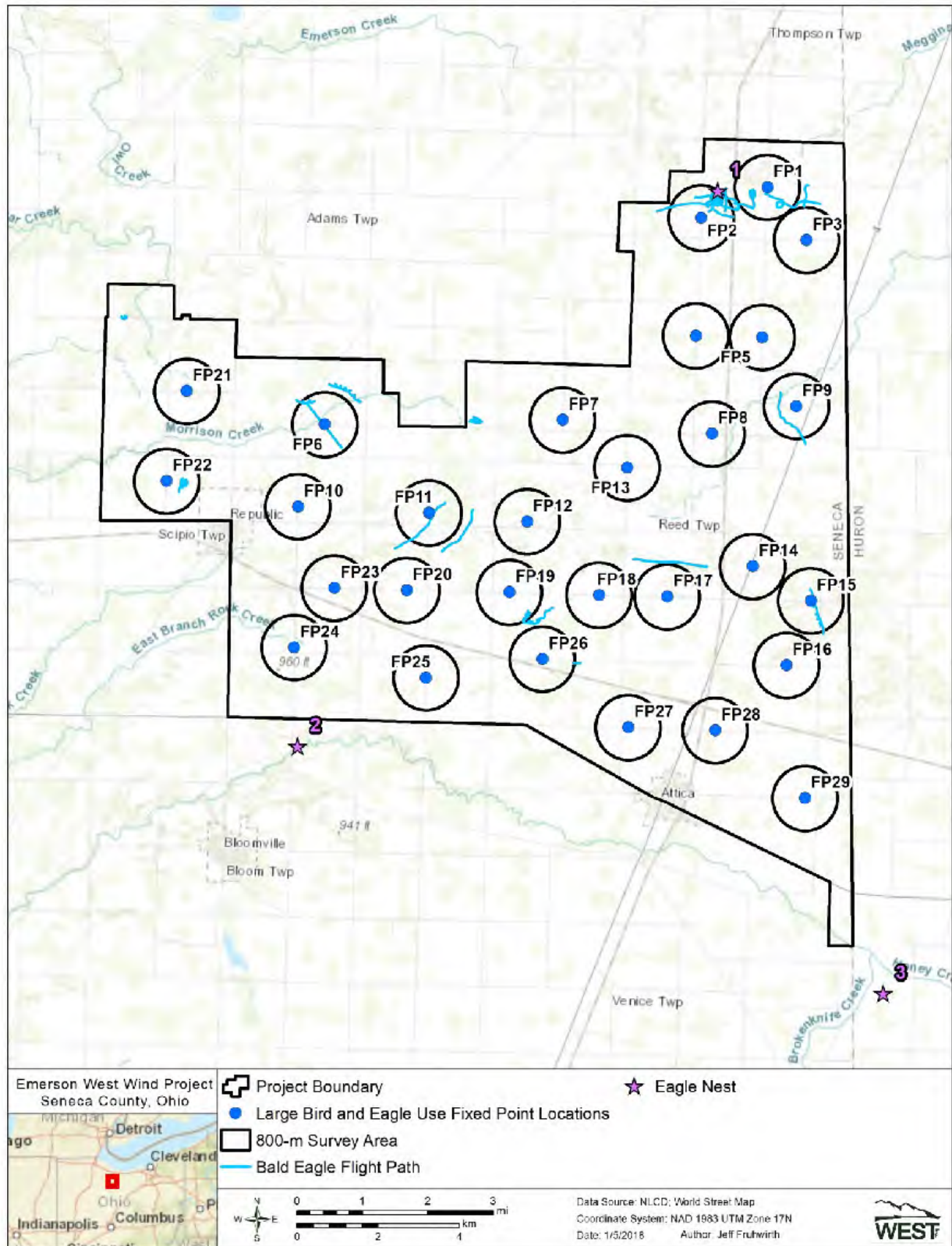


Figure 4. Flight paths of eagles recorded during eagle use surveys and known eagle nests at the Emerson West Wind Project from May 13, 2016 to April 20, 2017.



## Sensitive Species

No federally listed endangered or threatened species were recorded during any of the surveys or incidentally. Seven state-listed endangered northern harriers were observed during the surveys and 15 were observed incidentally (Table 5). In addition, one peregrine falcon (*Falco peregrinus*), a Bird of Conservation Concern (BCC), was observed incidentally in the fall (USFWS 2017).

**Table 5. Summary of federal- and/or state-listed species observed during large bird and eagle use surveys at the Emerson West Wind Project from May 13, 2016 to April 20, 2017.**

Species	Scientific Name	Status*		Large bird and eagle use surveys		Incidental		Overall	
		Ohio	Federal	# grps	# obs	# grps	# obs	# grps	# obs
Northern harrier	<i>Circus cyaneus</i>	E		7	7	15	15	22	22
Peregrine falcon	<i>Falco peregrinus</i>		BCC	0	0	1	1	1	1
<b>Total</b>	<b>2 species</b>			<b>7</b>	<b>7</b>	<b>16</b>	<b>16</b>	<b>23</b>	<b>23</b>

\*E= state-listed as endangered (ODNR 2016); BCC=bird of conservation concern (USFWS 2017)

## DISCUSSION

### Large Birds

Large bird species most often observed during the large bird surveys included Canada goose, turkey vulture, killdeer and mourning dove. Most large bird species observed are common, geographically abundant species likely to be unaffected by any potential habitat fragmentation related to the Project and impacts associated with direct mortality are unlikely to adversely affect local area populations. Therefore, impacts to large bird populations during all seasons are unlikely to be significant.

### Diurnal Raptors

Diurnal raptor use observed during the large bird surveys ranged from 0.3 bird/800-m plot/20-min survey in spring to 0.5 in summer and winter. These estimates were low compared with 46 other publicly available wind energy facilities that implemented similar protocols and had data for three or four seasons. The annual mean raptor use at these wind energy facilities ranged from 0.06 to 2.34 raptors/800-m plot/20-min survey (Appendix D). A relative ranking of annual mean raptor use was developed based on the results from these wind energy facilities as low (0 – 0.5 raptor/800-m plot/20-min survey), low to moderate (0.5 – 1.0 raptor/800-m plot/20-min survey), moderate (1.0 – 2.0 raptors/800-m plot/20-min survey), high (2.0 – 3.0 raptors/800-m plot/20-min survey), and very high (more than 3.0 raptors/800-m plot/20-min survey). Under this ranking, annual mean diurnal raptor use documented at the Project is low.

Raptor mortality at the Project will likely be within the range of rates reported at other facilities in the eastern half of the US, which is typically low and is likely to consist of the relatively common and widespread species documented in this survey. Within the Midwest, Northeast, and Southeast regions of North America, diurnal raptor fatality rates have ranged from zero to 0.59

raptor/megawatt (MW)/year, with a mean of 0.06 raptor/MW/year (Appendix E). Potential impacts to individuals are unlikely to cause significant adverse impacts to local or regional raptor populations. The prevalence of similar land cover types across the local and regional landscape suggests any population-level effects of habitat loss and displacement attributable to the Project will most likely be minor.

## **Eagles**

Bald eagles were recorded using the Project during all seasons; however, observations were concentrated near the bald eagle nest in the northwest portion of the Project. A total of 38 bald eagle risk minutes (flying within 800-m [2,625 ft] and below 200 m [656 ft]) were documented (i.e., 0.11 min/hour of study or approximately one risk minute every 9.15 hours of study). Forty-seven percent of all bald eagle risk minutes were observed at two points located within one mi of the nest. While eagles were observed throughout the Project, the majority of suitable eagle habitat is located outside of the Project, such as along the Sandusky River (approximately 8.0 km [5.0 mi] northwest, and near Lake Erie (approximately 24.1 km [15.0 mi] north). Although some eagle use may be observed in the Project especially around the nest located within the Project, we expect most eagle use to be concentrated outside of the Project and in more suitable habitats.

## **Sensitive Species**

No federal- and one state-listed bird species (northern harrier) was documented during the surveys. Northern harriers were more commonly observed in the winter, with no observations during the summer or breeding season. Northern harriers are uncommon collision fatalities at wind farms in the Midwest (See Appendix E for a list of facilities and references), and are generally considered at low risk of collision due to their behavioral tendency to fly and forage close to the ground (Whitfield and Madders 2005) with the exception of possible courtship displays at nesting sites during the breeding season. Data from this study indicate that northern harriers are migratory or winter residents, but not likely to breed in the area and are thus at very low risk of collision with turbines. Only one large BCC species was recorded (peregrine falcon; n=1), suggesting very low risk to BCC species (USFWS 2017).

## **CONCLUSIONS**

Analysis of the data collected during the surveys generally indicates that development of the Project is not likely to cause significant impacts to birds, including diurnal raptors or special-status species. The majority of species observed are widespread and abundant, and most are at low risk of collision with turbines or impacts associated with habitat fragmentation, suggesting low risk of adverse impacts to large birds.

Bald eagles were recorded using the Project area during all seasons, with use during surveys was concentrated near a known eagle nest near the northeastern edge of the Project. The presence of an active bald eagle nest within the Project and two other bald eagle nests near the Project boundary may warrant management consideration such as avoiding siting turbines in close proximity to the nests to reduce risk associated with these higher use areas.



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**Appendix A. Species Observed at the Emerson West Wind Project from March 13, 2016 –  
April 20, 2017**



**Appendix A. Summary of individuals (obs) and group (grps) observations within 800 m by bird type and species for large bird use surveys at the Emerson West Wind Project from May 13, 2016 – April 20, 2017.**

Type / Species	Scientific Name	Spring		Summer		Fall		Winter		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
<b>Waterbirds</b>	<b>NA</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>6</b>	<b>1</b>	<b>27</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>35</b>
double-crested cormorant	<i>Phalacrocorax auritus</i>	0	0	1	4	1	27	0	0	2	31
great blue heron	<i>Ardea herodias</i>	2	2	2	2	0	0	0	0	4	4
<b>Waterfowl</b>	<b>NA</b>	<b>10</b>	<b>40</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>57</b>	<b>13</b>	<b>374</b>	<b>25</b>	<b>473</b>
Canada goose	<i>Branta canadensis</i>	9	38	0	0	1	57	12	364	22	459
mallard	<i>Anas platyrhynchos</i>	1	2	0	0	0	0	1	10	2	12
wood duck	<i>Aix sponsa</i>	0	0	1	2	0	0	0	0	1	2
<b>Shorebirds</b>	<b>NA</b>	<b>32</b>	<b>58</b>	<b>31</b>	<b>112</b>	<b>20</b>	<b>106</b>	<b>0</b>	<b>0</b>	<b>83</b>	<b>276</b>
killdeer	<i>Charadrius vociferus</i>	32	58	31	112	20	106	0	0	83	276
<b>Diurnal Raptors</b>	<b>NA</b>	<b>25</b>	<b>28</b>	<b>32</b>	<b>44</b>	<b>29</b>	<b>33</b>	<b>36</b>	<b>43</b>	<b>122</b>	<b>148</b>
American kestrel	<i>Falco sparverius</i>	4	4	10	17	10	12	12	13	36	46
bald eagle	<i>Haliaeetus leucocephalus</i>	3	3	0	0	3	3	0	0	6	6
Cooper's hawk	<i>Accipiter cooperii</i>	0	0	0	0	4	4	2	2	6	6
northern harrier	<i>Circus cyaneus</i>	1	1	0	0	1	1	5	5	7	7
osprey	<i>Pandion haliaetus</i>	0	0	0	0	1	1	0	0	1	1
red-tailed hawk	<i>Buteo jamaicensis</i>	16	19	22	27	10	12	16	22	64	80
rough-legged hawk	<i>Buteo lagopus</i>	0	0	0	0	0	0	1	1	1	1
sharp-shinned hawk	<i>Accipiter striatus</i>	1	1	0	0	0	0	0	0	1	1
<b>Vultures</b>	<b>NA</b>	<b>56</b>	<b>133</b>	<b>69</b>	<b>179</b>	<b>46</b>	<b>94</b>	<b>0</b>	<b>0</b>	<b>171</b>	<b>406</b>
turkey vulture	<i>Cathartes aura</i>	56	133	69	179	46	94	0	0	171	406
<b>Doves/Pigeons</b>	<b>NA</b>	<b>12</b>	<b>34</b>	<b>35</b>	<b>93</b>	<b>13</b>	<b>99</b>	<b>8</b>	<b>75</b>	<b>68</b>	<b>301</b>
mourning dove	<i>Zenaida macroura</i>	9	18	31	85	11	57	2	29	53	189
rock pigeon	<i>Columba livia</i>	3	16	4	8	2	42	6	46	15	112
<b>Large Corvids</b>	<b>NA</b>	<b>27</b>	<b>54</b>	<b>7</b>	<b>18</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>59</b>	<b>54</b>	<b>131</b>
American crow	<i>Corvus brachyrhynchos</i>	27	54	7	18	0	0	20	59	54	131
<b>Overall</b>		<b>164</b>	<b>349</b>	<b>178</b>	<b>454</b>	<b>110</b>	<b>416</b>	<b>77</b>	<b>551</b>	<b>529</b>	<b>1,770</b>

**Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Large Birds  
Observed during Large bird Use Surveys at the Emerson West Wind Project from March  
13, 2016 – April 20, 2017**

**Appendix B. Mean large bird use (number of large birds/800-m plot/20-min survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season during large bird use surveys at the Emerson West Wind Project from May 13, 2016 – April 20, 2017.**

Type / Species	Mean Use				% of Use				% Frequency			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
<b>Waterbirds</b>	<b>0</b>	<b>0.02</b>	<b>0.07</b>	<b>0.31</b>	<b>0</b>	<b>0.6</b>	<b>1.3</b>	<b>6.5</b>	<b>0</b>	<b>2.3</b>	<b>3.4</b>	<b>1.1</b>
double-crested cormorant	0	0	0.05	0.31	0	0	0.9	6.5	0	0	1.1	1.1
great blue heron	0	0.02	0.02	0	0	0.6	0.4	0	0	2.3	2.3	0
<b>Waterfowl</b>	<b>4.30</b>	<b>0.46</b>	<b>0.02</b>	<b>0.66</b>	<b>67.9</b>	<b>11.5</b>	<b>0.4</b>	<b>13.7</b>	<b>8</b>	<b>9.2</b>	<b>1.1</b>	<b>1.1</b>
Canada goose	4.18	0.44	0	0.66	66.1	10.9	0	13.7	6.9	9.2	0	1.1
mallard	0.11	0.02	0	0	1.8	0.6	0	0	1.1	1.1	0	0
wood duck	0	0	0.02	0	0	0	0.4	0	0	0	1.1	0
<b>Shorebirds</b>	<b>0</b>	<b>0.67</b>	<b>1.29</b>	<b>1.22</b>	<b>0</b>	<b>16.6</b>	<b>24.7</b>	<b>25.5</b>	<b>0</b>	<b>29.9</b>	<b>29.9</b>	<b>19.5</b>
killdeer	0	0.67	1.29	1.22	0	16.6	24.7	25.5	0	29.9	29.9	19.5
<b>Diurnal Raptors</b>	<b>0.49</b>	<b>0.32</b>	<b>0.51</b>	<b>0.38</b>	<b>7.8</b>	<b>8.0</b>	<b>9.7</b>	<b>7.9</b>	<b>33.3</b>	<b>25.3</b>	<b>29.9</b>	<b>26.4</b>
<u>Accipiters</u>	0.02	0.01	0	0.05	0.4	0.3	0	1.0	2.3	1.1	0	4.6
Cooper's hawk	0.02	0	0	0.05	0.4	0	0	1.0	2.3	0	0	4.6
sharp-shinned hawk	0	0.01	0	0	0	0.3	0	0	0	1.1	0	0
<u>Buteos</u>	0.26	0.22	0.31	0.14	4.2	5.4	5.9	2.9	18.4	17.2	23	10.3
red-tailed hawk	0.25	0.22	0.31	0.14	4	5.4	5.9	2.9	18.4	17.2	23	10.3
rough-legged hawk	0.01	0	0	0	0.2	0	0	0	1.1	0	0	0
<u>Northern Harrier</u>	0.06	0.01	0	0.01	0.9	0.3	0	0.2	4.6	1.1	0	1.1
northern harrier	0.06	0.01	0	0.01	0.9	0.3	0	0.2	4.6	1.1	0	1.1
<u>Eagles</u>	0	0.03	0	0.03	0	0.9	0	0.7	0	2.3	0	2.3
bald eagle	0	0.03	0	0.03	0	0.9	0	0.7	0	2.3	0	2.3
<u>Falcons</u>	0.15	0.05	0.20	0.14	2.4	1.1	3.7	2.9	12.6	4.6	10.3	10.3
American kestrel	0.15	0.05	0.20	0.14	2.4	1.1	3.7	2.9	12.6	4.6	10.3	10.3
<u>Osprey</u>	0	0	0	0.01	0	0	0	0.2	0	0	0	1.1
osprey	0	0	0	0.01	0	0	0	0.2	0	0	0	1.1
<b>Vultures</b>	<b>0</b>	<b>1.53</b>	<b>2.06</b>	<b>1.08</b>	<b>0</b>	<b>38.1</b>	<b>39.4</b>	<b>22.6</b>	<b>0</b>	<b>51.7</b>	<b>57.5</b>	<b>35.6</b>
turkey vulture	0	1.53	2.06	1.08	0	38.1	39.4	22.6	0	51.7	57.5	35.6
<b>Doves/Pigeons</b>	<b>0.86</b>	<b>0.39</b>	<b>1.07</b>	<b>1.14</b>	<b>13.6</b>	<b>9.7</b>	<b>20.5</b>	<b>23.8</b>	<b>8</b>	<b>10.3</b>	<b>28.7</b>	<b>13.8</b>
mourning dove	0.33	0.21	0.98	0.66	5.3	5.2	18.7	13.7	2.3	8.0	25.3	11.5
rock pigeon	0.53	0.18	0.09	0.48	8.3	4.6	1.8	10.1	6.9	3.4	4.6	2.3
<b>Large Corvids</b>	<b>0.68</b>	<b>0.62</b>	<b>0.21</b>	<b>0</b>	<b>10.7</b>	<b>15.5</b>	<b>4.0</b>	<b>0</b>	<b>20.7</b>	<b>28.7</b>	<b>8.0</b>	<b>0</b>
American crow	0.68	0.62	0.21	0	10.7	15.5	4.0	0	20.7	28.7	8.0	0
<b>Overall</b>	<b>6.33</b>	<b>4.01</b>	<b>5.22</b>	<b>4.78</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>				

**Appendix C. Mean Use by Point for All Large Birds and Major Large Bird Types during  
Large bird Use Surveys at the Emerson West Wind Project from May 13, 2016 – April 20,  
2017**

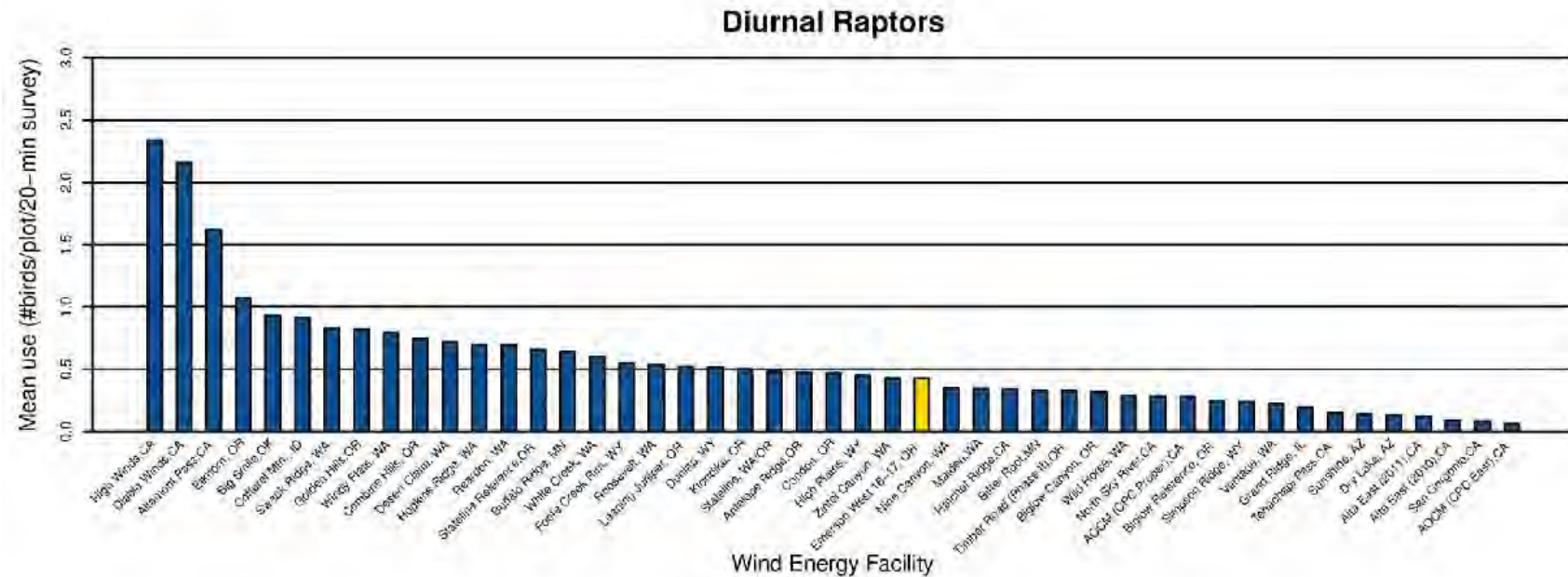
**Appendix C. Mean use for large birds (number of birds/800-m plot/20-min survey) by point for all major large bird types observed at the Emerson West Wind Project from May 13, 2016 – April 20, 2017.**

Bird Type	Survey Point														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Waterbirds	0	0	0	0.08	0.33	0	0	0	0	0	0	0	0	0	2.25
Waterfowl	0	0.17	0.50	22.7	0	0	3.00	4.75	1.83	0	0.33	3.75	0	0	0
Shorebirds	0.17	0.92	0.08	0.92	6.58	1.50	0.25	0.17	0.17	0	0.50	0.25	0.58	0.17	0.08
Diurnal Raptors	0.42	0.33	0.25	0.17	0.42	0.58	0.58	0.33	0.08	0.42	0.17	0.42	0.67	0.08	0.75
Vultures	1.50	0.25	1.83	0.83	0.33	2.00	1.33	0.67	1.08	1.67	0.5	1.00	1.08	1.17	2.83
Doves/Pigeons	0.17	0	0.42	0	0	2.92	0.17	0.5	0.33	0.17	1.42	0	3.08	0	0.25
Large Corvids	0.33	1.33	0	0.75	0	0.17	0.08	0.33	0	0.25	0.33	0.25	0.08	0.08	0.08
<b>All Large birds</b>	<b>2.58</b>	<b>3.00</b>	<b>3.08</b>	<b>25.4</b>	<b>7.67</b>	<b>7.17</b>	<b>5.42</b>	<b>6.75</b>	<b>3.5</b>	<b>2.5</b>	<b>3.25</b>	<b>5.67</b>	<b>5.5</b>	<b>1.50</b>	<b>6.25</b>

Bird Type	Survey Point													
	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Waterbirds	0	0	0	0	0	0	0	0.08	0.08	0.08	0	0	0	0
Waterfowl	0	0.08	0	0	0	0.17	0.92	0.42	0	0	0	0	0	0.83
Shorebirds	0.25	0.83	0.08	0.42	1.67	0.17	0.33	0	0.58	0.33	0.25	1.75	0.83	3.17
Diurnal Raptors	0.58	0.67	0.58	0.83	0.42	0.25	0.33	0.67	0.42	0.33	0.33	0.50	0.17	0.58
Vultures	2.42	2.08	0.83	0.75	0.92	0.33	0.67	0.50	1.33	1.00	1.75	1.25	1.08	0.83
Doves/Pigeons	3.50	0.92	1.75	1.08	1.25	0.50	0.08	0.83	0.17	0	0	0.25	4.67	0.67
Large Corvids	0.92	0.92	0.33	0.08	0.92	0.50	0.17	0.75	0.17	0.25	0.08	0.83	0.33	0.58
<b>All Large Birds</b>	<b>7.67</b>	<b>5.50</b>	<b>3.58</b>	<b>3.17</b>	<b>5.17</b>	<b>1.92</b>	<b>2.50</b>	<b>3.25</b>	<b>2.75</b>	<b>2.00</b>	<b>2.42</b>	<b>4.58</b>	<b>7.08</b>	<b>6.67</b>

## **Appendix D. Comparison of Diurnal Raptor Use at North American Wind Energy Facilities**



**Appendix D. Comparison of annual diurnal raptor use during large bird and eagle use surveys at the Emerson West Wind Project from May 13, 2016, to April 20, 2017, and annual diurnal raptor use recorded at other North American wind energy facilities.**

Data from the following sources:

Study and Location	Reference	Study and Location	Reference	Study and Location	Reference
Emerson West, OH	This study.	Foot Creek Rim, WY	Johnson et al. 2000b	Wild Horse, WA	Erickson et al. 2003d
High Winds, CA	Kerlinger et al. 2005	Roosevelt, WA	NWC and WEST 2004	North Sky River, CA	Erickson et al. 2011
Diablo Winds, CA	WEST 2006	Leaning Juniper, OR	Kronner et al. 2005	AOCM (CPC Proper), CA	Chatfield et al. 2010
Altamont Pass, CA	Orloff and Flannery 1992	Dunlap, WY	Johnson et al. 2009a	Biglow Reference, OR	WEST 2005c
Elkhorn, OR	WEST 2005a	Klondike, OR	Johnson et al. 2002	Simpson Ridge, WY	Johnson et al. 2000b
Big Smile (Dempsey), OK	Derby et al. 2010b	Stateline, WA/OR	Erickson et al. 2003b	Vantage, WA	Jeffrey et al. 2007
Cotterel Mtn., ID	BLM 2006	Antelope Ridge, OR	WEST 2009	Grand Ridge, IL	Derby et al. 2009
Swauk Ridge, WA	Erickson et al. 2003c	Condon, OR	Erickson et al. 2002b	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Golden Hills, OR	Jeffrey et al. 2008	High Plains, WY	Johnson et al. 2009b	Sunshine, AZ	WEST and the CPRS 2006
Windy Flats, WA	Johnson et al. 2007	Zintel Canyon, WA	Erickson et al. 2002a, 2003a	Dry Lake, AZ	Young et al. 2007a
Combine Hills, OR	Young et al. 2003a	Nine Canyon, WA	Erickson et al. 2001	Alta East (2011), CA	Chatfield et al. 2011
Desert Claim, WA	Young et al. 2003b	Maiden, WA	Young et al. 2002	Alta East (2010), CA	Chatfield et al. 2011
Hopkins Ridge, WA	Young et al. 2003c	Hatchet Ridge, CA	Young et al. 2007b	San Geronio, CA	Anderson et al. 2000, Erickson et al. 2002b
Reardon, WA	WEST 2005b	Bitter Root, MN	Derby and Dahl 2009	AOCM (CPC East), CA	Chatfield et al. 2010
Stateline Reference, OR	URS et al. 2001	Timber Road (Phase II), OH	Good et al. 2010		
Buffalo Ridge, MN	Johnson et al. 2000a	Biglow Canyon, OR	WEST 2005c		
White Creek, WA	NWC and WEST 2005				



**Appendix E. Wind energy facilities in the Midwest, Northeast, and Southeast regions of North America with comparable use and fatality data for raptors.**

**Appendix E. Wind energy facilities in the Midwest, Northeast, and Southeast regions of North America with comparable use and fatality data for raptors.**

Wind Energy Facility	Use Estimate <sup>A</sup>	Raptor Fatality Estimate <sup>B</sup>	No. of Turbines	Total MW
<b>Emerson West, OH (2016-2017)</b>	<b>0.43</b>			
<b>Midwest</b>				
Buffalo Ridge, MN (Phase I; 1999)		0.47	73	25
Moraine II, MN (2009)		0.37	33	49.5
Winnebago, IA (2009-2010)		0.27	10	20
Buffalo Ridge I, SD (2009-2010)		0.2	24	50.4
Cedar Ridge, WI (2009)		0.18	41	67.6
PrairieWinds SD1, SD (2013-2014)		0.17	108	162
Top of Iowa, IA (2004)		0.17	89	80
Cedar Ridge, WI (2010)		0.13	41	68
Ripley, Ont (2008)		0.1	38	76
Wessington Springs, SD (2010)	0.232	0.07	34	51
Rugby, ND (2010-2011)		0.06	71	149
NPPD Ainsworth, NE (2006)		0.06	36	20.5
Wessington Springs, SD (2009)	0.232	0.06	34	51
PrairieWinds ND1 (Minot), ND (2011)		0.05	80	115.5
PrairieWinds ND1 (Minot), ND (2010)		0.05	80	115.5
PrairieWinds SD1, SD (2012-2013)		0.03	108	162
Elm Creek, MN (2009-2010)		0	67	100
Rail Splitter, IL (2012-2013)		0	67	100.5
Pioneer Prairie II, IA (2011-2012)		0	62	102.3
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
Blue Sky Green Field, WI (2008; 2009)		0	88	145
Elm Creek II, MN (2011-2012)		0	62	148.8
Barton I & II, IA (2010-2011)		0	80	160
PrairieWinds SD1, SD (2011-2012)		0	108	162
Kewaunee County, WI (1999-2001)		0	31	20.46
Buffalo Ridge II, SD (2011-2012)		0	105	210
Buffalo Ridge, MN (Phase I; 1996)		0	73	25
Buffalo Ridge, MN (Phase I; 1997)		0	73	25
Buffalo Ridge, MN (Phase I; 1998)		0	73	25
Fowler I, IN (2009)		0	162	301
Big Blue, MN (2013)		0	18	36
Big Blue, MN (2014)		0	18	36
Top of Iowa, IA (2003)		0	89	80
Grand Ridge I, IL (2009-2010)	0.195	0	66	99
<b>Northeast</b>				
Munnsville, NY (2008)		0.59	23	34.5
Noble Ellenburg, NY (2009)		0.25	54	80
Noble Clinton, NY (2009)		0.16	67	100
Noble Wethersfield, NY (2010)		0.13	84	126
Noble Bliss, NY (2009)		0.12	67	100
Noble Ellenburg, NY (2008)		0.11	54	80
Noble Bliss, NY (2008)		0.1	67	100
Noble Clinton, NY (2008)		0.1	67	100
Mount Storm, WV (2010)		0.1	132	264
Noble Chateaugay, NY (2010)		0.08	71	106.5
Cohocton/Dutch Hills, NY (2010)		0.08	50	125
Mountaineer, WV (2003)		0.07	44	66

**Appendix E. Wind energy facilities in the Midwest, Northeast, and Southeast regions of North America with comparable use and fatality data for raptors.**

Wind Energy Facility	Use Estimate <sup>A</sup>	Raptor Fatality Estimate <sup>B</sup>	No. of Turbines	Total MW
High Sheldon, NY (2010)		0.06	75	112.5
Mount Storm, WV (2011)		0.03	132	264
Maple Ridge, NY (2007-2008)		0.03	195	321.75
Criterion, MD (2011)		0.02	28	70
Beech Ridge, WV (2012)		0.01	67	100.5
Beech Ridge, WV (2013)		0.01	67	100.5
Locust Ridge, PA (Phase II; 2009)		0	51	102
Locust Ridge, PA (Phase II; 2010)		0	51	102
High Sheldon, NY (2011)		0	75	112.5
Cohocton/Dutch Hill, NY (2009)		0	50	125
Lempster, NH (2009)		0	12	24
Lempster, NH (2010)		0	12	24
Stetson Mountain II, ME (2010)		0	17	25.5
Stetson Mountain II, ME (2012)		0	17	25.5
Mount Storm, WV (2009)		0	132	264
Casselman, PA (2009)		0	23	34.5
Casselman, PA (2008)		0	23	34.5
Mars Hill, ME (2007)		0	28	42
Mars Hill, ME (2008)		0	28	42
Pinnacle, WV (2012)		0	23	55.2
Stetson Mountain I, ME (2011)		0	38	57
Stetson Mountain I, ME (2009)		0	38	57
Stetson Mountain I, ME (2013)		0	38	57
Noble Altona, NY (2010)		0	65	97.5
<b>Southeast</b>				
Buffalo Mountain, TN (2000-2003)		0	3	1.98
Buffalo Mountain, TN (2005)		0	18	28.98

A=number of raptors/plot/20min survey

B=number of fatalities/MW/year

**Appendix E (continued). Wind energy facilities in the Midwest, Northeast, and Southeast regions of North America with comparable use and fatality data for raptors. Data from the following sources:**

Facility	Use Estimate	Fatality Estimate	Facility	Use Estimate	Fatality Estimate
<b>Emerson West, OH (16-17)</b>	<b>This study</b>				
Barton I & II, IA (10-11)		Derby et al. 2011b	Lempster, NH (10)		Tidhar et al. 2011
Beech Ridge, WV (12)		Tidhar et al. 2013	Locust Ridge, PA (Phase II; 09)		Arnett et al. 2011
Beech Ridge, WV (13)		Young et al. 2014	Locust Ridge, PA (Phase II; 10)		Arnett et al. 2011
Big Blue, MN (13)		Fagen Engineering 2014	Maple Ridge, NY (07-08)		Jain et al. 2009a
Big Blue, MN (14)		Fagen Engineering 2015	Mount Storm, WV (11)		Young et al. 2011a, 2012a
Blue Sky Green Field, WI (08; 09)		Gruver et al. 2009	Mountaineer, WV (03)		Kerns and Kerlinger 2004
Buffalo Mountain, TN (00-03)		Nicholson et al. 2005	Munnsville, NY (08)		Stantec 2009b
Buffalo Mountain, TN (05)		Fiedler et al. 2007	Noble Altona, NY (10)		Jain et al. 2011a
Buffalo Ridge, MN (Phase I; 96)		Johnson et al. 2000a	Noble Bliss, NY (08)		Jain et al. 2009b
Buffalo Ridge, MN (Phase I; 97)		Johnson et al. 2000a	Noble Bliss, NY (09)		Jain et al. 2010c
Buffalo Ridge, MN (Phase I; 98)		Johnson et al. 2000a	Noble Chateaugay, NY (10)		Jain et al. 2011b
Buffalo Ridge, MN (Phase I; 99)		Johnson et al. 2000a	Noble Clinton, NY (08)		Jain et al. 2009c
Buffalo Ridge, MN (Phase II; 98)		Johnson et al. 2000a	Noble Clinton, NY (09)		Jain et al. 2010a
Buffalo Ridge, MN (Phase II; 99)		Johnson et al. 2000a	Noble Ellenburg, NY (08)		Jain et al. 2009d
Buffalo Ridge, MN (Phase III; 99)		Johnson et al. 2000a	Noble Ellenburg, NY (09)		Jain et al. 2010b
Buffalo Ridge I, SD (09-10)		Derby et al. 2010d	Noble Wethersfield, NY (10)		Jain et al. 2011c
Buffalo Ridge II, SD (11-12)		Derby et al. 2012a	NPPD Ainsworth, NE (06)		Derby et al. 2007
Casselman, PA (08)		Arnett et al. 2009	Pinnacle, WV (12)		Gritski and Kronner 2010
Casselman, PA (09)		Arnett et al. 2010	Pioneer Prairie I, IA (Phase II; 11-12)		Hein et al. 2013
Cedar Ridge, WI (09)		BHE Environmental 2010	PrairieWinds ND1 (Minot), ND (10)		Chodachek et al. 2012
Cedar Ridge, WI (10)		BHE Environmental 2011	PrairieWinds ND1 (Minot), ND (11)		Derby et al. 2011d
Cohocton/Dutch Hill, NY (09)		Stantec 2010	PrairieWinds SD1 (Crow Lake), SD (11-12)		Derby et al. 2012c
Cohocton/Dutch Hills, NY (10)		Stantec 2011	PrairieWinds SD1 (Crow Lake), SD (12-13)		Derby et al. 2013
Criterion, MD (11)		Young et al. 2012b	PrairieWinds SD1, SD (13-14)		Derby et al. 2014
Elm Creek, MN (09-10)		Derby et al. 2010e	Rail Splitter, IL (12-13)		Good et al. 2013
Elm Creek II, MN (11-12)		Derby et al. 2012b	Ripley, Ont (08)		Jacques Whitford 2009
Fowler I, IN (09)		Johnson et al. 2010	Rugby, ND (10-11)		Derby et al. 2011c
Grand Ridge I, IL (09-10)	Derby et al. 2009	Derby et al. 2010a	Stetson Mountain I, ME (09)		Stantec 2009c
High Sheldon, NY (10)		Tidhar et al. 2012a	Stetson Mountain I, ME (11)		Normandeau Associates 2011
High Sheldon, NY (11)		Tidhar et al. 2012b	Stetson Mountain I, ME (13)		Stantec 2014
Kewaunee County, WI (99-01)		Howe et al. 2002	Stetson Mountain II, ME (10)		Normandeau Associates 2010
Mars Hill, ME (07)		Stantec 2008	Stetson Mountain II, ME (12)		Stantec 2013
Mars Hill, ME (08)		Stantec 2009a	Top of Iowa, IA (03)		Jain 2005
Moraine II, MN (09)		Derby et al. 2010f	Top of Iowa, IA (04)		Jain 2005
Mount Storm, WV (09)		Young et al. 2009, 2010b	Wessington Springs, SD (09)	Derby et al. 2008	Derby et al. 2010c
Mount Storm, WV (10)		Young et al. 2010a, 2011b	Wessington Springs, SD (10)		Derby et al. 2011a
Lempster, NH (09)		Tidhar et al. 2010	Winnebago, IA (09-10)		Derby et al. 2010g

FINAL REPORT

MIST NET SURVEYS OF  
SUMMER BATS ON THE  
PROPOSED REPUBLIC WIND FARM  
SENECA AND SANDUSKY COUNTIES, OHIO

5 October 2011

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## **1.0 Project Description**

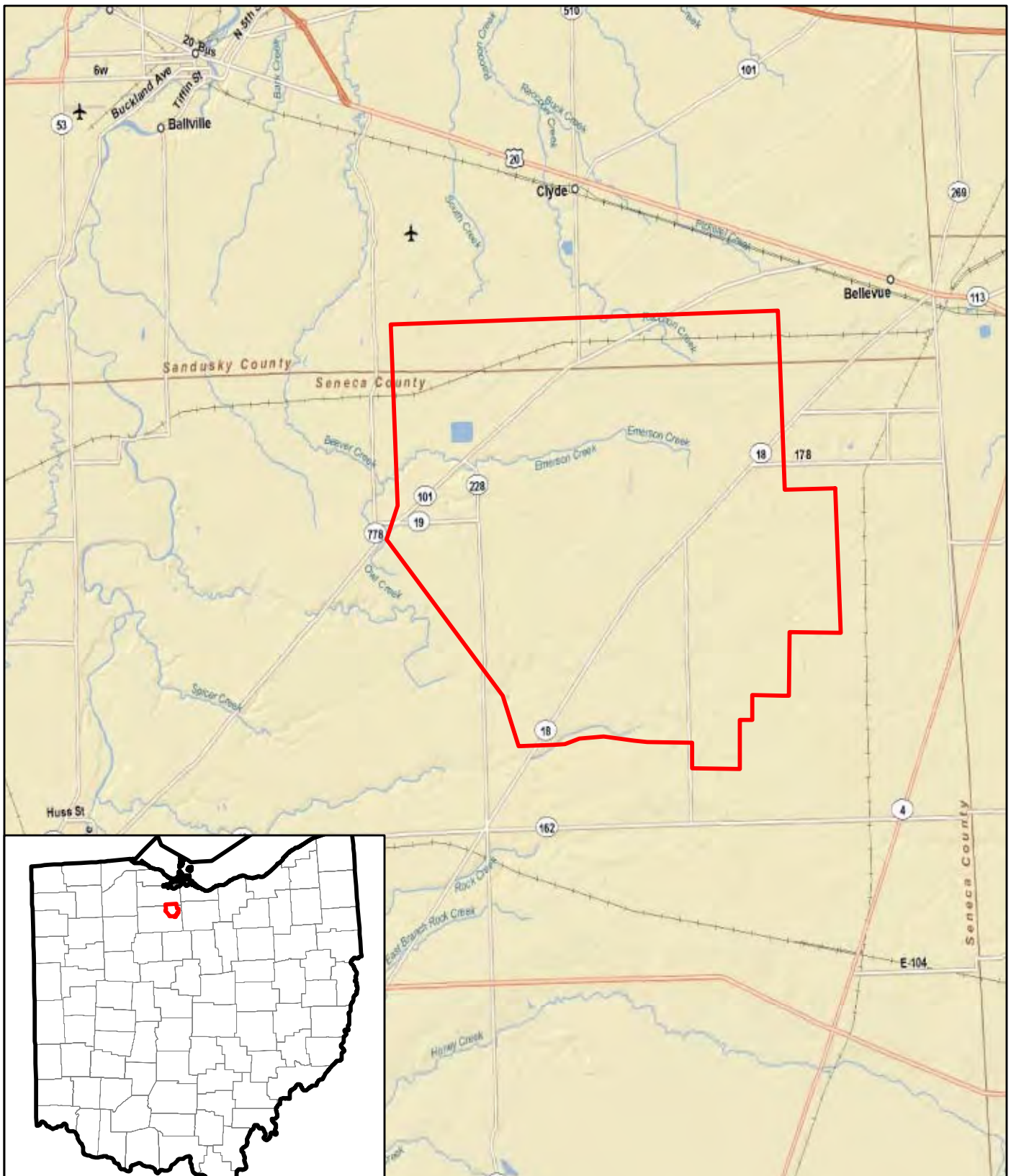
Republic Wind, LLC (Republic), is proposing to construct a commercial wind energy facility within a wind resource area consisting of approximately 16,028 hectares (39,607 ac) in Seneca and Sandusky counties, Ohio. The project area is referred to as the Republic Wind Farm (Project). On behalf of Republic, Tetra Tech EC, Inc. (Tetra Tech) contracted Environmental Solutions & Innovations, Inc. (ESI) to perform a summer mist net survey for summer bats on the Project site.

The Project straddles the Seneca/Sandusky county line, just east of the town of Green Springs in Sandusky County, Ohio (Figure 1) and covers part of the Fremont East, Clyde, Watson, and Fireside USGS 1/24000 Quadrangles. Indiana bats are resident in the state of Ohio during summer, and are known to hibernate in caves and mines within the state and in neighboring states of Indiana and Kentucky. The closest major hibernaculum is Preble Mine approximately 196.34 kilometers (122 mi) southwest of the Project in Preble County. The closest designated critical habitat for this species is Ray's Cave approximately 402.34 kilometers (250 mi) southwest of the Project in Greene County, Indiana. The closest county with documented maternity records is Lucas County to the northwest (Appendix A).

Based on previous agency coordination, Ohio Department of Natural Resources (ODNR) indicated that the Project met the need for a moderate monitoring and that sampling would require 25 mist-net sites.

## **2.0 Regulatory Setting**

On 26 October 2007, the Department of the Interior signed a Charter to create the Federal Advisory Committee (FAC) to develop "effective measures to avoid or minimize impacts to wildlife and their habitats related to land-based wind energy facilities". Based in part on guidance provided by this committee, both ODNR and U.S. Fish and Wildlife (USFWS) have developed guidance for pre- and post-construction wildlife studies at commercial wind facilities. This survey is designed to comply with the Tier 3 study guidance found in the USFWS Draft Land-Based Wind Energy Guidelines (USFWS 2011) and the On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio developed by the ODNR (ODNR 2008). These guidelines provide a framework for compliance with a variety of natural resources regulations, including the Endangered



 Project Boundary

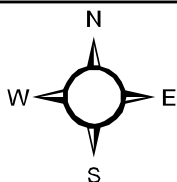


Figure 1. Location of the proposed Republic Wind Energy Facility in Seneca and Sandusky counties, Ohio.

Project No. 340

0 3 6  
KM  
Base Map: ESRI Street Map



ENVIRONMENTAL SOLUTIONS  
& INNOVATIONS, INC.

Species Act (ESA). Of particular concern is that the Project (as is the entire state of Ohio) is within the known range of the federally endangered Indiana bat (*Myotis sodalis*). As such, efforts to determine whether this species is present during summer are an important consideration of the study design, although these efforts should also be sufficient to document other species of bats present at the site.

The Federal Endangered Species Act (ESA) [16 U.S.C. 1531 et seq.] was codified into law in 1973. This law provides for the listing, conservation, and recovery of endangered and threatened species of plants and wildlife. Under the ESA, the U.S. Fish and Wildlife Service (USFWS) is mandated to monitor and protect listed species. Many states enacted similar laws.

Because the Project is within the range of the federally-endangered Indiana bat (*Myotis sodalis*), this study was designed to comply not only with the ODNR moderate intensity survey requirements for a commercial wind energy facility, but also to determine whether the site is occupied by a maternity colony of Indiana bats.

Section 9 of the ESA prohibits the “take” of listed species. “Take” is defined by the ESA as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect” Both the USFWS and ODNR wind energy guidelines are designed to address regulatory issues related to the take of state and federally-listed species.

ESI completed all field efforts in accordance with our Federal U.S. Fish & Wildlife Permit # TE02373A-1 and ODNR Wild Animal Permit-Scientific Collection # 14-70.

## **3.0 Methods**

### **3.1 Survey Objectives**

As described in Section 2.0, the survey was designed to meet ODNR and USFWS guidelines as a mechanism for ESA compliance. While these guidelines do not outline specific goals or objectives, various benchmarks may be inferred, based on aspects of the survey process.

#### **3.1.1 Presence or Probable Absence of Indiana Bats or Other Species of Concern**

Capture of a federally listed Indiana bat or other species of concern may indicate that further evaluation of the effects of the Project on the species may be necessary. Evaluation of effects can lead to determination of whether the Project should be developed, appropriate avoidance and minimization measures, and need for compensation for species or habitat losses. Table 1 provides listing status of eleven

Table 1. Bats of Ohio and their listing status.

Bat Species	Status
Big brown bat	
Little brown bat	Undergoing 90 day review by USFWS
Northern bat	Undergoing status review by USFWS
Indiana bat	Federally endangered
Eastern small-footed bat	State species of concern
Tri-colored bat	
Eastern red bat	
Hoary bat	
Silver-haired bat	
Evening bat	
Rafinesque's big-eared bat	State species of concern

bat species recorded in the State of Ohio (Brack et al. 2010). Appendix A provides ecology of listed species, and those species which may be listed during the life of the project.

### 3.1.2 Habitat of Indiana Bats or Other Species of Concern

If Indiana bats or other species of concern are captured, ODNR guidelines require identification of roosting and foraging habitat through the use of radio-telemetry. Identification of habitat use can aid in the evaluation of the potential effects of the Project on these species. Identification of maternity roosts, and subsequent exit counts, can suggest local population sizes, and thus potential effects. Roosting and foraging behavior can suggest habitat preferences and aid in the identification of preferred roosting and foraging habitat. Proximity of roosting and foraging habitat to the Project area can also aid in the evaluation of the potential effects of Project development on the listed species.

### 3.1.3 Maternity colonies of All Other Bat Species

ODNR requires radio telemetry to attempt to identify the location of the maternity colony in instances where more than fifteen reproductive females of one common colonial species (e.g., big brown bat, little brown, or northern bat) are captured in one night of mist netting. Similar to species of concern, data collected on maternity colonies of these species may provide insight to potential effects from Project development.

### 3.1.4 Bat Community Composition

While secondary to determining potential Project effects on listed species or larger colonies of non-listed species, local bat community composition may provide insight on reducing effects to all bat species in regions where wind energy development is likely. Certainly, data collected and recorded in a standardized manner should be comparable over different spatial and temporal scales. Thus, adherence to ODNR

survey guidelines may ensure consistency in evaluation of effects to listed and non-listed species.

### **3.2 Survey Effort**

Notwithstanding the foregoing, bat surveys are difficult to standardize because of the large amount of variability that exists at an individual survey site or between survey sites. Sampling efforts followed guidelines provided by the Indiana Bat Recovery Team in the 2007 Indiana Bat Draft Recovery Plan (First Revision) (Table 2) as supplemented by guidance provided in ODNR's On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio (ODNR 2008) (Table 3).

ODNR's guidelines provide ODNR the discretion to assess the site and determine the level of survey effort required. The following categories were used to determine the level of effort:

#### **Minimum**

- These areas are large tracts of agricultural lands that do not come within 500 meters of a woodland  $\geq 10$  hectares, wetlands  $\geq 3$  hectares, or large water body (i.e. rivers, lakes, or reservoirs)

#### **Moderate**

- Primarily agricultural or grasslands, with patches of forests, wetlands, and/or other habitat

#### **Extensive**

- These include those areas within proximity to migratory corridors, staging areas, Audubon Important Bird Areas (IBA's), or the Lake Erie shoreline (3-mile buffer)

Based on previous agency coordination, ODNR indicated that the Project met the need for a moderate monitoring study and recommended sampling at 25 mist net sites. A summary of moderate monitoring guidelines is provided in Table 3.

Each net site was sampled on two nonconsecutive nights. Within each net site, four individual net sets were placed. Mist nets were 6, 9, or 12 meters (18, 30 or 42 feet) wide, and 2-4 individual nets were stacked on each set of poles such that the entire set ranged in height from approximately 6 to 9 meters (20-30 feet). At least one net set at each site was 7.5 meters (24.6 feet) or taller in height. Following the USFWS and ODNR protocols, ESI conducted surveys within the 15 June to 31 July window, from 12 to 30 July 2011 at 25 net sites to provide adequate survey coverage of the Project.



Table 2. USFWS Indiana Bat Mist Net Survey Guidelines

USFWS NETTING GUIDELINES	
1.	Netting Season: 15 May to 15 August, when Indiana bats occupy summer habitat.
2.	Equipment (Mist Nets): constructed of the finest, lowest visibility mesh commercially available – monofilament or black nylon – with the mesh size approximately 38 millimeter (1.5 in).
3.	Net Placement: mist nets extend approximately from water or ground level to tree canopy and are bounded by foliage on the sides. Net width and height are adjusted for the fullest coverage of the flight corridor at each site. A “typical” net set consists of three (or more) nets “stacked” on top of one another; width may vary up to 20 meters (60 ft).
4.	Net Site Spacing: <ul style="list-style-type: none"> <li>◆ Streams – one net site per 1 kilometer (0.6 mi)</li> <li>◆ Land Tracts – two net sites per 1 square kilometer (246 ac)</li> </ul>
5.	Minimum Level of Effort Per Net Site: <ul style="list-style-type: none"> <li>◆ Two net locations (sets) per net site, with locations (sets) at least 30 meters (100 ft) apart</li> <li>◆ Two (calendar) nights of netting</li> <li>◆ At least four net-nights (1 net-night = 1 net set deployed for 1 night); typically, two net sets are deployed at one site for two nights, resulting in four net-nights</li> <li>◆ Sample Period: begin at dusk and net for 5 hours (approximately 0200h)</li> <li>◆ Nets are monitored at approximately 10-minute intervals</li> <li>◆ No disturbance near the nets between checks</li> </ul>
6.	Weather Conditions: net only if the following weather conditions are met: <ul style="list-style-type: none"> <li>◆ No precipitation</li> <li>◆ Temperature <math>\geq 10^{\circ}</math> Celsius (50° F)</li> <li>◆ No strong winds</li> </ul>
Source: U.S. Fish and Wildlife Service, 2007	

Nets were on a pulley system allowing biologists to raise and lower them as necessary to retrieve bats. Nets were erected at dusk and kept in place for at least 5 continuous netting hours. The nets were attended continuously and checked at least every 10 minutes.

### 3.3 Net site Selection

Thirty potential net sites (primarily in and adjacent to isolated woodlots) were pre-selected by ESI and Tetra Tech biologists prior to field deployment and approved by ODNR and USFWS (See appendix B). As outlined in the study plan additional four sites were located by biologists while conducting field work. As per ODNR and USFWS guidance, only 25 sites were netted. Exact net site and net locations are determined by assessing waterways, upland trails, and field margins for suitable foraging and commuting flyways. Ideally, the nets are draped across the flyway between the vegetation at each side, and will extend up to the canopy, as feasible. Exact net placement is based upon canopy cover, presence of a flight corridor, water, and habitat conditions near the site. Nets are set to maximize coverage of flight paths used by bats along suitable corridors. Riparian corridors often provide successful mist net sites; however, upland corridors (e.g., trails or logging roads) also provide suitable sites. Some of the isolated woodlands selected for sampling did not

have suitable flyways through them. As such, some nets were placed within openings in the woodlots, woodlot edges, or along wooded fencerows.

**Table 3. ODNR Moderate Monitoring Mist Net Survey Guidelines for Proposed Commercial Wind Facilities.**

<b>ODNR MODERATE MONITORING NETTING GUIDELINES</b>	
1. Netting Season: 15 June to 31 July.	
2. Net Placement:	<ul style="list-style-type: none"> <li>• Nets are placed on pulley systems that allow at least two standard nets to be "stacked" on top of each other and with one set of poles allowing 3 nets to be stacked and reach 7.5 meters from the substrate.</li> <li>• Proposed net sites are to be inspected by ODNR personnel prior to beginning sampling efforts.</li> </ul>
3. Net Site Spacing: Land Tracts – two net sites per 1 square kilometer (246 ac) of forested habitat	
4. Minimum Level of Effort Per Net Site:	<ul style="list-style-type: none"> <li>• Four net locations (sets) per net site, with all locations (sets) within at least 30 m (100 ft) of each other</li> <li>• Two non-consecutive (calendar) nights of netting</li> <li>• At least eight net-nights (1 net-night = 1 net set deployed for 1 night);</li> <li>• Sample Period: begin at dusk and net for 5 hours (approximately 0200 h)</li> <li>• Photos of all species captured</li> </ul>
5. Marking of Bats:	<ul style="list-style-type: none"> <li>• Small dots of nontoxic, water-soluble paint applied to one forearm of all bats to temporarily identify recaptures.</li> <li>• Indiana and Rafinesque's Big-Eared bats banded with bands provided by ODNR</li> <li>• Eastern Small-Footed Bats are not banded due to risk of injury</li> <li>• All Indiana, Rafinesque's big-eared, and eastern small-footed bats are radio-tagged and tracked to both day roosts and night foraging areas</li> <li>• When more than 15 reproductive bats of the common colonial species are captured one will be radio-tagged and tracked to its day roosts.</li> </ul>
Source: Ohio Department of Natural Resources 2009	

Net site selection also included consideration of habitat characterization described in current literature and ESI personnel's experience with the species. Habitat with the following characteristics was selected to the degree feasible:

- Large trees (>40 centimeters [16 in] dbh) frequently used for maternity roosts
- An open canopy, apparently important for warming roost sites
- An open, uncluttered understory, used for traveling and foraging

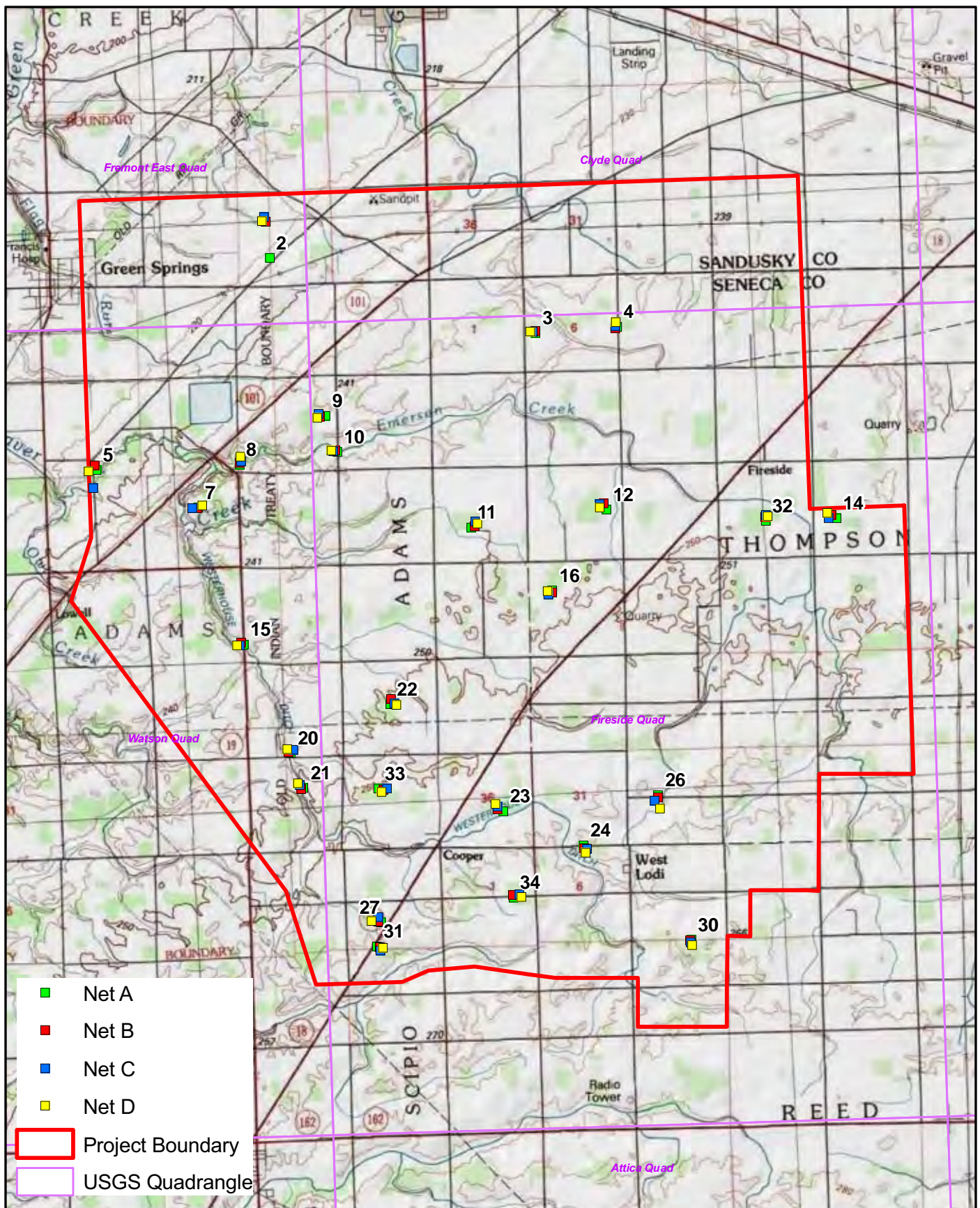
Site selection was based upon expectation of bat activity and maximizing coverage of the Project area (Figure 2). Appendix C provides data sheets and Table 4 contains coordinates for mist net sites.

Table 4. Mist net site GPS coordinates on the proposed Republic Wind Farm in Seneca and Sandusky counties, Ohio.

Site	Net	Latitude	Longitude
2	A	N41 15 36.4	W83 00 26.9
	B	N41 15 56.5	W83 00 28.7
	C	N41 15 59.1	W83 00 30.2
	D	N41 15 56.9	W83 00 31.7
3	A	N41 14 50.5	W82 57 13.5
	B	N41 14 51.4	W82 57 13.9
	C	N41 14 51.1	W82 57 15.7
	D	N41 14 51.1	W82 57 17.5
4	A	N41 14 52.3	W82 56 14.0
	B	N41 14 51.5	W82 56 15.4
	C	N41 14 52.7	W82 56 15.4
	D	N41 14 55.0	W82 56 14.8
5	A	N41 13 41.8	W83 02 38.6
	B	N41 13 44.5	W83 02 40.0
	C	N41 13 32.1	W83 02 41.5
	D	N41 13 41.4	W83 02 44.1
7	A	N41 13 19.7	W83 01 24.6
	B	N41 13 19.2	W83 01 25.6
	C	N41 13 19.4	W83 01 29.2
	D	N41 13 20.5	W83 01 21.6
8	A	N41 13 42.7	W83 0 53.6
	B	N41 13 43.8	W83 0 53.3
	C	N41 13 44.4	W83 0 52.2
	D	N41 13 46.8	W83 0 52.7
9	A	N41 14 08	W82 59 49.5
	B	N41 14 08	W82 59 53.5
	C	N41 14 09.2	W82 59 54.2
	D	N41 14 07	W82 59 55.3
10	A	N41 13 47.8	W82 59 41.8
	B	N41 13 48.5	W82 59 42.8
	C	N41 13 48.5	W82 59 44.3
	D	N41 13 48.9	W82 59 46.0
11	A	N41 13 3.7	W82 58 5.4
	B	N41 13 4.3	W82 58 2.6
	C	N41 13 7.0	W82 58 2.4
	D	N41 13 5.8	W82 58 0.8
12	A	N41 13 11.3	W82 56 25.8
	B	N41 13 14.7	W82 56 27.7
	C	N41 13 14.5	W82 56 30.7
	D	N41 13 12.5	W85 56 30.5
14	A	N41 13 02.6	W82 53 37.4
	B	N41 13 04.6	W82 53 41.2
	C	N41 13 02.9	W82 53 43.5
	D	N41 13 05.6	W82 53 44.4
15	A	N41 12 02.9	W83 00 54.7
	B	N41 12 04.1	W83 00 56.6
	C	N41 12 02.6	W83 00 57.6
	D	N41 12 02.7	W83 00 59.4
16	A	N41 12 27.6	W82 57 7.2
	B	N41 12 26.5	W82 57 7.2
	C	N41 12 25.5	W82 57 10.3
	D	N41 12 27.2	W82 57 10.8
20	A	N41 11 02.2	W83 00 22.4

Site	Net	Latitude	Longitude
	B	N41 11 02.7	W83 00 23.9
	C	N41 11 04.0	W83 00 20.8
	D	N41 11 04.3	W83 00 24.9
21	A	N41 10 42.9	W83 0 13.9
	B	N41 10 42.1	W83 0 15.5
	C	N41 10 44.3	W83 0 16.6
	D	N41 10 45.3	W83 0 17.7
22	A	N41 11 27.4	W82 59 08.7
	B	N41 11 30.5	W82 59 07.9
	C	N41 11 27.8	W82 59 05.6
	D	N41 11 27.1	W82 59 04.3
23	A	N41 10 26.2	W82 57 48.4
	B	N41 10 27.5	W85 57 52.5
	C	N41 10 29.2	W82 57 52.4
	D	N41 10 30.7	W82 57 53.8
24	A	N41 10 6.8	W82 56 50.4
	B	N41 10 4.6	W82 56 49.8
	C	N41 10 4.1	W82 56 47.6
	D	N41 10 1.9	W82 56 48.8
26	A	N41 10 32.4	W82 55 54.5
	B	N41 10 31.3	W82 55 54.9
	C	N41 10 29.6	W82 55 57.1
	D	N41 10 25.0	W82 55 53.7
27	A	N41 09 27.1	W82 59 20.5
	B	N41 09 27.6	W82 59 22.2
	C	N41 0 30.1	W82 59 22.1
	D	N41 09 28.0	W82 59 27.1
30	A	N41 09 12.1	W82 55 33.6
	B	N41 09 11.6	W82 55 34.6
	C	N41 09 10.6	W82 55 34.0
	D	N41 09 09.2	W82 55 33.3
31	A	N41 09 13.8	W82 59 23.8
	B	N41 09 13.2	W82 59 21.7
	C	N41 09 11.4	W82 59 21.2
	D	N41 09 12.8	W82 59 19.6
32	A	N41 13 02.3	W82 54 29.7
	B	N41 13 04.5	W82 54 29.8
	C	N41 13 05.9	W82 54 29.4
	D	N41 13 05.1	W82 54 27.7
33	A	N41 10 41.2	W82 59 19.2
	B	N41 10 40.3	W82 59 15.6
	C	N41 16 40.9	W82 59 13.0
	D	N41 10 39.2	W82 59 17.1
34	A	N41 09 38.4	W82 57 42.9
	B	N41 09 40.1	W82 57 43.3
	C	N41 09 40.2	W82 57 38.1
	D	N41 09 38.7	W82 57 36.7

NOTE: Numbers are not sequential because some pre-selected sites were not netted due to land-owner access or were deemed unsuitable following field visit by permitted bat biologists.



- Net A
- Net B
- Net C
- Net D
- Project Boundary
- USGS Quadrangle

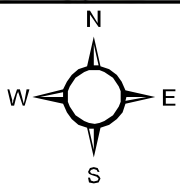


Figure 2. Mist net sites on the proposed Republic Wind Energy Facility in Seneca and Sandusky counties, Ohio.

Project No. 340

0 1750 3500  
Meters  
Base Map: USGS Topographic Map



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### **3.4 Habitat Assessment**

Habitat assessment at the net site focused on features indicative of suitability for Indiana bats. A habitat description for the net site was completed (Appendix C). The emphasis of this description was habitat form: size and relative abundance of large trees and snags that potentially serve as roost trees, canopy closure, understory clutter/openness, distance to water, and flight corridors. Habitat form was emphasized because the Indiana bat roosts in many tree species.

Habitat characterization identifies components of canopy and subcanopy layers. Trees that reach into the canopy are canopy trees, regardless of their diameter/size. As defined in the Indiana Bat Habitat Suitability Index Model (3D/Environmental 1995) dominant trees are the large trees in the canopy (>40 centimeters [16 in] dbh). Current literature seems to suggest that these trees have the greatest likelihood of being used by bat maternity colonies. Many smaller trees are often also found in the canopy, and in some situations, the canopy can be entirely composed of small-diameter trees. ESI's habitat characterization identifies both dominant and subdominant elements of the canopy.

The subcanopy vegetation layer is well defined in classical ecological literature. It is that portion of the forest structure between the ground vegetation (to approximately 0.6 meter (2 ft) and the canopy layers, usually beginning at about 7.6 meters (25 ft). The amount of vegetation in the understory is termed clutter. Many species of bats, including the Indiana bat, tend to avoid areas of high clutter.

### **3.5 Bat Capture**

The netting setup allows bats to be caught live and released unharmed near the point of capture. Bats were identified to species using a combination of morphological characteristics (e.g., ear and tragus, calcar, pelage, size/weight, length of right forearm, and overall appearance of the animal). The species, sex, reproductive condition, age, weight, length of right forearm, and time and location/net site of capture were recorded for all bats captured. Age (adult or juvenile) of bats is determined by examining ephiphyseal-diaphyseal fusion (calcification) of long bones in the wing. Weight was measured to 0.1 gram using an Avinet spring scale. Length of the right forearm of each bat was measured to at least the nearest 1.0 mm using either dial calipers or metric ruler. The reproductive condition of captured bats was classified as descended male (reproductive), non-descended male, non-reproductive female, pregnant female (based on gentle abdominal palpation), lactating female, or post-lactating female. Processing is typically completed within 30 minutes of the time each bat is removed from the net. Data sheets containing all bat capture data are provided in Appendix C. Photographs of each species of bat captured are provided in Appendix D.



In response to the current White Nose Syndrome (“WNS”) issue, the latest WNS protocols (currently White-Nose Syndrome Decontamination Protocol and Supporting Decontamination Documentation for Researchers), distributed by USFWS on 25 January 2011 was followed. Wing damage was categorized using the “Wing-Damage Index Used for Characterizing Wing Condition of Bats Affected by White-nose Syndrome” established by Jon Reichard in 2008.

### 3.6 Analysis of Netting Data

Bat capture data was analyzed using chi-square tests and diversity indices. Chi-square analysis, where  $\chi^2 = \sum [(O - E)^2 / E]$ , where O is the observed frequency and E is the expected frequency, was used to test for statistically significant differences between the proportion of males and females captured and among species captured. For comparison between sexes, the null hypothesis was that there are equal numbers of males and females in the bat population, so the expected value is one-half of the total capture of adult bats. For comparison among species captured, the null hypothesis was that species were represented equally in the sample.

The species diversity index of MacArthur (1972), similar to the reciprocal of the Simpson (1949) index, was used, where Diversity =  $1 / \sum P_i^2$ , where  $P_i$  is the proportion of bats belonging to species  $i$ . The value of this index starts with 1 as the lowest possible figure, which would represent a community containing only one species. The higher the value, the greater the diversity. The maximum value is the number of species in the sample (species richness).

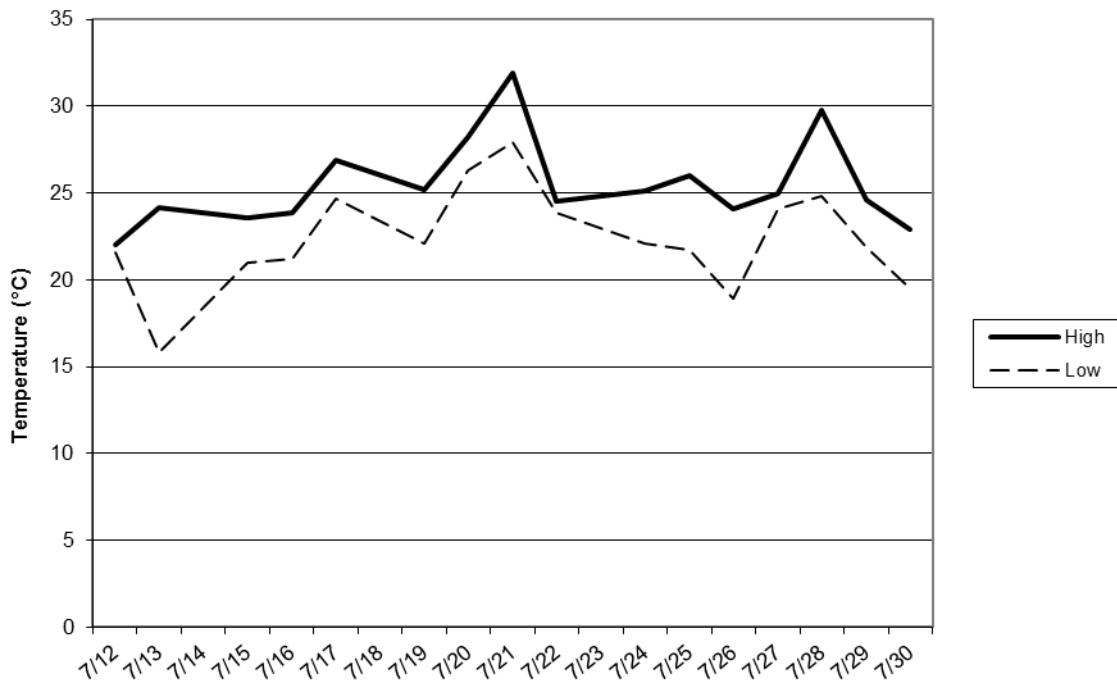
Simpson’s Evenness Index, where Evenness =  $(1 / \sum P_i^2) / D_{\max}$  (i.e., MacArthur Index/Species richness), gives a measure of the relative abundance of the different species making up the richness of an area. Maximum diversity for any level of richness is achieved when there is an equal distribution of individuals among species, so this value can range from 0 to 100 percent.

### 3.7 Weather and Temperature

Weather conditions were monitored during mist netting to ensure compliance with USFWS mist netting guidelines (Table 2). Conditions recorded include temperature, wind speed and direction, precipitation (not applicable during this survey), and percent cloud cover. A standard digital thermometer was used to record temperature, wind speed was determined by use of the Beaufort wind scale, and cloud cover was estimated. Appendix C contains completed weather data.

Temperatures in the study area were within acceptable limits of the USFWS guidelines (Figure 3). Survey temperatures ranged from 15.8° to 31.9° Celsius (60.4° to 89.4° F) during mist netting conducted 12 to 30 July 2011. Netting was discontinued due to precipitation on 22 and 23 July—data from these partial net nights are included below.

Figure 3. Weather data on the proposed Republic Wind Farm in Seneca and Sandusky Counties, Ohio.



### 3.8 Telemetry Studies

Telemetry studies were initiated on one Indiana and nine Big Brown bats per ODNR protocol (ODNR 2008) and a study plan approved by USFWS and ODNR. The Indiana bat was tracked to its nocturnal foraging area and roost trees. Big Brown bats were tracked to their day roosts only. Provided land owner access could be obtained, each roost was counted a minimum of three days including at least one when the radio-tagged bat was present. When it became clear that multiple sites would produce large numbers of big brown bats, ESI obtained verbal agreement from J. Norris of ODNR to withhold radio-tagging bats until the second night at the site. This decision was reached in an effort to comply with both the intent of guidelines and to reserve some radio-tags for use on other species in case a qualifying number of captures occurred. In these cases, the first juvenile or reproductive female that was captured was tagged.

#### 3.8.1 Transmitter Attachment

After morphometric data were collected, one Indiana bat and nine big brown bats were fitted with 0.25- to 0.35-gram radio-transmitters (Blackburn Transmitters®, Nacogdoches, Texas or LB2 Holohil Systems Ltd Transmitters®, Ontario, Canada). Radio-tagged bats were assigned names corresponding to their transmitter frequency.



Each transmitter had a unique frequency allowing for bats to be tracked individually and independently of one another. Transmitters were activated and tested before attachment to bats. Fur was trimmed from a small interscapular area, and the transmitter was attached with non-toxic TORBOT® liquid bonding cement (Torbot Group, Inc., Cranston, Rhode Island). This latex adhesive degrades over time and the transmitter eventually falls off the bat. Transmitter weight, weight of the bat before and after transmitter attachment, and holding time were recorded on the Bat Transmitter Data Sheets, included in Appendix C.

### **3.8.2 Tracking**

Radio-tagged bats were tracked by ground telemetry to locate roost trees and foraging areas. Biologists used Communication Specialist, Inc.® (Orange, California) R-1000 Telemetry Receivers, Wildlife Materials, Inc.® (Murphysboro, Illinois) TRX-2000S PLL Synthesized Tracking Receivers, hand-held three-element and five element Yagi directional antennas (Wildlife Materials or Titley Electronics). Tracking was completed on foot and in vehicles. Yagi directional antennas were used to estimate the direction of a signal relative to the tracker.

### **3.8.3 Roosts**

On days subsequent to radio-transmitter attachment, radio receivers attached to Yagi antennas were used during daylight hours to locate roosts. Once a roost was located, data were collected for that tree and surrounding habitat and recorded on Roost Tree Data Sheets (Appendix C). Roost data focused primarily on characteristics of the roost tree including roost tree species, tree size (dbh), height of roosting site on the tree, percent of exfoliating bark, presence of roosting features, other indications of current bat use (guano, vocalizations), etc. General habitat characteristics near each roost were also evaluated, including species composition, canopy closure, slope, distance to water, and distance to flight corridors. Each roost was documented with a sketch, photographs, and GPS coordinates. Roost nomenclature was based on the first radio-tagged bat to use the roost. Consistent with bat names, roost names were based on transmitter frequencies.

Emergence counts were completed to determine the number of bats emerging from each roost. Emergence counts were completed visually while sitting near or under each roost tree. Bats were tallied only if emerging from a roost, not merely flying in the vicinity. Beginning at sunset, counts lasted approximately 1 to 1.5 hours or until bats finished emerging and/or darkness precluded accurate counting. In accordance with ODNR protocol, emergence counts were conducted on at least 3 occasions including the day when the radio-tagged bat was present. Potential maternity roosts were counted 5 times if land-owner permission could be obtained. Direction of bat emergence (as feasible) and other behavior were also noted on the Roost Tree Emergence Data Sheets (Appendix C).

### **3.8.4 Nocturnal Telemetry**

Nocturnal telemetry data were collected for only the Indiana bat. Fixed telemetry stations were established immediately adjacent to portions of the Project area. Stations were chosen using a combination of experience and anticipation in an effort to determine the bats' use of available habitat. Use of available high spots on the terrain maximized coverage. Mobile telemetry, conducted from a vehicle, was used to follow the signal from a radio-tagged bat concurrent with fixed station telemetry. Mobile telemetry was employed to acquire general locations of certain bats when triangulation was not possible. At least three fixed telemetry stations were monitored at any given time, in an attempt to achieve triangulation at each reading. GPS coordinates for fixed telemetry stations were recorded on Garmin® (Olathe, Kansas) GPS 12 hand-held GPS units. Telemetry readings were synchronized using clocks on the GPS units.

Beginning at sunset, radio-tracking was conducted for at least 3 hours. Three or four biologists simultaneously participated in telemetry in an effort to obtain triangulation on each bat. Biologists simultaneously recorded azimuths at 5-minute intervals for all bats within receiver range. Two-way radios were used to synchronize readings and relay information. Timing of azimuth readings and locations of fixed telemetry stations varied among nights of the survey, depending on where and when certain bats were present. Appendix C contains Telemetry Data Sheets.

#### **3.8.4.1 Foraging and Activity Area Data Analyses**

Locate III was used to convert field data (i.e. azimuths taken from known points) into a likely location. Internally, the software measures the total angular error between observed bearings and all potential locations. The location with the lowest angular is thus deemed to be the most likely location. Theoretically, this can be thought of as a three dimensional regression.

Using this information, foraging and activity areas were calculated for the Indiana bat using Home Range Tools (Rodgers et al. 2007) for ArcGIS® (ESRI Corporation, Redlands, California) and Animal Space Use (Horne and Garton 2007). Foraging area was defined as the area each bat actively foraged or traveled after emerging from a diurnal roost; therefore, calculations only included nocturnal telemetry locations. Activity area was defined as the area used by each bat for all life requisites during a specified period, including: foraging, traveling, periods of inactivity (roosts), etc. Calculations for activity area included nocturnal telemetry locations and diurnal roosts.

Fixed kernel techniques (95%) were employed to calculate the foraging and activity areas. All home range estimates are artificial constructs and have their limitations (Boulanger and White 1990). Kernel analysis was used because it is considered one of the most robust of the probabilistic techniques for calculating home ranges

(Worton 1989). Kernel methods generally do not underestimate home range at small sample size, are least affected by sample size (Worton 1989), and require no unrealistic assumptions about the utilization distribution (Worton 1989). Fixed kernel methods with cross validation produce the most accurate estimates of simulated home ranges (Worton 1995, Seaman and Powell 1996). However, estimated distributions can vary greatly depending on which method is used to select the smoothing parameter (or bandwidth). Worton (1995) suggested that choosing the appropriate level of smoothing is the most important factor when using the kernel method for home-range analysis. If sample sizes are less than 50, likelihood cross validation (CVh) is proven to be the best method to calculate the smoothing parameter (Horne and Garton 2006). The software Animal Space Use 1.1, developed by Horne and Garton (2007) was used to calculate the smoothing parameter. Home Range Tools for ArcGIS® (Rodgers et al. 2007) was used to produce 95 percent fixed kernel home ranges.

## **4.0 Results**

### **4.1 Survey Objectives**

The main survey objective, to determine the presence or probable absence of Indiana bats or other species of concern, was met. One Indiana bat was captured and transmittered to determine habitat use. Nine net nights produced greater than 15 reproductive big brown bats, and thus radio telemetry was conducted on nine big brown bats to determine the location of their maternity colony(s). The bat community was characterized through the capture of 907 bats of eight species at 25 net sites.

### **4.2 Habitat Characterization of Net Sites**

Table 5 summarizes habitat characteristics at each net site. The majority of sites were positioned across forest openings in woodlots and adjacent to crop and pasture land. Nets at sites 15 and 21 were placed across streams. Shagbark hickory (*Carya ovata*) and white oak (*Quercus alba*) were the most commonly encountered dominant tree species. Maples, including red maple (*Acer rubrum*) and sugar maple (*Acer saccharum*) were the most common subdominant species. Canopy closure was predominantly closed (56%;  $n = 14$ ) with moderate closure at 36 percent of sites ( $n = 9$ ). Sites 5 and 7 were characterized as open. Roost tree potential for Indiana bats was low at 44 percent of sites ( $n = 11$ ), moderate at 44 percent of sites, and high at 12 percent of sites ( $n = 3$ ; Sites 5, 7, and 12). Appendix C provides habitat description data sheets and Appendix D provides representative photographs of net sites.

Table 5. Habitat characteristics at mist net survey sites on the proposed Republic Wind Farm in Seneca and Sandusky Counties, Ohio, 2011.

Site	Water Source		Tree Species			Canopy Closure	Clutter		Roost Tree		Habitat Type	Herb. Cover
	Name	Distance (m)	Dominant Canopy	Subdominant Canopy	Subcanopy		Rating	Com-position	Potential	Composition		
2	Unnamed pond	10	Acer rubrum, Carya ovata, Quercus palustris	Acer rubrum, Quercus palustris, Fagus grandifolia		M	C	Branches & Saplings	L	None	YL, FE, W, C/PL, DL/P	M
3	Unnamed stream	500	Carya ovata, Quercus alba	Carya ovata	Acer saccharum	M	M	Saplings	L	Lrg trees	MU, FE, W, C/P L	M
4	Unnamed stream	400	Quercus rubra, Juglans nigra	Juglans nigra		M	M	Saplings	M	Lrg trees	MU, FE, W, C/PL	M
5	Unnamed creek	0	Platanus occidentalis, Populus deltoides	Fraxinus pennsylvanica, Ulmus americana, Tilia americana, Juglans nigra, Acer saccharum, Aesculus glabra	Acer negundo	O	M	Branches	H	Lrg trees & snags	ML, C/PL S/R	M
7	Unnamed pond	20	none	Prunus serotina, Acer saccharum, Juglans nigra, Celtis occidentalis, Fraxinus pennsylvanica, Populus deltoides	Ulmus rubra, Ulmus americana, Juglans nigra	O	M	Saplings	H	Snags	W, OF, C/PL DL/P	M
8	Unnamed pond	50	Carya ovata, Acer rubrum, Quercus palustris	Acer rubrum, Fagus grandifolia, Carya ovata	none	C	M	Branches & Saplings	L	Lrg trees	YU, W, S/R DL/P	M
9	Unnamed creek		Tilia americana, Acer sp.	Carya ovata	none	M	O	Branches	L		W, OF, lawn	M
10	Unnamed stream	0	Acer saccharinum, Juglans nigra	Ulmus rubra	Ulmus rubra	C	M	Saplings	L	Lrg trees	ML, S/R	M



Site	Water Source		Tree Species			Canopy Closure	Clutter		Roost Tree		Habitat	Herb.
	Name	Distance (m)	Dominant Canopy	Subdominant Canopy	Subcanopy		Rating	Com-position	Potential	Composition		
11	Albright Ditch	500	Acer saccharum, Ulmus americana, Prunus serotina, Juglans nigra	Acer saccharum, Ulmus americana	Acer saccharum	M	M	Branches	M	Lrg trees & snags	W, C/PL, W, C/PL, S/R	D
12	Unnamed vernal pool	0	Acer rubrum, Carya ovata	Acer rubrum, Carya ovata	none	M	M	Branches & Saplings	H	Lrg trees & snags	YL, FE, W, C/PL, VP	M
14	Unnamed stream	500	Quercus alba, Carya ovata	Prunus serotina	Prunus serotina	C	M	Saplings	M	Lrg trees & snags	MU, FE, W, S/PL	M
15	Unnamed creek	15	Juglans nigra	Acer saccharinum	Acer negundo	M	M	Saplings	L	Lrg trees	ML, FE, W, OF, C/PL S/R	D
16	private pond (Reed, Mary)	250	Ulmus americana, Acer saccharinum	Fraxinus pennsylvanica, Juglans nigra, Carya ovata, Ulmus americana, Acer saccharinum	Juglans nigra, Ulmus americana, Carya ovata	M	O	Branches	M	Lrg trees & snags	W, OF, C/PL, DLP	S
20	Unnamed stream	0	Populus deltoides	Prunus serotina, Juglans nigra, Acer saccharinum	Fraxinus americana, Juglans nigra, Malus coronaria	C	C	Shrubs & Saplings	M	Lrg trees & snags	W, OF, C/PL, S/R	D
21	Unnamed stream	0	Acer negundo, Acer rubrum, Acer saccharum	Acer negundo, Acer rubrum, Acer saccharum	Acer rubrum, Acer saccharum	C	C	Branches & Saplings	L	Lrg trees	YL, FE, W, C/PL S/R	D
22	Unnamed pond	450	Acer rubrum, Acer saccharum, Quercus palustris, Quercus alba, Tilia americana, Fagus grandifolia	Quercus palustris, Tilia americana, Fraxinus pennsylvanica, Ulmus rubra, Acer saccharum	Quercus palustris, Acer rubrum, Sassafras albidum	C	M	Branches	M	Lrg trees & snags	W, OF, C/PL	M
23	Unnamed stream	10	Acer saccharum, Carya ovata, Quercus alba	Acer saccharum, Prunus serotina, Acer rubrum	Acer saccharum, Acer rubrum	C	C	Branches & Saplings	L	Lrg trees & snags	YL, FE, W, C/PL, S/R	D

Site	Water Source		Tree Species			Canopy Closure	Clutter		Roost Tree		Habitat	Herb.
	Name	Distance (m)	Dominant Canopy	Subdominant Canopy	Subcanopy		Rating	Com-position	Potential	Composition		
24	Unnamed ditch	400	Quercus palustris, Quercus alba, Fraxinus pennsylvanica	Carya ovata, Acer rubrum, Acer saccharum	Carpinus caroliniana, Crataegus sp.	M	O	Branches	L	Lrg trees	W, C/PL	M
26	Unnamed stream	50	Quercus alba, Acer rubrum	Acer rubrum, Acer saccharum, Fraxinus pennsylvanica		C	M	Branches & Saplings	L	Lrg trees & snags	ML, FE, W, C/PL, S/R	
27	Unnamed pond	5	Quercus bicolor, Fraxinus pennsylvanica, Quercus palustris	Fraxinus pennsylvanica, Quercus palustris, Acer saccharum	Acer saccharinum, Fraxinus pennsylvanica	C			M	Lrg trees & snags	W, C/PL, DL/P, OF	D
30	Unnamed stream	300	Quercus rubra, Acer rubrum, Carya ovata	Acer rubrum, Tilia americana, Quercus rubra	Acer rubrum, Acer saccharum	C	M	Shrubs & Saplings	M	Lrg trees	YL, FE, C/PL	M
31	Unnamed pond	500	Carya ovata, Acer rubrum	Carya ovata, Acer rubrum	Acer rubrum, Fagus grandifolia	C	C	Branches & Saplings	M	Lrg trees	YL, FE, W, C/PL	M
32	Unnamed stream	300	Quercus alba, Quercus rubra	Prunus serotina	Ulmus americana, Acer saccharum	C	M	Saplings	L	Lrg trees & snags	MU, FE, W, C/PL	M
33	Unnamed perennial stream	0	Acer saccharum, Quercus alba, Juglans nigra	Acer saccharum, Carya cordiformis, Prunus, serotina, Tilia americana	Asimina triloba, Acer saccharum, Ostrya virginiana	C	M	Saplings	M	Lrg trees & snags	MU, VP	M
34	Unnamed pond	150	Quercus alba, Quercus rubra, Carya ovata	Carya ovata, Tilia americana, Ulmus americana	Ulmus americana, Acer saccharum, Acer rubrum	C	M	Saplings	M	Lrg trees & snags	MU	M

**NOTE:** Numbers are not sequential because some pre-selected sites were not netted due to land-owner access or were deemed unsuitable following field visit by permitted bat biologists.

**Tree Species:** Ohio buckeye (*Aesculus glabra*), box elder (*Acer negundo*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), sugar maple (*Acer saccharum*), maple species (*Acer* sp.), tall pawpaw (*Asimina triloba*), ironwood (*Carpinus caroliniana*), bitternut hickory (*Carya cordiformis*), shagbark hickory (*Carya ovata*), American hackberry (*Celtis occidentalis*), hawthorn (*Crataegus* spp.), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), green ash (*Fraxinus pennsylvanica*), black walnut (*Juglans nigra*), sweet crabapple (*Malus coronaria*), hop hornbeam (*Ostrya virginiana*), sycamore (*Platanus occidentalis*), eastern cottonwood (*Populus deltoides*), black cherry (*Prunus serotina*), white oak (*Quercus alba*), swamp white oak (*Quercus bicolor*), pin oak (*Quercus palustris*), northern red oak (*Quercus rubra*), sassafras (*Sassafras albidum*), American basswood (*Tilia americana*), American elm (*Ulmus americana*), slippery elm (*Ulmus rubra*).

**Canopy Closure/Subcanopy Clutter:** O = Open; M = Moderate; C = Closed

**Roost Potential Rating:** H = High; M = Moderate; L = Low

**Habitat Type:** MU = Mature Upland Forest; ML = Mature Lowland Forest, Young Lowland Forest, Forest Edge; FE = Forest Edge; W = Woodlot; OF = Old Field; C/PL = Crop/Pasture Land; S/R = Stream/River; VL = Vernal Pool; DL/P = Deepwater Lake/Pond

**Herb (Herbaceous) Cover:** S = Sparse; M = Moderate; D = Dense

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Republic Wind Farm Mist Net Survey

### 4.3 Bat Capture

A total of 907 bats representing 8 species was captured over 200 net nights during the mist net survey, including 650 big brown bats (*Eptesicus fuscus*), 95 northern bats (*Myotis septentrionalis*), 82 eastern red bats (*Lasiurus borealis*), 52 little brown bats (*Myotis lucifugus*), 16 hoary bats (*Lasiurus cinereus*), 9 tri-colored bats (*Perimyotis subflavus*), 2 evening bats (*Nycticeius humeralis*) and 1 Indiana bat (*Myotis sodalis*) (Table 6, Figure 4).

Table 6. Total Bat Capture on the proposed Republic Wind Farm in Seneca and Sandusky Counties, Ohio, 2011.

Bat Species	Adult	Adult Female <sup>1</sup>				Juvenile		Escape <sup>2</sup>	Total
	Male	P	L	PL	NR	Male	Female		
Big brown bat	153		32	199	4	140	105	17	<b>650</b>
Eastern red bat	7		1	15	4	17	34	4	<b>82</b>
Hoary Bat				1	1	6	8		<b>16</b>
Little brown bat	12		1	14	1	15	8	1	<b>52</b>
Northern bat	17		6	32		16	22	2	<b>95</b>
Indiana bat				1					<b>1</b>
Evening Bat							1	1	<b>2</b>
Tri-colored bat	2			1		4	2		<b>9</b>
<b>Total</b>	<b>191</b>	<b>0</b>	<b>40</b>	<b>263</b>	<b>10</b>	<b>198</b>	<b>180</b>	<b>25</b>	<b>907</b>

<sup>1</sup>P = pregnant; L = lactating; PL = Post lactating; NR = non-reproductive

<sup>2</sup>Escape = escaped from net or hand before all sex, age, and reproductive data were collected

#### 4.3.1 Species Diversity

The hypothesis of species evenness (relative abundance among species) was rejected ( $df = 7$ ,  $\chi^2 = 2985.35$ ;  $P < 0.001$ ); that is, the proportion of species captured was not similar among species (Figure 4). Big brown bats accounted for 72 percent of the sample. The Simpson's Evenness Index suggested low species equitability ( $ED = 0.233$ ). The MacArthur Diversity Index ( $1/ED$ ) was 1.9, so the equivalent of 1.9 of 8 total species was equally represented in the sample.

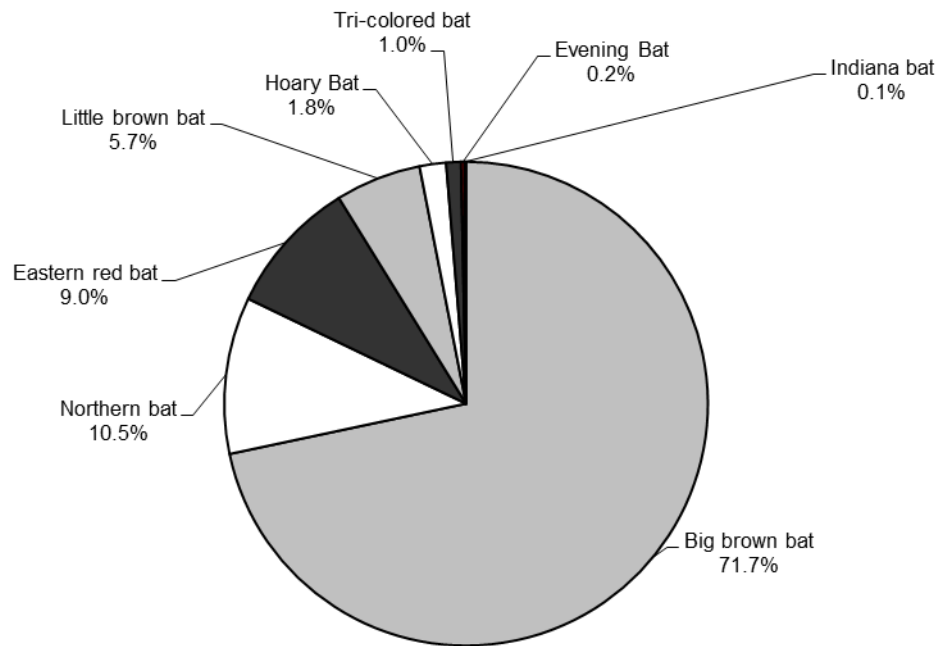
#### 4.3.2 Occurrence by Sex and Age

Seventeen big brown bats, four eastern red bats, two northern bats, one little brown bat and one evening bat escaped before sex or age were determined (Table 6). Of the remaining 882 bats, 57 percent were adults ( $n = 504$ ), and 43 percent were juveniles ( $n = 378$ ). Of the adults, 62 percent ( $n = 313$ ) were females and 38 percent were males ( $n = 191$ ). Adult males and females were not represented equally in the sample ( $df = 1$ ,  $\chi^2 = 29.53$ ,  $P < 0.001$ ). Ninety-seven percent ( $n = 303$ ) of adult



females captured were reproductive, with 87 percent ( $n = 263$ ) post lactating and 13 percent ( $n = 40$ ) lactating. Evidence of reproduction was found for all the species captured (Table 5).

Figure 4. Percent bat captures by species on the proposed Republic Wind Farm in Seneca and Sandusky Counties, Ohio, 2011.



#### 4.3.3 Bat Capture by Net Site

The mean number of bats captured per site was 36 ( $n = 25$ ,  $SD = 20.5$ ; Median = 34). Eighty-seven bats were captured at Site 30 followed by 70 bats at Site 26, 64 bats at Site 32 and 62 bats at Site 14. Site 31 had the least number of captures with 8 bats. The mean number of species captured per site was 3.9 ( $n = 25$ ,  $SD = 0.97$ ; Median = 4). Species richness was highest at Sites 5, 7, 8, 10, 14, 16, 21 and 30 where five of the eight species were captured. The Indiana bat was captured at Site 16 and the two evening bats were captured at Site 12.

## **4.4 Indiana Bat Capture and Telemetry**

### **4.4.1 Details of Capture**

The only Indiana bat captured or radio-tagged tagged on the proposed Republic Wind Farm during the 2011 survey was an post-lactating adult female captured at 2120 hrs at site 16 (Tables 7 and 8; Appendices C and D) the night of 24 July 2011. It was caught in a 6-meter (19.68 ft) wide by 6.2-meter (20.34 ft) high mist net placed within a small woodland opening. The woodland has multiple small ephemeral wetlands and is regularly burned for brush control (the landowner indicated it was last burned in 2009). Due to burning, the understory is open and multiple sizes and ages of dead trees are present. USFWS and ODNR were informally notified by phone on 25 July and received formal notification (including roost location) on 26 July.

### **4.4.2 Roosting Ecology**

The bat was fitted with a 0.35-gram transmitter (172.219 MHz) and released at the capture site. At time of release, the bat was alert and active and flew away after being placed on a tree near the capture site. Over the next six days, the bat was tracked to six different roost trees (Tables 7 and 8; Figure 5). All roost trees were live shagbark hickories (*Carya ovata*). The night of 30 July, the radio-tag remained in the tree following emergence, indicating it had been shed by the bat.

All roosts were counted on three nights, with the exception of roost 218-5, which was counted once due to restricted access. As many as seven bats were observed exiting any one roost, and that happened on two nights (30 July from 218-RT 3 and 2 August from 218-RT 6). On 30 July 3 bats including 218 were also counted exiting 218-RT 6.

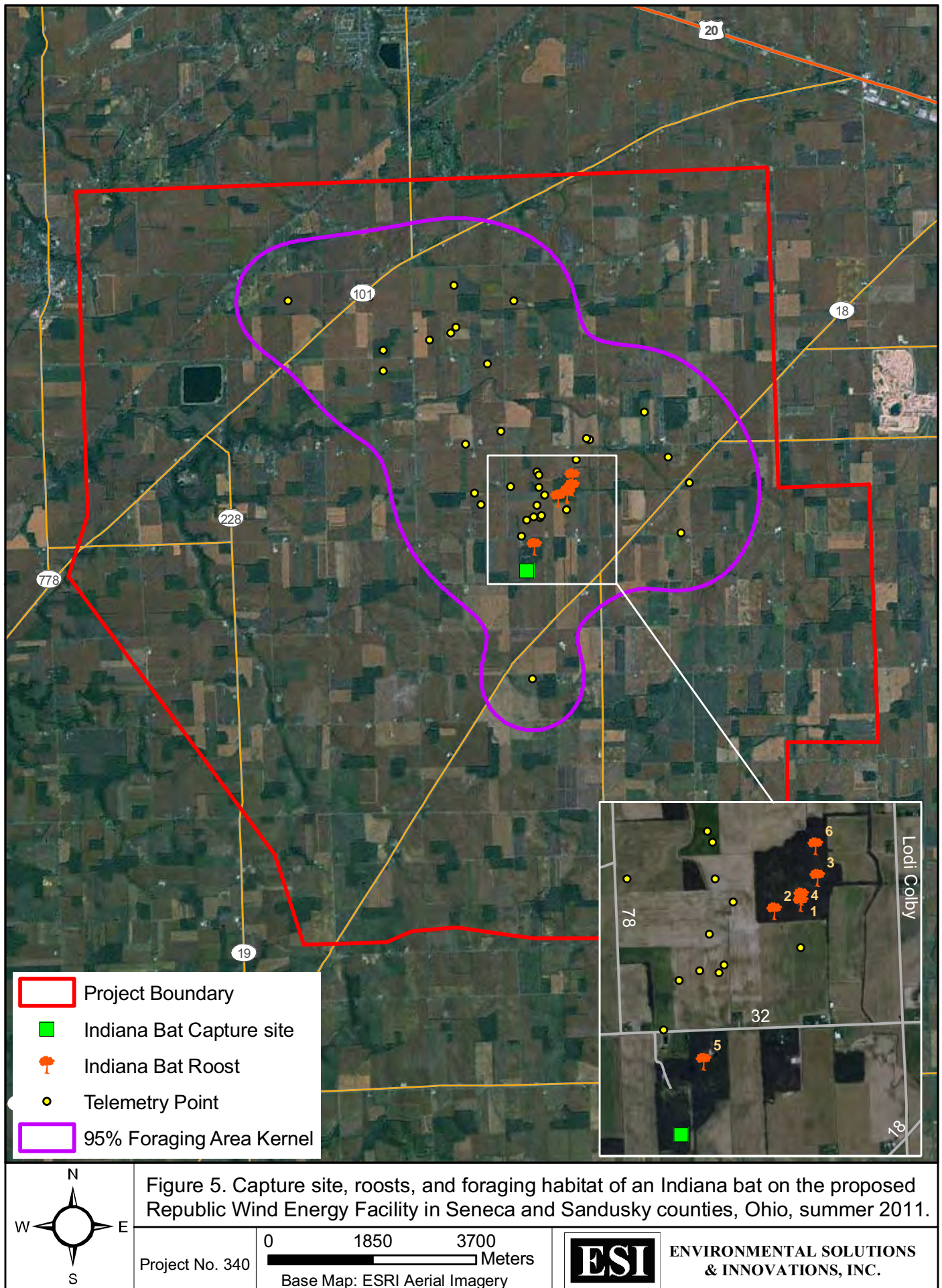


Table 7. Summary data for roost trees used by Indiana bat 218 on the proposed Republic Wind Farm, summer 2011.

Roost	Tree Species	Tree Status	DBH (cm)	Exfoliating Bark (%)	% Canopy Closure	Tree Height (m)	Roost Height (m)
218-RT1	Carya ovata	Live	25	30	40	22	10
218-RT2	Carya ovata	Live	30	40	5	40	30
218-RT3	Carya ovata	Live	25	30	75	40	20
218-RT4	Carya ovata	Live	30	30	30	40	20
218-RT5	Carya ovata	Live	40	40	25	40	35
218-RT6	Carya ovata	Live	20	30	75	30	15

Table 8. Summary of emergence counts for roost trees used by Indiana bat 218 on the proposed Republic Wind Farm, summer 2011.

Date of Count	Roost Number						Total
	218-1	218-2	218-3	218-4	218-5	218-6	
25 July	4 <sup>1</sup>						4
26 July	4	1 <sup>1,2</sup>					5
27 July		0	1 <sup>1,2</sup>				1
28 July				4 <sup>1</sup>			4
29 July	1		2	1	1 <sup>1</sup>		5
30 July			7	0		3 <sup>1</sup>	10
31 July		0				0	0
2 August						7	7

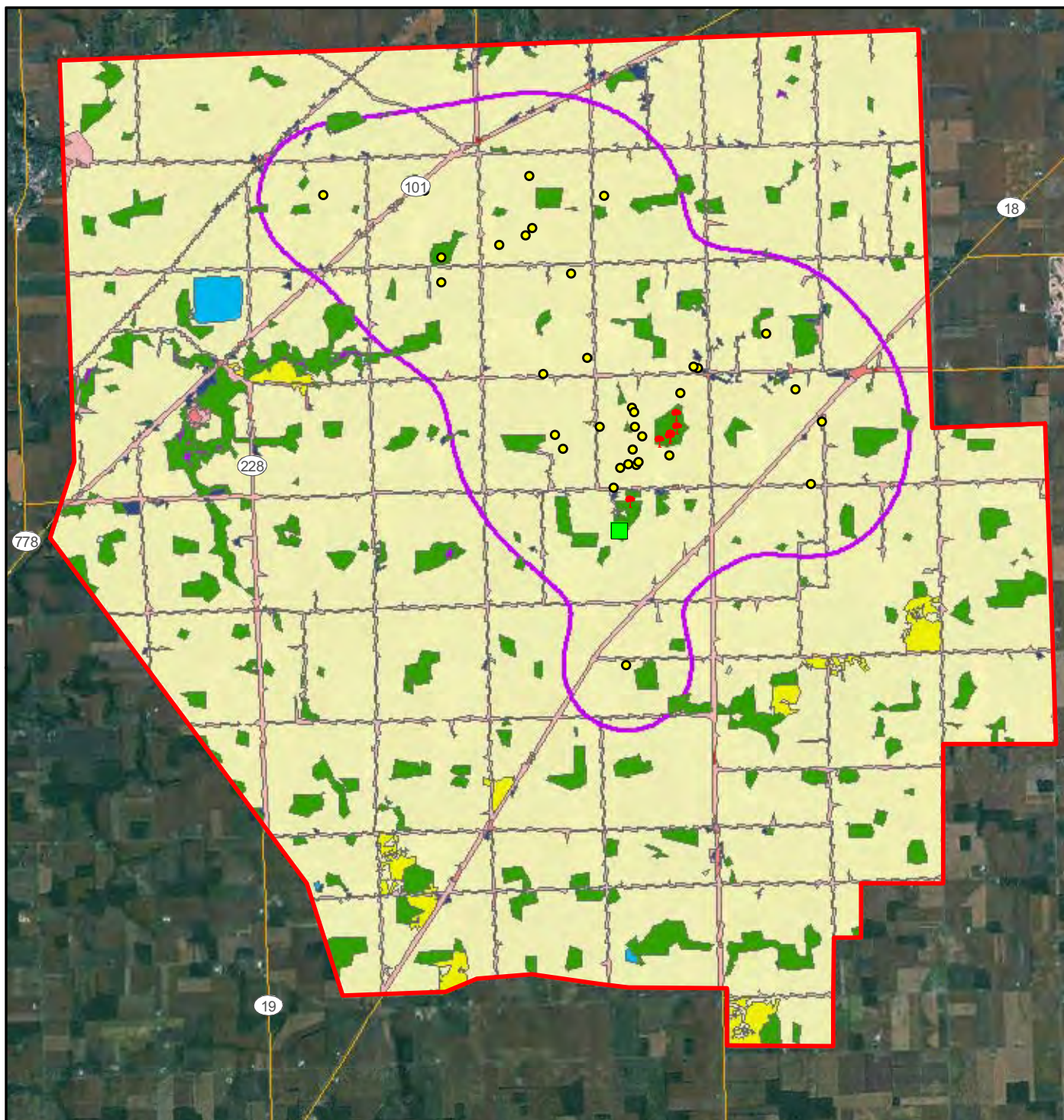
<sup>1</sup>Bat 218 present in roost

<sup>2</sup>Point of emergence obscured by vegetation thus this is a minimal count

#### 4.4.3 Nocturnal Behavior

Data on nocturnal behavior was collected on for five days (25-29 July) (Figure 6, Table 9). Most foraging activity occurred in an area located between State Highways 101 and 18. This foraging area was entirely contained within the project boundary and included approximately a quarter (27.8%) of the Project area. Habitat use at all scales was dominated by cultivated crops (Figure 7, Table 9). The majority of triangulated data points fell within cultivated fields (28 of 34 points, 82.3 %). Similar dominance of agricultural lands was observed at the scales of both the 95 percent foraging area (87.7% cultivated) and the 95 percent activity area (87.6% cultivated) despite inclusion of the roosts in the later metric.





### Habitat

Deciduous Forest

Evergreen Forest

Woody Wetlands

Emergent Herbaceous Wetlands

Grassland/Herbaceous

Cultivated Crops

Pasture/Hay

Developed, Open Space

Developed, Low Intensity

Developed, Medium Intensity

Open Water

Project Boundary

Indiana Bat Capture site

Indiana Bat Roost

Telemetry Point

95% Foraging Area Kernel

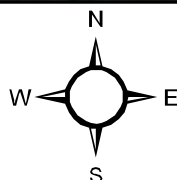


Figure 6. Habitat used by foraging Indiana bat on the on the proposed Republic Wind Energy Facility in Seneca and Sandusky counties, Ohio, summer 2011.

Project No. 340

0 1850 3700  
Meters  
Base Map: ESRI Aerial Imagery



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Table 9. Summary data for roost trees used by Indiana bat 218 on the proposed Republic Wind Farm, summer 2011.

Habitat Type	Raw Data Points	95% Foraging Area (Ac)	95% Activity Area (Ac)	Total Project Boundary (Ac)
Open Water				114.30
Developed, Open Space	4	624.46	552.72	2089.58
Developed, Low Intensity		33.29	30.69	135.15
Developed, Medium Intensity		2.63	2.63	7.33
Deciduous Forest	1	633.07	577.39	2976.94
Evergreen Forest				1.93
Grassland/Herbaceous	1	60.39	53.92	200.35
Pasture/Hay				423.16
Cultivated Crops	28	9672.37	8589.22	33617.96
Woody Wetlands				29.90
Emergent Herbaceous Wetlands				10.28
<b>Total</b>	<b>34</b>	<b>11026.21</b>	<b>9806.57</b>	<b>39606.88</b>

#### 4.5 Big Brown Bat Telemetry

Following ODNR guidelines, ESI biologists radio-tagged a total of nine big brown bats from 9 net sites whose conditions indicated recent reproduction (Table 10). Seven of these bats were successfully tracked to roosts (Table 11, Figure 7) in anthropogenic structures including five barns, one garage, and one house. No tagged bats changed roosts, and no roosts were shared by tagged bats. Because each roost was occupied by multiple untagged bats (range 15-218) it is likely that each roost is occupied by a separate colony. Locations of radio-tagged big brown bat captures and roost trees are illustrated in Figure 7. Appendix D contains representative photographs of the captured big brown bats. Details of telemetry effort for each bat are described in the following sections.



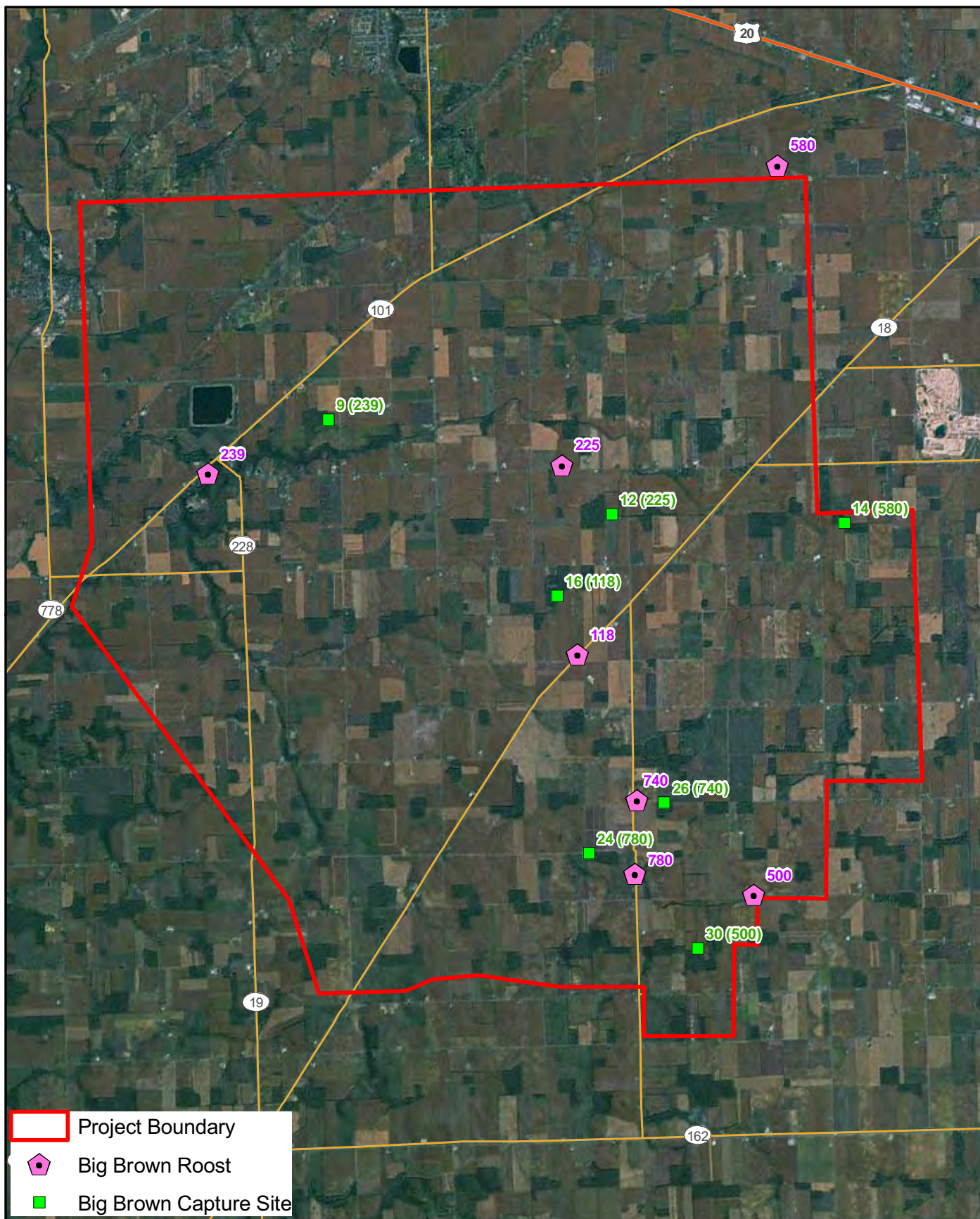
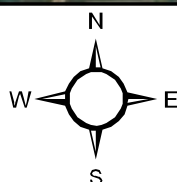


Figure 7. Capture site and roosts of radio-tagged big brown bats on the proposed Republic Wind Energy Facility in Seneca and Sandusky counties, OH, summer 2011.



Project No. 340

0 1800 3600  
Meters  
Base Map: ESRI Aerial Imagery



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Table 10. Big brown bats radio-tagged on the proposed Republic Wind Farm, summer 2011.

Bat Number	Date Captured (2010)	Transmitter Frequency	Site Name	Sex	Age	Reproductive Condition
740	15 July	172.740	26	F	Ad	PL
780	18 July	172.780	24	F	Jv	NR
239	20 July	172.239	9	F	Jv	NR
118	22 July	172.118	16	F	Ad	L
500	24 July	172.500	30	F	Jv	NR
580	24 July	172.580	14	F	Jv	NR
122	27 July	172.122	4	M	Jv	NR
225	30 July	172.225	12	F	Ad	PL
950	30 July	172.950	32	F	Jv	NR

F=female, M=male, Ad=adult, Jv= juvenile, L = lactating, PL=postlactating, NR=not reproductive

Table 11. Roosts used by big brown bats radio-tagged on the proposed Republic Wind Farm, summer 2011.

Bat Number	Roost Number	Type Structure	First Day Occupied	Last Day Occupied	Maximum Bats
740	740-1	Barn	16 July	29 July	44
780	780-1	Garage	19 July	24 July	218
239	239-1	House	21 July		No Counts
118	118-1	Barn	23 July	28 July	117
500	500-1	Barn	25 July	29 July	23
580	580-1	Barn	25 July	2 August	15
122	Not located				
225	225-1	Barn	31 July	5 August	173
950	Not located				

#### 4.5.1 Bat 740

The first big brown bat tagged during the 2011 season was an post-lactating adult female captured at 2300 hrs on 15 July at Site 26 (Tables 10, 11, and 12, Appendices C and D). It was caught in a 6-meter (19.6 ft) wide by 6-meter (19.6 ft) high mist net set across an ATV trail south of TR126 and east of CR27. The surrounding habitat consisted of cropland surrounding a large woodlot.

The bat was fitted with a 0.35-gram transmitter (172.740 MHz) and hand-released at the capture site. At time of release, the bat was alert and active and flew away. The next morning, the bat was tracked to an old barn to the northwest of the capture site. Emergence counts were conducted at this site over the next 5 days and revealed a maternity colony containing at least 44 bats.

Table 12. Emergence data for big brown bat 740 on the proposed Republic Wind Farm, July and August 2011.

Roost Number	Date Counted	#Bats <sup>1</sup>	First Emergence	Last Emergence	Notes
740-1	16 July	44	2128	2149	Bat 740 emerged at 2143
740-1	17 July	34	2130	2252	Bat 740 emerged at 2136
740-1	18 July	35	2115	2141	Bat 740 emerged at 2131
740-1	19 July	40	2128	2151	Bat 740 emerged at 2147
740-1	29 July	42	2127	2148	Bat 740 emerged at 2146

<sup>1</sup>Number of bats counted emerging from the roost. This number fluctuates because some bats move between roosts.

#### 4.5.2 Bat 780

The second big brown bat tagged during the 2011 season was a juvenile female captured at 2150 hrs on 18 July at Site 24 (Tables 10, 11, and 13, Appendix C). It was caught in a 9-meter (29.5 ft) wide by 9.2-meter (30.1 ft) high mist net set across an ATV trail south of CR38. The surrounding habitat consisted of a mature mesic woodlot with an open understory, a few shrubs and large trees present.

The bat was fitted with a 0.35-gram transmitter (172.780 MHz) and hand-released at the capture site. At time of release, the bat was alert and active and flew away. The next morning, the bat was tracked to a dilapidated detached brick garage to the east of the capture site. Emergence counts were conducted at this site for 5 days and revealed a maternity colony containing at least 218 bats.

Table 13. Emergence data for big brown bat 780 on the proposed Republic Wind Farm, July and August 2011.

Roost Number	Date Counted	#Bats	First Emergence	Last Emergence	Notes
780-1	19 July	73	2130	2144	Bat 780 emerged at 2140
780-1	20 July	93	2110	2136	Bat 780 emerged at 2135
780-1	21 July	190	2116	2148	Bat 780 emerged at 2125 Added second observer
780-1	22 July	218	2114	2146	Added second observer
780-1	23 July				No count
780-1	24 July	150	2100	2136	Transmitter off bat

<sup>1</sup>Number of bats counted emerging from the roost. This number fluctuates because some bats move between roosts.

#### 4.5.3 Bat 239

The third big brown bat tagged during the 2011 season was a juvenile female captured at 2145 hrs on 20 July at Site 9 (Tables 10 and 11, Appendices C and D). It was caught in a 9-meter (29.5 ft) wide by 9-meter (29.5 ft) high mist net set across a forested access road west of CR179. The surrounding habitat consisted of a moderately open canopy closure in a mature mesic woodlot.

The bat was fitted with a 0.25-gram transmitter (172.239 MHz) and hand-released at the capture site. At time of release, the bat was alert and active and flew away. The next morning, the bat was tracked to a house southwest of the capture site. Despite repeated efforts, ESI was unable to make contact with the home owners and thus conducted no emergence counts. During efforts to obtain permission to conduct emergence counts, biologists noted extensive amounts of guano splattered beneath the probable entrance to the roost. This observation is consistent with occupancy by multiple bats.

#### 4.5.4 Bat 118

The fourth big brown bat tagged during the 2011 season was a lactating adult female captured at 0000 hrs on the night of 24 July at Site 16 (Tables 10, 11, and 14, Appendices C and D). It was caught in a 6-meter (19.6 ft) wide by 6.2-meter (20.3 ft) high mist net set in an opening in a woodlot that is burned every 5 to 10 years to control brush. The most recent burning appeared to be approximately 2 or more years ago. The woodlot contained several ephemeral wetlands and was adjacent to a soybean field.

The bat was fitted with a 0.25-gram transmitter (172.118 MHz) and hand-released at the capture site. At time of release, the bat was alert and active and flew away. The next morning, the bat was tracked south of the capture site to a wooden barn that appeared to be approximately 80-100 years old. Emergence counts were conducted at this site for 5 days and revealed a maternity colony containing at least 117 bats.

Table 14. Emergence data for big brown bat 118 on the proposed Republic Wind Farm, July and August 2011.

Roost Number	Date Counted	#Bats	First Emergence	Last Emergence	Notes
118-1	24 July	87	2100	2135	Bat 118 emerged at 2115
118-1	25 July	73	2116	2136	Bat 118 emerged at 2120
118-1	26 July	75	2112	2129	Bat 118 emerged at 2125
118-1	27 July	117	2112	2130	Bat 118 emerged at 2116
118-1	28 July				No count
118-1	12 August	62	2045	2107	Transmitter off bat

<sup>1</sup>Number of bats counted emerging from the roost. This number fluctuates because some bats move between roosts.

#### 4.5.5 Bat 500

The fifth big brown bat tagged during the 2011 season was a juvenile female captured at 2200 hrs on 24 July at Site 30 (Tables 10, 11, and 15, Appendix C). It was caught in a 12-meter (39.3 ft) wide by 9-meter (29.5 ft) high mist net set across a forested logging trail.

The bat was fitted with a 0.35-gram transmitter (172.500 MHz) and hand-released at the capture site. At time of release, the bat was alert and active and flew away. The next morning, the bat was tracked to a barn northeast of the capture site. Emergence counts were conducted at this site for 5 days and revealed a maternity colony containing at least 15 bats.

Table 15. Emergence data for big brown bat 500 on the proposed Republic Wind Farm, July and August 2011.

Roost Number	Date Counted	#Bats	First Emergence	Last Emergence	Notes
500-1	25 July	14	2110	2126	Bat 500 emerged at 2122
500-1	26 July				No count
500-1	27 July				No count
500-1	28 July				No count
500-1	29 July				No count
500-1	17 August	23	2036	2052	Transmitter not heard
500-1	18 August	23	2036	2048	Transmitter not heard
500-1	22 August	23	2011	2057	Transmitter not heard
500-1	24 August	16	2022	2036	Transmitter not heard
500-1	26 August	22	2025	2038	Transmitter not heard

<sup>1</sup>Number of bats counted emerging from the roost. This number fluctuates because some bats move between roosts.

#### 4.5.6 Bat 580

The sixth big brown bat tagged during the 2011 season was an juvenile female captured at 0030 hrs on the night of 24 July at Site 14 (Tables 10, 11, and 16, Appendix C). It was caught in a 12-meter (39.3 ft) wide by 9-meter (29.5 ft) high mist net set across a forested farm drive between two crop fields.

The bat was fitted with a 0.35-gram transmitter (172.518 MHz) and hand-released at the capture site. At time of release, the bat was alert and active and flew away. The next morning, the bat was tracked to a barn north of the capture site. Emergence counts were conducted at this site for 5 days and revealed a maternity colony containing at least 15 bats. It is likely that this colony was larger in size than counts would estimate because colonies of big brown bat begin to break up in early August (Whitaker 1996, Duchamp et al. 2004).

Table 16. Emergence data for big brown bat 580 on the proposed Republic Wind Farm, July and August 2011.

Roost Number	Date Counted	#Bats	First Emergence	Last Emergence	Notes
580-1	29 July	14	2110	2126	Bat 500 emerged at 2122
580-1	30 July				No count
580-1	31 July				No count
580-1	1 August				No count
580-1	2 August				No count
580-1	8 August	14	2055	2105	Transmitter off bat
580-1	9 August	12	2051	2113	Transmitter off bat
580-1	10 August	15	2056	2106	Transmitter off bat
580-1	11 August	11	2050	2100	Transmitter off bat

<sup>1</sup>Number of bats counted emerging from the roost. This number fluctuates because some bats move between roosts.

#### 4.5.7 Bat 122

The seventh big brown bat tagged during the 2011 season was a juvenile male captured at 0140 hrs on the night of 27 July at Site 4 (Tables 10 and 11, Appendices C and D). It was caught in a 6-meter (19.6 ft) wide by 9-meter (29.5 ft) high mist net set across a forested trail leading to an open area.

The bat was fitted with a 0.35-gram transmitter (172.122 MHz) and hand-released at the capture site. At time of release, the bat was alert and active and flew away. Searches for this bat were continued for five days, but the bat was never encountered.

#### 4.5.8 Bat 225

The eighth big brown bat tagged during the 2011 season was a post lactating female captured at 2200 h on 30 July at Site 12 (Tables 10, 11, and 17, Appendices C and D). It was caught in a 9-meter (29.5 ft) wide by 6-meter (19.7 ft) high mist net placed across a vernal pool in a woodlot surrounded by crop fields.

The bat was fitted with a 0.30-gram transmitter (172.225 MHz) and released by hand near the capture site at 2250 h. At time of release, the bat was alert and active and immediately flew away. Bat 225 was tracked to a roost in a barn northwest of the capture site. Emergence counts were conducted at this site for 5 days and revealed a maternity colony containing at least 173 bats.

Table 17. Emergence data for big brown bat 225 on the proposed Republic Wind Farm, July and August 2011.

Roost Number	Date Counted	#Bats	First Emergence	Last Emergence	Notes
225-1	31 July	36	2117	2125	Took time to locate exit point. Bat 225 emerged at 2125
225-1	1 August	121	2102	2126	Bat 225 emerged at 2109
225-1	2 August				No count
225-1	3 August	117	2105	2125	Bat 225 emerged at 2115
225-1	4 August	173	2102	2129	Bat 225 emerged at 2113
225-1	5 August	169	2056	2120	Bat 225 emerged at 2109

<sup>†</sup>Number of bats counted emerging from the roost. This number fluctuates because some bats move between roosts.

#### 4.5.9 Bat 950

The ninth and final big brown bat tagged during the 2011 season was a juvenile female captured at 2235 hrs on 30 July at Site 32 (Tables 10 and 11, Appendices C and D). It was caught in a 12-meter (39.3 ft) wide by 9-meter (29.5 ft) high mist net set across a forested trail at the edge of a woodlot. The surrounding habitat consisted of crop fields.

The bat was fitted with a 0.35-gram transmitter (172.950 MHz) and hand-released at the capture site. At time of release, the bat was alert and active and flew away. Searches for this bat were continued for five days, but the bat was never detected.

## 5.0 Discussion/Conclusion

This study had three major objectives. The first objective was to determine if any species of concern, at either the state or federal level, was present. The second was to determine if any colonies of common species were present and locate the roosts. The third was to provide an overview of the summer bat community. Mist netting efforts completed for this Project complied with guidelines set by the USFWS (as identified in the Indiana Bat Recovery Plan) for the federally endangered Indiana bat and the ODNR moderate intensity pre-construction monitoring of bats. All three objectives were met.

### 5.1 Presence of the Indiana Bat

The results of the current study indicate that a maternity colony of Indiana bats is present. This conclusion is based on the following data and is consistent with guidance in the draft recovery plan (USFWS 2007) for the species. First, the bat

captured (218) was an adult female who had recently ceased lactation (i.e. her young was recently weaned). This is a time of year when large summer colonies of Indiana bats begin to change their behavior (Humphrey et al. 1977, Brack 1983, Kurta et al. 1993, Callahan et al. 1997, Kurta 2004, Sparks et al. 2008, Whitaker and Sparks 2008). During lactation, most bats are associated with one or more primary roosts, but as the young become more independent, bats begin to move into a much larger number of trees including both the important summer roosts and other nearby trees (Sparks et al. 2008). All roosts used by bat 218 were large, living shagbark hickories, and thus are most likely alternate roosts. The presence of five of six roosts within a single woodlot suggests that woodlot also contains a primary roost.

Interpretation of the foraging data must consider three factors. First, only a single bat was tracked. Second, this landscape is dominated by agriculture and other habitats occur as small isolated parcels within this larger matrix. Under these conditions, any telemetry error is likely to result in the data point being mapped within a cultivated field. Biologists in the field noted that bats spent much of their time moving along small wooded parcels (especially fencerows) that are small enough to not appear on the habitat map. Indiana bats are known to make extensive use of woodland throughout the range (Kiser and Elliott 1996, Kurta 2004, Murray and Kurta 2004, Sparks et al. 2004, Sparks et al. 2005, Watrous et al. 2006), but the small sample size prevented such an analysis.

## **5.2 Presence of Other Listed Species**

No eastern small-footed or Rafinesque's big-eared bats were captured. However, there were 17 northern bats, 12 little brown bats, and two evening bats captured. Evidence of reproduction was found for all three species, which likely indicates that a maternity colony is present within the local area for these species as well. This is an important consideration because both northern and little brown bats have recently been petitioned for listing under ESA as threatened or endangered species (Kunz and Reichard 2010, The Center for Biological Diversity 2010). At present, the northern bat is undergoing a formal status review by the USFWS for consideration of addition to the federal list of threatened and endangered species. Similarly, the little brown bat is undergoing a 90-day evaluation by USFWS to determine if the species will receive a full status review.

Evening bats are not currently listed by ODNR partly because the species is uncommon enough that there is some question as to whether the species is a resident of the state. Recent data indicated that the species is much more common in neighboring areas of Indiana (Whitaker et al. 2007) than previously thought, and a maternity colony has been found in Michigan (Kurta et al. 2005). As such, there is reason to believe this species will also be listed at some point in Ohio.



### 5.3 Presence of Maternity Colonies of Common Species

The results of the current study also indicate that the Project area is home to a minimum of seven maternity colonies of the big brown bat. The presence of multiple colonies of big brown bats is typical of the Midwest (Cope et al. 1991, Whitaker 1996, Sparks et al. 1998, Duchamp et al. 2004, Whitaker et al. 2004, Brack and Duffey 2006). The species is locally abundant, associated with human activities during all parts of its life, and has a relatively high reproductive potential (Brack et al. 2010). Small numbers of big brown bat fatalities have been recorded at wind energy facilities (Kunz et al. 2007a, Kunz et al. 2007b, Arnett et al. 2008). Given the species abundance in the Project area and its habit of foraging in open areas (Duchamp et al. 2004), it is likely that some big brown bats could be killed at the facility. However, the robust local population, dispersal of these bats in multiple roosts, and relatively high reproductive potential makes it unlikely that this mortality would have population-level impacts.

### 5.4 Characterization of the Bat Community

The third objective of characterizing the bat community on the site was met. The bat community is typical for this area of Ohio and was dominated by big brown bat, which is associated with anthropogenic structures in all parts of its life history (Davis et al. 1968, Barbour and Davis 1969). Eleven species of bats are typically considered to occur in Ohio (Gottschang 1981, Belwood 1998, Brack et al. 2010). Published studies in the region are rare; however, Brack and Duffey (2006) reported capture of 6 of 11 Ohio bat species on the Ravenna Training and Logistics Site (RTL), Portage and Trumbull counties, Ohio. The main differences between the current study and that of Brack and Duffey (2006) was the much higher local abundance of little brown bats at RTL and the presence of the Indiana and evening bat in this study.

This study documented the presence of two migratory tree bats-- the eastern red and hoary bat. The silver-haired bat is not typically present in this region during summer, but is likely abundant during migration (Brack et al. 2010). Together, these migratory tree bats are the species most commonly killed at wind energy facilities (Kunz et al. 2007a, Kunz et al. 2007b, Arnett et al. 2008).

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**APPENDIX A  
SPECIES ECOLOGY**

## 1.0 Ecology of Listed Species

### 1.1 Indiana Bat (*Myotis sodalis*)

#### 1.1.1 Description

The Indiana bat is a medium-sized bat in the genus *Myotis*. The forearm length has a range of 35 to 41 millimeters (1.4 – 1.6 in). The head and body length ranges from 41 to 49 millimeters (1.6 – 1.9 in). Its appearance most closely resembles that of congeners little brown bat (*M. lucifugus*) and northern bat (*M. septentrionalis*). Indiana bats differ from similar *Myotis* species in that they have a distinctly keeled calcar (cartilage that extends from the ankle to support the tail membrane). Other minor differences include smaller and more delicate hind feet, shorter hairs on the feet that do not extend past the toenails, and a pink nose. The fur lacks luster, and the wing and ear membranes have a dull, flat coloration that does not contrast with the fur (USFWS 2007). Fur on the chest and belly is lighter than fur on the back, but is not as strongly contrasting as that of similar *Myotis* species. Overall color is slightly grayer, while the little brown bat and northern bat are browner. The skull has a crest and tends to be smaller, flatter, and narrower than that of the little brown bat (USFWS 2007).



Photo by  
Adam Mann

#### 1.1.2 Status

The USFWS listed the Indiana bat as endangered on 11 March 1967. The most current range-wide estimate of the population is 387,835 individuals (USFWS 2010), which represents about half of the estimated population of 1960. Listing was based on long-term declines of winter populations across the range of the species, although population changes are best documented where the species was most abundant in Kentucky, Missouri, and Indiana (Brack et al. 1984, Johnson et al. 2002, Whitaker et al. 2002, Brack et al. 2003, Sparks et al. 2008), although such information is now being acquired in most states. It is probable that habitat loss during summer (USFWS 2007) and winter disturbances during hibernation (Johnson et al. 1998) both contributed to the overall decline of the species.

#### Federal Register Documents

[41 FR 41914](#); 24 September 1976: Final Critical Habitat, Critical habitat-mammals

[40 FR 58308](#) [58312](#); 16 December 1975: Proposed Critical Habitat, Critical habitat-mammals

[32 FR 4001](#); 11 March 1967: Final Listing, Endangered



The only official recovery plan for the species was completed on 14 October 1983. A revised draft was released in April 2007. Although widely used as a regulatory document, the 2007 version of the recovery plan has not been officially approved.

Critical habitat was designated on 24 September 1976, and includes 11 caves and 2 abandoned mines in Illinois, Indiana, Kentucky, Missouri, Tennessee, and West Virginia.

### **1.1.3 Regional Species Occurrence**

Neither Seneca nor Sandusky counties has records of the Indiana bat. The closest major hibernaculum is Lewisburg Mine, approximately 180 kilometers (112 mi) southwest of the Project in Preble County. The closest designated critical habitat for this species is Ray's Cave, approximately 385 kilometers (239 mi) southwest of the WRA in Greene County, Indiana. Prior to the survey, the closest counties with documented non-reproductive summer records were Richland and Ashland Counties (Figure 1). However, following completion of the study a reproductive Indiana bat was captured within 5 miles of the WRA (J. Norris, ODNR).

### **1.1.4 Ecology**

The Indiana bat is a "tree bat" in summer and a "cave bat" in winter. There are four ecologically distinct components of the annual life cycle: winter hibernation, spring staging and autumn swarming, spring and autumn migration, and the summer season of reproduction. The U.S. Fish & Wildlife Service Recovery Plan (2007) provides a description of the life history. Figure 2 provides an annual chronology of seasonal activities.

#### **1.1.4.1 Summer Roosting Ecology**

The summer range of the Indiana bat is large and includes much of the eastern deciduous forestlands between the Appalachian Mountains and Midwest prairies (Figure 3). Distribution throughout the range is not uniform and summer occurrences are more frequent in southern Iowa and Michigan, northern Missouri, Illinois, and Indiana. Greater tree densities do not equate to more bats (Brack et al. 2002).

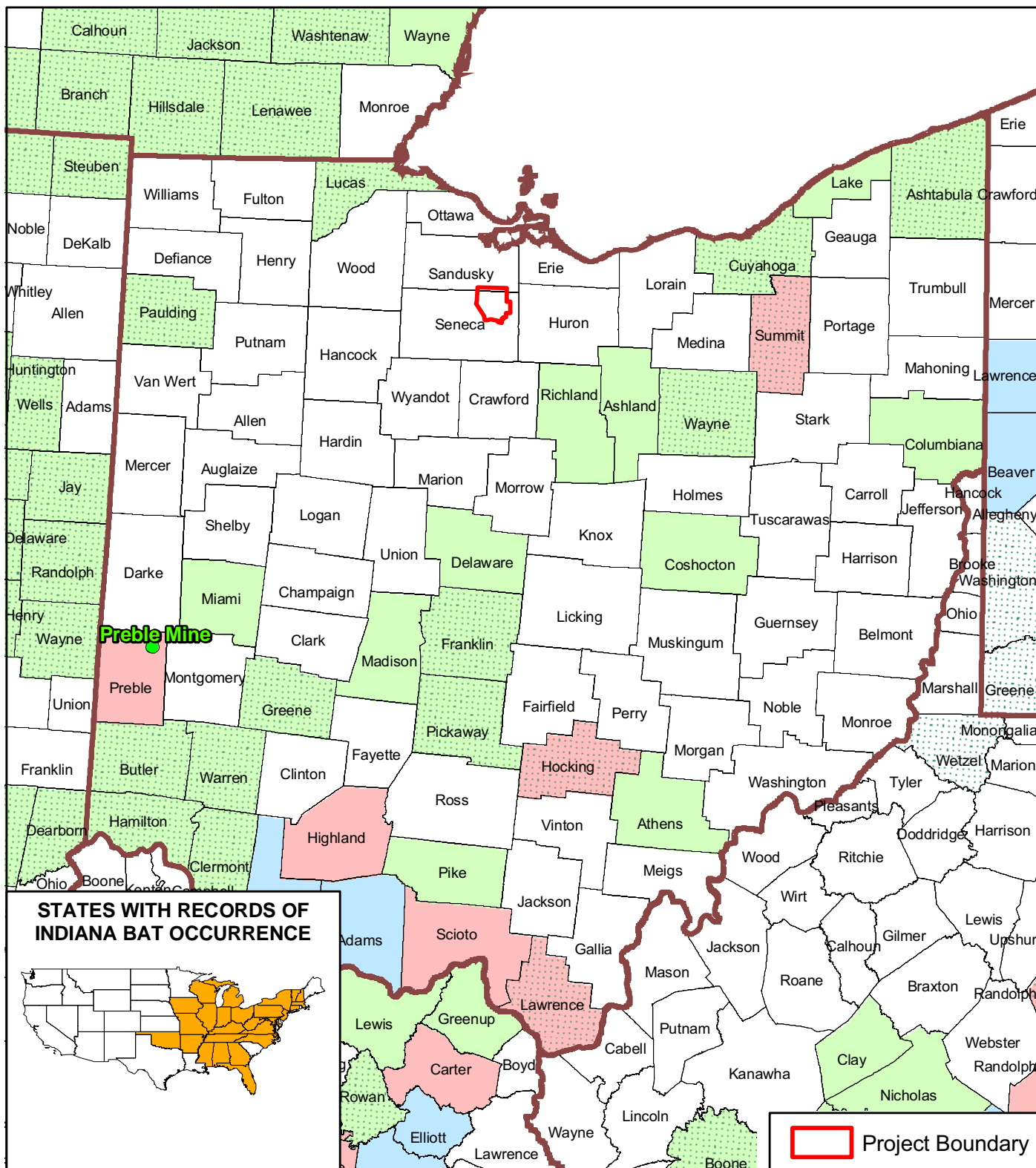


Figure 1. Counties near the project area with hibernacula, summer maternity, and other summer (non-reproductive) records for the Indiana bat (*Myotis sodalis*).

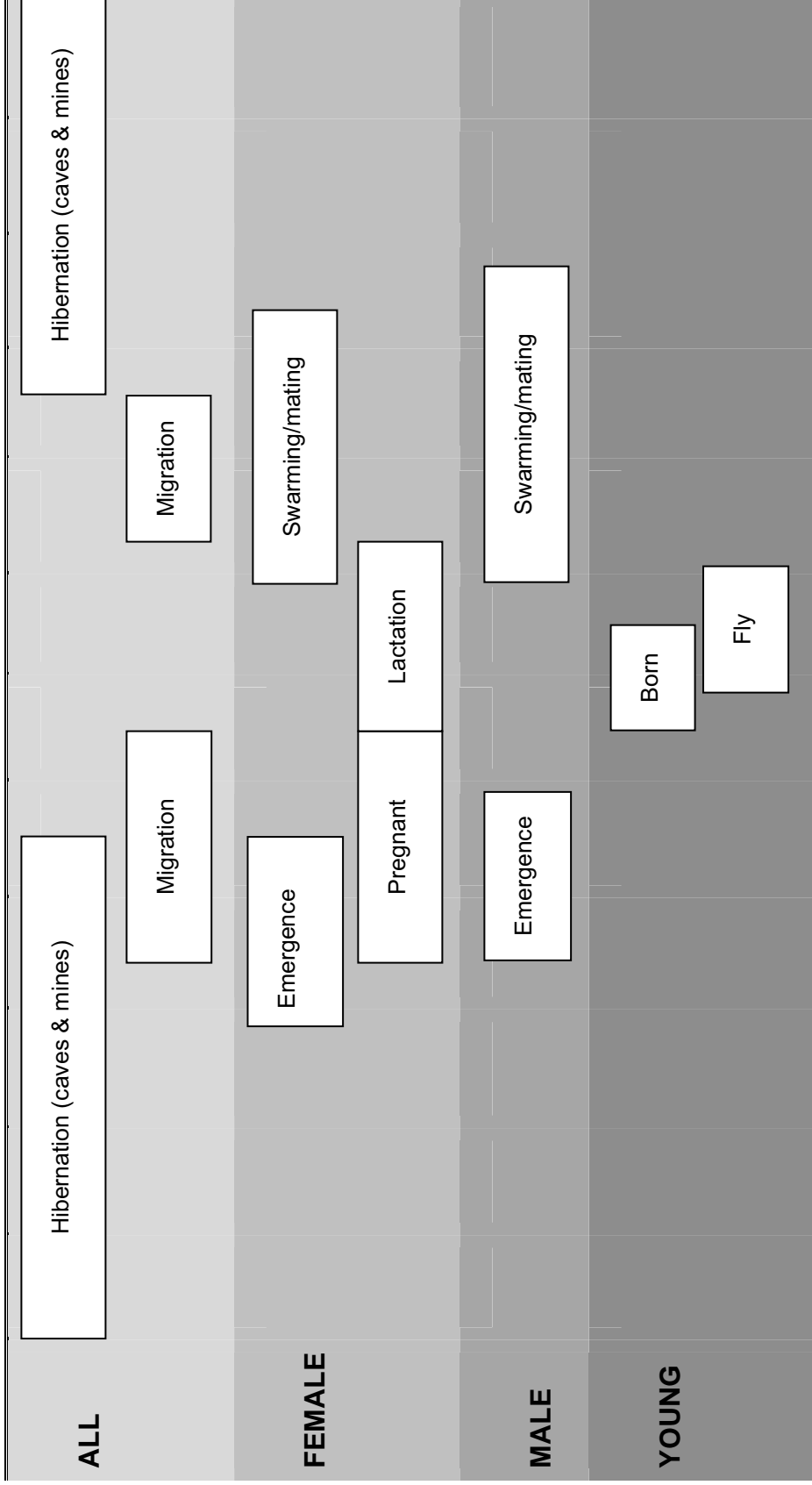
Project No.340

Sources: USFWS, Indiana Bat Revised Recovery Plan, Agency Draft, 2007.  
Updated October 2010



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JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC



JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Figure 2. Seasonal chronology of Indiana bat activities.

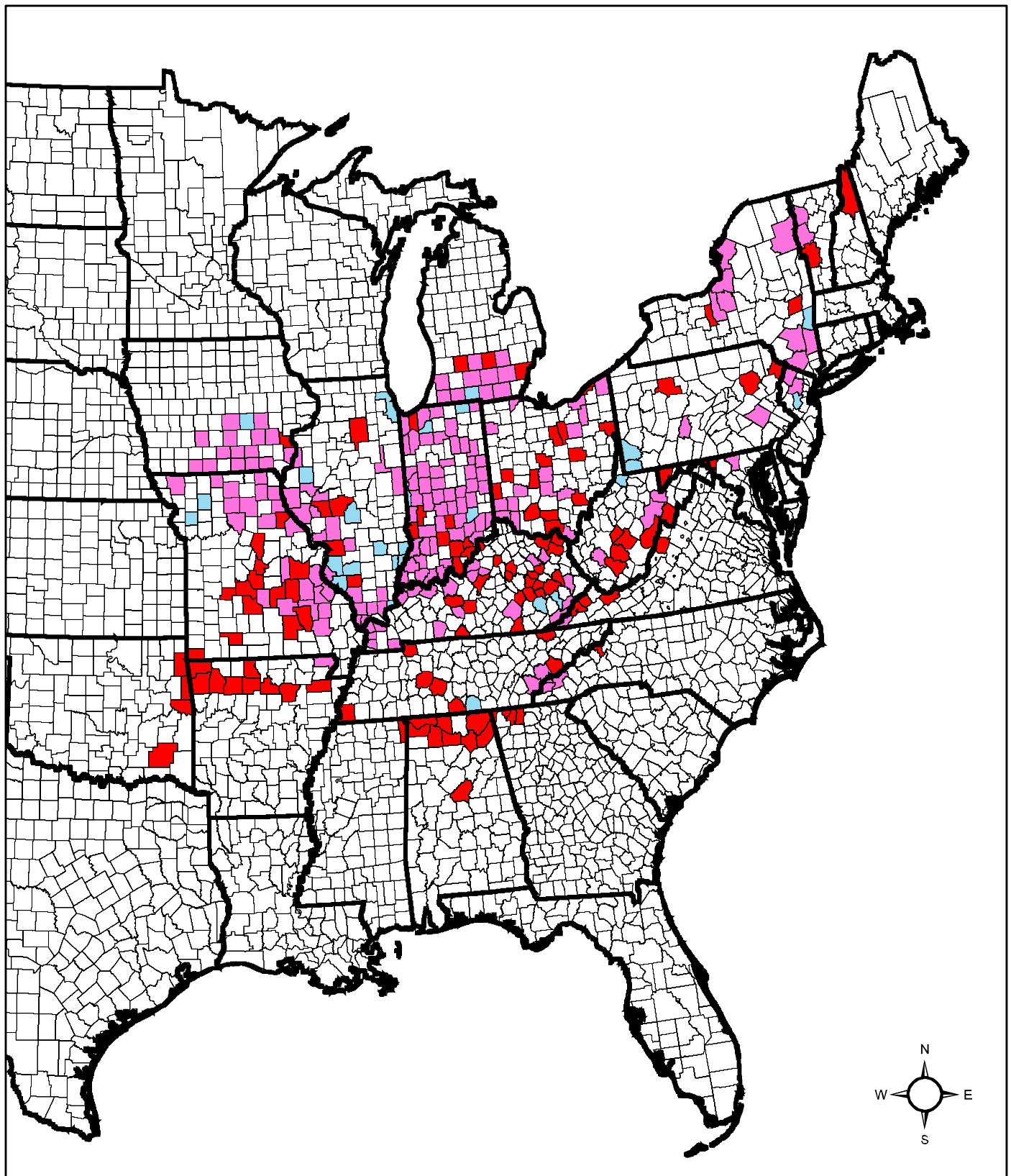


Figure 3. Rangewide distribution of the Indiana bat during summer, showing counties with reproductive (adult female and/or young-of-the-year) and non-reproductive records.

 County with Record of Indiana Bat Reproductive Occurrence	 County with Record of Indiana Bat Summer Non-Reproductive Occurrence	 County with Record of Indiana Bat Reproductive and Summer Non-Reproductive Occurrence
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Cooler summer temperatures associated with latitude or altitude likely affect reproductive success and the summer distribution of the species (Brack et al. 2002).

#### **1.1.4.1.1 Males**

Some males remain near hibernacula throughout summer while others migrate varying distances (Whitaker and Brack 2002). Males can be caught at hibernacula on most nights during summer (Brack 1983, Brack and LaVal 1985), although there may be a large turnover of individuals between nights (Brack 1983).

Structurally, woodland roosts used by males are similar to those used by maternity colonies (Kiser and Elliott 1996, Schultes and Elliott 2002, Brack and Whitaker 2004, Brack et al. 2004). These trees are smaller (Kurta 2004), perhaps because males are often solitary or form small groups and thus need less space or because males may have different thermal requirements than females. Males appear somewhat nomadic; over time, the number of roosts and the size of an area used increases. Activity areas encompass roads of all sizes, from trails to interstate highways. Roosts have also been located near roads of all sizes (Kiser and Elliott 1996, Schultes and Elliott 2002, Brack et al. 2004), including adjacent to an interstate highway (Sparks et al. 1998, Brack et al. 2004, Whitaker and Sparks 2008, Sparks et al. 2009).

#### **1.1.4.1.2 Females and Maternity Colonies**

When female Indiana bats emerge from hibernation, they migrate to maternity colonies that may be located up to several hundred miles from the hibernacula (Kurta and Murray 2002, Winhold and Kurta 2006). Females form nursery colonies under exfoliating bark of dead, dying, and living trees in a variety of habitat types, including uplands and riparian habitats. A wide variety of tree species (Kurta 2004), occasionally including pines (Britzke et al. 2003), are used as nursery colonies indicating that it is tree form, not species that is important for roosts (Kurta 2004). Because many roosts are in dead or dying trees, they are often ephemeral. Roost trees may be habitable for one to several years, depending on the species and condition of the tree (Callahan et al. 1997, Kurta 2004, Whitaker and Sparks 2008). Indiana bats exhibit strong site fidelity to summer roosting and foraging areas (Kurta and Murray 2002, Kurta et al. 2002, Sparks et al. 2004, Whitaker et al. 2004, Winhold et al. 2005, Whitaker and Sparks 2008, Sparks et al. 2009).

A maternity colony typically consists of 25 to 325 adult females. Nursery colonies often use several roost trees (Kurta et al. 1993, Foster and Kurta 1999, Kurta and Murray 2002, Whitaker and Sparks 2008), moving among roosts within a season. Most members of a colony coalesce into one or a few roost trees about the time of parturition, the action or process of giving birth to offspring. Once young are volant, capable of flying, the bats spend less time in these major roosts and more time in minor roosts—often roosting alone under the bark of live trees. Roosts that contain large numbers of bats (more than 20 bats) are often called primary roosts, while secondary roosts hold fewer bats. Primary roost trees are often greater than 46

centimeters (18 in) dbh and secondary roost trees are often greater than 23 centimeters (9 in) dbh (Gardner et al. 1991, Callahan et al. 1997, Kurta et al. 2002, Miller et al. 2002, Carter 2003). Numerous suitable roosts may be needed to support a single nursery colony, possibly about 45 stems per hectare (20/acre) (Gardner et al. 1991, Miller et al. 2002, Carter 2003).

Roost trees often have 10 hours of solar exposure per day, with 20 to 80 percent canopy closure (Humphrey et al. 1977, Gardner et al. 1991, Kurta et al. 1993, Kurta et al. 1996, Kurta et al. 2002, Carter 2003), but the need for solar exposure may vary with latitude. Although Indiana bats typically roost under the exfoliating bark of dead and dying trees, they have also been found roosting in a variety of cracks and hollows in trees (L. C. Watkins in Humphrey et al. 1977, Kurta et al. 1993, Kurta et al. 2002), (Butchkoski and Hassinger 2002, Kurta 2004), utility poles (ESI 2004, Hendricks et al. 2004), buildings (Butchkoski and Hassinger 2002, V. Brack Unpublished data, A. C. Hicks Personal communication), and bat boxes (Butchkoski and Hassinger 2002, Carter 2002, Butchkoski 2005, Ritzi et al. 2005, Whitaker et al. 2006). The colony of bats near the Indianapolis Airport have used a combination of both natural roosts (trees) and batboxes every year since 2003 (Sparks et al. 2008).

Females are pregnant when they arrive at maternity roosts. Females produce one young per year, typical for the genus *Myotis* (Asdell 1964, Hayssen et al. 1993). Parturition typically occurs between late June and early July. Lactating females have been caught 11 June to 29 July in Indiana, 26 June to 22 July in Iowa, and 11 June to 6 July in Missouri (Humphrey et al. 1977, LaVal and LaVal 1980, Brack 1983, Clark et al. 1987). Juveniles become volant between early July and early August. Reproductive phenology is likely dependent upon seasonal temperatures and the thermal character of the roost (Humphrey et al. 1977, Kurta et al. 1996). Like many microchiropterans, Indiana bats are thermal conformists (Stones and Wiebers 1967), with prenatal, neonatal, and juvenile development temperature dependent (Racey 1982). Cooler summer temperatures associated with latitude or altitude likely affect reproductive success and therefore the summer distribution of the species (Brack et al. 2002).

#### **1.1.4.2 Food Habits and Foraging Ecology**

Like many other species of microchiropterans, the Indiana bat often uses travel corridors that consist of open flyways such as streams, woodland trails, small infrequently used roads, and possibly utility corridors, regardless of suitability for foraging or roosting (Brown and Brack 2003). Members of maternity colonies forage in a variety of woodland settings, including upland and floodplain forest (Humphrey et al. 1977, Brack 1983, Gardner et al. 1991). Foraging activity is concentrated above and around foliage surfaces, such as over the canopy in upland and riparian woods, around crowns of individual or widely spaced trees, and along edges. They forage less frequently over old fields, and occasionally over bushes in open pastures. Forest edges, small openings, and woodlands with patchy trees provide more foraging opportunities than dense woodlands. Most species of woodland bats forage

prominently along edges, less in openings, and least within forests (Grindal 1996). Openings also provide a better supply of insects than do wooded areas (Tibbels and Kurta 2003).

### **1.1.5 Causes of Past/Current Decline**

Long-term, detailed documentation of population changes of Indiana bats are lacking in most areas. Summer habitat degradation (USFWS 2007), pesticides, and winter disturbance (Johnson et al. 1998) are believed to have contributed to an overall decline. Beginning in 2006, bats (including Indiana bats) hibernating in mines near Albany, New York were observed with fungal disease that is now known as white nose syndrome (WNS), which has been responsible for dramatic declines in bats throughout the northeast (Blehert et al. 2008; 2009).

Populations of hibernating bats in the northeastern United States have been dying in record numbers, and the specific cause of the deaths is unknown. However, this crisis is directly associated with WNS, named for a white fungus evident on the muzzles and wings of affected bats (Meteyer et al. 2009). This affliction was first documented at four sites in eastern New York in the winter of 2006-2007 (Blehert et al. 2008; 2009). Since then, WNS has rapidly spread to multiple sites throughout the northeast and has begun to spread into the Southeast and Midwest. Researchers associate WNS with a newly identified fungus (*Geomyces destructans*) that thrives in the cold and humid conditions characteristic of the caves and mines used by bats (Gargas et al. 2009). Bats apparently have a reduced immune responses while hibernating (Carey et al. 2003), which may predispose them to infection by *G. destructans*. Biologists and/or cavers have documented WNS in bat hibernacula in New Hampshire, Vermont, New York, Massachusetts, Connecticut, New Jersey, Pennsylvania, West Virginia, Virginia, Maryland, Delaware, Tennessee, and the Canadian provinces of Ontario and Quebec. We recently documented its presence in Indiana and it has been reported from both Ohio and Kentucky. The disease can lead to severe wing damage (Reichard and Kunz 2009) which can be used as a “red flag” for infected individuals, although the majority of bats within an infected area have only slightly damaged or undamaged wings (Francl et al. 2011). By combining sensitive molecular techniques (Lorch et al. 2010) with field observations of damaged wings, the fungal agent of WNS has now been documented in Missouri and Oklahoma.

The Indiana bat uses a variety of wooded summer habitats, from large tracts of woodlands to riparian strips and woodlots on a man-dominated landscape. Summer habitat losses include tree removal or land clearing for a variety of land use practices. Removal of standing dead trees, especially during summer months, is potentially harmful. Removal of riparian forest along streams and ditches also degrades summer habitat. Loss of wooded lands can lead to increased forest fragmentation, and a compounding of adverse effects. In many portions of their core range, Indiana bats utilize savanna-like habitats, with large trees, an open canopy, and an uncluttered understory. However, suppression of fire and removal of dominant



grazing herbivores, combined with frequent tree harvest, has often produced wooded lands of smaller trees with a closed canopy and a cluttered understory, which may have affected the quality of maternity habitat (USFWS 2007). Similarly, urbanization removes potential foraging habitat and bats may not cross developed areas to access otherwise suitable foraging habitat (Sparks et al. 2005).

## 1.2 Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*)

### 1.2.1 Description

Rafinesque's big-eared bat is a medium-sized bat, approximately 102 millimeters (4 in) in length with a wingspread of about 280 millimeters (11 in). The Virginia big-eared bat (*Corynorhinus townsendii virginianus*), a federally listed sub-species also has large, conspicuous ears but several characteristics separate the two. The Rafinesque's big-eared bat has grayish-brown fur on the upperparts, a whitish belly, and long toe hairs that extend noticeably beyond the tips of the toes. The Virginia big-eared bat has medium brown upperparts, a buff belly color, and very short toe hairs. Both species of big-eared bats have two large lumps (glands) on the upper surface of the snout, accounting for the alternative name, 'lump-nosed' bat.



### 1.2.2 Status

Rafinesque's big-eared bat is a federal species of management concern and is listed in Ohio as a species of concern. The Rafinesque's big-eared bat is rare in Ohio, known only from Adams County, in extreme south central Ohio (<http://www.mammalsociety.org/mammals-ohio>).

### 1.2.3 Ecology

This is a bat of forested regions. Hibernation in the north and in mountainous regions most often occurs in caves or similar sites; small caves are selected, and the bats stay near the entrance (often within 30 meters) and are thought to move about in winter (Handley 1959, Barbour and Davis 1969). In Kentucky, shallow caves or rock shelters in sandstone formations of the Cumberland Plateau often are used. Rafinesque's big-eared bats are also known to use abandoned mines year-round (Belwood and Waugh 1991). Many are found hibernating singly, but clusters of up to about 100 individuals have been found on rare occasions. From spring through fall, the species is most often found in sandstone rock shelters along cliff lines and in small caves, but abandoned buildings are frequently used in some areas (<http://www.biology.eku.edu/bats/rafbat.html>).

Summer roosts often are in hollow trees, occasionally under loose bark, or in abandoned buildings in or near wooded areas. Nursery colonies are rare in caves, but are known to occur in Kentucky and Tennessee (Barbour and Davis 1969). There

are records of roosts under bridges and even in a cistern. Maternity colonies consist of from a few to several dozen females and are found in roosts from May through August or September (<http://www.biology.eku.edu/bats/rafbat.html>). Pups are typically born in late May and early June, and they are volant by mid-July. Male bats may roost singly or in small clusters, often at different sites than females and young. Rafinesque's big-eared bats are thought to forage in forests and along forest edges, preying mostly on moths, which they frequently eat at roost sites. A collection of moth wings on the ground often indicates the species' use of a sheltered place as a roost site (<http://www.biology.eku.edu/bats/rafbat.html>). Hurst and Lacki (1997) noted that the diet of these bats primarily consisted of lepidopterans. Big-eared bats primarily relied on gleaning near the cave, but at least occasionally captured moths in flight (Lacki and Ladeur 2001).

### 1.3 Eastern Small-footed Bat (*Myotis leibii*)

#### 1.3.1 Description

The small-footed bat is one of the eastern United States smallest bats averaging 8.9 centimeters (3.5 in) long, with a 3.8-centimeter (1.5-in) tail. Although it generally similar to the little brown bat (*Myotis lucifugus*), it differs from that species in having a dark face and wing membranes that contrast with the fur, smaller feed (less than 8 millimeters [.3 in]) and a strongly keeled calcar (Best and Jennings 1997).



#### 1.3.2 Status

The eastern small-footed bat is not a listed species, protected under ESA, although USFWS has been petitioned to list the species as a result of the emergence of WNS (The Center for Biological Diversity 2010), and after their 90-day review of the petition are completing a Status Assessment to determine whether or not to recommend listing. In Ohio, the eastern small-footed bat is considered the rarest bat in the state and is listed as a species of concern (<http://www.dnr.state.oh.us/wildlife/Home/resources/mgtplans/specofconcern/tabid/6007/Default.aspx>). In May 2011, for the first time in more than 100 years the species was identified in Ohio, roosting in Castalia Quarry MetroPark.

The range of the eastern small-footed bat, extends from northern New England through New York, south along the Appalachian Mountains to North Carolina and westward through Tennessee and northern Georgia, Alabama and Mississippi with disjunct populations occurring in cliffs along the Ohio River and in the Ozarks (Whitaker and Hamilton 1998). Despite its wide distribution, the species is rarely encountered in sufficient numbers for meaningful interpretation of seasonal reproductive cycles, habitat use, food habits, or even seasonal changes in morphometric data.

### 1.3.3 Ecology

The small-footed bat is considered a “hearty” species that enters hibernation late in autumn and emerges early in spring and is thought to hibernate at cold temperatures (Best and Jennings 1997). Throughout the range, most winter observations have been of individuals using open areas of caves and mines (Mohr 1936, Gunier and Elder 1972, Best and Jennings 1997, Veilleux 2007), but these observations are probably not typical of areas most used. Observations of bats hibernating beneath stones and rocks on floors of caves (Davis 1955, Krutzsch 1966) as well as the capture by trapping sites a railroad tunnel where the bats were not observed during visual surveys in Maryland (Johnson and Gates 2008), all suggest the species may typically hibernate in a variety of narrow rock crevices.

The mating behavior of the eastern small-footed bat is frequently assumed to be similar to that of better-known congeners, such as the Indiana bat and little brown bat, with autumn swarming at caves and mines providing an opportunity to mate (Humphrey and Cope 1976, Cope and Humphrey 1977, LaVal and LaVal 1980, McDaniel et al. 1982). During autumn studies in Wise County, Virginia, eastern small-footed bats came to caves and mines, generally after feeding, rather than emerging from them, emphasizing the importance of caves and mines in the social behavior of the species (V. Brack, Pers. Comm.). The mass of bats in autumn, prior to hibernation, was about 44 percent greater than the mass of bats in spring, after hibernation. Bats captured during swarming in West Virginia fed on 7 orders of insects although moths (Lepidoptera) and flies (Diptera) were predominant (Johnson and Gates 2007). In southern New Hampshire the summer diet (May through September) included insects belonging to eight orders, spiders (Araneae), unidentified arthropods and vegetation (Moosman et al. 2007). Moths (Lepidoptera), trueflies (Diptera), and beetles (Coleoptera) composed most of the diet. Diet of adult males contained significantly fewer beetles than that of juveniles, but diet was similar between other demographic groups and across time. The Presence of spiders and crickets (Gryllidae) in the diet suggested gleaning.

Bats captured during spring emergence from a Maryland railroad tunnel made short (less than 2 km) migrations to summer grounds (Johnson and Gates 2008). These bats selected summer roosts amongst slopes covered with shale and occasional trees, and appeared to roost randomly amongst the rock. Although few published accounts are available, the species is considered a specialist in using rocky areas (Best and Jennings 1997). The following comments are based on a review of the limited available published data (Best and Jennings 1997, Erdle and Hobson 2001, Johnson and Gates 2008, Johnson et al. 2009, PGC 2010), discussions with a biologist with the largest unpublished study (J. P. Veilleux, personal communication), observations of ESI biologists on capture sites and roosts discovered via radio-telemetry, and the known roosting biology of other eastern bats (Barclay and Kurta 2007). Ideal summer habitats for this species are large expanses of rock that provide the bats with a variety of thermal conditions. Such conditions are naturally found in rock fields, tallus slopes, and cliff lines. Suitable anthropogenic habits are known to

include high walls and mine tailings, and rip-rapped dams, but also likely include road cuts. Reproductive females likely select roosts with significant solar exposure that allow for more rapid development of the young. Other bats likely select more shaded and thus cooler roosts that allow bats to use daily torpor to save energy. As such, occasional individuals may also occupy smaller rock outcroppings even if isolated.

Other aspects of summer ecology consist primarily of anecdotal observations (Best and Jennings 1997). By late June, most adult females are lactating, although pregnant individuals can still be found. About 30 percent of females captured are not reproductively active, which suggests females do not mate the first year. A similar rate of capture of reproductive females and adult males during summer suggests males and females use the habitat similarly, and maternity colonies, if present, are small. Flight is slow (Davis et al. 1965, Barbour and Davis 1969, van Zyll de Jong 1984), which suggests the species may extensively glean prey items from surface structures.

## **2.0 Additional Species that May be Listed During the Life of the Project**

### **2.1 Northern Long-eared Bat (*Myotis septentrionalis*)**

#### **2.1.1 Natural History**

The northern long-eared bat ranges from the northern border of Florida north and west to Saskatchewan and east to Labrador. In Ohio, it ranges in forested areas throughout the state (Brack et al. 2010). Maternity colonies are typically found in hollow trees and under bark although they sometimes use bat-houses, and buildings (Sparks 2003, Whitaker et al. 2004). Colonies are usually smaller than other species of *Myotis* and occupy small territories (D. W. Sparks Unpublished Data). Northern long-eared bats hibernate in crevices and fissures in caves and mines (Whitaker and Rissler 1992), and probably such structures as highway cuts. The Lewisburg Limestone Mine is home to approximately 100 of these bats in winter (Brack 2007). Unpublished studies in suburban Indianapolis and along the Wabash River near Terre Haute indicate this species forages almost exclusively in forested areas within 1 kilometer (0.6 mi) of the roost (D. W. Sparks, Unpublished). The species forages on a variety of insects including flies, moths, beetles, and is noteworthy for its consumption of spiders (Brack and Whitaker 2001).

## **2.2 Little Brown Bat (*Myotis lucifugus*)**

### **2.2.1 Natural History**

The little brown bat ranges from the edge of the Coastal Plain north to Alaska and may dominate bat communities where scattered buildings (potential roosts) occur in a matrix dominated by natural or agricultural landscapes. The species is commonly captured in Ohio (Brack and Duffey 2006) and likely occurs throughout the state (Brack et al. 2010), including the Project Area. However, White-Nose Syndrome has impacted the little brown bat more than any other species. The species may no longer be the most common species and likely will continue to decline. Maternity colonies are typically found in buildings, bridges, bat-houses, and under the bark of trees (Barclay and Cash 1985, Cope et al. 1991). Near large colonies, this species may dominate the local bat community. Most little brown bats hibernate in caves and mines (Whitaker et al. 2002, Whitaker et al. 2003). Nearly 20,000 use nearby Preble Mine as a hibernaculum (Brack 2007). Recent declines may be due to White-Nose Syndrome. Little brown bats have not been extensively radio-tracked to study foraging areas. A single bat captured near Indianapolis flew to a roost approximately 6 kilometers (3.7 mi) from its point of capture (Whitaker et al. 2004). This species makes extensive use of riparian zones and wetlands for foraging (Brack 2009). The species forages on a variety of insects including flies, moths, beetles, and flying ants (Whitaker et al. 2007).

## **2.3 Evening Bat (*Nycticeius humeralis*)**

### **2.3.1 Natural History**

The evening bat ranges from central Nebraska east to the Atlantic Ocean and south to the Gulf of Mexico. In Ohio, this bat is uncommon and is known from only three counties (Medina, Harrison, and Pickaway) (Brack et al. 2010). During the summer mist net survey two juvenile female bats were captured. These two bats are the first recorded occurrence in Seneca County. Since both individuals were juveniles and this species has a remarkably short foraging range with virtually all bats foraging in woodlots and over agricultural fields within 4 kilometers (2.5 mi) of the roost, it is very likely a maternity colony is located close to the capture site (Duchamp et al. 2004). Maternity colonies may occur in buildings (Whitaker and Gummer 2003); however, most roosts now occur in hollow trees, and several hundred bats may cram into a woodpecker hole (Duchamp et al. 2004). In Indiana, the species occurs in the bottomlands of major streams (Whitaker and Gummer 2003). The evening bat is highly sensitive to development as a result of their small foraging range. The species forages heavily on spotted cucumber beetles, other beetles, green stink bugs, and moths (Whitaker and Clem 1992).

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**APPENDIX B**  
**STUDY PLAN AND ASSOCIATED CORRESPONDENCE**



## STUDY PLAN

# MIST NET SURVEYS OF SUMMER BATS ON THE REPUBLIC WIND ENERGY PROJECT RESOURCE AREA SENECA AND SANDUSKY COUNTIES, OHIO

20 June 2011

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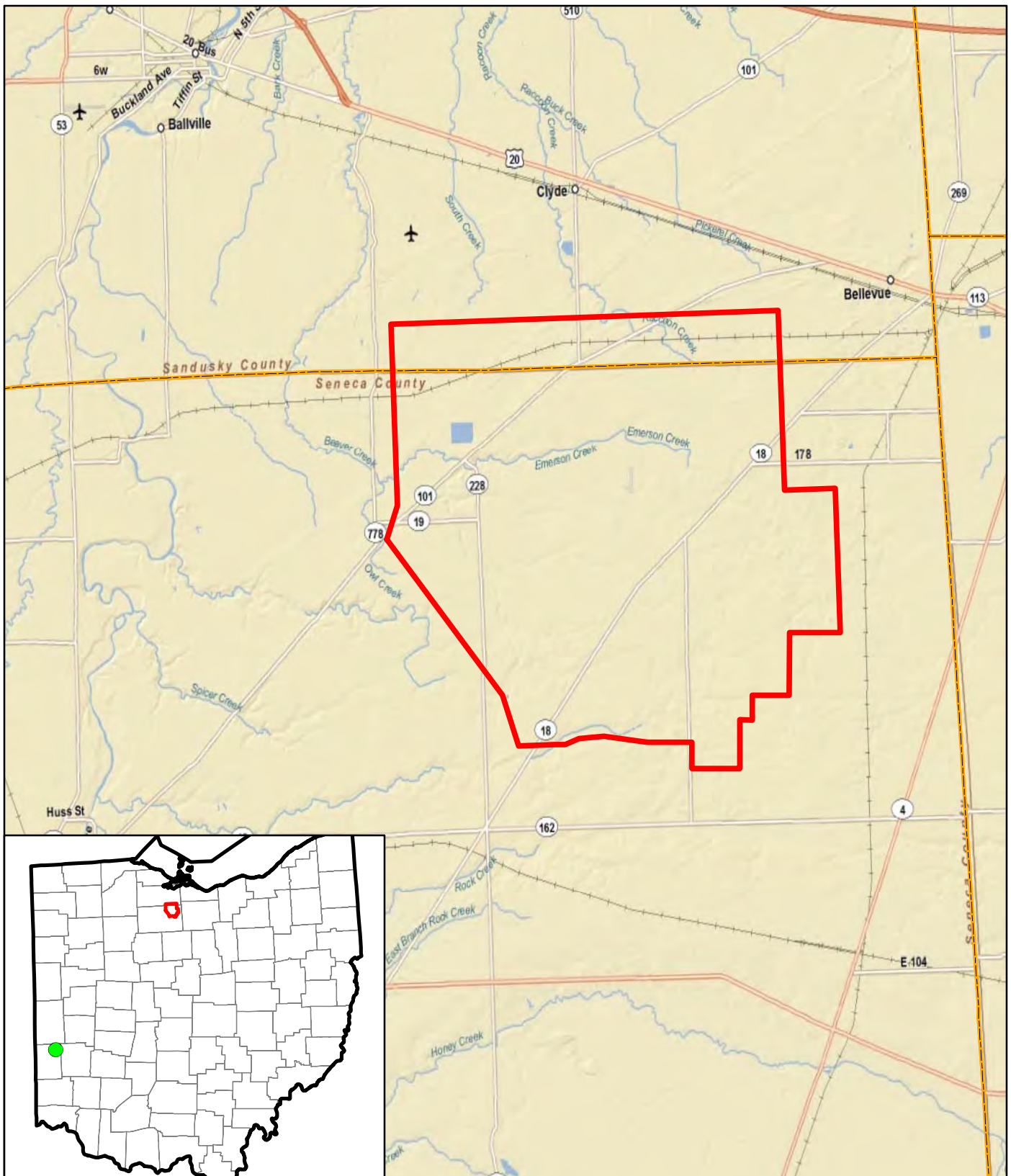


## **1.0 Introduction and Project Description**

Republic Wind Energy, LLC (Republic), a Nordex affiliated company, is proposing to construct a commercial wind energy facility within a wind resource area consisting of approximately 16,028 hectares (39,607 ac) in Seneca and Sandusky Counties, Ohio. The project area is referred to as the Republic Wind Energy Project (Project). On behalf of Republic, Tetra Tech EC, Inc. (Tetra Tech) contracted Environmental Solutions & Innovations, Inc. (ESI) to perform a summer mist net survey for summer bats on the Project site.

The Project straddles the Seneca/Sandusky county line, just east of the town of Green Springs in Sandusky County, Ohio (Figure 1) and covers part of the Fremont East, Clyde, Watson, and Fireside USGS 1/24000 Quadrangles. Indiana bats are found in the state of Ohio during summer, and are known to hibernate in caves and mines within the state and in neighboring states of Indiana and Kentucky. The closest major hibernaculum is Preble Mine approximately 196.34 kilometers (122 mi) southwest of the Project in Preble County. The closest designated critical habitat for this species is Ray's Cave approximately 402.34 kilometers (250 mi) southwest of the Project in Greene County, Indiana. The closest county with documented maternity records is Lucas County to the northwest (Figure 2).

Based on previous agency coordination, Ohio Department of Natural Resources (ODNR) indicated that the Project met the need for a moderate monitoring and that sampling would require 25 mist-net sites. Field studies will be carried out under ESI's current Federal Fish and Wildlife Permit #TE02373A-1 and ODNR Wildlife Animal Permit-Scientific Collection # 14-70.



● Priority 2 Hibernaculum — Project Boundary □ County Boundary

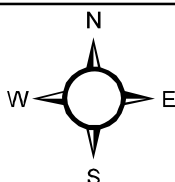


Figure 1. Location of the Project area in Seneca and Sandusky Counties, Ohio and relation of the Project to a Priority 2 hibernaculum in Preble County.

Project No. 340

0 3450 6900  
Meters  
Base Map: ESRI Street Map



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