Exhibit R. 2015 Bat Mist-Netting Report

COPPERHEAD
ENVIRONMENTAL CONSULTING

Summer 2015 Bat Surveys for the Proposed Republic Wind Project, Seneca and Sandusky Counties, Ohio

USFWS No. 15-045

Completed by:

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PROJECT BACKGROUND

Copperhead Environmental Consulting, Inc. (Copperhead) completed a bat mist-net and telemetry survey for the proposed Republic Wind Project (Project) in Seneca and Sandusky counties, Ohio. The Project is located approximately 11 kilometers northeast of Republic Ohio, and covers approximately 37,777 acres, the majority of which is non forested (~94%) based on estimates derived from National Land Cover Dataset (Figure 1). The goals of this survey were to document bat species diversity and abundance within the study area, and inform understanding of roosting habitat, foraging range, and spatial distribution of Indiana bats and northern long-eared bats, if captured.

METHODOLOGY

Level of Effort/Site Selection

Mist-net surveys were implemented in accordance with guidelines outlined in the 2015 Range-wide Indiana Bat Summer Survey Guidelines (USFWS 2015), 2009 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), and the most recent Ohio Division of Wildlife Guidance for Bat Permitted Biologist (ODNR-DOW 2015). Because the survey was not a presence/absence survey for listed bats, the total number of net nights per mist-net site and specific net set requirements followed ODNR (2009). A study plan was submitted to the USFWS and the ODNR on 7 July 2015 and concurrence was received on 13 July (USFWS) and 22 July (ODNR).

The level of effort outlined in the study plan was based on the estimated amount of forested habitat within the Study Area (~4,454 ac) resulting in 36 mist-net sites surveyed from 23 July through 31 July 2015. After field work was completed, the area of the Project was reduced and is denoted as Project Area – Reduced Fall 2015 in Figure 1. The level of effort completed exceeds the level of effort required for the Project Area.

Locations of mist-net sites were chosen based on the best available habitat present within parcels where landowner access was granted, and deemed most likely to yield Indiana and northern long-eared bat captures.

Mist-Net Surveys

Mist-nets were set-up to maximize coverage of flight paths used by bats along suitable travel corridors, foraging areas, or drinking areas. Placement of mist-nets was based on the extent of canopy cover, presence of an open flyway, and forest conditions near the site. Actual location and orientation of each net was determined in the field by permitted biologists and mapped with ArcGIS (v. 10.3.1 ESRI, Redlands, CA).

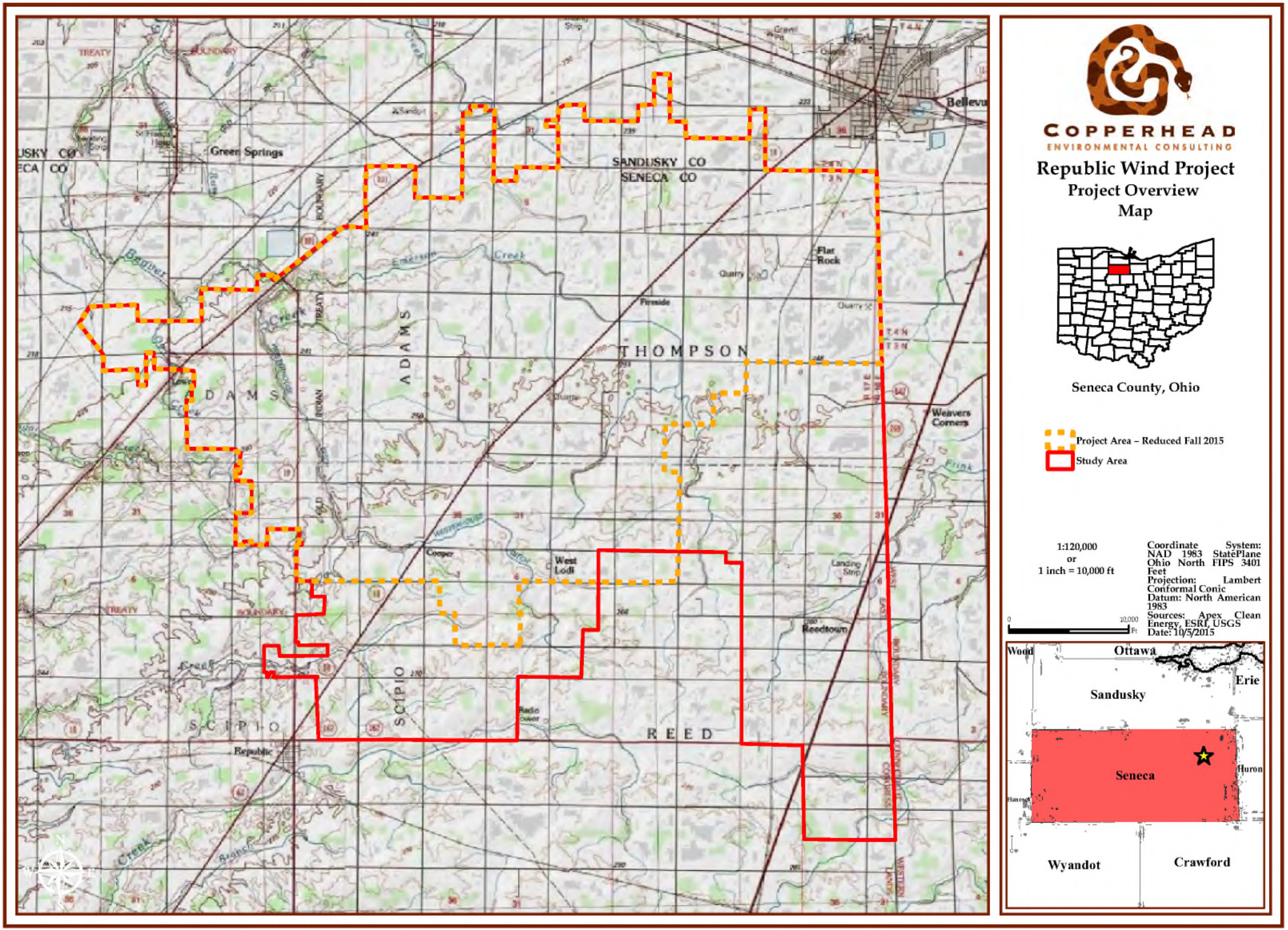

Figure 1. Proposed Republic Wind Project and bat study area overview, Seneca and Sandusky Counties, Ohio, 2015.

Each mist-net site consisted of four net sets with at least one set being a high net (three mist-nets stacked to create one set that was ~7.5 m tall). Mist-net sites were surveyed for two nonconsecutive nights (due to an access issue, site 3 was surveyed for only one night), totaling eight net nights per site. Low visibility, high-quality, nylon nets, 4 to 12 meters (~13 - 42 ft.) in length (depending upon the width of the corridor) were used for each net set. Nets were deployed at sunset each night, left open for at least five hours, and checked every 10 minutes.

Disturbance near the nets was kept to a minimum. Weather data, including temperature, wind speed, and cloud cover, were recorded for each site on an hourly basis to ensure compliance with the mist-netting guidelines (e.g., temperature during survey > 50°F).

Bats were live-caught in mist-nets and released unharmed near the point of capture. Biological and morphometric data, i.e., species, sex, age class, reproductive condition, mass, and forearm length were recorded on data sheets for each individual captured. In addition, the height and the specific net set of capture were recorded for each bat. Processing of bats was completed within 30 minutes from the time the bat was removed from the net. All captured northern long-eared bats and Indiana bats were banded utilizing ODNR, Division of Wildlife (DOW) bands as required by ODNR and OH USFWS.

White-Nose Syndrome Protocol

In an effort to minimize the transmission of White-Nose Syndrome (WNS) between captured bats, all netting and field activities followed the most up-to-date guidelines established by USFWS. All hard, non-porous netting equipment was sanitized with a Lysol® IC solution prior to arrival at the project site and after each survey night; all other equipment was submersed in hot water (140°F) for a minimum of 20 minutes. Disposable latex gloves were worn over sanitized handling gloves and changed following the handling of each bat. All non-disposable equipment, e.g., PESOLA® scales, rulers, calipers, etc., coming into contact with bats was sanitized immediately following the handling of each bat. Bats were evaluated for potential WNS infection through wing scoring following the "Wing-Damage Index Used for Characterizing Wing Condition of Bats Affected by White-nose Syndrome" (Reichard and Kunz 2009).

Radio Telemetry

Radio Transmitter Attachment

Captured Indiana and northern long-eared bats were radio-tagged in order to locate diurnal roosts. Radio transmitters (Holohil Systems Ltd. LB-2X, frequency 172 kHz, 0.30 g and Lotek PicoPip Ag337, 172 kHz, <0.32g) were tested before being attached

between the scapulae of the bat with Permatype, a nontoxic surgical adhesive that degrades over time allowing the transmitter to fall off the bat. Each transmitter had a unique frequency, which was used to identify individual bats during radio-tracking.

Diurnal Radio Telemetry & Emergence Counts

Model TRX-1000S (Wildlife Materials Inc., Carbondale, Illinois, USA) tracking receivers and 172-3 FB 3- and 5-element Yagi directional antennas were used to track radio-tagged bats and locate day roosts. Once located, each roost tree was photographed and coordinates were obtained using a handheld GPS unit. In addition, a variable radius plot was established around each roost tree using a 10-factor English prism (Cruise Master Prisms, Inc.) to determine stand characteristics and basal density. Data recorded for each tree within the plot included species, diameter at breast height (dbh), tree height, roost height, canopy cover, and bark condition. Roost tree locations were mapped with ArcGIS (v. 10.3.1 ESRI, Redlands, CA).

Emergence counts were conducted on each roost tree located during telemetry efforts. The number of roost trees monitored on a given evening was determined by availability of personnel and access to roost trees, with priority given to roost trees that were occupied by a radio-tagged bat. Emergence counts were conducted by a biologist or recorded with a night vision video camera, which allowed emergence counts to be conducted on several trees concurrently each night. Observers arrived at roosts before sunset and positioned themselves so that the roost was backlit by the evening sky and remained at the roost until darkness inhibited further counts. Video cameras were positioned at a roost tree before sunset and retrieved after emergence was finished for the night. Videos were watched the next day by biologists and the number of bats emerging was counted. Emergence data were recorded on the back of the roost tree data sheets.

Foraging Telemetry

Foraging telemetry was conducted using a Cessna Sky Hawk 172 fitted with aircraft strut mount assemblies (Advanced Telemetry Systems Inc., [ATS] 1997, Isanti, MN) with two 172-3FB 4-element ATS Yagi directional antennas (ATS model #13886). The use of fixed-winged aircraft to collect foraging data allowed for the collection of data on multiple bats each night, and the ability to move long distances between multiple foraging areas in one night. The aerial crew consisted of a pilot and a navigator/copilot. The pilot maintained an elevation of approximately 455 meters (1500 ft.) above ground level. The navigator monitored the transmitter signal through the receiver estimating the bat location on mapping software (DeLorme Topo North America 9.0, Yarmouth, ME). Two strategies were employed for determining a bat's location. For one method, the pilot flew the airplane in tight circles above the bat with the airplane positioned so the inside antenna was always pointed toward the bat. The

other method utilized multiple crosses over the bat, listening to signal strength, switching antennas, and viewing the airplane's GPS location on the laptop. When enough information was gathered and the navigator felt confident with the bat's approximate location, a foraging point was plotted on the electronic map and labeled with a bat frequency and time. To estimate error associated with location data collected from the airplane, the aerial crew estimated locations of stationary bats in their roosts during the day (n=6) and compared them to the actual locations of those roosts as documented via ground telemetry. The resulting telemetry error from the airplane was 340.0±128.0 (SE) m (range: 91.0 – 950.0 m).

Locations of foraging bats and capture locations were pooled and examined using the fixed kernel method and a least squares cross-validation smoothing parameter conducted with Biotas™ version 2.0a 3.8 (Ecological Software Solutions LLC, Hegymagas, Hungary) to determine utilization distributions (UD) for each individual. UD's were imported into ArcGIS to calculate the 50%, 75%, and 95% probability contour for each individual bat and for all bats combined. Foraging areas were defined based on the area of use within these probability contours. Most of the foraging area with outlier locations eliminated was defined by the 95% probability contours (majority foraging area), areas within the 75% probability contours were considered intermediate foraging usage areas, and 50% probability contours were considered core foraging areas. Probability contours were imported into ArcGIS for additional analysis using aerial photography, USGS spatial analysis, and GIS layers provided by Apex to characterize foraging areas.

One-sample Student's t-tests were used to determine differences in foraging area sizes (50%, 75%, 95% probability contours) among individual bats and among female northern long-eared bats. Average values were reported with plus or minus standard error (±SE). Pearson's correlation tests (r) were used to determine the relationship between the number of points collected for each foraging bat and the number of nights a bat was tracked. An analysis of variance (one-way ANOVA) was used to determine differences among individual bats in distances foraged from forested habitat.

RESULTS AND DISCUSSION

Mist-Net Survey

Mist-net surveys were conducted at 36 sites from 23 - 31July 2015 (Table 1, Figure 2). A total of 429 bats of six species were captured, including one female Indiana bat and fourteen (12 female, 2 male) northern long-eared bats, over 284 net nights (Table 2). Big brown bats (*Eptesicus fuscus*) comprised 75 percent of total captures (n=320) and eastern red bats (*Lasiurus borealis*) comprised 21 percent of total captures (n=88). Completed bat capture data sheets are provided in Appendix A, photographs of mist-net sites are provided in Appendix B, and representative photographs of each bat species captured are provided in Appendix C.

Table 1. Mist-net site locations, Republic Wind Project, Ohio, 2015.

Site No.	Latitude	Longitude	Site Location
1	41.167111	-82.884334	N. County Rd. 29, Schriner Prop., Woodlot Near Pond
2	41.115820	-82.843740	Stream Corridor Southeast Of Township Rd And Trail 0197
3	41.181645	-82.932637	Wood Lot; Saturated Mud Flats
4	41.155000	-82.855900	Woodlot Off Reedtown Rd
5	41.167295	-82.848025	Woodlot West Of CR 4 With Intermittent Stream
6	41.186530	-82.849620	Woodlot South Of CR 46
7	41.252800	-82.865720	SW Of Site 28
8	41.170720	-82.893070	Stream Off Of CR 136
9	41.143560	-82.929480	Woodlot South Of E Township Road 124
10	41.153120	-82.926210	Forest Gap; Logging Road; Pond In Forest
11	41.139200	-82.992230	CR 122
12	41.184500	-82.935600	Wooded Area Of N. CR 27
13	41.178090	-82.890620	Woodlot Logging Road Off Stream
14	41.224734	-83.028039	Woodlot SE Of Portland Rd
15	41.200800	-83.015200	Creek Along Hwy 19
16	41.157652	-82.989259	Pond In Woodlot West Of CR 28 And S Of East CR 24
17	41.175850	-82.960330	Woodlot Next To Soybean Field Off N Township Rd 183
18	41.179190	-82.928270	Woodlot And Perennial Stream
19	41.176590	-83.003480	Forest/Ag Edge, Stream, Corridor
20	41.186390	-82.931455	Wood Lot Off CR 15 S And East Of North CR 27
21	41.211200	-82.963580	Woodlot South Of Site 26

Site No.	Latitude	Longitude	Site Location
22	41.219650	-82.944167	5425 N SR 18, Woodlot, Ziegler Property
23	41.249950	-82.962020	Township Road 78 Meacham Prop, Interior Mudflats & Trails @ deer stand
24	41.178040	-82.888610	Logging Road Through Woodlot; Open Water Of Emergent Wetland
25	41.217306	-82.908250	Decker Property Of E CR 32
26	41.218160	-82.967180	Trails Through Woods Behind "Sugar Shack"
27	41.188540	-82.986353	Snavely Property Off TR 138
28	41.253563	-82.868040	Woodlot South Of CR 62, West Of CR 68
29	41.247860	-82.937220	Woodlot Beside Lodi-Colby Road, Ag Field
30	41.182580	-83.024150	Woodlot East Of Township Road 138
31	41.155560	-82.949780	Woodlot Bordered By Bean And Corn, South Of E. County Road 24
32	41.175420	-82.922500	Woodlot South Of East Township Road
33	41.182330	-82.935820	Woodlot And Pond Near Coyote Grove Campground
34	41.153410	-82.961690	Woodlot South Of East County Rd 34 And West Of Township Rd 183
35	41.183680	-82.903440	Recently Logged Wood Lot
36	41.155480	-83.004700	Woodlot South Of County Rd. 24

Table 2. Total bat captures by species, age, sex, and reproductive status, Republic Wind Project, Ohio, 2015.

Species	Adult Male		Adult Female			Juvenile			Escaped	Total
	NR*	S	P	L	PL	NR	Female	Male		
Eptesicus fuscus	42	52	1	10	73	8	51	71	12	**320**
Lasiurus borealis	2	3	0	4	16	3	37	10	13	**88**
Lasiurus cinereus	0	0	0	0	0	1	1	3	0	**5**
Myotis septentrionalis	1	0	0	2	3	2	5	1	0	**14**
Myotis sodalis	0	0	0	0	1	0	0	0	0	**1**
Perimyotis subflavus	0	0	0	0	0	0	1	0	0	**1**

* NR=non-reproductive, S=scrotal, P=pregnant, L=lactating, PL=post-lactating

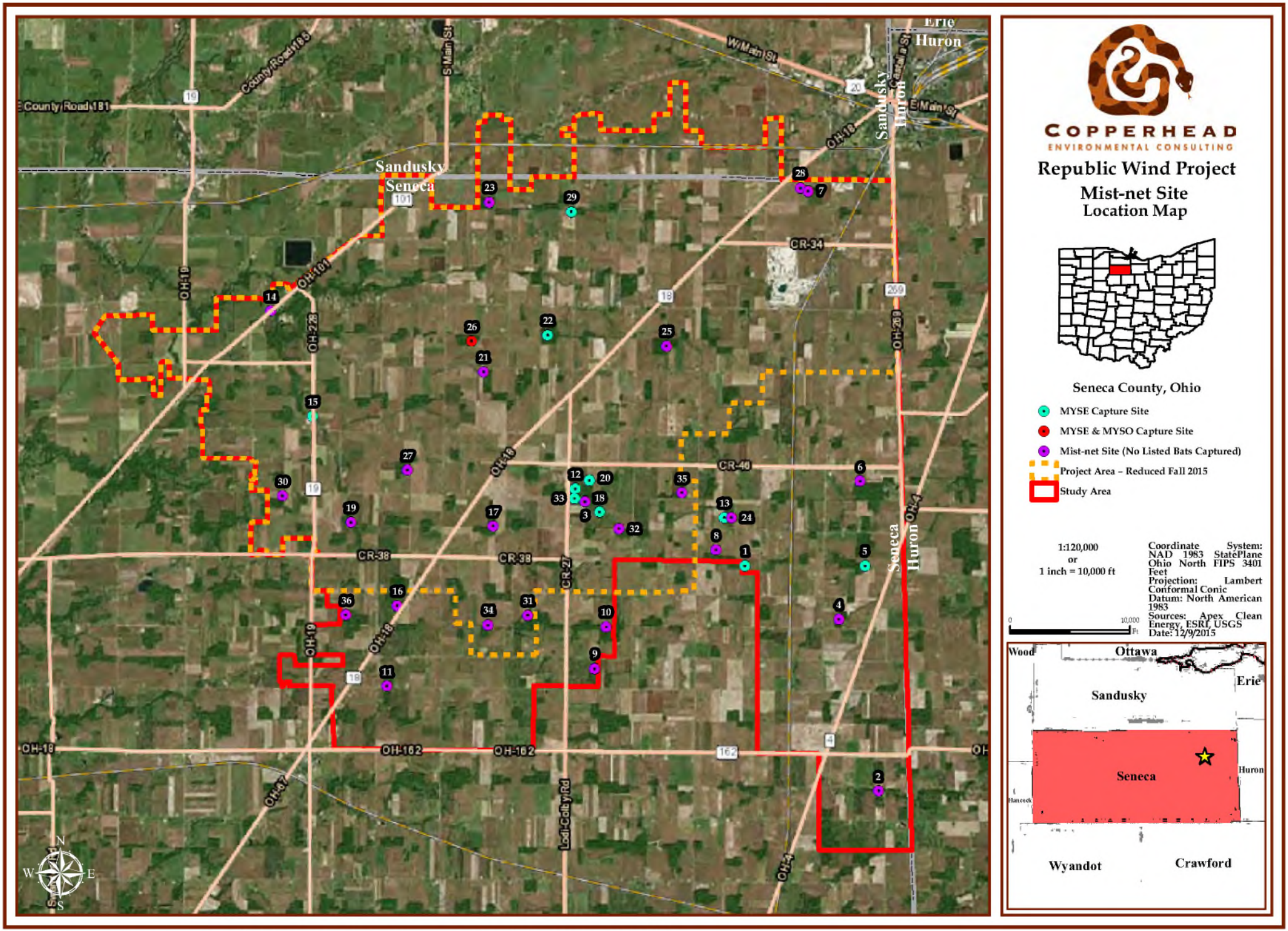

Figure 2. Mist-net site locations, Republic Wind Project study area, Seneca and Sandusky Counties, Ohio, 2015.

Diurnal Radio Telemetry

In accordance with the ODNR/USFWS approved study plan, seven northern long-eared bats and the only Indiana bat captured were radio-tagged in order to locate diurnal roost trees (Table 3).

Table 3. Indiana and northern long-eared bats captured and radio-tagged during the mist-net survey, Republic Wind Project, Ohio, 2015.

Species[1]	Site No.	Band Number (ODNR)	Age[2]	Sex[3]	Reproductive Status[4]	Mass (g)	Transmitter Freq. (172.xxx) BAT ID
MYSE	26	23551	A	F	PL	6.5	188
MYSE	26	23552	A	F	PL	7.25	587
MYSE	18	23360	J	F	NR	6.75	030
MYSE	18	23361	A	F	NR	7.5	137
MYSE	13	17179	A	F	L	7.5	205
MYSE	22	17171	A	M	NR	8.0	287
MYSE	33	17166	A	F	NR	6.0	450
MYSE	18	23362	J	F	NR	6.0	-
MYSE	1	17172	A	M	NR	7.0	-
MYSE	5	-[5]	J	F	NR	6.0	-
MYSE	12	17344	J	F	NR	6.0	-
MYSE	13	17179	A	F	L	7.0	-
MYSE	15	17345	A	F	PL	7.5	-
MYSE	20	17168	J	F	NR	6.0	-
MYSO	26	23553	A	F	PL	8.5	779

[1] MYSE=northern long-eared bat, MYSO=Indiana bat
[2] A=adult, J=juvenile
[3] F=female, M=male
[4] PL=post-lactating, NR=non-reproductive, L=lactating
[5] Escaped before band could be fitted

Of the eight bats that were radio-tagged, three northern long-eared bats and one Indiana bat were tracked for seven days each. One northern long-eared bat (MYSE 188) was tracked for two days, and one (MYSE 137) was tracked for three days, both due to the transmitter falling off. One northern long eared bat (MYSE 450) was captured on the last night of the mist-net survey and was only tracked for two days because the maximum number of bats to be radio-tagged had already been met. The male northern long-eared bat was not tracked during diurnal telemetry because the target number of females were met. As a result of the diurnal radio telemetry effort, 14 northern long-eared bat roost trees and two Indiana bat roost trees were located (Table 4, Figures 3-6). Completed roost tree data sheets are in Appendix D and roost tree photographs are in Appendix E.

Table 4. Northern long-eared bat and Indiana bat roost trees located during radio telemetry efforts, Republic Wind Project, Ohio, 2015.

Roost Tree No.	Tree Species	DBH (cm)	Estimated Height (m)		Condition[2]	Tree Ranking[3]	Bat Species Use[4] _BAT ID	No. Calendar Days Used
			Tree	Roost				
983	*Fraxinus pennsylvanica*	27.0	9.0	3.0	S	S	MYSE_188	1
395	*Prunus serotina*	37.2	17.0	10.7	S	C	MYSE_188 MYSE_587	3
985	*Fraxinus pennsylvanica*	28.5	12.0	8.0	S	C	MYSE_137	1
988	*Acer saccharinum*	36.3	15.0	20.0	LD	C	MYSE_137	1
986	*Acer saccharinum*	16.6	5.0	4.0	S	S	MYSE_137	1
984	*Fraxinus pennsylvanica*	34.3	12.0	7.0	S	C	MYSE_030	2
987	*Acer saccharinum*	56.3	12.0	8.0	S	C	MYSE_030	5
369	*Fraxinus pennsylvanica*	40.0	4.0	3.0	S	U	MYSE_587	1
371	*Fraxinus pennsylvanica*	42.4	18.0	9.0	S	C	MYSE_587	2
372	*Carya ovata*	34.0	23.0	15.0	L	C	MYSE_587	1
373	*Fraxinus* sp.	47.2	24.5	12.0	S	C	MYSE_587	2
140	*Fraxinus sp.*	48.5	25.0	20.0	S	C	MYSE_205	2
314	*Quercus sp.*	91.0	18.5	-	S	C	MYSE_205	2
396	*Fraxinus sp.*	31.0	11.0	6.0	S	C	MYSE_450	2
368	Unk.[1]	52.7	21.5	7.5	S	C	MYSO_779	5
370	*Fraxinus. pennsylvanica*	58.7	18.5	3.0	S	C	MYSO_779	1

[1] unk = too decayed to determine species

[2] L = live, LD = live damaged, S = snag

[3] C= canopy, SC = sub canopy, U = understory

[4] MYSE = northern long-eared bat, MYSO = Indiana bat

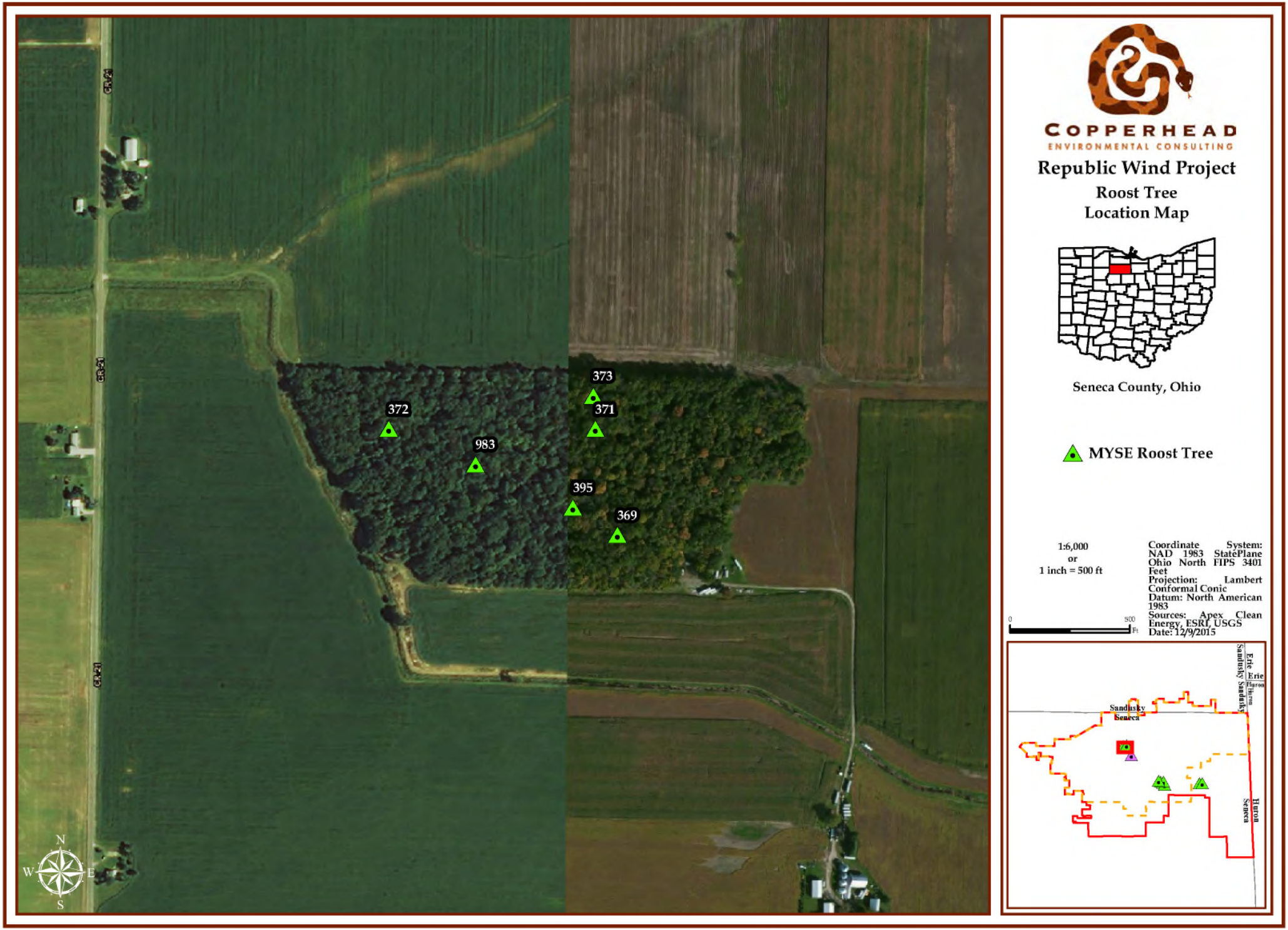

Figure 3. Roost trees used by northern long-eared bats, Republic Wind Project 2015.

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Republic Wind Project

Roost Tree Location Map

Seneca County, Ohio

MYSE Roost Tree

1:6,000
or
1 inch = 500 ft

0 500 Ft

Coordinate System: NAD 1983 StatePlane Ohio North FIPS 3401 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Sources: Apex Clean Energy, ESRI, USGS
Date: 12/9/2015

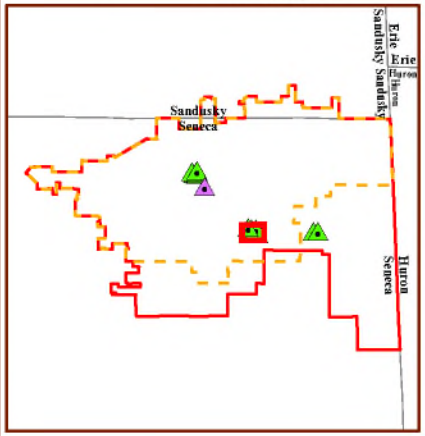

Figure 4. Roost trees used by northern long-eared bats, Republic Wind Project, 2015.

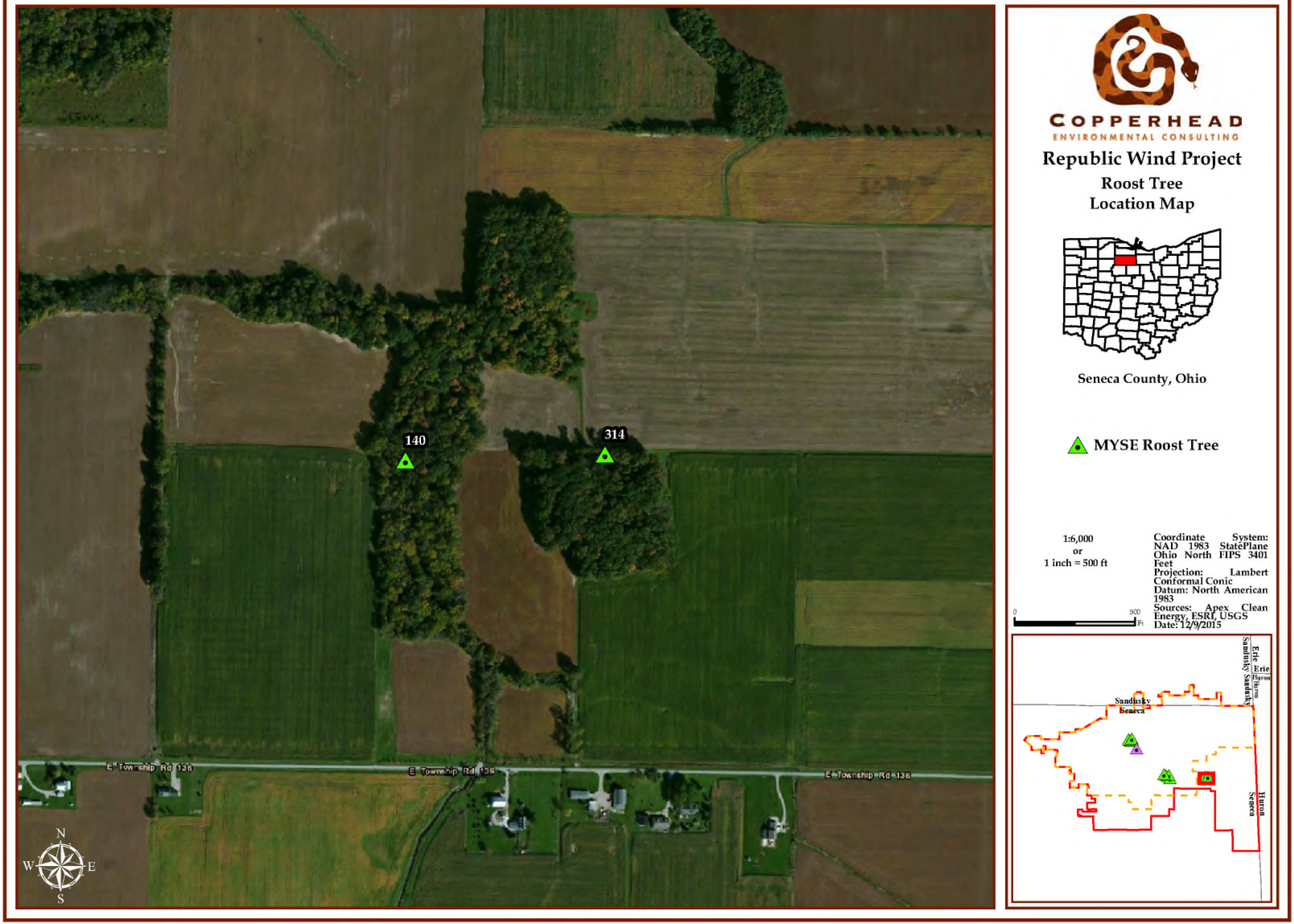

Figure 5. Roost trees used by northern long-eared bats, Republic Wind Project, 2015.

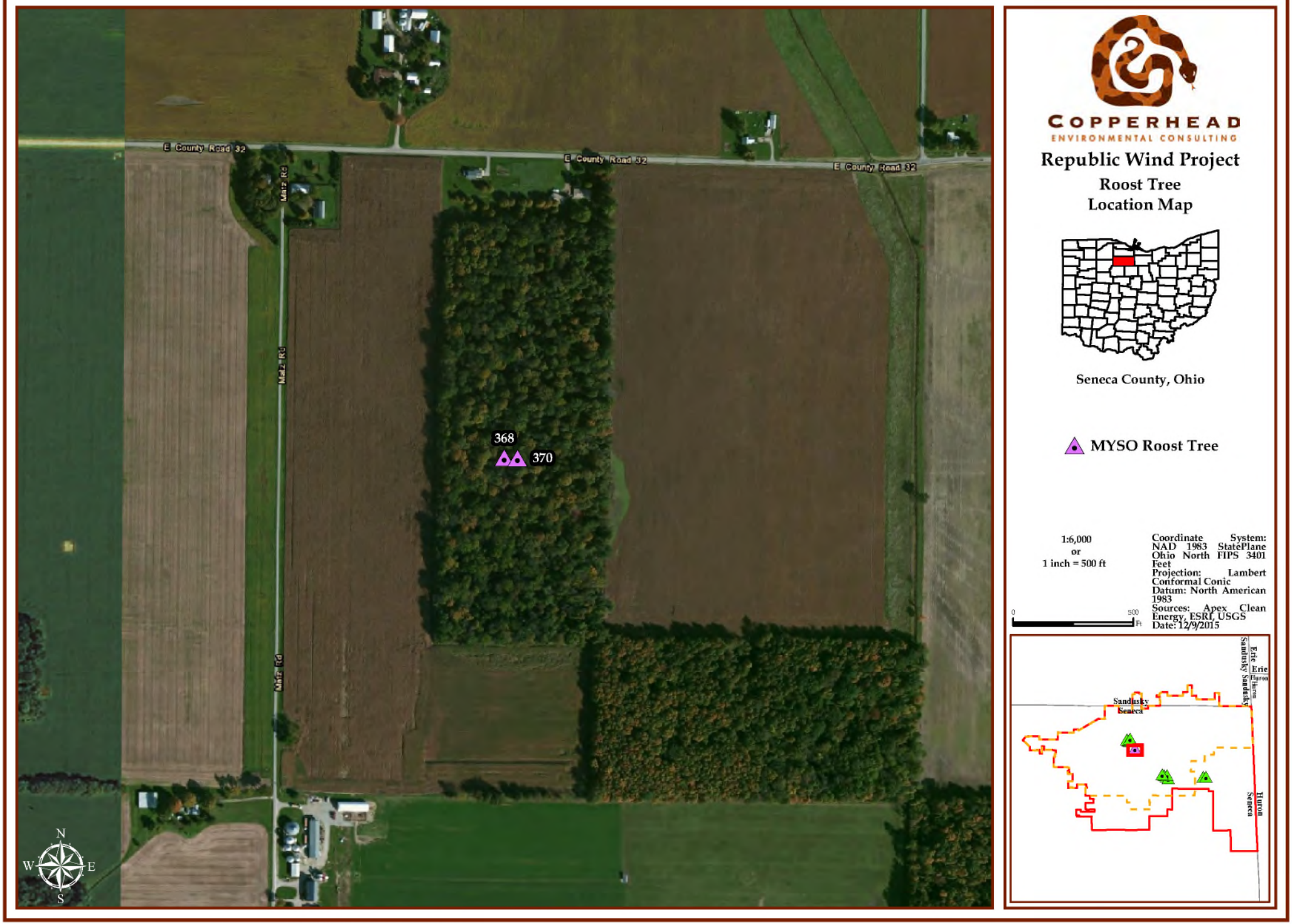

Figure 6. Roost trees used by the Indiana bat, Republic Wind Project, 2015.

Radio-tagged bat(s) not located by ground crew(s) after several hours of searching were located by the airplane the same day. In these cases, the aerial crew provided coordinates of the bat's estimated location to the ground crew, allowing them to quickly pick up the transmitter signal and continue on foot to locate the roost tree. All radio-tagged bats were accounted for during each day of tracking, except for MYSE 205, which could not be located by either the ground or aerial crew on 29 July 2015; MYSE 205 was heard again on 30 July 2015 where it was found in roost tree 314 (Table 5).

The aerial crew was also used to confirm whether a transmitter had been shed by a bat. When a radio-tagged bat did not emerge from its roost tree during an emergence count and was not heard flying during foraging telemetry efforts that evening, it was considered to have been shed by the bat. This occurred with MYSE 188 on day three of tracking and MYSE 137 on day four of tracking (Table 5).

During seven days of tracking, the juvenile female northern long-eared bat switched roost trees the fewest times (n=2), using two roost trees. The greatest number of roost tree switches (n=4) was done by an adult female northern long-eared bat (MYSE 587) that used five roost trees over seven days. The adult female Indiana bat also switched roost trees four times, but only used two different roost trees over seven days (Table 5).

Table 5. Roost tree (RT) use by radio-tagged northern long-eared and Indiana bats, Republic Wind Project, Ohio, 2015.

Bat ID	Bat[1]	25-Jul	26-Jul	27-Jul	28-Jul	29-Jul	30-Jul	31-Jul	1-Aug	2-Aug
188	AF-MYSE	RT983	RT395	shed	-	-	-	-	-	-
137	AF-MYSE	-	-	RT985	RT986	RT988	shed	-	-	-
030	JF-MYSE	-	-	RT984	RT984	RT987	RT987	RT987	RT987	RT987
587	AF-MYSE	-	-	RT395	RT369	RT371	RT371	RT372	RT373	RT373
205	AF-MYSE	-	-	RT140	RT140	no signal	RT314	RT314	off parcel	off parcel
450	AF-MYSE	-	-	-	-	-	-	-	RT396	RT396
779	AF-MYSO	-	-	RT368	RT370	RT368	off parcel	RT368	RT368	RT368

[1] AF = adult female, JF = juvenile female, MYSE=northern long-eared bat, MYSO=Indiana bat

Emergence Counts

A total of 37 emergence counts were conducted from 25 July – 2 August 2015 (Table 6). The highest emergence count from a single roost tree was five bats, which occurred at two northern long-eared bat roost trees [RT987 (juvenile female), RT371 (adult female)], and one Indiana bat roost tree [RT368 (adult female)]. In several instances, despite knowing there was at least one radio-tagged bat in a roost tree, the bat(s) did not emerge before dark and those roost trees were given an emergence count of zero (Table 6).

Table 6. Emergence counts of northern long-eared and Indiana bat roost trees, Republic Wind Project, Ohio, 2015.

Roost No.	25-Jul	26-Jul	27-Jul	28-Jul	29-Jul	30-Jul	31-Jul	1-Aug	2-Aug
MYSE[1]									
983	1						1		
395		1		0[2]		0[2]			
985			2	1					
984			1	1					
140			2	2					
986				1			0		
369				0[2]					
987					3	3	5	3	1
988					2	0[2]			
371					3	5			
314						3			
372							1		
396								1	2
373								1	1
Total Bats	1	1	5	5	8	11	7	5	4
MYSO[1]									
368			4	1	2		5	2	1
370				1		0			
Total Bats			4	2	2	0	5	2	1

[1] MYSE = northern long-eared bat, MYSO = Indiana bat
[2] radio-tagged bat was present in tree, but did not emerge before dark

Foraging Telemetry

Foraging telemetry was conducted on one Indiana bat and five northern long-eared bats from 27 – 31 July 2015 as outlined in the USFWS/ODNR approved study plan (Table 7). Two northern long-eared bats, one adult male and one adult female, were tracked for less than five nights because telemetry effort focused on female bats and MYSE 137's transmitter shed after three days. All other radio-tagged bats were tracked for five nights each. The number of foraging points collected for each bat ranged from 10 – 87 with an average of 54.5±11.6 points per bat (Figure 7).

Table 7. Data collected on foraging northern long-eared and Indiana bats, 27 July – 31 July, Republic Wind Project, Ohio, 2015.

Bat ID	Age*	Sex*	Repro. Status*	Species*	No. Nights Tracked	No. Points Collected
030	J	F	NR	MYSE	5	87
137	A	F	NR	MYSE	3	38
205	A	F	L	MYSE	5	63
587	A	F	PL	MYSE	5	49
287	A	M	NR	MYSE	2	10
779	A	F	PL	MYSO	5	80

* J = juvenile, A = adult, F = female, M = male, NR = non-reproductive, L = lactating, PL = post-lactating, MYSE = northern long-eared bat, MYSO = Indiana bat

Foraging area sizes were calculated for six radio-tagged bats (Table 8, Fig. 8). Sizes of the 50% and 75% probability contour foraging areas were not different among individuals; however, 95% probability contour foraging areas did vary in size among individuals (Table 9). Variation in total foraging area sizes is to be expected when comparing across multiple species, ages, and sexes; however, total foraging area sizes varied even among female northern long-eared bats (Table 9, 10). Foraging areas for individual bats are displayed in Figures 9 – 14.

Mean foraging distance from forested habitat did not differ among individual bats ($F_{5,121} = 1.692$, $P = 0.142$), therefore all bats were grouped together resulting in 39 percent of foraging points (n=127) being located outside of forested habitat. The mean distance bats foraged from the forest edge was 57.5±5.1 meters (range: 0.2 – 379.3 m). However, 61 percent of foraging points (n = 202) were within forested habitat.

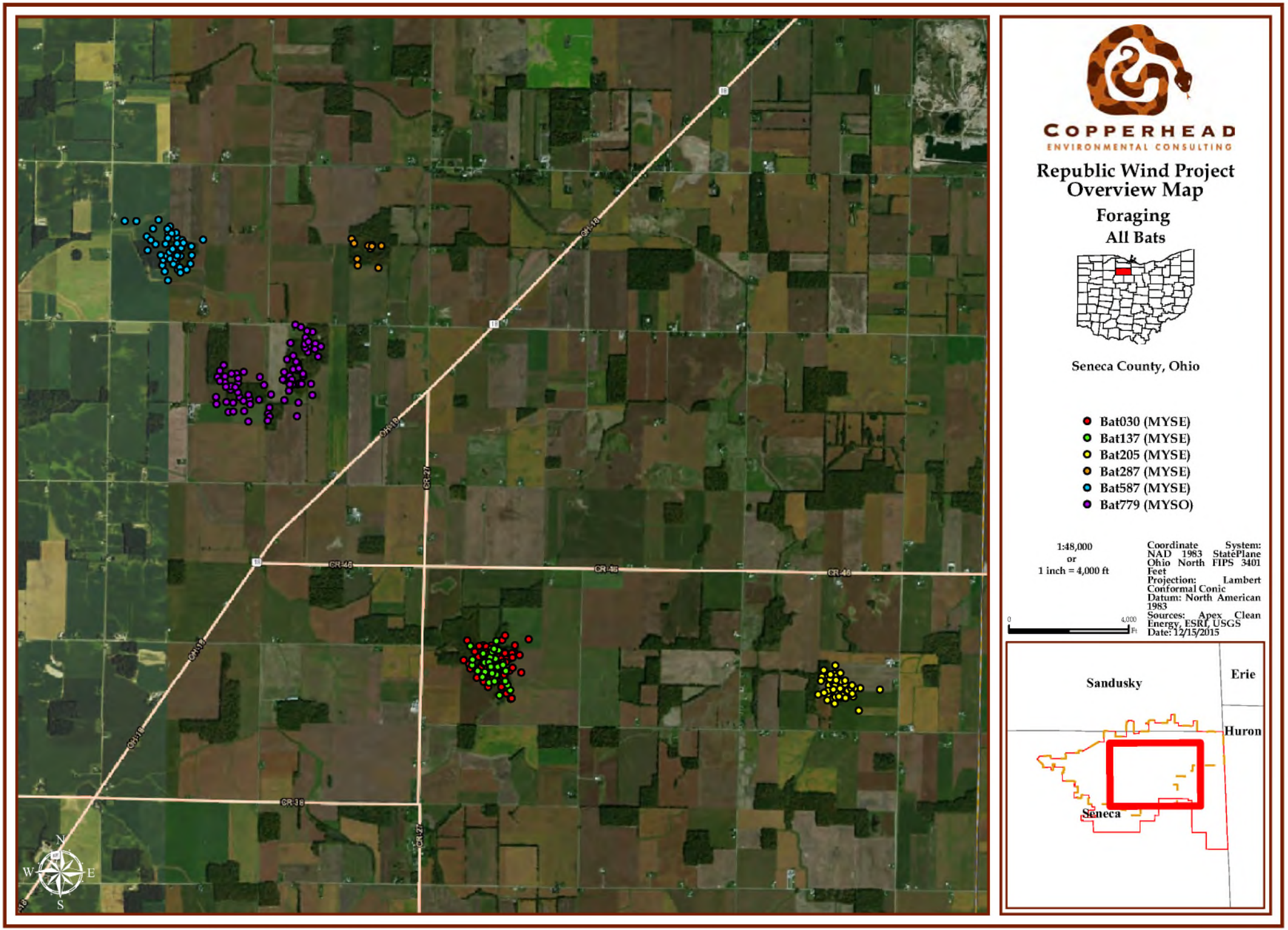

Figure 7. Foraging points collected on five northern long-eared bats and one Indiana bat, Republic Wind Project, 2015.

Table 8. Foraging area sizes for northern long-eared and Indiana bats, Republic Wind Project, 27 July – 31 July, 2015.

				Foraging Area (acres)		
Bat ID	**Age***	**Sex***	**Species***	**95% contour**	**75% contour**	**50% contour**
multiple			Sum of All Bats	366.0	74.2	27.6
030	J	F	MYSE	100.6	41.5	20.4
137	A	F	MYSE	65.4	31.2	8.0
205	A	F	MYSE	52.6	22.7	10.6
587	A	F	MYSE	110.2	18.1	45.3
287	A	M	MYSE	15.1	3.2	1.1
779	A	F	MYSO	266.4	138.7	58.1
multiple			Mean of All Bats	101.7±35.8	47.1±3.2	19.4±8.3

* J = juvenile, A = adult, F = female, M = male, MYSE = northern long-eared bat, MYSO = Indiana bat

Table 9. Comparison of foraging area size among individuals, Republic Wind Project, 27 July – 31 July, 2015. Italicized values are significant at level alpha = 0.05.

	Foraging Area					
	mean 95% contour		**mean 75% contour**		**mean 50% contour**	
Bat Group	t	p	t	p	t	p
All Bats (n = 6)	2.347	0.066	2.437	> 0.05	2.841	*0.036*
Female MYSE (n=4)	2.479	0.089	5.506	*0.012*	5.956	*0.009*

Table 10. Mean foraging area size for three adult and one juvenile female northern long-eared bats, Republic Wind Project, 27 July – 31 July, 2015.

	Foraging Area (acres)					
Bat group	**mean 95% contour**	**range**	**mean 75% contour**	**range**	**mean 50% contour**	**range**
Female MYSE (n = 4)	82.2±13.8	52.6 – 110.2	35.2±5.1	22.7 – 45.3	14.3±2.9	8.0 – 20.4

The number of foraging points collected per bat was similar to the low end number of foraging points collected in other similar studies that were conducted for much longer periods of time (Menzel et al. 2005, Womack et al. 2013). In addition, the overall number of foraging points collected over five days was similar to the number collected from ground crews over several months in other studies (Menzel et al. 2005, Womack et al. 2013). Although the number of foraging points collected was strongly correlated with the number of nights a bat was tracked ($r = 0.879$, $p = 0.021$), the size of the core

foraging area (50% probability contour) was not correlated to the number of nights a bat was tracked ($r = 0.664$, $p = 0.150$) or the number of location points collected ($r = 0.557$, $p = 0.251$) for each bat.

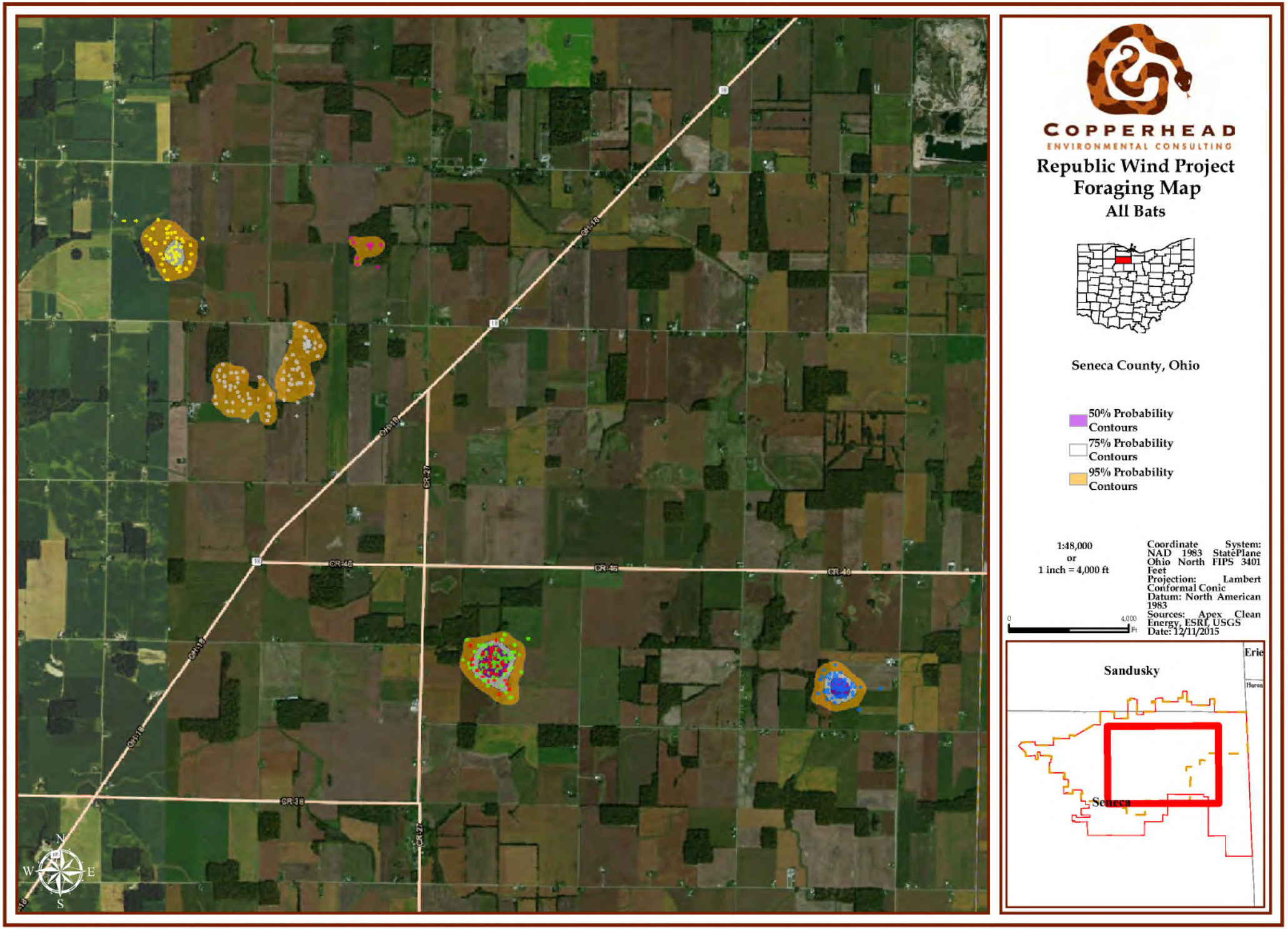

Figure 8. Foraging areas utilized by radio-tagged bats, Republic Wind Project, 2015.

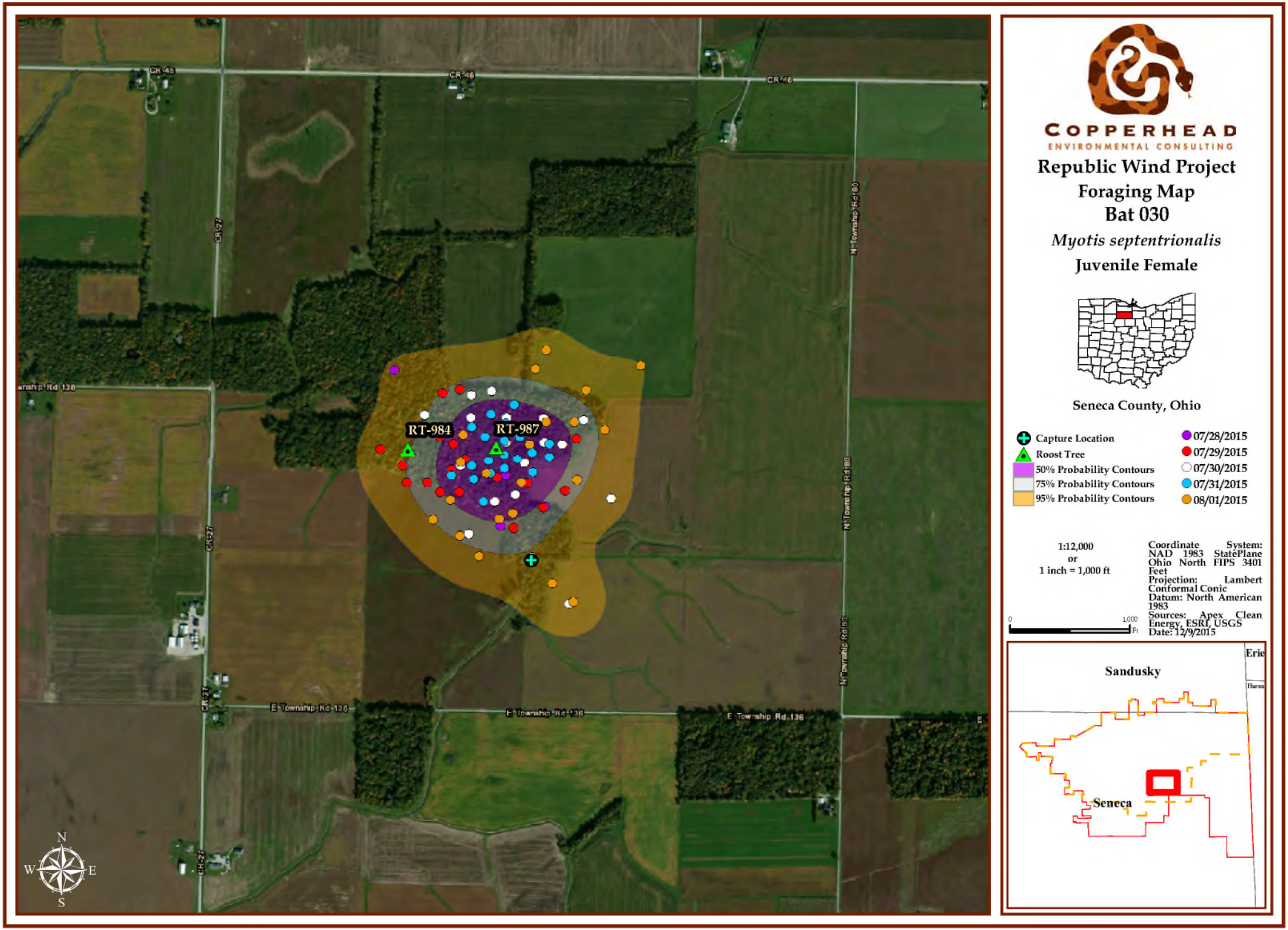

Figure 9. Foraging area utilized by bat 030, Republic Wind Project, 2015.

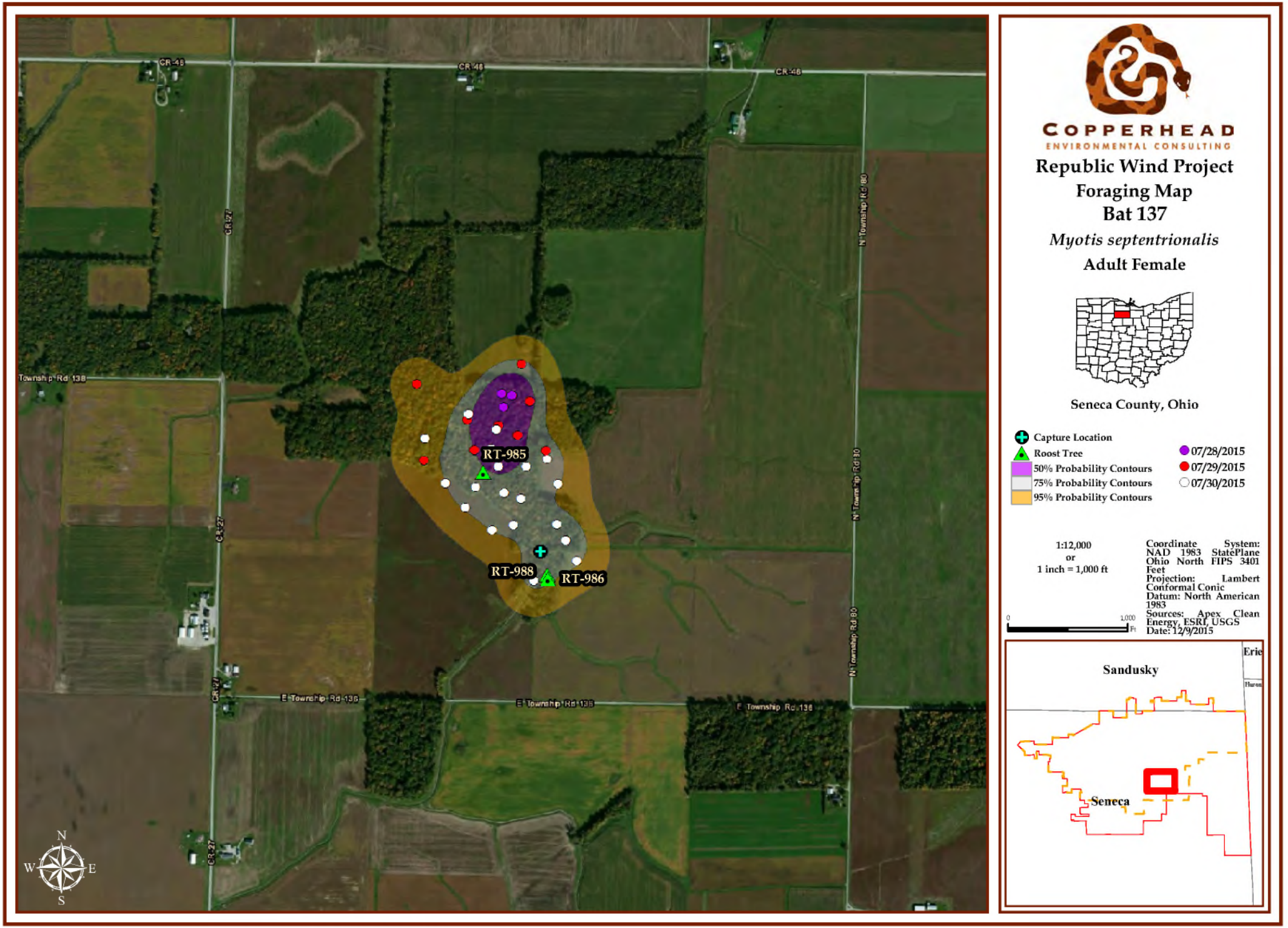

Figure 10. Foraging area utilized by bat 137, Republic Wind Project, 2015.

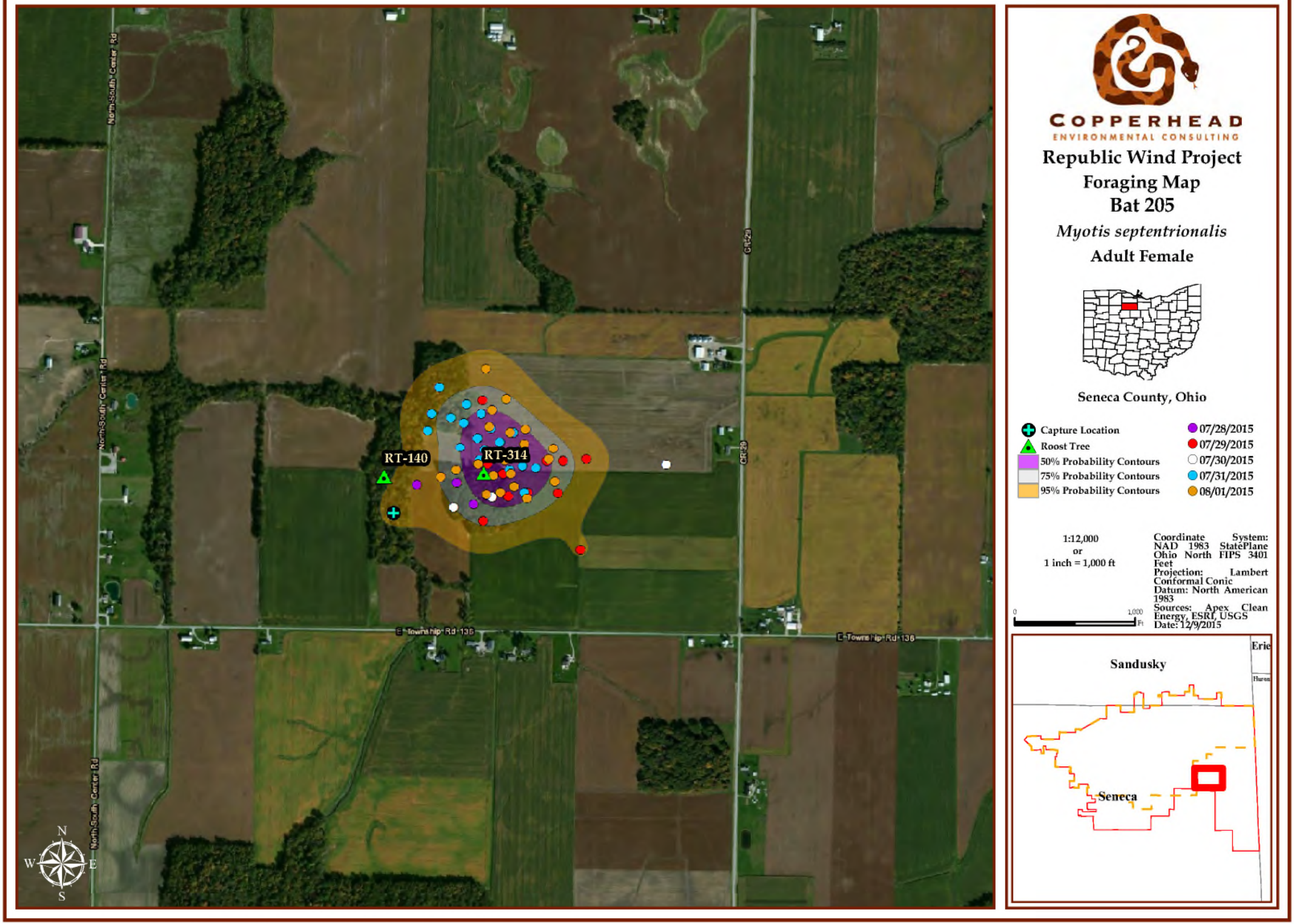

Figure 11. Foraging area utilized by bat 205, Republic Wind Project, 2015.

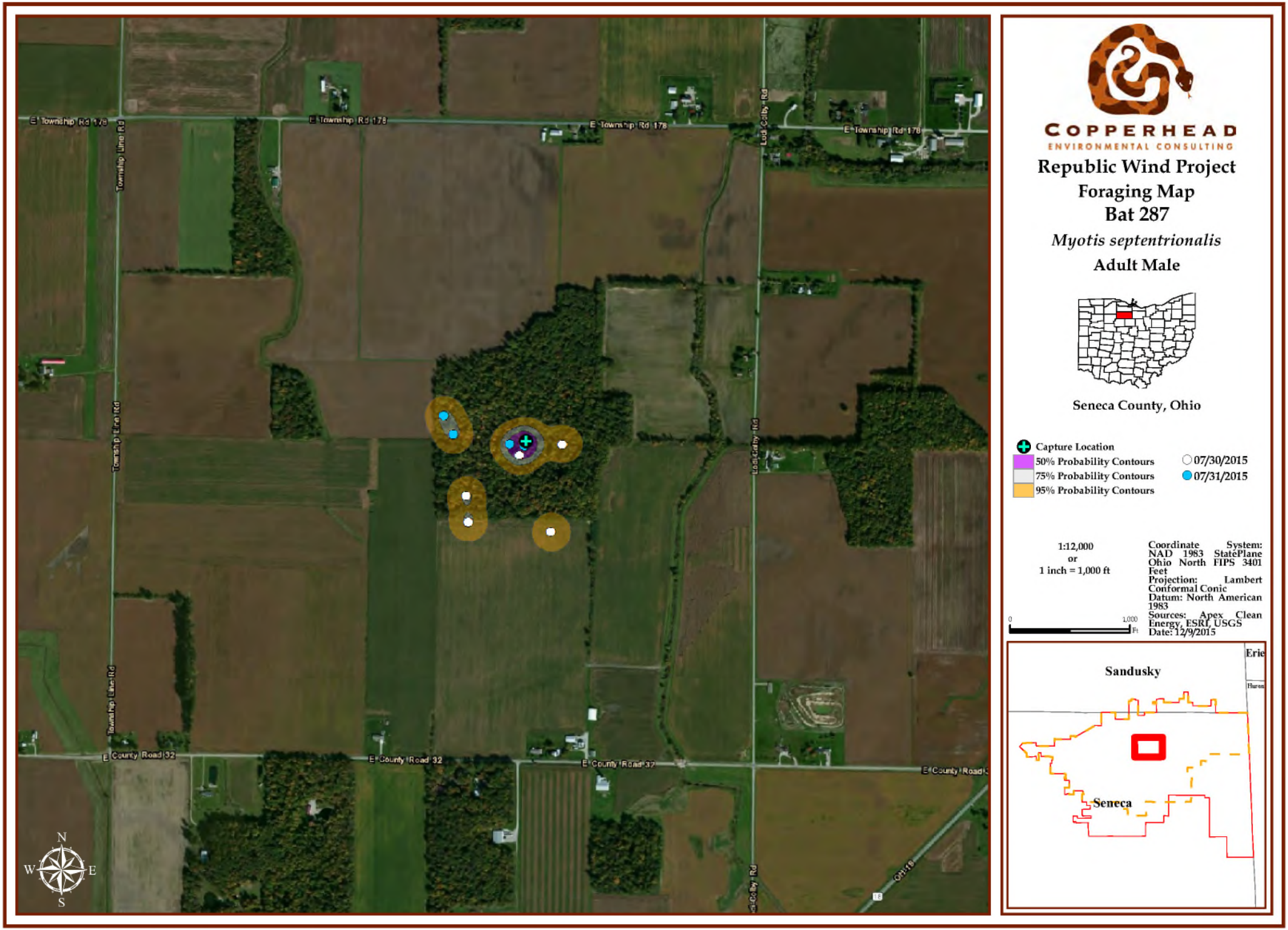

Figure 12. Foraging area utilized by bat 287, Republic Wind Project, 2015.

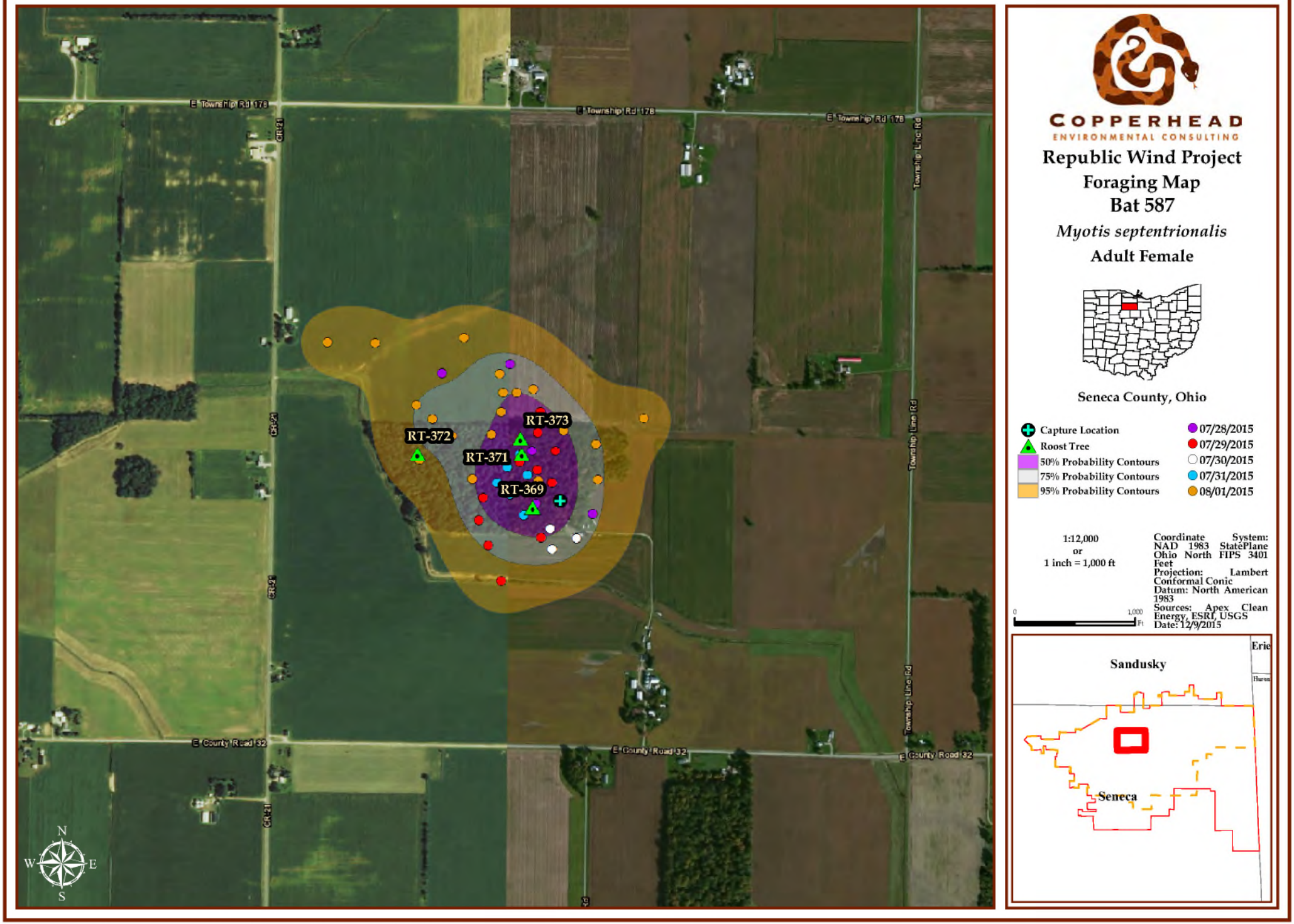

Figure 13. Foraging area utilized by bat 587, Republic Wind Project, 2015.

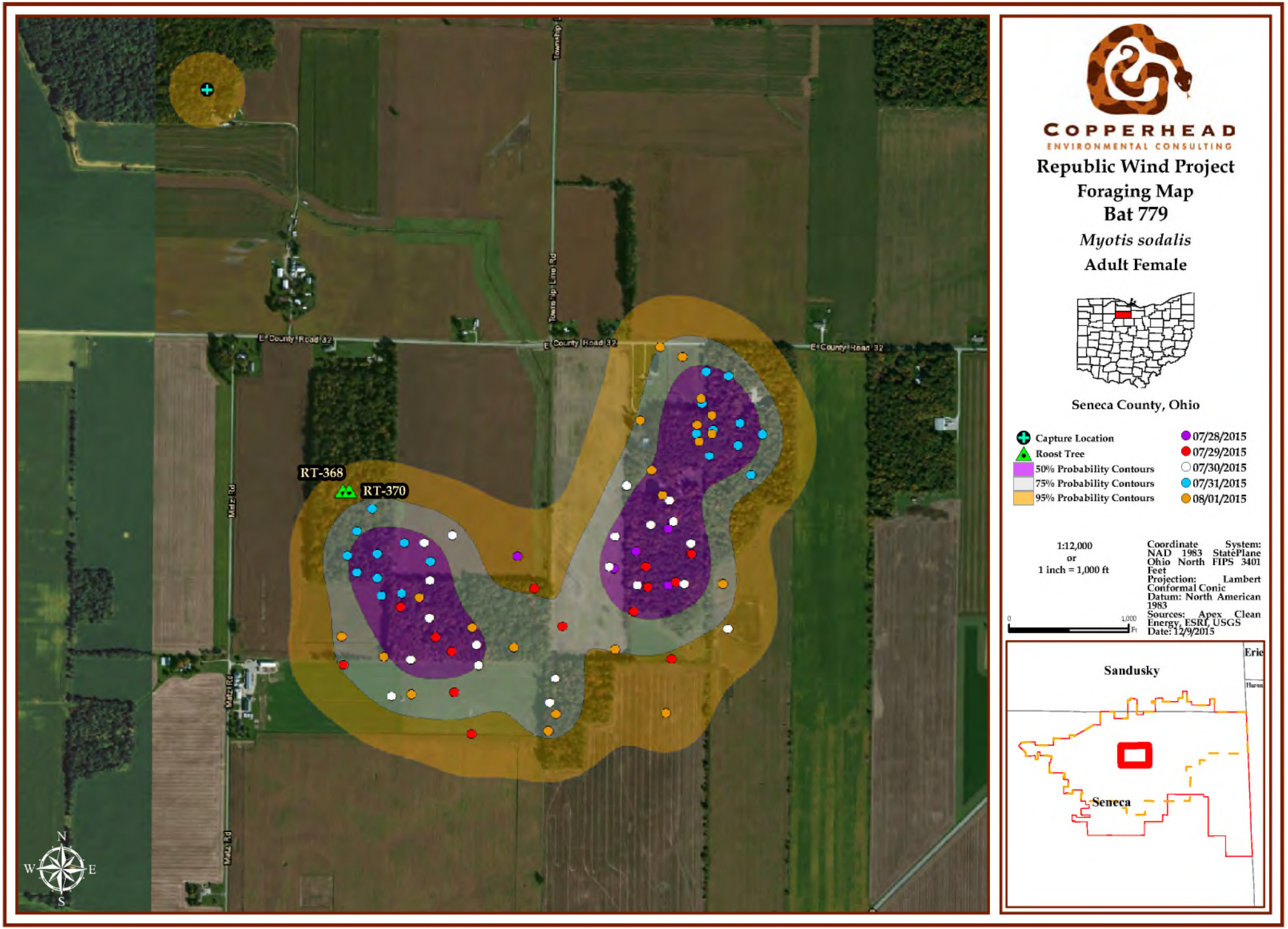

Figure 14. Foraging area utilized by bat 779, Republic Wind Project, 2015.

CONCLUSIONS

Of the 429 bats captured during this survey, big brown bats comprised 75 percent (n=320) and eastern red bats comprised 21 percent (n=88) of the total captures. The remaining 14 percent of captures included 14 northern long-eared bats and one Indiana bat. Notably fewer northern long-eared bats were captured during this survey (14 bats/284 net nights) than in 2011 (95 bats/200 net nights; ESI 2011). One female Indiana bat was captured in both 2015 and 2011.

Capture data and diurnal and foraging telemetry data from this study suggest that at least eight areas within the Study Area are being used by northern long-eared bats. However, three of these areas are not within the Project Area (Figure 2). The close proximity of the 2015 and 2011 Indiana bat captures and the overlap in foraging areas from both studies suggests that 2015 and 2011 captures are from the same colony.

Foraging areas of northern long-eared and Indiana bats were primarily restricted to forest and forest edges, similar to Menzel et al. (2005), with individual location points well clustered. All northern-long eared bats were captured within their respective estimated foraging areas, however, the Indiana bat was captured in a woodlot that it did not revisit during the collection of foraging data. The Indiana bat utilized several woodlots in close proximity to one another during foraging bouts, suggesting that this Indiana bat was more likely than the northern long-eared bats to travel between non-contiguous woodlots during foraging bouts. Differences in the sizes of the 50% and 75% probability contour foraging areas among the female northern long-eared bats suggests that foraging data collected from one individual within each sex/age class is likely not representative of the population's use of the area; however, grouping all bats into one foraging area can provide a representation of land use by listed bats within the area studied. Telemetry data from this study suggests that avoiding turbine placement within 380 meters of suitable habitat would likely reduce interactions of summer resident Indiana or northern long-eared bats with turbines therefore decreasing the likelihood of collision caused mortality during the maternity season.

LITERATURE CITED

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(USFWSa) United States Fish and Wildlife Service. 2015. Range-wide Indiana Bat Summer Survey Guidelines.

Womack, K.M., S.K. Amelon, F.R. Thompson III. 2013. Summer home range size of female Indiana bats (*Myotis sodalis*) in Missouri, USA. Acta Chiropterologica 15(2): 423-429.

APPENDIX A

Mist-Net Data Sheets

Mist Netting Data Form

Sheet____ of ____

Site No. 1 Project No./Name 412.01 / Emerson Creek Date 7/31/2015

Site Location N CR 79, woodlot near pond

County Seneca State OH Time Up 8:50 Time Down 2:00

Lat/Lon; UTM: N/E 41.167111 W/N -82.884334 Zone ____ Datum NAD83 Observers Rain Storm Brandon Smith

COPPERHEAD ENVIRONMENTAL CONSULTING

#	Time	Species	Age	Sex	Repr.	Mass (g)	FA (mm)	Net	Height (m)	WDI	G/H/B/T	Band# Type____	Freq. ____
1													
2		NO BATS											
3													
4													
5													
6													
7													
8													
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10													
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26													
27													
28													
29													
30													

Species Abbreviations: Corynorhinus rafinesquii (CORA); Corynorhinus t. virginianus (COVI); Eptesicus fuscus (EPFU); Lasiurus borealis (LABO); Lasiurus cinereus (LACI); Lasiurus seminolus (LASE); Lasionycteris noctivagans (LANO); Myotis austroriparius (MYAU); Myotis grisescens (MYGR); Myotis leibii (MYLE); Myotis lucifugus (MYLU); Myotis septentrionalis (MYSE); Myotis sodalis (MYSO); Nycticeius humeralis (NYHU); Perimyotis subflavus (PESU); Tadarida brasiliensis (TABR)

Other Abbreviations: Male: M; Female: F; Pregnant: P; Lactating: L; Post Lactating: PL; Scrotal: S; Non Repro: NR

Moon Phase 100 % **Wax / Wane**

	Rise	Set
Sun	6:25am	8:51pm
Moon	9:23 pm	9:10 am

Time	Temp (F)	Sky	Wind	No. Bats
9:00	68	1	0	0
10:51	63.5	1	0	0
2:00	58.1	1	0	0

Sky Code	
0	Clear
1	Few Clouds
2	Partly Cloudy
3	Cloudy or overcast
4	Fog or smoke
5	Drizzle or light rain
6	Heavy rain - thunder storm

Beaufort Wind Scale	
0	Calm: <1 mph
1	Light air: 1-3 mph
2	Light breeze: 4-6 mph
3	Gentle breeze: 7-10 mph
4	Moderate breeze: 11-16 mph

Please Return to:
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Mist Netting Data Form

Site No. 2 Project No./Name 112.01 / Emerson Creek Date 7/27/2015

Site Location N County Rd. 29, Schriver Rd., Woodlot near pond

County Seneca State OH Time Up 9:05 Time Down 2:05

Lat/Lon ; UTM: (N)/E 41.167111 W/N -82.884234 Zone — Datum NAD83 Observers Rain Storm Brandon Sw

COPPERHEAD ENVIRONMENTAL CONSULTING

#	Time	Species	Age	Sex	Repr.	Mass (g)	FA (mm)	Net	Height (m)	WDI	G/H/B/T	Band# Type ODNR	Freq. —
1	11:25	MYSE	A	M	NR	7	36	D	2.6	0	0	17172	—
2													
3													
4													
5													
6													
7													
8													
9													
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29													
30													

Acoustic Survey: Unit type_____ Unit #_____ Date_____ Start time_____ Stop time_____

Date_____ Start time_____ Stop time_____

Date_____ Start time_____ Stop time_____

Weatherproofing_____ Coordinates_____

Comments:

Moon Phase 97 % (Wax) / Wane

	Rise	Set
Sun	6:22 am	8:55 pm
Moon	5:51 pm	3:11 am

Time	Temp (F)	Sky	Wind	No. Bats
9:30	68	1	0	0
11:13	66	1	0	1
2:05	62	1	0	1

Sky Code	
0	Clear
1	Few Clouds
2	Partly Cloudy
3	Cloudy or overcast
4	Fog or smoke
5	Drizzle or light rain
6	Heavy rain - thunder storm

Beaufort Wind Scale	
0	Calm: <1 mph
1	Light air: 1-3 mph
2	Light breeze: 4-6 mph
3	Gentle breeze: 7-10 mph
4	Moderate breeze: 11-16 mph

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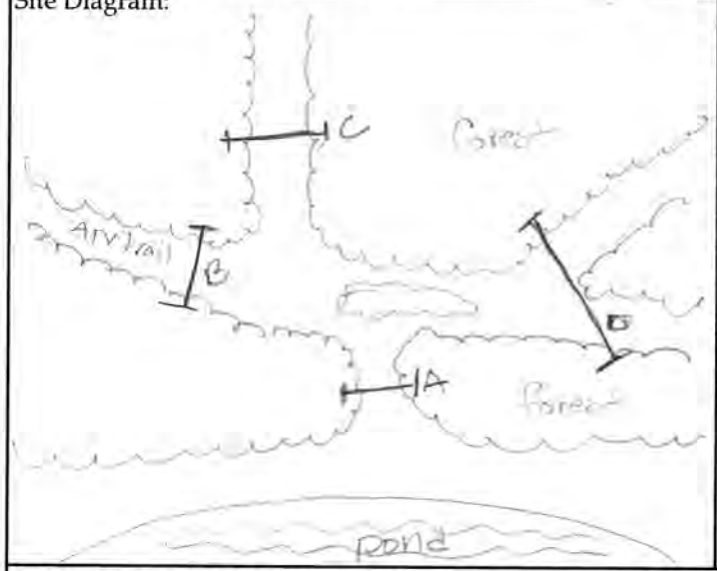
Property owner - Harold Daniels

Mist Net Site Habitat Sheet Site No. 1 Project No./Name 412.01 / Emerson Creek Date 7/27/2015

Lat/Lon ; UTM: N/E 41.167111 W/N -82.884324 Zone — Observers Ron Stone, Brandon Smith

Datum: NAD83 County Seneca State OH Quad Fremont

Site Diagram:



Net	Height (m)	Length (m)	Dates
A	20ft	6m	7/27/2015
B	20ft	6m	7/27/2015
C	20ft	6m	7/27/2015
D	30ft	9m	7/27/2015
E			
F			

Site Photographs
Camera: Ron's
Photo Log: 1A, 1B, 1C, 1D

Dominant Vegetation

1. Red Maple
2. SB Hickory
3. Co Hemlock
4. Green ash
5. Sugar maple
6.

Net Set by Habitat

Habitat	A	B	C	D	E	F
River						
Stream						
Pond						
Corridor	X	X	X	X		
Cave						
Mine						
Forest Gap						
Other						

Indiana Bat Habitat Characterization (Choose appropriate score for each habitat characteristic)

3 **Roost habitat**: **1. Poor**: No or few snags >= 5" DBH with sloughing bark or other usable roost features (cracks, crevices, etc)
2. Moderate: Snags with sloughing bark or other roost features present 5-15 inch DBH within 1000 feet of forested areas.
3. Optimal: Snags with sloughing bark or other roost features present >15 inch DBH within 1000 feet of forested areas.

3 **Water Resources**: **1. Poor**: bat drinking resources not present at the site.
2. Moderate: Ephemeral or intermittent streams or ponded areas present but too cluttered to allow many bats to drink easily or simultaneously. No corridors, openings or canopy gaps allow bats easy access to the resource.
3. Optimal: Streams or ponds (including road ruts) present that appear to offer drinking resource throughout the majority of the summer. Flyways to resources are available.

3 **Forest Structure**: (if hardwoods are absent or nearly absent or if stand is monoculture, area automatically qualifies as a 1: poor).
1. Poor: Habitat even aged and young. Trees smaller than 5 inch DBH. Understory growth cluttered and restricts flying/foraging
2. Moderate: some diversity in age of trees in the stand. Trees 5 to 15 inches present. Understory clutter dominant but not ubiquitous. Trees greater than 15" DBH may be present but rare.
3. Optimal: Mature forest. Diverse age classes of trees present. Trees > 15 inch DBH frequent. Varying tree height and treefalls allow for frequent small openings and gaps that facilitate bat foraging.

2 **Land Cover**: **1. Poor**: Square kilometer surrounding site predominantly un-forested. Few mature trees present not connected to other areas of trees.
2. Marginal: Trees present in the form of small woodlots and wooded fence rows. Little connection to adjacent forested areas.
3. Optimal: Area is largely forested. Wooded stands are connected to other wooded stands via wooded stream, fence row, or other wooded corridor.

11 **Total Habitat Score** (Should be between 4 & 12)

Comments:

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P.O. Box 73, Paint Lick, KY. 40461
859-925-9012

COPPERHEAD

OHIO BAT BANDING DATA FORM

Principle Investigator(s) Rain Storm Location (lat/longs in D:M:S format) 41.167111, -82.854334

County Seneca Site Description wooded lane road off NR19 Survey dates 7/27/2015 7/31/2015 Total mist net nights 8@site 1

Band Number	N/R?	Date of Capture	Time of Capture	Habitat	Species	Arm Banded	Sex	Age	Reproductive Status	Weight (g)	Forearm Length
1772	N	7/27	11:25	forest	MYSE	right	M	J	NR	7.0	36mm

N/R?: N = new capture, unbanded when captured, R = recapture, already banded when captured; **HABITAT** (at capture site): C = creek/riparian, B = bottomland forest, U = upland forest, P = pond, O = other (note type in margin); **ARM BANDED:** L = left, R = right (typically males are banded on the right forearm and females on the left); **SEX:** M = male, F = female; **AGE:** A = adult, J = juvenile, U = unknown; **REPRODUCTIVE CONDITION:** S = scrotal, P = pregnant, L = lactating, PL = post lactating, NR = nonreproductive, U = unknown

Mist Netting Data Form

Sheet____ of _____

Site No. 2 Project No./Name 412 / Apex Energy Emerson Cr. Wind Date 26 July 2015

Site Location Stream corridor southeast of Township Rd 9 and Trail 0197

County Seneca State OH Time Up 2050 Time Down ~~0150~~ 0155

Lat/Lon; UTM: (N)/E 41.11582 (W)/N -82.84374 Zone / Datum NAD83 Observers K. Pearman, A. Trousdale

COPPERHEAD ENVIRONMENTAL CONSULTING

#	Time	Species	Age	Sex	Repr.	Mass (g)	FA (mm)	Net	Height (m)	WDI	G/H/B/T	Band# Type____	Freq. ____
1	2340	EPFU	A	M	NR	17.0	45	A	0.5	0	—	—	—
2	0015	EPFU	A	M	NR	16.75	45	C	0.5	0	—	—	—
3	0110	LABO	J	F	NR	10.5	40	C	3.5	0	—	—	—
4													
5													
6													
7													
8													
9													
10													
11													
12													
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28													
29													
30													

Species Abbreviations: Corynorhinus rafinesquii (CORA); Corynorhinus t. virginianus (COVI); Eptesicus fuscus (EPFU); Lasiurus borealis (LABO); Lasiurus cinereus (LACI); Lasiurus seminolus (LASE); Lasionycteris noctivagans (LANO); Myotis austroriparius (MYAU); Myotis grisescens (MYGR); Myotis leibii (MYLE); Myotis lucifugus (MYLU); Myotis septentrionalis (MYSE); Myotis sodalis (MYSO); Nycticeius humeralis (NYHU); Perimyotis subflavus (PESU); Tadarida brasiliensis (TABR)

Other Abbreviations: Male: M; Female: F; Pregnant: P; Lactating: L; Post Lactating: PL; Scrotal: S; Non Repro: NR

Moon Phase 60% (Wax) / Wane

	Rise	Set
Sun	0620	2055
Moon	1628	0202

Time	Temp (F)	Sky	Wind	No. Bats
2100	68.9	2	0	0
2209	65.1	3	1	2
2307	66.4	2	1	1
0007	64.6	3	0	1
0140	62.8	2	1	—

Sky Code	
0	Clear
1	Few Clouds
2	Partly Cloudy
3	Cloudy or overcast
4	Fog or smoke
5	Drizzle or light rain
6	Heavy rain - thunder storm

Beaufort Wind Scale	
0	Calm: <1 mph
1	Light air: 1-3 mph
2	Light breeze: 4-6 mph
3	Gentle breeze: 7-10 mph
4	Moderate breeze: 11-16 mph

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Mist Netting Data Form

Site No. 2 Project No./Name 412 / APEX Emerson Creek Wind Date 31 July 2015

Site Location Stream Corridor SE of CR9 & Trail 0197

County Seneca State OH Time Up 2048 Time Down 0148

Lat/Lon ; UTM: N/E 41.11582 W/N -82.84374 Zone ____ Datum NAD83 Observers K. Pearman, Alex Padover

COPPERHEAD ENVIRONMENTAL CONSULTING

#	Time	Species	Age	Sex	Repr.	Mass (g)	FA (mm)	Net	Height (m)	WDI	G/H/B/T	Band# Type	Freq.
1	2135	EPFU	J	F	NR	12.25	46	B	5	0	—	—	—
2	2218	EPFU	A	F	PL	20.0	50	B	6	0	—	—	—
3	2245	EPFU	A	F	PL	21.0	49	B	6	0	—	—	—
4	0155	LABO	J	F	NR	10.75	41	B	6	0	—	—	—
5													
6													
7													
8													
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29													
30													

Moon Phase 97 % Wax / Wane

	Rise	Set
Sun	0625	2050
Moon	2050	0642

Time	Temp (F)	Sky	Wind	No. Bats
2100	74.1	0	1	—
2200	69.6	0	1	1
2300	65.4	1	1	2
0000	63.7	2	1	0
0100	60.6	1	0	0
0200	59.2	1	0	0
0230				

Sky Code	
0	Clear
1	Few Clouds
2	Partly Cloudy
3	Cloudy or overcast
4	Fog or smoke
5	Drizzle or light rain
6	Heavy rain - thunder storm

Beaufort Wind Scale	
0	Calm: <1 mph
1	Light air: 1-3 mph
2	Light breeze: 4-6 mph
3	Gentle breeze: 7-10 mph
4	Moderate breeze: 11-16 mph

Acoustic Survey: Unit type ____ Unit # ____ Date ____ Start time ____ Stop time ____

Date ____ Start time ____ Stop time ____

Date ____ Start time ____ Stop time ____

Weatherproofing ____ Coordinates ____

Comments:

Please Return to:
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Summary: Application Exhibit R Part 1 of 11 electronically filed by Teresa Orahood on behalf of Dylan F. Borchers