



**Site 18 Net D**



**Site 18 Net E**



**Site 19 Net A**



**Site 19 Net B**



**Site 19 Net C**



**Site 19 Net D**



**Site 19 Net E**



**Site 20 Net A**



**Site 20 Net B**



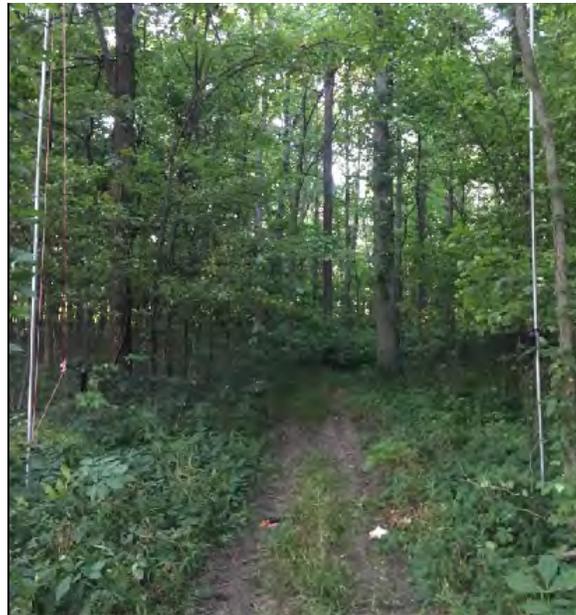
**Site 20 Net C**



**Site 20 Net D**



**Site 20 Net E**



**Site 20 Net F**



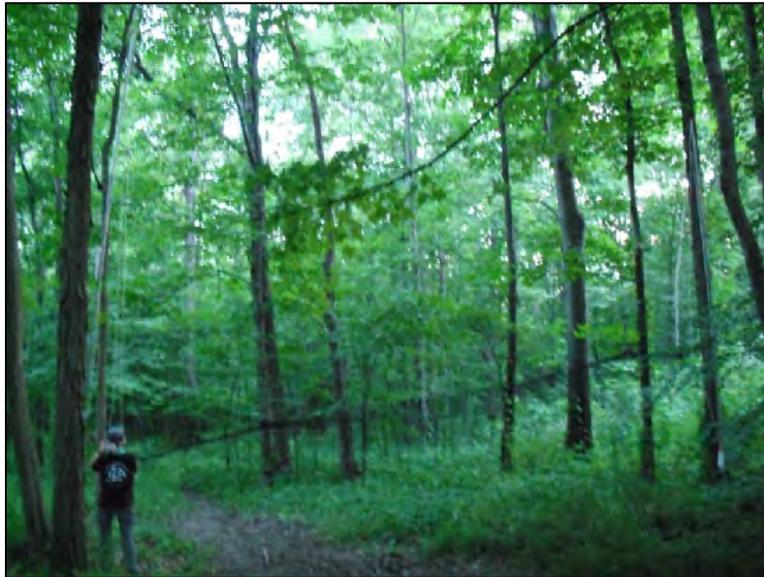
**Site 20 Net G**



**Site 20 Net H**



**Site 21 Net A**



**Site 21 Net B**



**Site 21 Net C**



**Site 21 Net D**



**Site 21 Net E**



**Site 22 Net A**



**Site 22 Net B**



**Site 22 Net C**



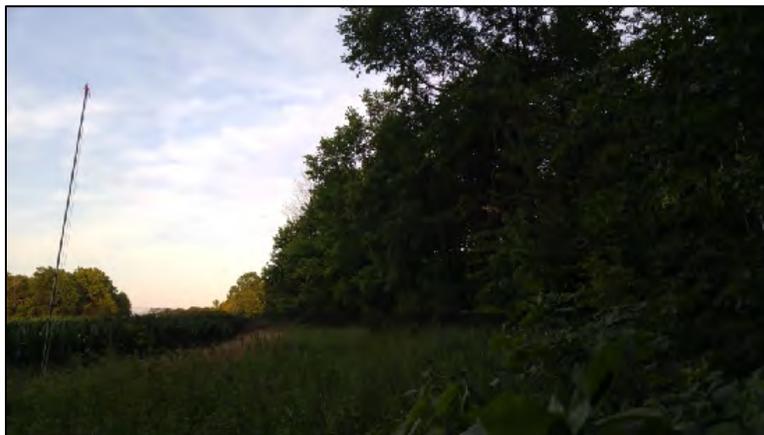
**Site 22 Net D**



**Site 22 Net E**



**Site 23 Net A**



**Site 23 Net B**



**Site 23 Net C**



**Site 23 Net D**



**Site 23 Net E**



**Site 24 Net A**



**Site 24 Net B**



**Site 24 Net C**



**Site 24 Net D**



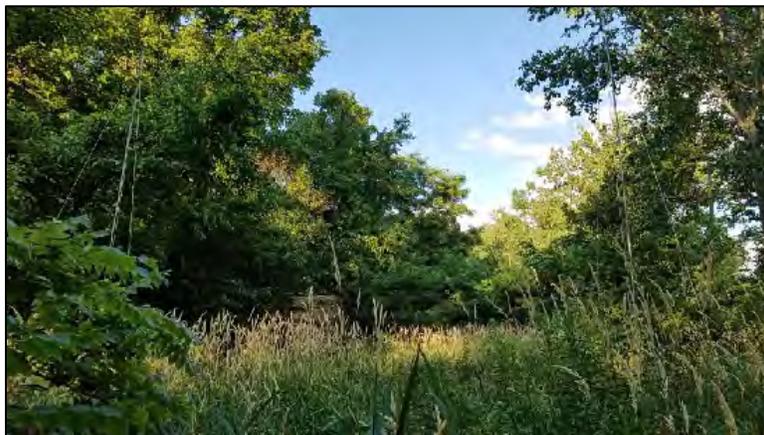
**Site 24 Net E**



**Site 25 Net A**



**Site 25 Net B**



**Site 25 Net C**



**Site 25 Net D**



**Site 25 Net E**



**Site 26 Net A**



**Site 26 Net B**



**Site 26 Net C**



**Site 26 Net D**



**Site 26 Net E**



**Site 27 Net A**



**Site 27 Net B**



**Site 27 Net C**



**Site 27 Net D**



**Site 27 Net E**



**Site 28 Net A**



**Site 28 Net B**



**Site 28 Net C**



**Site 28 Net D**



**Site 28 Net E**



**Site 29 Net A**



**Site 29 Net B**



**Site 29 Net C**



**Site 29 Net D**



**Site 29 Net E**

## APPENDIX C

### **Bat Capture Photographs**

501- Emerson West Wind Project Bat Survey, Seneca County, Ohio, July 2015 and 2016.

Business Confidential - Not for Public Disclosure

## Representative Bat Photographs



Big Brown Bat (*Eptesicus fuscus*)



Eastern Red Bat (*Lasiurus borealis*)



Hoary Bat (*Lasiurus cinereus*)



Northern Long-Eared Bat (*Myotis septentrionalis*)

## APPENDIX D

### **Roost Tree Data Sheets**

501- Emerson West Wind Project Bat Survey, Seneca County, Ohio, July 2015 and 2016.

Business Confidential - Not for Public Disclosure

Roost Tree # 140 Project No./Project Name 412.02, Emerson CI Date First Found 27 July 15

Location near wood lot w/ creek bordered by agriculture

County Spencer State OH Quad Firestone

Lat-Long/UTM: N/E 41.17892 W/N 82.89089 Zone - Datum: NAD83 Observers: C. Lott

#	Tree Tag #	Species	DBH (cm)	Height ft of m		Condition*	% Bark Cover**		Tree Ranking***	Available Roost/Observation
				Tree	Roost		Usable	Total		
1	140	Fraxinus sp.	48.5	25	20	Snag	10	90	Canopy	Bark
2		V. americana	6.7	3	-	Live	0	100	Sub	-
3		Fraxinus sp.	45.8	23	-	Snag	30	70	Canopy	Bark
4		Fraxinus sp.	54	20	-	Snag	30	50	Canopy	Bark
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

Habitat		
Interior	<u>Edge</u>	Open

Canopy Cover at Roost		
<u>Open</u>	Intermediate	Closed

Basal Area		
Live Trees	Snags	All Trees
10	30	40

Roost Location		
<u>Bark</u>	Cavity	Crevice

↓ QUICK REFERENCE / ↑ CIRCLE

*Condition		
Snag	Live	Live-Damaged

**% Bark Cover		
High = ≥ 25%	Moderate = ≥ 10- < 25%	Low = < 10%

***Tree Ranking		
Canopy	Sub-Canopy	Understory

A 10 factor English prism is used to identify trees within the plot, centered on the roost tree.



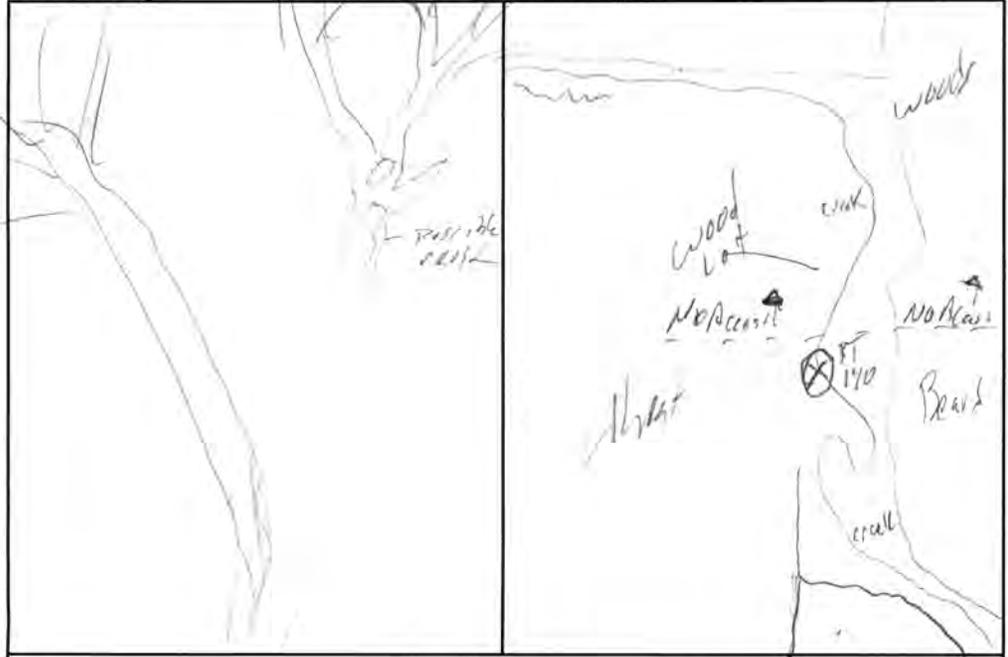
Roost Tree # 140

Bat Species/Sex/Frequency: MYSE/F/172.205

ODNR  
Band # 17178

Roost Tree Diagram:

Location Diagram:



Bat Days					
No.	Date	Bat Freq.	Bat Band #	Sex of Bat	Observations
1	27 July	172.205	17178	F	
2	28 July	172.206	17178	F	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Emergence Count

No.	Date	Temp °F	Weather	# of Bats	Time			Focal Bat exit #	Personnel/Comments
					Sunset	Bats Start	Bats End		
1	27	20°C	clear	2	20:55	21:09	21:13	21:13	2
2	28	68.5	clear	2	20:53	21:11	21:20	21:20	2
3									
4									

Cavity or Crevice Characteristics

No.	Nature	Aspect	Opening Measurements			
			Width	Height	Ground	H <sub>2</sub> O Level
1						
2						
3						

Comments:

walk wheel field/woodlot edge to 41.17889; -82.89136 then turn due East to tree  
 GRACE CREEK  
 - Double Red Flagging marks good emergence spot

Point = 41.175375  
 -82.889903



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 Paint Lick, KY 40461 (859) 925-9012

Roost Tree # 314 Project No./Project Name 412.01 / EMERSON CREEK Date First Found 7-30-15

Location Eastof RT140

County SENECA State OH Quad Fireside

Lat-Long/UTM: N/E 41.17900 W/N -82.88789 Zone Datum: NAD83 Observers: MTM, ELS

#	Tree Tag #	Species	DBH (cm)	Height ft or m		Condition*	% Bark Cover**		Tree Ranking***	Available Roost/Observation
				Tree	Roost		Usable	Total		
1	314	Quercus sp.	91	60'		SNAG	Low	High	C	
2		Ulmus sp	10"	12'		LIVE	Low	High	Sub-C	
3		Ulmus Sp	7"	10'		LIVE	Low	High	Under	
4		Ulmus Sp	23"	40'		LIVE	Low	High	Sub-C	
5		Acer rubrum	19.5"	35'		LIVE	Low	High	C	
6		Carya ovata	36"	55'		LIVE	High	High	C	✓
7		Carya ovata	31"	55'		LIVE	High	High	C	✓
8		Carya ovata	9"	12'		LIVE	Low	High	BANDER	
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

Habitat		
Interior	Edge	Open

Canopy Cover at Roost		
Open	Intermediate	Closed

Basal Area		
Live Trees	Snags	All Trees
70	10	80

Roost Location		
Bark	Cavity	Crevice

↓ QUICK REFERENCE / ↑ CIRCLE

*Condition		
Snag	Live	Live-Damaged

**% Bark Cover		
High = ≥ 25%	Moderate = ≥ 10-<25%	Low = < 10%

***Tree Ranking		
Canopy	Sub-Canopy	Understory

A 10 factor English prism is used to identify trees within the plot, centered on the roost tree.



Plus / Emergence

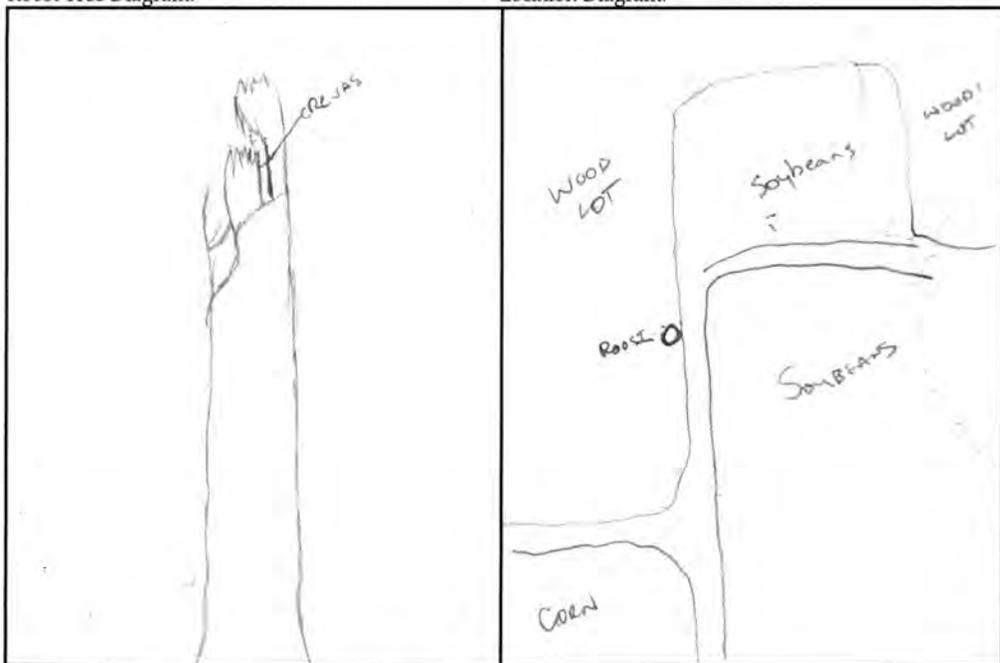
Roost Tree # 314

Bat Species/Sex/Frequency: MYSE / F / 205

Band # ODNR 17178

Roost Tree Diagram:

Location Diagram:



Bat Days					
No.	Date	Bat Freq.	Bat Band # ODNR #	Sex of Bat	Observations
1	7-30	205	17178	F	1
2	7-31	205	17178	F	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Emergence Count

No.	Date	Temp °F	Weather	# of Bats	Time				Focal Bat exit #	Personnel/Comments
					Sunset	Bats Start	Bats End	Tagged Bat		
1	7/30/15	81	Clear	3	8:49	8:47	9:44	9:44A		TAB
2										
3										
4										

Cavity or Crevice Characteristics

No.	Nature	Aspect	Opening Measurements			
			Width	Height	Ground	H <sub>2</sub> O Level
1						
2						
3						

Comments:

81° - Start time : 8:35 pm ; Frequency 206  
 75° - End Time : 10:14 pm

First - bat tree to the right, not Northern  
 Second - left Big Brown

1111

847

9:10 } possibly same bat

9:12

9:44 - Northern Emerged - no ping on Receiver

8-1-15 off parcel

8-2-15

N 41.17860 W 82.88918 - 242  
 N 41.17904 W 82.88830 - 332'



Copperhead Environmental Consulting Inc.  
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 Paint Lick, KY 40461 (859) 925-9012

Likely tree location

N 41.178988  
 W 82.888251

Roost Tree # 860 Project No./Project Name 501.01 / Emerson West Date First Found 7/12/16

Location Open woodlot adjoining wheat field

County Seneca

State OH

Quad Watson

Lat-Long/UTM: N/E 41.17548

W/N -83.04216

Zone        Datum: NAD83 Observers: G. Jandz, K. DeBeck

#	Tree Tag #	Species	DBH (cm)	Height ft or m		Condition*	% Bark Cover**		Tree Ranking***	Available Roost/Observation
				Tree	Roost		Usable	Total		
1	860	F. Pennsylvania	45.5	12	6	S	H	H	C	Bark
2		V. americana	27.5	8		S	L	H	C	Bark
3		F. pennsylvanica	26.2	15		S	M	H	C	Bark
4		V. americana	17.7	9		S	L	H	SC	Bark
5		Q. rubra	14.9	6		L	NL	H	SC	None
6		A. saccharum	24.9	10		L	NL	H	SC	None
7		P. occidentalis	62.5	12		L	L	H	C	Bark
8		Aesculus glabra	32.0	8		L	NL	H	C	None
9		V. americana	10.5	5		L	NL	H	U	None
10		A. saccharum	48.1	9		L	NL	H	C	None
11		Q. rubra	34.1	14		L	NL	H	C	None
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

Habitat		
Interior	Edge	Open

Canopy Cover at Roost		
Open	Intermediate	Closed

Basal Area		
Live Trees	Snags	All Trees
70	40	110

Roost Location		
Bark	Cavity	Crevice

↓ QUICK REFERENCE / ↑ CIRCLE

*Condition		
Snag	Live	Live-Damaged

**% Bark Cover		
High = ≥ 25%	Moderate = ≥ 10-25%	Low = < 10%

***Tree Ranking		
Canopy	Sub-Canopy	Understory

A 10 factor English prism is used to identify trees within the plot, centered on the roost tree.

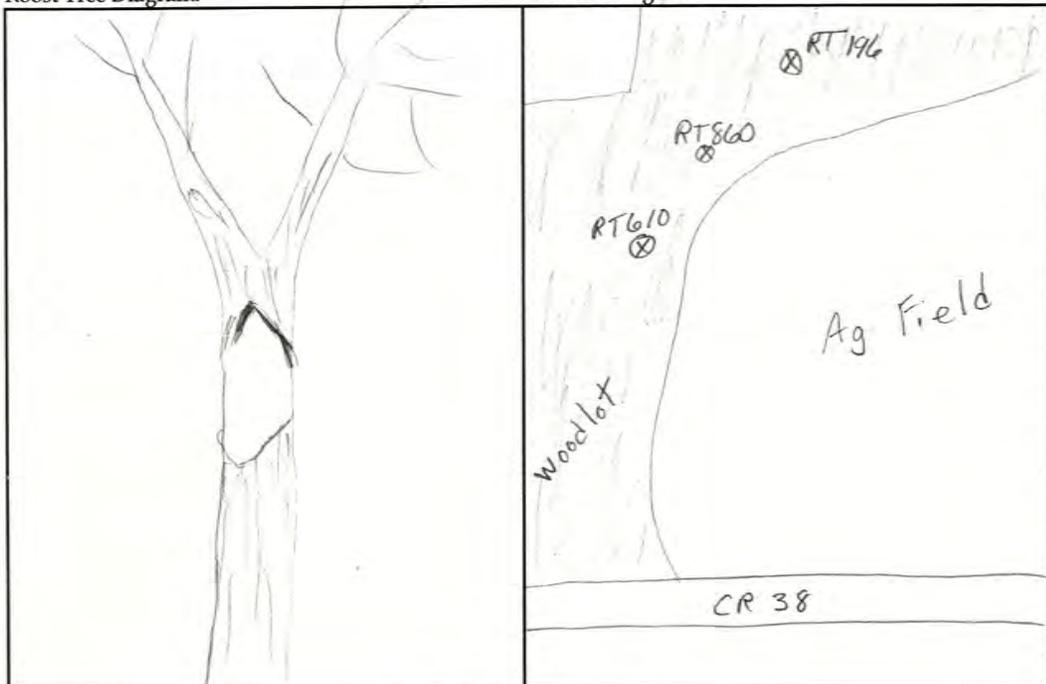


Roost Tree # 860

Bat Species/Sex/Frequency: MYSE/F/172.387 Band # ODNR 23529

Roost Tree Diagram:

Location Diagram:



Bat Days					
No.	Date	Bat Freq.	Bat Band #	Sex of Bat	Observations
1	7/12	172.387	23529	F	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Emergence Count

No.	Date	Temp °F	Weather	# of Bats	Time				Focal Bat exit #	Personnel/ Comments
					Sunset	Bats Start	Bats End	Tagged Bat		
1	7/12	79	Clear	3	2105	2113	2125	2125	3	K. DeBeck
* 2	7/13	78	Cloudy	3	2105	2113	2125	2125	3	
3	7/14	78	Partly cloudy	0	2104	N/A	N/A	N/A	N/A	video camera
4										

Cavity or Crevice Characteristics

No.	Nature	Aspect	Opening Measurements			
			Width	Height	Ground	H <sub>2</sub> O Level
1						
2						
3						

Comments:

\* Unfavorable conditions (rain & wind) before sunset did not allow for an emergence count to be done

Roost Tree # 196 Project No./Project Name 501 / Emerson West Date First Found 13 July 2016

Location Woodlot north of CR38

County Seneca

State OH

Quad Watson

Lat-Long/UTM: N/E 41.17633

W/N 83.04134

Zone - Datum: NAD83 Observers: Tewbertson, D. Hayes

#	Tree Tag #	Species	DBH (cm)	Height (ft or m)		Condition*	% Bark Cover**		Tree Ranking***	Available Roost/Observation
				Tree	Roost		Usable	Total		
1	196	<i>U. americana</i>	19.9	16	5	Snag	High <sup>60</sup>	High <sup>85</sup>	SubCanopy	Bark
2		<i>U. americana</i>	5.0	3	-	Live	High	-	U.	-
3		<i>U. americana</i>	17.2	13	-	Snag	High	-	Subcanopy	-
4		<i>U. americana</i>	27.2	2.5	-	Snag	Low	Low	understory	-
5		<i>Q. palustris</i>	39.5	19	-	Live	-	High	Canopy	-
6		<i>F. pennsylvanica</i>	24.5	17	-	Snag	Low	High	Canopy	-
7		<i>Q. palustris</i>	40.3	19	-	Live	-	High	Canopy	-
8		<i>Acer rubrum</i>	25.5	16	-	Snag	Low	High	Subcanopy	-
9		<i>F. pennsylvanica</i>	34.6	18	-	Snag	Low <sup>10</sup>	High <sup>90</sup>	Canopy	-
10		<i>U. americana</i>	11.1	15	-	Live	Low	High	Canopy	-
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

Habitat		
<u>Interior</u>	Edge	Open

Canopy Cover at Roost		
Open	<u>Intermediate</u>	Closed

Basal Area (x10)		
Live Trees	Snags	All Trees
40	60	100

Roost Location		
<u>Bark</u>	Cavity	Crevice

↓ QUICK REFERENCE / ↑ CIRCLE

*Condition		
Snag	Live	Live-Damaged

**% Bark Cover		
High = ≥ 25%	Moderate = ≥ 10-25%	Low = < 10%

***Tree Ranking		
Canopy	Sub-Canopy	Understory

A 10 factor English prism is used to identify trees within the plot, centered on the roost tree.



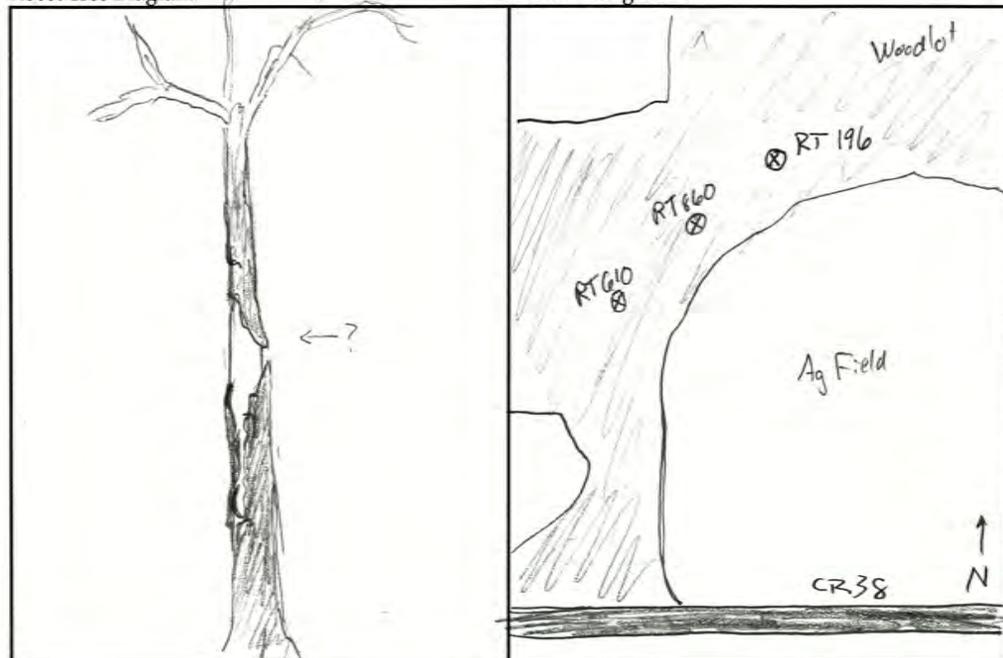
Roost Tree # 196

Bat Species/Sex/Frequency: MYSE/F/172.387

Band # ODNR 23529

Roost Tree Diagram:

Location Diagram:



Bat Days					
No.	Date	Bat Freq.	Bat Band ODNR #	Sex of Bat	Observations
1	7/13	172.387	23529	F	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Emergence Count

No.	Date	Temp °F	Weather	# of Bats	Time			Focal Bat exit #	Personnel/Comments
					Sunset	Bats Start	Bats End		
* 1	7/13	—	Cloudy	—	2105	—	—	—	—
2	7/14	78	Partly Cloudy	0	2104	—	—	—	K. De Beck
3	7/15	77	Partly Cloudy	0	2103	—	—	—	T. Culbertson
4									

Cavity or Crevice Characteristics

No.	Nature	Aspect	Opening Measurements			
			Width	Height	Ground	H <sub>2</sub> O Level
1	Bark	—	—	—	—	—
2						
3						

Comments:

\* Unfavorable conditions (rain + wind) before sunset did not allow for an emergence count to be completed

MYSE / F / 172, 387

Roost Tree # 610 Project No./Project Name 501 / Emerson West Date First Found 14 July 2016

Location Woodlot north of CR 38

County Seneca State OH Quad Watson

Lat-Long/UTM: N 41.17530 W 83.04322 Zone - Datum: NAD83 Observers: T. Culbertson, D. Hayes

#	Tree Tag #	Species	DBH (cm)	Height ft or (m)		Condition*	% Bark Cover**		Tree Ranking***	Available Roost/Observation
				Tree	Roost		Usable	Total		
1	610	F. pennsylvanica	29.5	7	6.5	Snag	Low	High	Subcanopy	Crevice
2		F. pennsylvanica	28.4	17	-	Snag	Low	High	Canopy	
3		A. saccharum	50	20	-	Live	Low	High	Canopy	
4		P. deltoides	86.5	22	-	Live	Low	High	Canopy	
5		A. saccharum	38	16	-	Live	Low	High	Canopy	
6		F. pennsylvanica	38.4	19	-	Snag	Low	Low	Canopy	
7		A. saccharum	57.0	21	-	Live	Low	High	Canopy	
8		F. grandifolia	48.8	2.5	-	Snag	High	Low	Understory	
9		F. grandifolia	56.6	18	-	Live	High	Low	Canopy	
10		J. nigra	42.2	22	-	Live	High	Low	Canopy	
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

Habitat		
<input checked="" type="radio"/> Interior	<input type="radio"/> Edge	<input type="radio"/> Open

Canopy Cover at Roost		
<input type="radio"/> Open	<input checked="" type="radio"/> Intermediate	<input type="radio"/> Closed

Basal Area		
Live Trees	Snags	All Trees
60	40	100

Roost Location		
<input type="radio"/> Bark	<input type="radio"/> Cavity	<input checked="" type="radio"/> Crevice

↓ QUICK REFERENCE / ↑ CIRCLE

*Condition		
<input type="radio"/> Snag	<input type="radio"/> Live	<input type="radio"/> Live-Damaged

**% Bark Cover		
High = ≥ 25%	Moderate = ≥ 10- < 25%	Low = < 10%

***Tree Ranking		
<input type="radio"/> Canopy	<input type="radio"/> Sub-Canopy	<input type="radio"/> Understory

A 10 factor English prism is used to identify trees within the plot, centered on the roost tree.



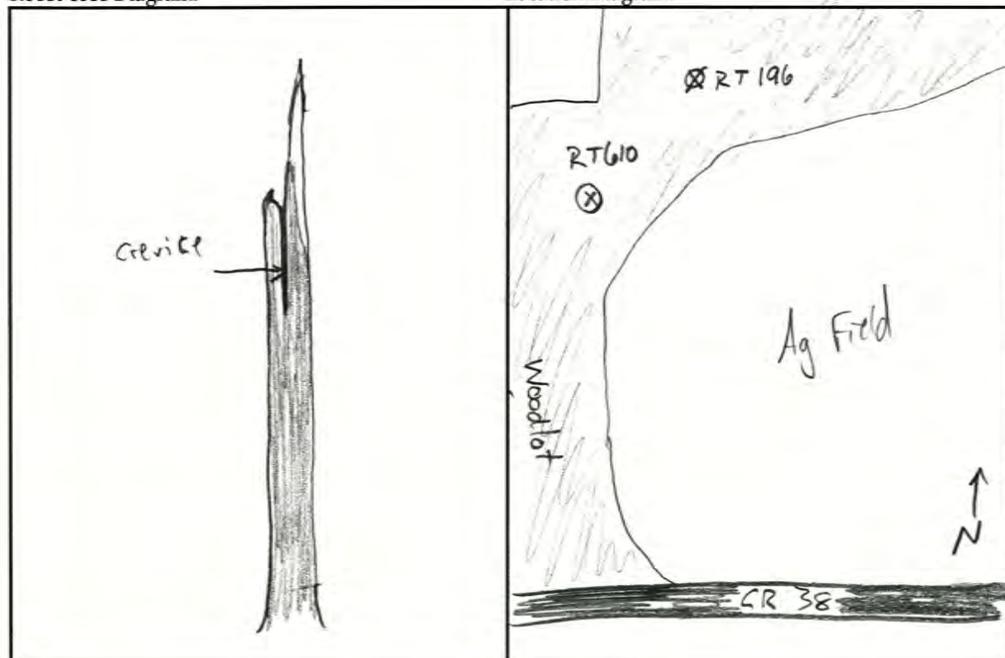
Roost Tree # 610

Bat Species/Sex/Frequency: MYSE/F/172.387

Band # ODNR 23529

Roost Tree Diagram:

Location Diagram:



Bat Days					
No.	Date	Bat Freq.	Bat Band ODNR #	Sex of Bat	Observations
1	7/14	172.387	23529	F	Crevice
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Emergence Count

No.	Date	Temp °F	Weather	# of Bats	Time				Focal Bat exit #	Personnel/ Comments
					Sunset	Bats Start	Bats End	Tagged Bat		
1	7/14	78	Partly Cloudy	4	2104	2121	2132	2122	2	H. Price
2	7/15	77	Partly Cloudy	0	2103	-	-	-	-	D. Hayes
3	7/14									
4	7/14									

Cavity or Crevice Characteristics

No.	Nature	Aspect	Opening Measurements			
			Width	Height	Ground	H <sub>2</sub> O Level
1	Crevice			6.5		-
2						
3						

Comments:

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Roost Tree # 602 Project No./Project Name 501 / Emerson West Date First Found 16 July 2016Location Woodlot north of CR 38County SenecaState OHQuad WatsonLat-Long/UTM: NDE 41.17557 W/N 83.04156 Zone - Datum: NAD83 Observers: T. Culbertson, D. Hayes

#	Tree Tag #	Species	DBH (cm)	Height ft or m		Condition*	% Bark Cover**		Tree Ranking***	Available Roost/Observation
				Tree	Roost		Usable	Total		
1	602	<i>F. pennsylvanica</i>	40.5	18	9	Snag	Low	High	Canopy	Bark
2		<i>A. saccharum</i>	38.5	18		Snag	low	High	Canopy	
3		<i>C. laciniosa</i>	44.0	17		Snag	Mod	Mod	Canopy	
4		<i>O. americana</i>	36.8	13		Snag	low	low	Sub-C	
5		<i>F. pennsylvanica</i>	49.0	19		Snag	low	High	Canopy	
6		<i>F. pennsylvanica</i>	29.4	17		Snag	low	High	Canopy	
7		<i>A. saccharum</i>	13.5	8		Live	low	High	Understory	
8		<i>B. lenta</i>	26.2	10		Live	low	High	Sub-C	
9		<i>F. grandifolia</i>	29.0	11		Live	low	High	Sub-C	
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

A 10 factor English prism is used to identify trees within the plot, centered on the roost tree.

Habitat		
<u>Interior</u>	Edge	Open

Canopy Cover at Roost		
Open	<u>Intermediate</u>	Closed

Basal Area		
Live Trees	Snags	All Trees
30	60	90

Roost Location		
<u>Bark</u>	Cavity	Crevice

↓ QUICK REFERENCE / ↑ CIRCLE

*Condition		
Snag	Live	Live-Damaged

**% Bark Cover		
High = $\geq 25\%$	Moderate = $\geq 10 < 25\%$	Low = $< 10\%$

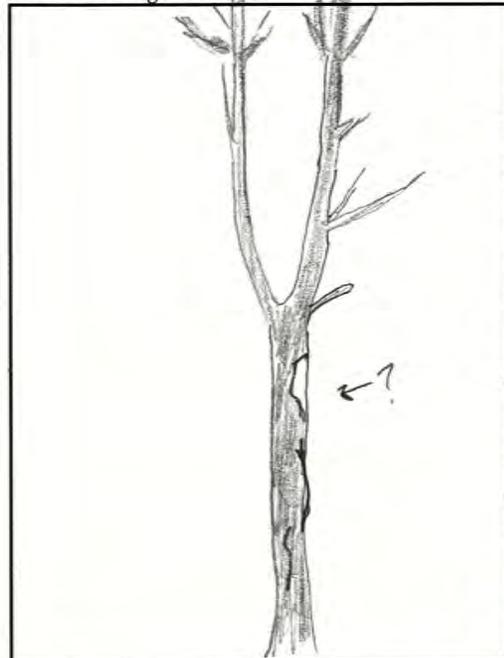
***Tree Ranking		
Canopy	Sub-Canopy	Understory

Roost Tree # 602

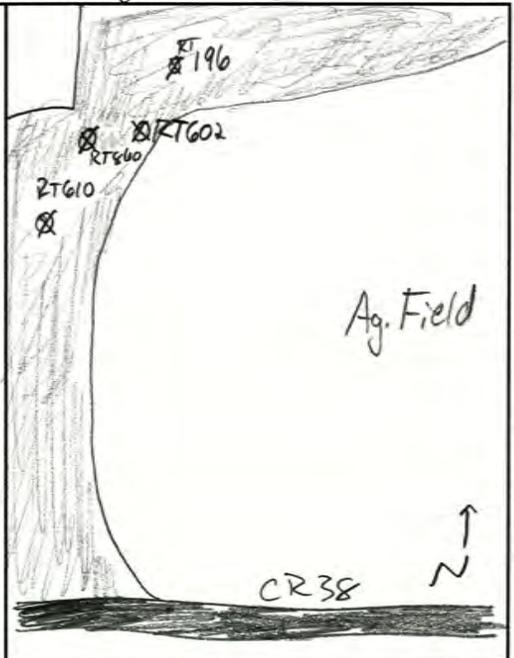
Bat Species/Sex/Frequency: MYSE/F/172.387

Band # ODNR 23529

Roost Tree Diagram:



Location Diagram:



Bat Days					
No.	Date	Bat Freq.	Bat Band ODNR #	Sex of Bat	Observations
1	7/16	172.387	23529	F	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Emergence Count

No.	Date	Temp °F	Weather	# of Bats	Time				Focal Bat exit #	Personnel/Comments
					Sunset	Bats Start	Bats End	Tagged Bat		
1	7/16	72	clear	2	2102	2115	2120	2115	1	K. DeBeck
2	7/17	78	clear	1	2102	2118	2138	-	-	M. Gorden
3										
4										

Cavity or Crevice Characteristics

No.	Nature	Aspect	Opening Measurements			
			Width	Height	Ground	H <sub>2</sub> O Level
1	Bark					
2						
3						

Comments:

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Copperhead Environmental Consulting Inc.  
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Paint Lick, KY 40461 (859) 925-9012

MYSE/F/172, 387

Roost Tree # 603 Project No./Project Name 501 / Emerson West Wind Date First Found July 18, 2016

Location Woodlot north of CP 38

County Seneca

State Ohio

Quad Watson

Lat-Long/UTM: N E 41, 17520

N 83, 09289

Zone - Datum: NAD83

Observers: T. Culbertson, D. Hoyer

#	Tree Tag #	Species	DBH (cm)	Height ft or m		Condition*	% Bark Cover**		Tree Ranking***	Available Roost/Observation
				Tree	Roost		Usable	Total		
1	603	<i>F. pennsylvanica</i>	44.5	17	5	Snag	High	High	Canopy	Bark
2		<i>A. saccharum</i>	15.0	13		Live	low	High	Sub-C	
3		<i>U. americana</i>	26.4	16		Live	low	High	Canopy	
4		<i>A. saccharum</i>	17.5	12		Live	low	High	Sub-C	
5		<i>C. ovata</i>	13.2	12		Live	low	High	Sub-C	
6		<i>U. americana</i>	15.8	10		Live	low	High	Sub-C	
7		<i>Q. rubra</i>	60.6	20		Live	low	High	Canopy	
8		<i>Q. rubra</i>	40.1	21		Live	low	High	Canopy	
9		<i>B. lenta</i>	25.0	18		Live	low	High	Canopy	
10		<i>A. saccharum</i>	25.6	15		Live	low	High	Canopy	
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

Habitat		
<input checked="" type="radio"/> Interior	<input type="radio"/> Edge	<input type="radio"/> Open

Canopy Cover at Roost		
<input type="radio"/> Open	<input type="radio"/> Intermediate	<input checked="" type="radio"/> Closed

Basal Area		
Live Trees	Snags	All Trees
90	10	100

Roost Location		
<input checked="" type="radio"/> Bark	<input type="radio"/> Cavity	<input type="radio"/> Crevice

↓ QUICK REFERENCE / ↑ CIRCLE

*Condition		
<input type="radio"/> Snag	<input type="radio"/> Live	<input type="radio"/> Live-Damaged

**% Bark Cover		
High = ≥ 25%	Moderate = ≥ 10- < 25%	Low = < 10%

***Tree Ranking		
<input type="radio"/> Canopy	<input type="radio"/> Sub-Canopy	<input type="radio"/> Understory

A 10 factor English prism is used to identify trees within the plot, centered on the roost tree.



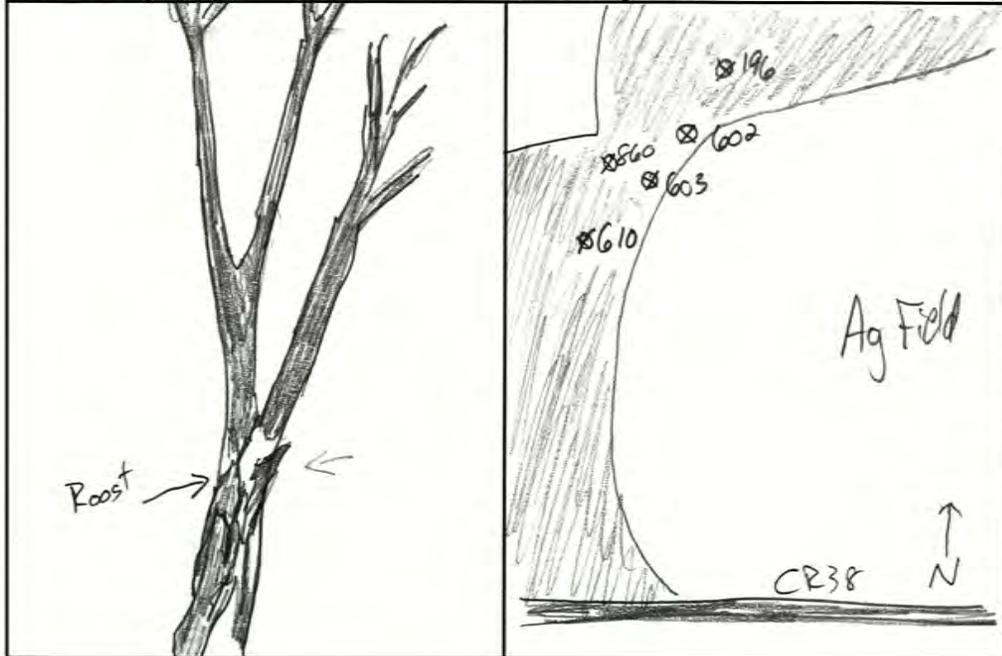
Roost Tree # 603

Bat Species/Sex/Frequency: MYSE/F/172,387

Band # ODNR 23529

Roost Tree Diagram:

Location Diagram:



Bat Days					
No.	Date	Bat Freq.	Bat Band ODNR#	Sex of Bat	Observations
1	7/18	172,387	23529	F	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Emergence Count

No.	Date	Temp °F	Weather	# of Bats	Time				Focal Bat exit #	Personnel/ Comments
					Sunset	Bats Start	Bats End	Tagged Bat		
1	7/18	76	Partly Cloudy	6	2101	2103	2135	2103	1	J. Culbertson D. Hayes
2	7/19	72	Few Clouds	0	2100	-	-	-	-	A. Hawkins
3										
4										

Cavity or Crevice Characteristics

No.	Nature	Aspect	Opening Measurements			
			Width	Height	Ground	H <sub>2</sub> O Level
1	Booth	90°	4"	1.5m	-	-
2						
3						

Comments:

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Roost Tree # 309 Project No./Project Name 501.02 / Emerson West Date First Found 20 July 2016  
 Location Woodlot South of E. Township Road 122 and West of South County Rd 23  
 County Seneca State OH Quad Firside  
 Lat-Long/UTM: 0/E 41.13634 0/W/N -82.96265 Zone - Datum: NAD83 Observers: J Adams, H Pica

#	Tree Tag #	Species	DBH (cm)	Height ft or (m)		Condition*	% Bark Cover**		Tree Ranking***	Available Roost/Observation
				Tree	Roost		Usable	Total		
1	309	<i>P. deltooides</i>	35	12		Snag	95	80	Canopy	Bark
2		<i>P. deltooides</i>	30	12		Alive	100	100	Canopy	None
3		<i>Q. palustris</i>	45	15		Alive	0	100	Canopy	None
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

Habitat		
<input checked="" type="radio"/> Interior	<input type="radio"/> Edge	<input checked="" type="radio"/> Open

Canopy Cover at Roost		
<input checked="" type="radio"/> Open	<input type="radio"/> Intermediate	<input type="radio"/> Closed

Basal Area		
Live Trees	Snags	All Trees
20	10	30

Roost Location		
<input checked="" type="radio"/> Bark	<input type="radio"/> Cavity	<input type="radio"/> Crevice

↓ QUICK REFERENCE / ↑ CIRCLE

*Condition		
<input checked="" type="radio"/> Snag	<input type="radio"/> Live	<input type="radio"/> Live-Damaged

**% Bark Cover		
<input checked="" type="radio"/> High = ≥ 25%	<input type="radio"/> Moderate = ≥ 10- < 25%	<input type="radio"/> Low = < 10%

***Tree Ranking		
<input checked="" type="radio"/> Canopy	<input type="radio"/> Sub-Canopy	<input type="radio"/> Understory

A 10 factor English prism is used to identify trees within the plot, centered on the roost tree.



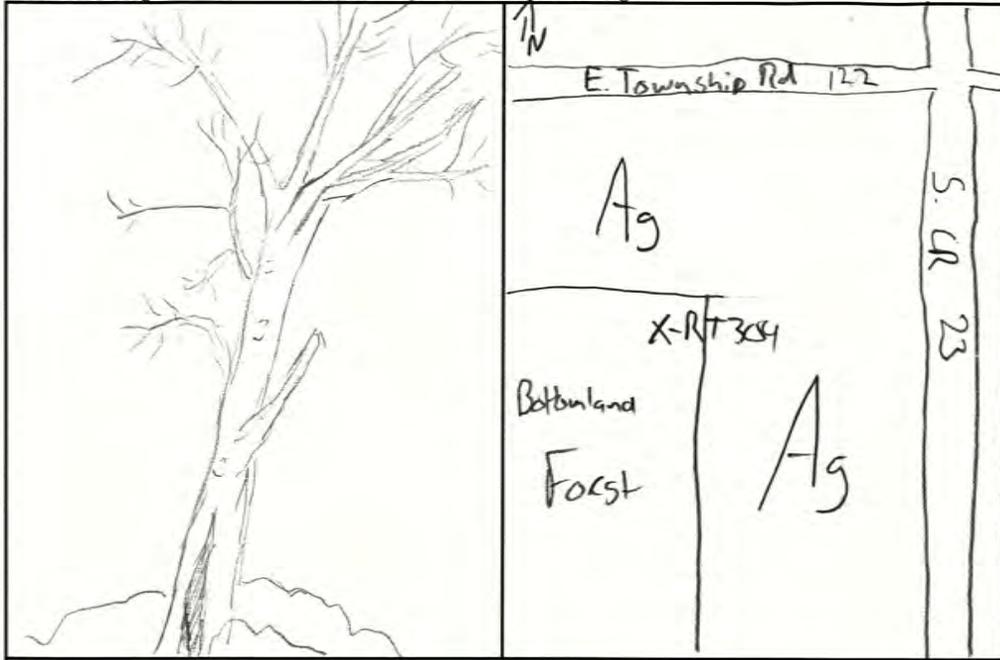
Roost Tree # 309

Bat Species/Sex/Frequency: MYSE/Male/.267

Band # ODNR 23588

Roost Tree Diagram:

Location Diagram:



Bat Days					
No.	Date	Bat Freq.	Bat Band #	Sex of Bat	Observations
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Emergence Count

No.	Date	Temp °F	Weather	# of Bats	Time				Focal Bat exit #	Personnel/ Comments
					Sunset	Bats Start	Bats End	Tagged Bat		
1	7/20	73	Clear	1	2059	2135	2135	2135	1	
2	7/21	79	Partly Cloudy	0	2058	-	-	-	-	D. Hayes
3										
4										

Cavity or Crevice Characteristics

No.	Nature	Aspect	Opening Measurements			
			Width	Height	Ground	H <sub>2</sub> O Level
1						
2						
3						

Comments:

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Roost Tree # 258 Project No./Project Name 501 / APEX Date First Found 7-22-16

Location 973 ft East of Cooper Rd and 1900 ft South of Rd 162 in wood lot

County Seneca State OH Quad ATTICA

Lat-Long/UTM: N 41.11945 W/N -82.97298 Zone      Datum: WGS 84 Observers: T. Fagin, M. Gordon

#	Tree Tag #	Species	DBH (cm)	Height ft or m		Condition*	% Bark Cover**		Tree Ranking***	Available Roost/Observation
				Tree	Roost		Usable	Total		
1	258	<i>C. ovata</i>	28.1	18m		S	H	H	C	
2		<i>U. americana</i>	25.9	17m		L	L	H	C	
3		<i>A. saccharum</i>	32.5	18m		L	L	H	C	
4		<i>C. ovata</i>	40.9	20m		L	H	H	C	
5		<i>U. americana</i>	39.6	15m		S	H	L	V	
6		<i>A. saccharum</i>	16.0	15m		L	L	H	V	
7		<i>C. ovata</i>	36.1	18m		S	H	H	C	
8		<i>C. ovata</i>	28.8	18m		L	H	H	C	
9		<i>J. nigra</i>	28.4	18m		L	L	H	C	
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

Habitat		
<input checked="" type="radio"/> Interior	<input type="radio"/> Edge	<input type="radio"/> Open

Canopy Cover at Roost		
<input type="radio"/> Open	<input checked="" type="radio"/> Intermediate	<input type="radio"/> Closed

Basal Area		
Live Trees	Snags	All Trees
60	30	90

Roost Location		
<input checked="" type="radio"/> Bark	<input type="radio"/> Cavity	<input type="radio"/> Crevice

↓ QUICK REFERENCE / ↑ CIRCLE

*Condition		
Snag	Live	Live-Damaged

**% Bark Cover		
High = ≥ 25%	Moderate = ≥ 10 < 25%	Low = < 10%

***Tree Ranking		
Canopy	Sub-Canopy	Understory

A 10 factor English prism is used to identify trees within the plot, centered on the roost tree.



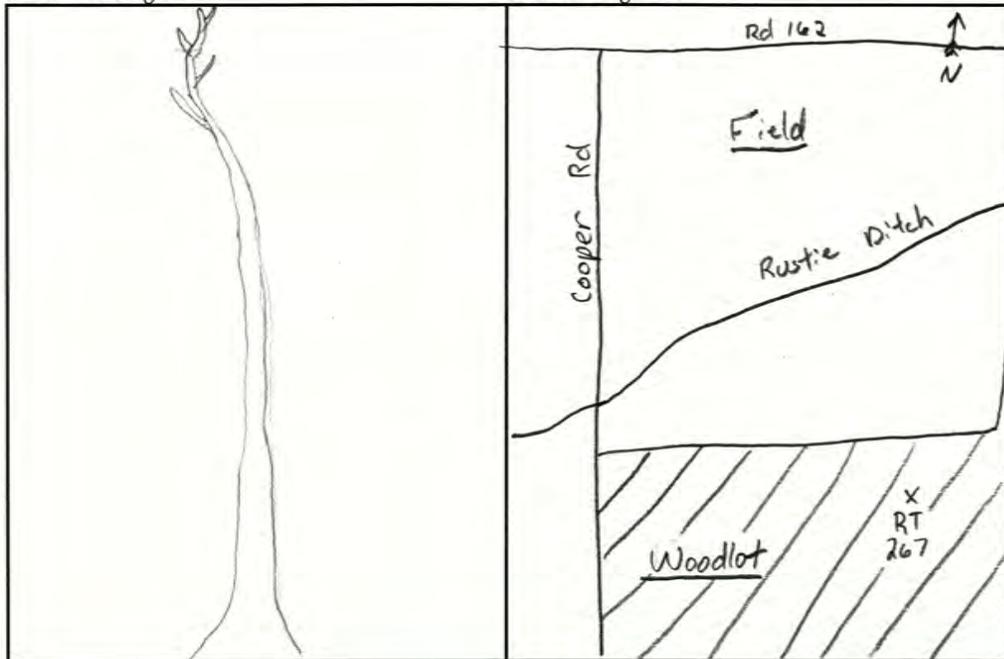
Roost Tree # 258

Bat Species/Sex/Frequency: MySE / M / 172.267

Band #

Roost Tree Diagram:

Location Diagram:



Bat Days					
No.	Date	Bat Freq.	Bat Band #	Sex of Bat	Observations
1	7/22	267		M	C. Lettwich
2	7/24	267		M	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Emergence Count

No.	Date	Temp °F	Weather	# of Bats	Time				Focal Bat exit #	Personnel/ Comments
					Sunset	Bats Start	Bats End	Tagged Bat		
1	7/22	78	clear	1	2052	2110	2110	2110	1	C. Lettwich
2	7/23	75	clear	2	2052	2118	2121	—	—	M. Gooden
3	7/24	71	clear	3	2051	2102	2114	2106	2	M. Gooden
4	7/25	78	clear	1	2050	2110	2110	—	—	T. Fagin M. Gooden

Cavity or Crevice Characteristics

No.	Nature	Aspect	Opening Measurements			
			Width	Height	Ground	H <sub>2</sub> O Level
1						
2						
3						

Comments:

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Roost Tree # 251 Project No./Project Name 501 / APEX Date First Found 7-23-16  
 Location 1600 ft south of Miller Straub Rd East of Rd 77 in Wood lot  
 County Seneca State OH Quad Fire side  
 Lat-Long/UTM: N/E 41.13470 W/N -82.96410 Zone \_\_\_\_\_ Datum: WGS 84 Observers: T. Egan, M. Gordon

#	Tree Tag #	Species	DBH (cm)	Height ft or m		Condition*	% Bark Cover**		Tree Ranking***	Available Roost/Observation
				Tree	Roost		Usable	Total		
1	251	<i>U. americana</i>	23.7	12m		S	H	H	S-C	
2		<i>C. ovata</i>	51.1	22m		L	H	H	C	
3		<i>A. saccharum</i>	20.9	15m		S	M	L	S-C	
4		<i>A. dulcoides</i>	18.3	16m		S	M	M	C	
5		<i>A. dulcoides</i>	36.0	20m		L	L	H	S-C	
6		<i>C. ovata</i>	51.1	20m		L	H	H	C	
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

Habitat		
Interior	Edge	<u>Open</u>

Canopy Cover at Roost		
Open	<u>Intermediate</u>	Closed

Basal Area		
Live Trees	Snags	All Trees
30	30	60

Roost Location		
<u>Bark</u>	Cavity	Crevice

↓ QUICK REFERENCE / ↑ CIRCLE

*Condition		
Snag	Live	Live-Damaged

**% Bark Cover		
High = ≥ 25%	Moderate = ≥ 10-25%	Low = < 10%

***Tree Ranking		
Canopy	Sub-Canopy	Understory

A 10 factor English prism is used to identify trees within the plot, centered on the roost tree.



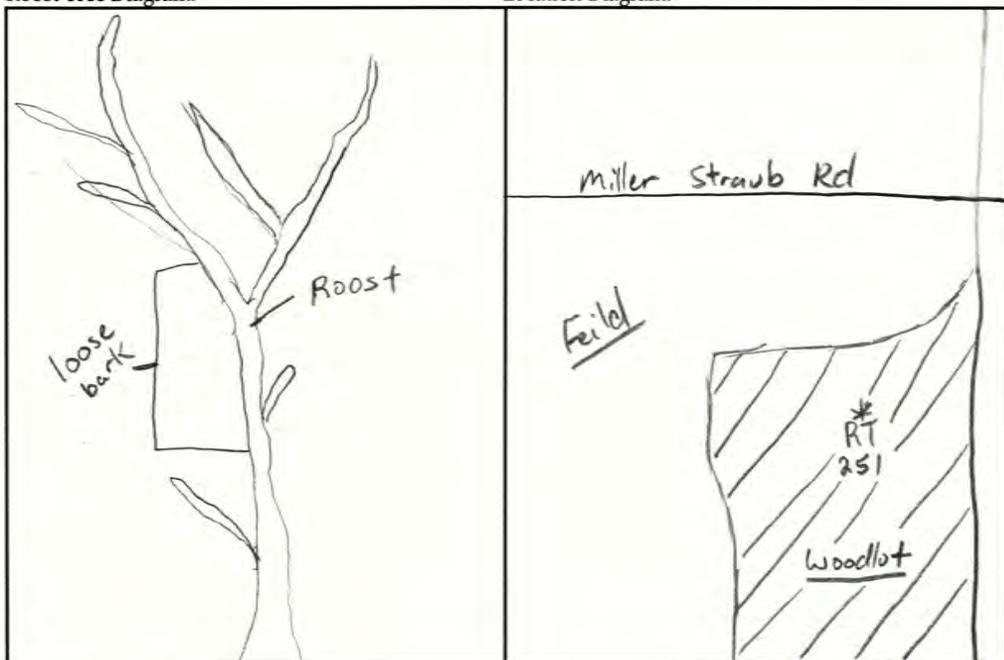
Roost Tree # 251

Bat Species/Sex/Frequency: M/SE / M / 172.267

Band #

Roost Tree Diagram:

Location Diagram:



Bat Days					
No.	Date	Bat Freq.	Bat Band #	Sex of Bat	Observations
1	7/23	267		M	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Emergence Count

No.	Date	Temp °F	Weather	# of Bats	Time				Focal Bat exit #	Personnel/ Comments
					Sunset	Bats Start	Bats End	Tagged Bat		
1	7/23	75	clear	1	2052	21:10	21:10	21:10	1	T. Fagin
2	7/24	71	clear	1*	2051	21:10	21:10	—	—	T. Fagin
3										
4										

Cavity or Crevice Characteristics

No.	Nature	Aspect	Opening Measurements			
			Width	Height	Ground	H <sub>2</sub> O Level
1						
2						
3						

Comments:

Taylor's phone  
 \* Bat could have possibly emerged from nearby tree

## APPENDIX E

### **Roost Tree Photographs**

501- Emerson West Wind Project Bat Survey, Seneca County, Ohio, July 2015 and 2016.

Business Confidential - Not for Public Disclosure

Roost Tree Photos



RT 140



RT 314



RT 860



RT196



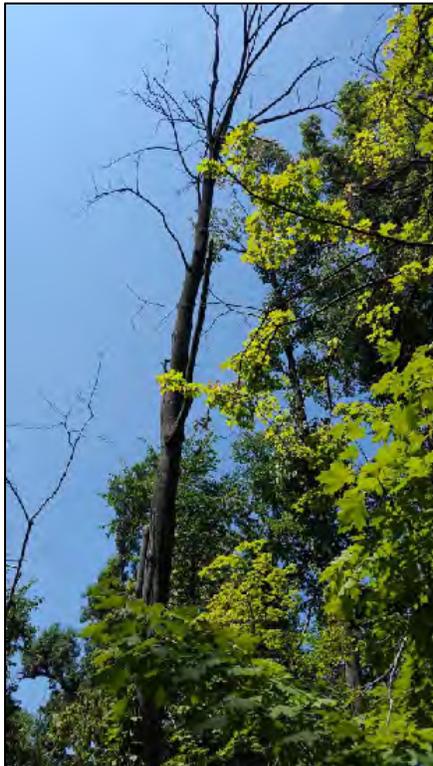
RT610



RT602



RT603



RT309



RT258



RT251

**Eastern Massasauga Habitat Assessment  
for the Emerson West Wind Project  
Seneca County, Ohio**

---

**December 2016**



---

**Prepared by:**

**Goniela Iskali and Travis Brown**

Western EcoSystems Technology, Inc.  
408 W. 6<sup>th</sup> Street  
Bloomington, Indiana 47404

**December 5, 2016**



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*Privileged and Confidential - Not For Distribution*

## **EXECUTIVE SUMMARY**

Emerson West Wind, LLC (Emerson West) is developing the Emerson West Wind Project (Project) in Seneca County, Ohio. Western EcoSystems Technology, Inc. (WEST) was contracted to complete a desktop assessment of potential suitable habitat within the Project area for the eastern massasauga (*Sistrurus catenatus*).

Eastern massasaugas prefer open wetlands or wet grasslands that have less than 50% canopy coverage, and that are located adjacent to upland grasslands or shrub scrub areas. They also have been documented using forested areas. WEST reviewed species records provided by the U.S. Fish and Wildlife Service (USFWS) and existing publicly available datasets such as the USFWS National Wetland Inventory (NWI) and the US Geological Survey (USGS) National Land Cover Database (NLCD) to assess the potential for suitable eastern massasauga habitat within the Project area (defined as forested and emergent wetlands, and adjacent suitable upland habitats larger than 0.01 square kilometers (km<sup>2</sup>; 2.5 acres [ac]).

Forty-four habitat patches were identified as wetland areas or wetland areas with adjacent potential upland habitat with a minimum size of 0.01 km<sup>2</sup> (2.5 ac). Thirty-seven habitat patches were identified as freshwater forested and shrub wetlands that ranged from 0.013 km<sup>2</sup> – 0.48 km<sup>2</sup> (3.22 ac – 118.27 ac) and six wetland complexes were identified as emergent wetlands that ranged from 0.01 km<sup>2</sup> – 0.62 km<sup>2</sup> (2.80 – 152.99 ac).

These 44 habitat patches met the criteria used to define potential suitable eastern massasauga habitat; however, these patches were isolated and fragmented and would likely not support eastern massasauga populations. Note that there are no known records of eastern massasauga occurring in Seneca County or within the Project area. Risk of impact posed by the Project is low; however, avoidance of potentially suitable habitat is recommended to ensure impact avoidance.

## **STUDY PARTICIPANTS**

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

Rhett Good	Senior Project Manager
Goniela Iskali	Project Manager and Report Compiler
Travis Brown	Report Editor
Jeff Fruhwirth	GIS Technician
Rebecca Schmitt	Technical Editor

## **REPORT REFERENCE**

Iskali, G. and T.Brown. 2016. Eastern Massasauga Habitat Assessment for the Emerson West Wind Project, Seneca County, Ohio. Draft Report: November 2016. Prepared for Apex Clean Energy, Inc. (Apex), Charlottesville, Virginia. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana.

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## **INTRODUCTION**

Emerson West Wind, LLC (Emerson West) is developing the Emerson West Wind Project (Project) in Seneca County, Ohio. Western EcoSystems Technology, Inc. (WEST) was contracted to complete a desktop assessment of the potential habitat present within the Project area for the eastern massasauga (*Sistrurus catenatus*).

## **SPECIES BACKGROUND**

The eastern massasauga was once common throughout much of the Great Lakes basin, but is now restricted to scattered populations that are often isolated in the Midwest region (Harding 1997). Habitat loss and fragmentation, as well as persecution by humans, are thought to be the main reasons for the decline of this species (Szymanski 1998). The eastern massasauga has been listed as state endangered in Ohio since 1996, and was listed in the Federal Register as federally threatened on September 30, 2016 (effective October 31, 2016 [USFWS 2016a]).

Seneca County is within the historic range of this species; however the USFWS stated that there were no known records for the eastern massasauga in Seneca County and indicated that the nearest known population was located in the Richmond Township of Huron County, which is 2.65 kilometers (km; 1.65 miles) east of the Project boundary (K. Lott, USFWS, pers. comm.).

The eastern massasauga spends the majority of the year in open lowland swamps, bogs, fens, and wet prairies with less than 50% canopy coverage, but the species has also been documented using forested areas (Reinert and Kodrich 1982; Harding 1997; Johnson et al. 2000; USFWS 2000). This species is generally active between April and late September, and it often hibernates in transition zones between uplands and wetlands, using crayfish burrows, rock crevices, tree roots, and other types of crevices that do not freeze (Seigel 1986; Johnson and Menzies 1993; Johnson 1995; Tennant and Bartlett 2000; Michigan Department of Natural Resources [MDNR] 2016). When they emerge from their hibernacula, they typically stay near the site for one to two weeks, basking in elevated sites before moving on to their summer habitats (Johnson 1995; King 1997; Parent 1997). Their summer months are spent in well-drained upland habitats, such as fields and grasslands (Harding 1997).

Temporal shifts in habitat selection during the eastern massasauga's active season have been documented in some studies, and preference between upland and wetland habitats seems to vary regionally and among populations (Reinert and Kodrich 1982; Seigel 1986; Bissell 2006; Harvey and Weatherhead 2006). The differences in habitat preference and use may result from local habitat conditions such as resource availability, landscape context, and fragmentation, or from sampling methods used among researchers (Bailey et al. 2012). However, most studies are in agreement that the eastern massasauga's association with wetlands is consistent, and individuals are almost never found more than 500 meters (m; 1,640 feet [ft]) away from wetlands (USFWS 2016b).

The home range of the eastern massasauga varies substantially within and among populations. In southern Michigan, average home range size varies from 0.05 square kilometers (km<sup>2</sup>; 12.4 acres [ac]) to 0.012 km<sup>2</sup> (3.19 ac; USFWS 2016b). However, larger home range sizes 0.25 – 0.26 km<sup>2</sup> (61.7 – 64.2 ac) have been documented in Ontario, Canada (Weatherhead and Prior 1992) and New York (Johnson 2000), and the smallest home range documented is 0.01 km<sup>2</sup> (2.5 ac) in Monroe County, Wisconsin (USFWS 2016c). Existing literature does not provide information on the minimum patch size needed for individuals or populations of the eastern massasauga to exist, although persistence of populations is thought to decrease as patch size, quality of the habitat, and connectivity among microhabitats decreases. Connectivity between the summer and winter hibernating habitat is important for this species, as they must have unimpeded ability to access either type of habitat (USFWS 2016c).

## **PROJECT DESCRIPTION**

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] 2016).

Approximately 81.3% of the nearly 198 km<sup>2</sup> (49,110 ac) Project area is composed of cultivated cropland (Table 1). The next most common habitat is forested area, which 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 habitat types compose less than 3% of the Project area individually. The only types of wetlands present within the Project area are woody and emergent herbaceous wetlands, which compose less than 0.01% of the Project area individually (Figure 1, Table 1; US Geological Survey [USGS] National Land Cover Database [NLCD] 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

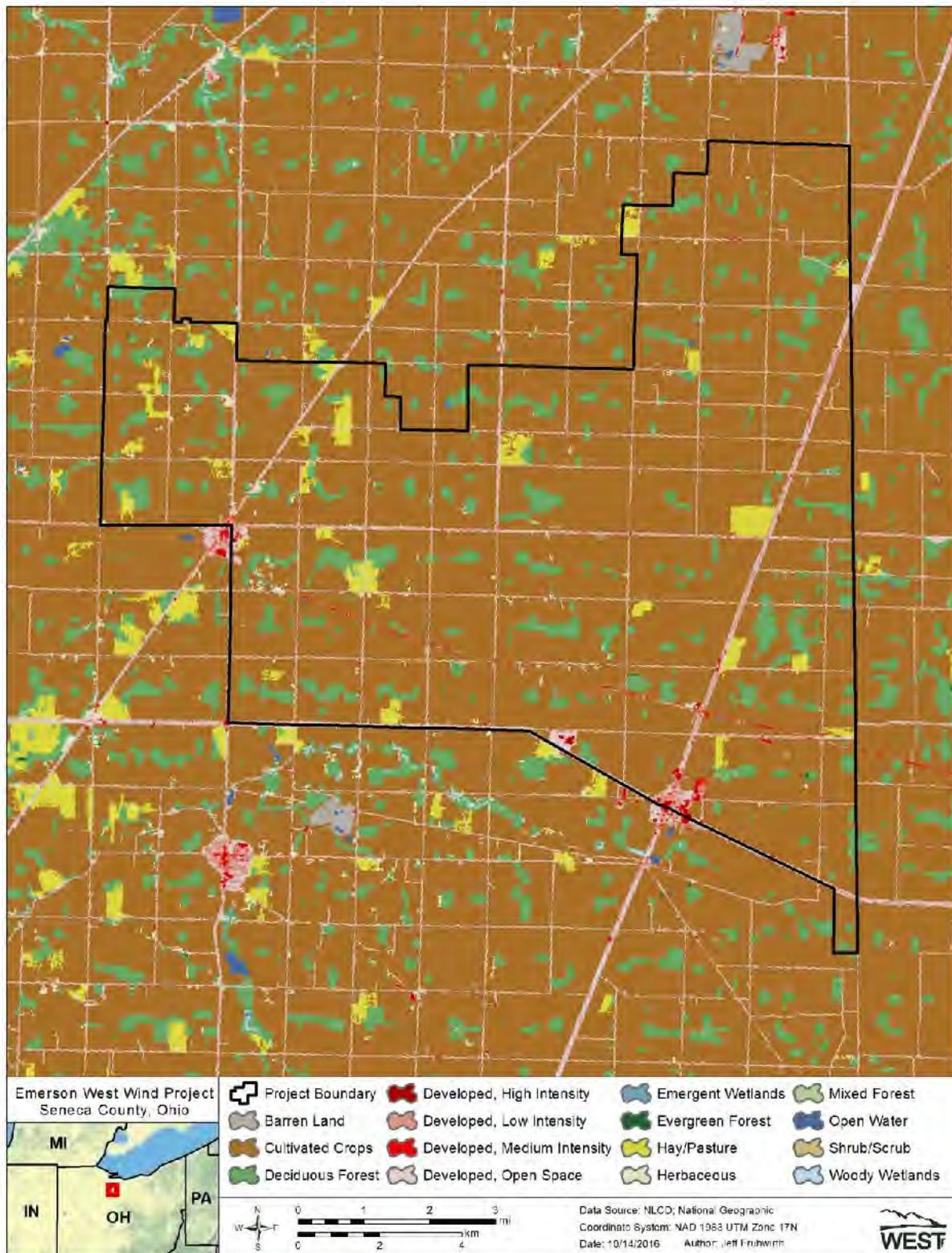


Figure 1. Land cover and location of the Emerson West Wind Project (USGS NLCD 2011, Homer et al. 2015).

## **METHODS**

For the purposes of this desktop habitat assessment, WEST defined potential habitat as forested and emergent wetlands as well as adjacent suitable upland habitats (grassland, shrubs and forest) that when combined were larger than the minimum home range size recorded for the species 0.01 km<sup>2</sup> (2.5 ac; USFWS 2016c). Wetlands were identified using the USFWS National Wetland Inventory (NWI) data (USFWS NWI 2016) because the USFWS NWI database is more accurate and conservative when identifying wetlands compared to the USGS NLCD. Potential upland habitats were identified using the USGS NLCD (USGS NLCD 2011; Homer et al. 2015). WEST reviewed these datasets, as well as requested information on occurrence of the eastern massasauga from the Ohio USFWS Field Office, to identify potentially suitable habitat patches and evaluate their connectivity and potential suitability to support the species.

## **RESULTS**

Forty-four habitat patches were identified as wetland areas or wetland areas with adjacent potential upland habitat with a minimum size of 0.01 km<sup>2</sup> (2.5 ac). Thirty-eight habitat patches were identified as freshwater forested and shrub wetlands with adjacent upland habitat that ranged from 0.013 km<sup>2</sup> – 0.486 km<sup>2</sup> (3.22 ac – 118.27 ac) and six habitat patches were identified as emergent wetlands with adjacent upland habitat that ranged from 0.011 km<sup>2</sup> – 0.619 km<sup>2</sup> (2.80 ac – 152.99 ac). Potential suitable habitat comprises 6.42 km<sup>2</sup> (1,587.5 ac) or less than 3.3% of the total Project area (Figure 2).

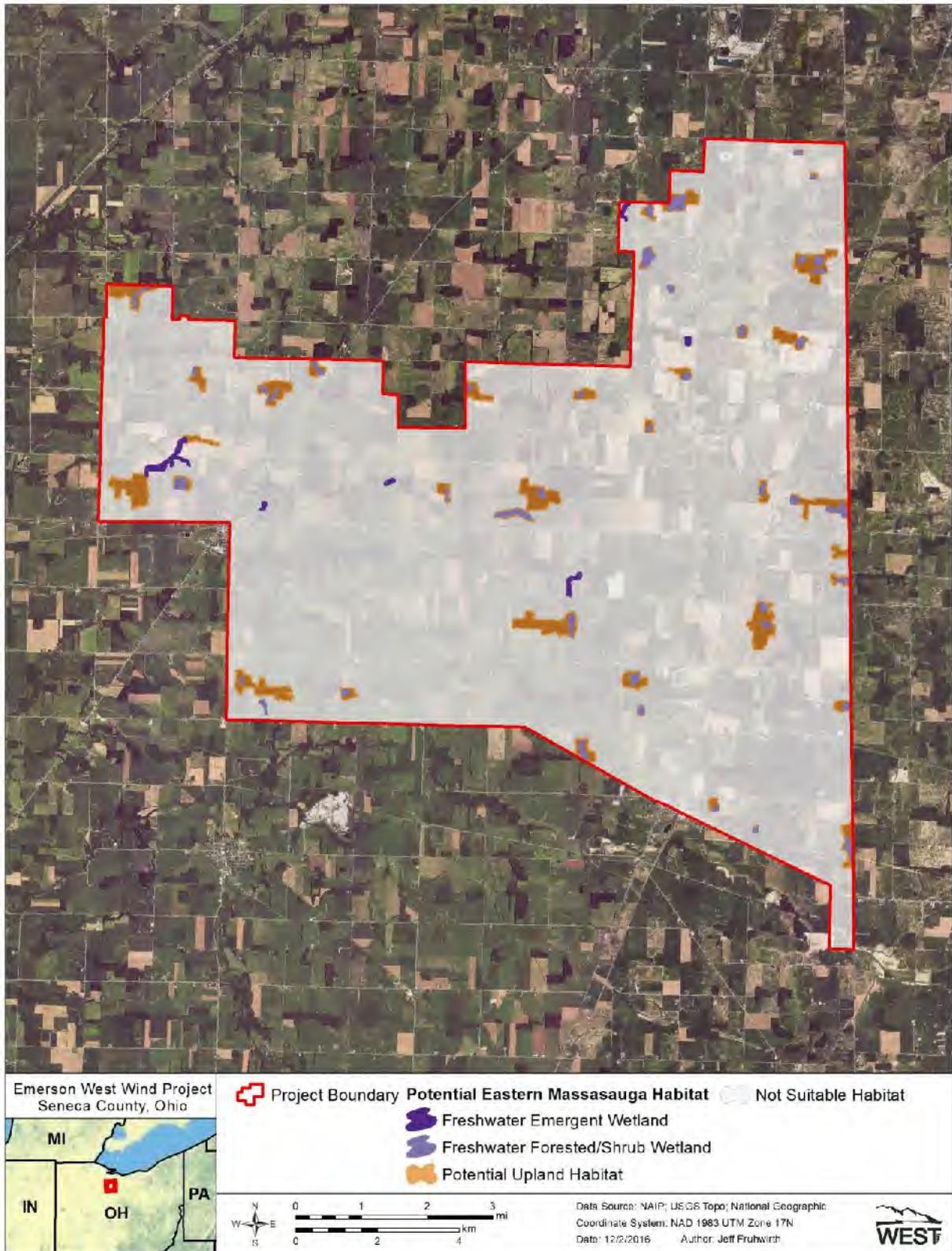


Figure 2. Potential habitat for the eastern massasauga within the Emerson West Wind Project (USFWS NWI 2016, USGS NLCD 2011, Homer et al. 2015).

## CONCLUSION

Open wetland habitats preferred by the eastern massasauga appear to be rare and fragmented within the Project area, and the majority of the wetland areas within the Project area are forested. Eastern massasaugas have been documented to use forests (e.g., in Pennsylvania, the eastern massasaugas use some woodlands adjacent to grasslands, with all areas having a shrub component (Reinert and Kodrich 1982); therefore, there is some potential for eastern massasaugas to occur in forested wetlands that contain openings or have adjacent grassland/shrub communities.

Patches of potential eastern massasauga habitat detected in the project area were relatively small (maximum 0.619 km<sup>2</sup>) and were isolated from other patches by roads, developed areas, and row crop agriculture. Johnson et al. (2000) suggested that the value of suitable habitat patches for eastern massasaugas is reduced by isolation and fragmentation, and Durbian et al. (2008) recommended 1 km<sup>2</sup> (247.11 ac) as the minimum patch size for managers interested in restoring a viable population of this species.

Desktop assessments are limited based on the scale of available landcover data; open areas preferred by eastern massasauga could be present within the forested wetlands documented in the Project area; however, patch size and patch distribution, as well as the fact that the species is not known to occur in Seneca County, suggest that it is unlikely to occur. Nonetheless, avoiding impact to potentially suitable habitat is recommended to ensure impact avoidance.

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