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Date August 27, 2015

To: Andrew Horton, USFWS
Lisie Kitchel, WDNR

Cc: Karla Leithoff, WisDOT
Alyssa Barrette, WisDOT

From: Olivia Munzer, Wildlife Biologist, Cardno ENTRIX/Natural Resources and Health Sciences
Dan Salas, Senior Ecologist, Cardno Restoration Services

RE: **West Waukesha Bypass Northern Long-Eared Bat (NLEB) Survey Results**

Dear Mr. Horton and Ms. Kitchel:

We are providing this memo to report the findings of the field surveys Cardno biologists completed for the presence/ absence of northern long-eared bat (*Myotis septentrionalis*; NLEB) within the limits of the West Waukesha Bypass Project.

Project Background

Wisconsin Department of Transportation (WisDOT) is proposing to construct the West Waukesha Bypass (project) to alleviate congestion from growing local and regional traffic volumes, and enhance traffic flow and safety. The approximately 5.3 mile (8.5 km) project will extend between Interstate 94 and Wisconsin State Highway 59 on the west side of the City of Waukesha, Waukesha County, Wisconsin (project area). The project will expand the northern section of the existing County Road (CR) TT (Merrill Hills Road), and the project will consist primarily of new construction south of Madison Street. Habitat types potentially impacted by the project include landscaped yards, agriculture, open fields, riparian woodlands, oak woodlands, mesic prairie, and wetlands.

The project occurs within the range of the northern long-eared bat (*Myotis septentrionalis*; NLEB); however, no records occur for the NLEB in Waukesha County according to Wisconsin Department of Natural Resources records (WDNR 2015). On April 2, 2015, NLEBs were listed as threatened under the Endangered Species Act by the United States Fish and Wildlife Service (USFWS). At the request of WisDOT, Cardno biologists performed presence/absence acoustic surveys and identified potential roost trees (PRTs) for the NLEB within the proposed project area.

Survey Guidelines

Acoustic surveys for NLEB were conducted in accordance with the U.S. Fish and Wildlife Service's (USFWS) *2015 Range-wide Indiana Bat Summer Survey Guidelines* issued on April 2015 (*Guidelines*; USFWS 2015). Acoustic surveys for NLEBs were conducted from August 12–14, 2015 using SD2 AnaBat™ ultrasonic detectors (Titley Electronics Pty Ltd., NSW, Australia). Each Anabat unit was enclosed in a waterproof box and placed on a 5-foot tripod. Cardno deployed a total of 10 detectors in suitable habitat throughout the project area for 2 nights (totaling 20 detector nights), with at least 2 detector nights per each of the eight 1-kilometer sampling blocks (Figure 1). Cardno placed an additional 2 AnaBats (F and L) for 1 night near a pond and along Pebble Creek once Cardno was granted access by the landowner (Figure 1). Thus, this equates to 12 acoustic sampling sites for a total of 22 detector nights. Except for 3 AnaBats (F, G, and L), all sites were located greater than 656 feet (200 meters) apart. Acoustic monitoring began from approximately half hour before sunset until

half hour after sunrise except at Sites I and K, which began recording just prior to sunset on 12 August. For analysis of bat calls, Cardno initially used Echoclass Version 3.1 (Dr. Eric Britzke, U.S. Army Research and Development), an automated acoustic analysis program approved by the USFWS, to determine potential presence of NLEB.

Cardno biologists identified NLEB PRTs within the project area. Per the *Guidelines*, PRTs for NLEBs included live trees and/or snags with a diameter at breast height (DBH) > 3 inches that have exfoliating bark, cracks, crevices, and/or cavities. Cardno biologists collected data on the size, condition, and suitability of each PRT including species, potential roost structure type (i.e., cavity, crevice, exfoliating bark and/or crack), DBH, height, and decay state. Other significant data collected was distance to water, percent canopy closure at PRT, forest condition, and PRT canopy position. All PRTs were photographed and the location recorded with a sub-meter Trimble Geo XH.

Potential Roost Tree Findings

Cardno biologists identified a total of 95 PRTs within the proposed project area from August 12-13, 2015 (Figure 1). The majority of the PRTs are concentrated in forested habitat south of CR D and along the west side of CR TT south of Northview Road (Figure 1). PRT findings are summarized in Table 1 below. Additional information on roost tree characteristics were recorded for each of these PRT's, and are included in a full data table attached to this memo.

Table 1. Potential Roost Tree Findings

PRT ID	Property Owner	Species	DBH	Height	Habitat	Distance from Water (ft)	Condition	Primary Potential Roost Type	Notes
rt1	Private	Honey locust	8	56.8	Edge	395	Live-Damaged	Cavity	
rt2	Private	Honey locust	21.2	63	Edge	350	Live-Damaged	Bark	
rt3	Private	Honey locust	14.4	45	Edge	300	Live-Damaged	Bark	
rt4	Private	Weeping willow	24.8	40	Edge	275	Live-Damaged	Bark	
rt5	Private	Bigtooth aspen	17.1	50	Edge	275	Live-Damaged	Bark	
rt6	Private	Unknown	5.5	45	Edge	45	Snag	Bark	
rt7	Private	Unknown	9.8	45	Edge	40	Snag	Bark	
rt8	Private	Unknown	11	45	Edge	30	Snag	Bark	
rt9	Private	Unknown	3	30	Interior	60	Snag	Bark	
rt10-20	Private	Red pine	8	25	Interior	90	Snag	Bark	10 trees with 7-9dbh and 20-30 height
rt21	Private	Black walnut	33	75	Interior	25	Live-Damaged	Crevice	Crevice where branch cracked and bark split
rt22	Private	Black walnut	15.5	89	Interior	60	Live-Damaged	Bark	Bark flaking off also a large crack in bark
rt23	Private	Black cherry	9.5	60	Interior	125	Live-Damaged	Bark	
rt24	Private	Silver maple	9.5 - 9 trunks	61	Edge	190	Live	Bark	
rt25	Private	Silver maple	9.5 - 12 stems	61	Edge	240	Live	Bark	
rt26	Private	Silver maple	9.5 - 7 stems	61	Edge	260	Live	Bark	
rt27	Private	Boxelder	12	52	Interior	190	Live-Damaged	Cavity	
rt28	Private	Oak	21	65	Edge	300	Snag	Crevice	
rt29	Private	Mulberry			Interior	375	Live-Damaged	Crevice	
rt30	Private	Silver	31	50	Edge	435	Live	Bark	

PRT ID	Property Owner	Species	DBH	Height	Habitat	Distance from Water (ft)	Condition	Primary Potential Roost Type	Notes
		maple							
rt31	Private	Silver maple	24	50	Edge	455	Live-Damaged	Bark	
rt32	Private	American elm	22	60	Edge	805	Live-Damaged	Bark	Curly bark
rt33	Private	Boxelder	22	50	Interior	905	Live-Damaged	Bark	Sloughing bark in spots
rt34	State	Boxelder	10	33	Interior	905	Snag	Cavity	
rt35	Private	Unknown	26	40	Edge	590	Snag	Bark	
rt36	Private	Black cherry	22	60	Edge	200	Live-Damaged	Bark	
rt37	Private	Black cherry	17	50	Edge	115	Live-Damaged	Bark	
rt38	Private	Red pine	8	55	Interior	125	Snag	Cavity	Holes throughout tree
rt39	Private	Black cherry	15	75	Interior	90	Live-Damaged	Bark	Flaky bark
rt40	Private	Black cherry	12	65	Interior	90	Snag	Bark	
rt41	Private	Black cherry	13	65	Edge	40	Snag	Bark	Dead flaky bark
rt42	Private	Green ash	15	50	Interior	210	Snag	Bark	Dead flaky bark
rt43	State	Green ash	11	77	Interior	710	Live	Bark	Bark is shaggy in some areas
rt44	Private	White oak	33		Edge	935	Live-Damaged	Crevice	Crevices where thick pieces of bark are separating
rt45	Private	Unknown	14	60	Interior	980	Snag	Bark	Dead flaky bark
rt46	Private	Red oak	33	70	Edge	1100	Live-Damaged	Crevice	Crevices where branches have split off
rt47	Private	Shagbark hickory	22	60	Open	1200	Live	Bark	shaggy bark
rt48	Private	Shagbark hickory	22	60	Open	1070	Live	Bark	Shaggy bark
rt49	Private	White oak	29	55	Open	1045	Live	Crevice	Crack in trunk
rt50	Private	Shagbark hickory	26	80	Interior	950	Live	Bark	Shaggy bark
rt51	Private	Shagbark hickory	23	50	Edge	710	Live	Bark	Shaggy bark
rt52	Private	Boxelder	9	20	Edge	645	Snag	Cavity	
rt53	Private	Unknown	25	40	Open	660	Snag	Bark	
rt54	Private	Shagbark hickory	15	75	Interior	1075	Live	Bark	Shaggy bark
rt55	Private	Red oak	40	60	Interior	980	Live-Damaged	Crevice	Some cavities and crevices in bark and wood
rt56	Private	Black cherry	5	55	Interior	995	Live	Bark	
rt57	Private	Black cherry	4.5	40	Interior	1055	Live	Bark	
rt58	Private	Quaking aspen	6	25	Edge	975	Snag	Bark	
rt59	Private	Shagbark hickory	15	65	Interior	1080	Live-Damaged	Bark	Shaggy bark
rt60	Private	Shagbark hickory	4	40	Interior	1065	Live	Bark	Shaggy bark
rt61	Private	Shagbark hickory	6	55	Interior	1085	Live	Bark	Shaggy bark
rt62	Private	Shagbark hickory	10	60	Interior	1085	Live	Bark	

PRT ID	Property Owner	Species	DBH	Height	Habitat	Distance from Water (ft)	Condition	Primary Potential Roost Type	Notes
rt63	Private	Black cherry	21	35	Interior	1075	Live-Damaged	Crevice	
rt64	Private	Shagbark hickory	11	60	Interior	1130	Live	Bark	3 trunks with shaggy bark
rt65	Private	White oak	28	85	Interior	1185	Live	Bark	Some curls in bark
rt66	Private	Shagbark hickory	7	60	Interior	1180	Live	Bark	Shaggy bark
rt67	Private	Red oak	38.5	85	Interior	1230	Live	Cavity	Multiple large cavities
rt68	Private	Bigtooth aspen	12	55	Interior	1270	Snag	Bark	
rt69	Private	Shagbark hickory	8	60	Interior	1260	Live	Bark	Shaggy bark
rt70	Private	Shagbark hickory	6.5	50	Interior	1290	Live	Bark	Shaggy bark
rt71	Private	White oak	41	60	Interior	1310	Live-Damaged	Bark	Abundant flaky bark and crevices
rt72	Private	Red oak	36	90	Interior	1330	Live-Damaged	Cavity	Cavities in broken off branches
rt73	Private	Shagbark hickory	21	75	Interior	1320	Live	Bark	Shaggy bark
rt74	Private	Red oak	42	75	Interior	1250	Live-Damaged	Cavity	Cavity on south, crevices in bark all around
rt75	Private	White oak	27	85	Interior	1330	Live	Bark	Large curls in some bark
rt76	Private	Shagbark hickory	13	60	Interior	1335	Live	Bark	
rt77	Private	Shagbark hickory	6	45	Interior	1110	Live	Bark	
rt78	Private	Shagbark hickory	7	40	Interior	1110	Live	Bark	
rt79	Private	Shagbark hickory	8	55	Interior	1130	Live	Bark	
rt80	Private	Shagbark hickory	8	55	Interior	1110	Live	Bark	
rt81	Private	Shagbark hickory	9	60	Interior	1195	Live	Bark	
rt82	Private	Shagbark hickory	8	60	Interior	1195	Live	Bark	
rt83	Private	Shagbark hickory	9	60	Interior	1205	Live	Bark	
rt84	Private	Red oak	34	65	Interior	1120	Live-Damaged	Crevice	
rt85	Private	Unknown	12	30	Open	435	Snag	Cavity	
rt86	Private	American elm	13	35	Edge	820	Snag	Bark	Dead flaky bark
rt87	Private	Green ash	13	40	Edge	785	Snag	Bark	Dead flaky bark
rt88	Private	Silver maple	4 stems 20-40"	50	Open	30	Live	Bark	
rt89	Private	Unknown	17	30	Open	10	Snag	Cavity	
rt90	Private	Silver maple	28	60	Edge	20	Live	Bark	
rt91	Private	Silver maple	4 trunks 10-20"	65	Edge	20	Live	Bark	
rt92	Private	Silver maple	35	75	Edge	15	Live	Bark	
rt93	Private	Silver maple	multiple stems 10-25"	70	Edge	65	Live	Bark	

PRT ID	Property Owner	Species	DBH	Height	Habitat	Distance from Water (ft)	Condition	Primary Potential Roost Type	Notes
rt94	Private	Red oak	29	70	Interior	500	Live	Cavity	Multiple small cavities
rt95	Private	Boxelder	18	50	Interior	510	Live-Damaged	Cavity	1 small cavity

Acoustic Survey Findings

Acoustic surveys were completed from August 12–14, 2015 at 12 sites for a total of 22 detector nights (Figure 1 and Table 2). Coordinates and a brief description of the 12 AnaBat sites are in Table 2 below. Pictures and datasheets for each AnaBat site are attached to this memo. Weather conditions during acoustic surveys met the standards put forth by the USFWS (USFWS 2015).

Table 2. AnaBat Site Locations, Number of Detector Nights, and Descriptions

AnaBat Site	No. of Detector Nights	Latitude	Longitude	General Site Description
A	2	43º02'48.88"	88º17'13.51"	Corridor in upland deciduous forest
B	2	43º01'55.36"	88º17'09.66"	Edge of riparian forest
C	2	43º01'19.30"	88º17'11.52"	Edge of riparian forest and pond
D	2	43º00'58.34"	88º17'07.65"	Corridor in upland deciduous forest
E	2	43º00'37.49"	88º17'14.14"	Edge of riparian deciduous forest along an intermittent creek
F	1	42º59'38.75"	88º17'30.82"	Open grassland adjacent to a pond
G	2	42º59'36.08"	88º17'26.31"	Edge of upland, mixed forest
H	2	42º59'17.63"	88º16'42.36"	Open, riparian herbaceous area along perennial creek
I	2	42º58'49.51"	88º16'33.52"	Edge of upland mixed forest in open, herbaceous area
J	2	42º58'55.07"	88º16'23.30"	Emergent and herbaceous riparian area along perennial creek
K	2	43º00'19.25"	88º17'24.69"	Edge of mixed forest
L	1	42º59'38.61"	88º17'24.67"	Edge of riparian forest in open, herbaceous riparian area

EchoClass identified a total of 5,113 bat call, of which 1,666 files (32%) were identified to species (Table 3). A total of 9 species were identified by the acoustic analysis software EchoClass: hoary bat (*Lasiurus cinereus*), red bat (*Lasiurus borealis*), silver-haired bat (*Lasionycteris noctivagans*), big brown bat (*Eptesicus fuscus*), tri-colored bat (*Perimyotis subflavus*), little brown bat (*Myotis lucifugus*), NLEB, eastern small-footed myotis (*Myotis leibeii*), and Indiana bat (*Myotis sodalis*). EchoClass identified only two bat calls from little brown bats, which is a common and widespread species in Wisconsin. Eastern small-footed myotis and Indiana bat are not known to presently occur in Wisconsin (Iberg 2004; WDNR 2013b); therefore, the calls were reclassified as little brown bat calls after qualitative analysis. A total of 23 bat call files were preliminarily identified by EchoClass as NLEB (Table 3).

Table 3. Summary of Bat Call Files Identified to Species by EchoClass, BCID, and Kaleidoscope Automatic Acoustic Analysis Programs Before Qualitative Analysis.

Site	Date	Program	Big Brown Bat	Red Bat	Hoary Bat	Silver-haired Bat	Tri-colored Bat	Little Brown Bat	NLEB	Indiana Bat*	Eastern small-footed Bat*	Unknown
A												
	8/12/2015	Kaleidoscope	212	316	379	657	0	32	1	0	0	110
		EchoClass	1	342	232	1	7	0	4	0	0	1705
		BCID	8	21	1	42	4	5	0	0	0	3
	8/13/2015	Kaleidoscope	6	31	11	5	0	19	0	0	0	14
		EchoClass	0	30	0	0	0	0	6	0	0	65
		BCID	1	0	0	0	2	0	2	0	0	2
B												
	8/12/2015	Kaleidoscope	6	10	2	9	1	12	0	0	0	8
		EchoClass	3	10	0	0	0	0	0	0	0	54
		BCID	0	0	0	1	1	1	0	0	0	3
	8/13/2015	Kaleidoscope	4	5	3	19	0	12	0	0	0	9
		EchoClass	2	9	1	1	0	0	1	0	0	53
		BCID	0	0	0	0	1	2	1	0	0	0
C												
	8/12/2015	Kaleidoscope	0	23	9	26	4	7	0	0	0	3
		EchoClass	2	21	12	1	0	0	0	0	0	39
		BCID	0	11	0	7	3	2	0	0	0	2
	8/13/2015	Kaleidoscope	0	33	2	18	1	9	0	0	0	4
		EchoClass	0	30	2	0	0	0	0	0	0	35
		BCID	1	17	0	7	5	6	0	0	0	1
D												
	08/12/15	Kaleidoscope	1	34	2	25	4	45	0	0	0	12
		EchoClass	0	41	2	0	1	1	0	2	0	88
		BCID	1	20	0	5	10	18	1	0	0	1
	08/13/15	Kaleidoscope	2	58	17	39	4	18	0	0	0	22
		EchoClass	1	53	4	0	0	0	2	0	0	118
		BCID	1	16	0	8	6	4	0	0	0	0
E												
	08/12/15	Kaleidoscope	1	27	15	24	1	15	0	0	0	9
		EchoClass	0	26	5	0	2	0	0	0	0	64
		BCID	2	5	3	1	4	4	0	0	0	3
	08/13/15	Kaleidoscope	0	13	12	24	2	20	0	0	0	6
		EchoClass	2	23	8	1	0	0	1	0	0	53
		BCID	0	5	1	5	3	2	0	0	0	1

Site	Date	Program	Big Brown Bat	Red Bat	Hoary Bat	Silver-haired Bat	Tri-colored Bat	Little Brown Bat	NLEB	Indiana Bat*	Eastern small-footed Bat*	Unknown
F												
	08/13/15	Kaleidoscope	15	14	0	22	3	10	0	0	0	5
		EchoClass	4	15	0	1	0	0	1	1	1	56
		BCID	3	3	0	8	0	2	1	0	0	3
G												
	08/12/15	Kaleidoscope	2	69	13	23	3	60	0	0	0	19
		EchoClass	0	70	6	1	0	0	3	2	0	151
		BCID	1	17	6	4	4	1	1	0	0	3
	08/13/15	Kaleidoscope	0	64	9	21	1	14	0	0	0	6
		EchoClass	0	63	5	0	0	0	0	0	0	59
		BCID	1	43	3	10	5	2	0	0	0	2
H												
	08/12/15	Kaleidoscope	0	9	5	31	1	8	0	0	0	5
		EchoClass	1	14	3	4	1	0	0	0	0	40
		BCID	2	3	2	10	4	3	0	0	0	0
	08/13/15	Kaleidoscope	1	11	2	14	2	5	0	0	0	2
		EchoClass	2	6	3	1	0	0	0	0	0	28
		BCID	2	2	1	7	5	3	0	0	0	0
I												
	08/12/15	Kaleidoscope	6	41	2	14	2	18	0	0	0	8
		EchoClass	2	29	1	0	0	0	2	0	0	69
		BCID	2	13	0	8	6	1	0	0	0	5
	08/13/15	Kaleidoscope	10	14	1	12	7	13	0	0	0	6
		EchoClass	4	17	0	1	0	0	0	0	0	55
		BCID	3	4	0	3	3	2	0	0	0	1
J												
	08/12/15	Kaleidoscope	2	22	10	306	0	69	0	0	0	8
		EchoClass	0	60	49	3	0	0	1	0	0	334
		BCID	2	3	7	43	5	3	0	0	0	2
	08/13/15	Kaleidoscope	3	12	0	12	0	49	0	0	0	10
		EchoClass	0	34	0	0	0	0	1	0	0	71
		BCID	0	1	0	2	1	4	0	0	0	0
K												
	08/12/15	Kaleidoscope	10	239	6	31	3	49	0	0	0	26
		EchoClass	2	201	8	1	1	1	0	0	0	180
		BCID	12	114	0	19	6	12	0	0	0	4
	08/13/15	Kaleidoscope	11	96	13	27	4	30	0	0	0	14
		EchoClass	6	84	7	0	0	0	0	0	0	122
		BCID	3	36	1	16	12	8	0	0	0	4

Site	Date	Program	Big Brown Bat	Red Bat	Hoary Bat	Silver-haired Bat	Tri-colored Bat	Little Brown Bat	NLEB	Indiana Bat*	Eastern small-footed Bat*	Unknown
L												
	08/13/15	Kaleidoscope	15	16	6	27	1	27	0	0	0	1
		EchoClass	5	38	3	1	0	0	1	1	0	66
		BCID	6	4	1	17	8	3	0	0	0	2
TOTAL		**Kaleidoscope**	**307**	**1,157**	**519**	**1,386**	**44**	**541**	**1**	**0**	**0**	**307**
		EchoClass	**37**	**1,216**	**351**	**18**	**12**	**2**	**23**	**6**	**1**	**3,505**
		BCID	**51**	**338**	**26**	**223**	**98**	**88**	**6**	**0**	**0**	**39**

*These species are not known to occur in Wisconsin and these bat call files were reclassified.

Due to aberrant results from EchoClass, the Cardno bat biologist ran the data through two other USFWS-approved automatic acoustic analysis programs: BCID Eastern USA v2.7c (Bat Call Identification, Inc.) and Kaleidoscope v3.1.2 (Wildlife Acoustics). BCID identified 869 bat call files and of those, 830 files (96%) were identified to species (Table 3). Kaleidoscope identified 4,262 bat call files and 307 files (7%) could not be identified to species by the program (Table 3). Both programs preliminarily identified calls to 7 species: hoary bat, red bat, silver-haired bat, big brown bat, tri-colored bat, little brown bat, and NLEB. BCID preliminarily identified 6 bat call files as NLEB and Kaleidoscope identified 1 call file as NLEB.

In general, Myotid call sonograms appear very similar and can be difficult to distinguish between species, particularly under certain conditions (Titley Scientific 2009; WDNR 2013a). Depending upon the species present during surveys, misidentification rates can range from 5-30% and can result in false-positives (Clement et al. 2014). Therefore, Cardno conducted a qualitative analysis of the bat calls that were identified by EchoClass, BCID, or Kaleidoscope as NLEB to further clarify presence or absence of this species in the project area. Although the initial results from the automatic analysis programs indicate potential presence of NLEB, manual review of the NLEB calls indicate they were likely misidentified by the programs. For example, EchoClass identified two calls as NLEB but the calls were from a red bat and silver-haired bat. The NLEB call identified by Kaleidoscope had an uncalibrated confidence score was 0.15; a lower value indicates less confidence in the species identification. Upon review of this call file, the Cardno bat biologist determined that the call was likely from a little brown bat.

For independent validation, Cardno coordinated with the endangered resource and bat biologists at the Wisconsin Department of Natural Resources (Lisie Kitchel, Paul White, and Heather Kaarakka WDNR) on manually vetting the findings of possible NLEB calls. The WDNR concluded that there was no definitive evidence of NLEB calls based on the data reviewed. Some of the calls provided to the WDNR did not have enough acoustic information to conclusively indicate presence of NLEB and they were designated as Myotid calls.

Conclusion

Cardno conducted acoustic surveys and potential roost tree surveys for the West Waukesha Bypass on August 12–14, 2015 using SD2 AnaBat™ ultrasonic detectors (Titley Electronics Pty Ltd., NSW, Australia). Potential roost surveys identified 95 potential roost trees within the project area.

Acoustic monitoring recordings were analyzed by three different analysis programs (EchoClass, Kaleidoscope, and BCID), each yielding differing results. Questionable results were manually reviewed by Cardno's bat biologist and independently by bat biologists from WDNR. Based on this analysis, it is our professional opinion that no Federal threatened or endangered bat species likely occur within the project area. However, two State threatened bat species including big brown bat and little brown bat likely occur within the project area, as well as several other species considered as State special concern (hoary bat, red bat, and silver-haired bat).

Attachments

The following attachments are included with this memo report:

- Photos of AnaBat™placement locations
- Maps depicting AnaBat™ placements and PRT locations
- AnaBat™ site datasheets
- PRT data table – complete findings

Literature Cited

Clement, M.J., T.J. Rodhouse, P.C. Ormsbee, J.M. Szewczak, and J.D. Nichols. 2014. Accounting for false-positive acoustic detections of bats using occupancy models. Journal of Applied Ecology 51:1460–1467.

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Photo 1. South view of AnaBat Site A.

Photo 2. South view of AnaBat Site B.

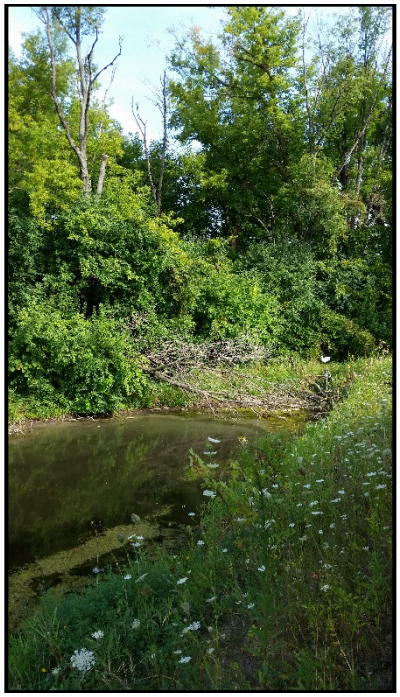


Photo 3. North view of AnaBat Site C.

Photo 4. East view of AnaBat Site D along a City of Waukesha Nature Trail.

Photo 5. Southwest view of AnaBat Site E along an unnamed tributary of Pebble Creek.

Photo 6. East view of AnaBat Site F.

Photo 7. East view of AnaBat Site G.

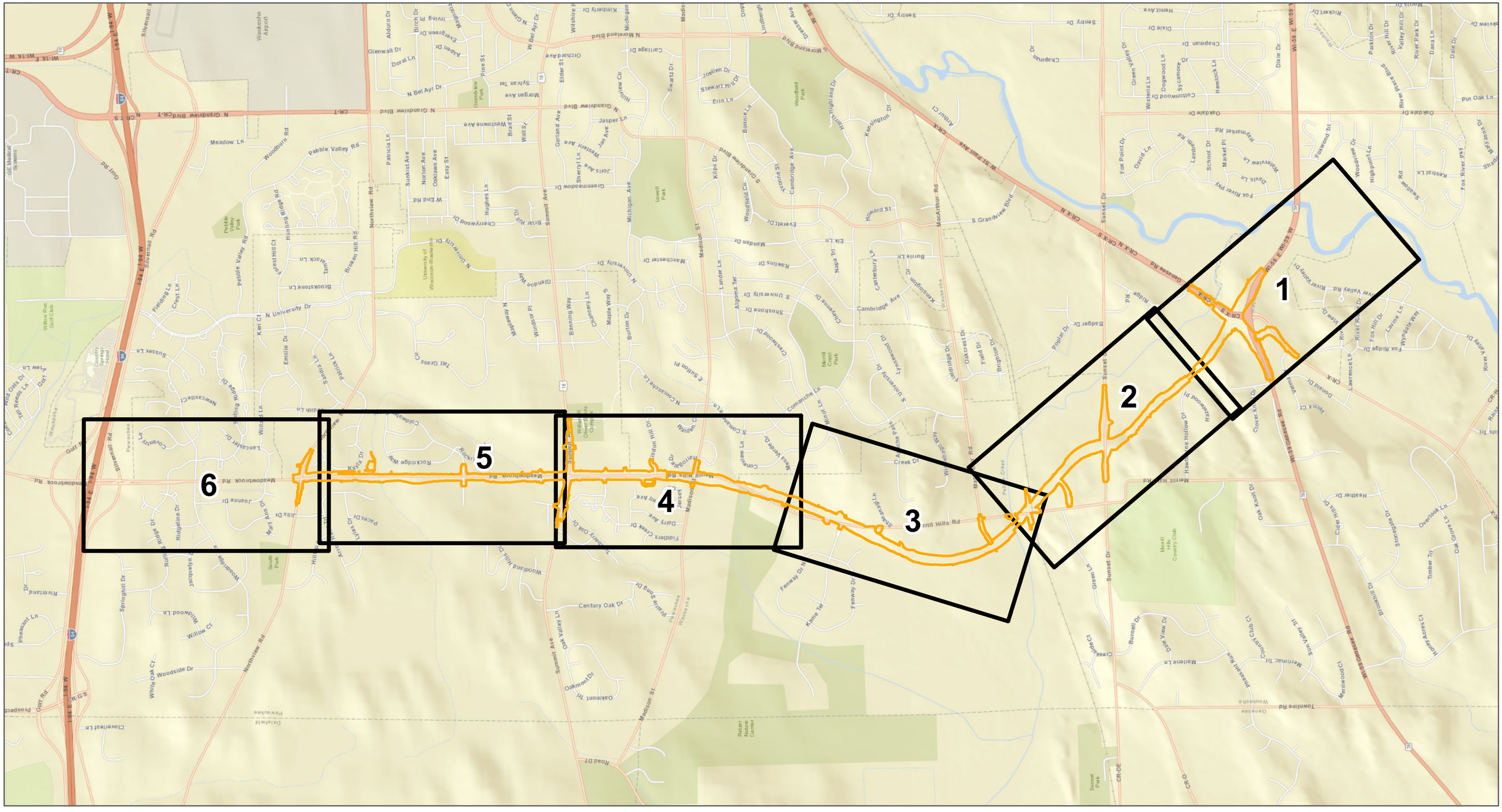
Photo 8. East view of AnaBat Site H along Pebble Creek.

Photo 9. Northeast view of AnaBat Site I.

Photo 10. West view of AnaBat Site L along Pebble Creek.

Photo 11. North view of AnaBat Site K.

Photo 12. North view of AnaBat Site J along Pebble Creek.



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Project No. J130901M35

Potential Roost Trees and AnaBat Sites: Overview

Waukesha Bypass NLEB Surveys
Wisconsin Department of Transportation
Waukesha County, Wisconsin

0 1,000 2,000 3,000 4,000 Feet

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Data Sources:

GIS Analyst: alex.cohen

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Project No. J130901M35

Potential Roost Trees and Anabat Sites: Page 1 of 6

Waukesha Bypass NLEB Surveys
Wisconsin Department of Transportation
Waukesha County, Wisconsin

0 250 500 Feet

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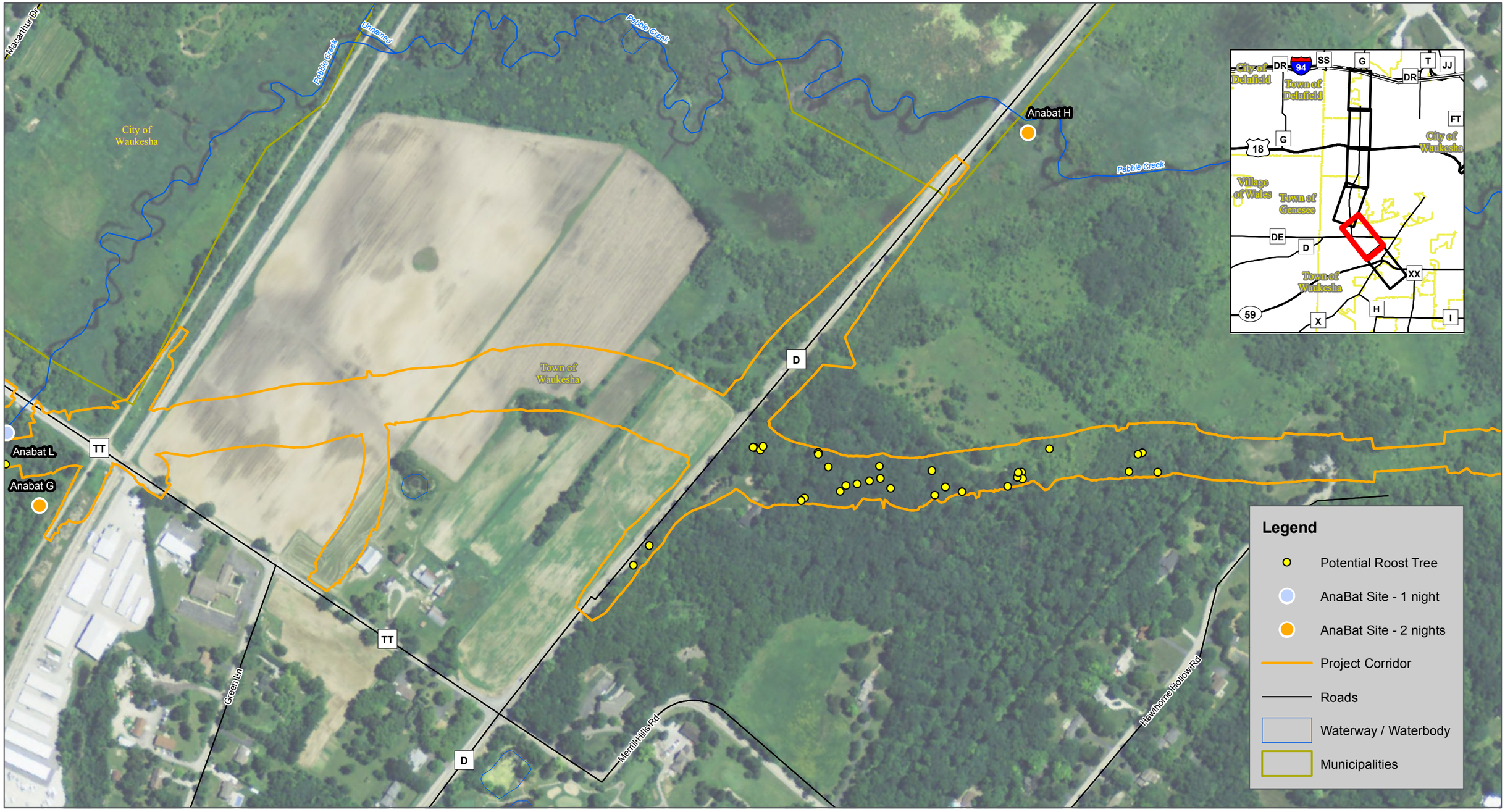
Data Sources:

GIS Analyst: alex.cohen



Project No. J130901M35

Potential Roost Trees and Anabat Sites: Page 2 of 6

Waukesha Bypass NLEB Surveys
Wisconsin Department of Transportation
Waukesha County, Wisconsin

0 250 500 Feet

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Data Sources:

GIS Analyst: alex.cohen

Project No. J130901M35

Potential Roost Trees and Anabat Sites: Page 3 of 6

Waukesha Bypass NLEB Surveys
Wisconsin Department of Transportation
Waukesha County, Wisconsin

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Data Sources:

GIS Analyst: alex.cohen

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Project No. J130901M35

Potential Roost Trees and Anabat Sites: Page 4 of 6

Waukesha Bypass NLEB Surveys
Wisconsin Department of Transportation
Waukesha County, Wisconsin

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Data Sources:

GIS Analyst: alex.cohen

Project No. J130901M35

Potential Roost Trees and Anabat Sites: Page 5 of 6

Waukesha Bypass NLEB Surveys
Wisconsin Department of Transportation
Waukesha County, Wisconsin

0 250 500 Feet

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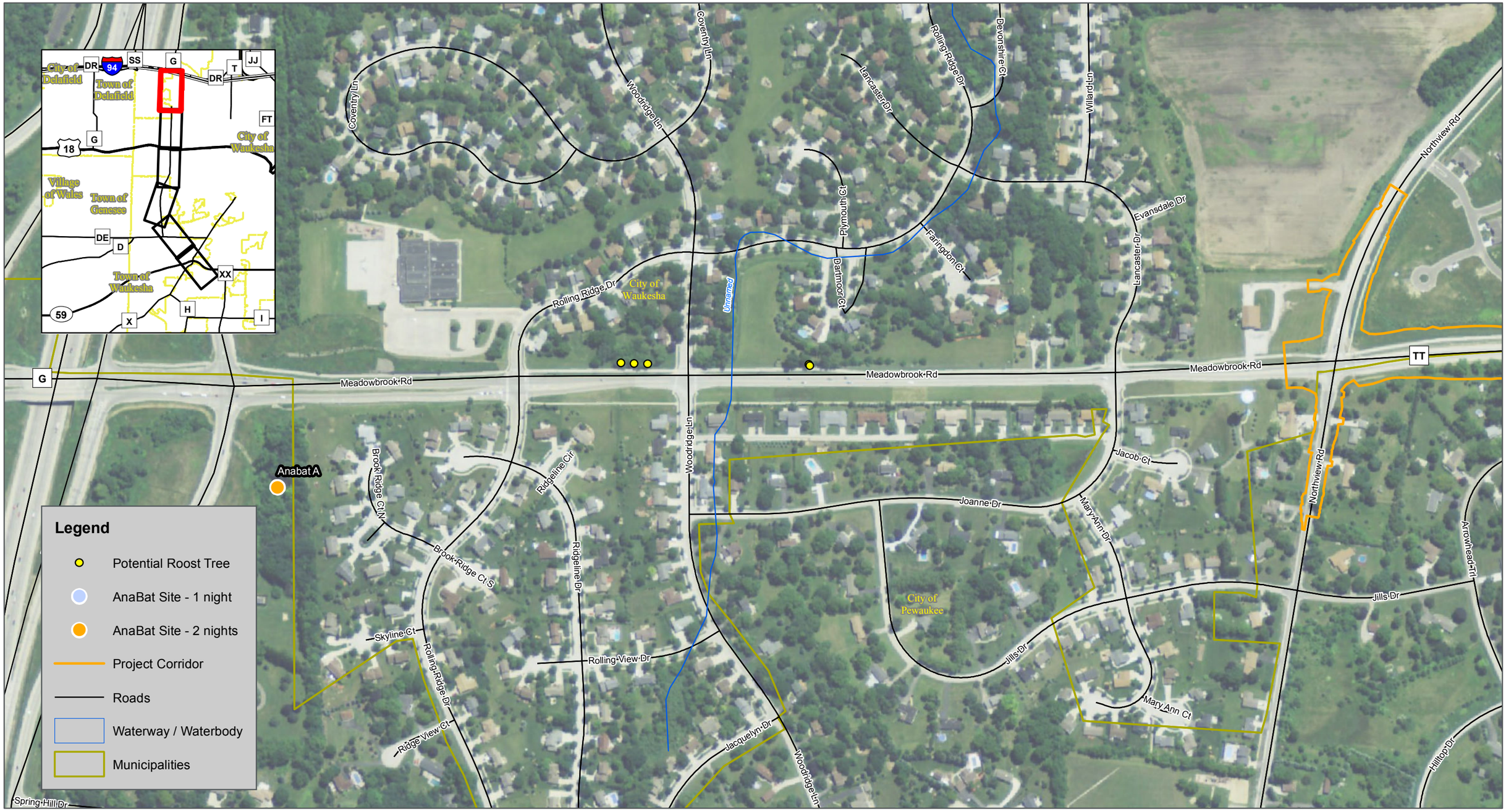
Data Sources:

GIS Analyst: alex.cohen



N E S W

Project No. J130901M35

Potential Roost Trees and Anabat Sites: Page 6 of 6

Waukesha Bypass NLEB Surveys
Wisconsin Department of Transportation
Waukesha County, Wisconsin

0 250 500 Feet

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Data Sources:

GIS Analyst: alex.cohen

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass
Site #: A

Date: 8/13/15
Observer: am

Acoustic Site Information

Location: NAD 27 NAD83 UTM
Zone:_____
~~Easting~~: 43°02'48.68" N LAT
~~Northing~~: 88°17'13.51" W LONG

Detector Type: SD1 (SD2) Other:_____
Serial Number_____
Detector #: A

Placement: (Ground) Raised Raised System: ~~N/A~~ Pulley Fixed

Microphone Height: ~5.0' Microphone Direction: NE
Station: Fixed (Temporary)

Microphone Location Type: (Plastic Bin) Bat Hat Other _____
Sound Reception: (PVC Elbow) Reflector Plate Other _____

Distance to H2O -> 100m

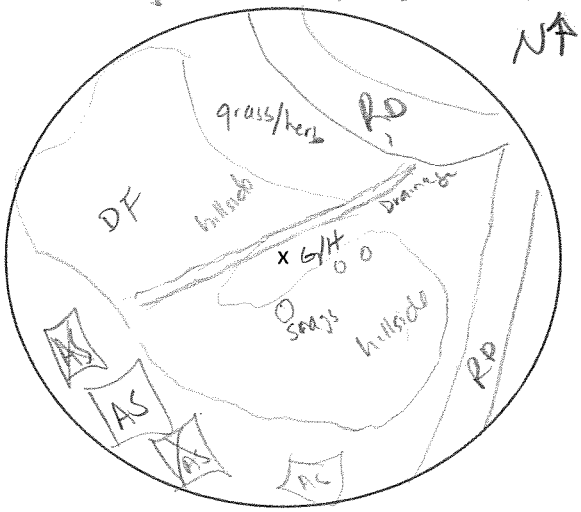
Site Habitat Information

Habitat Primary: DF
Secondary: G/H
Tertiary:_____

Landform (hillslope, terrace, plains): hillside
Local Relief (concave, convex, none):

Comments: Stand of deciduous trees, upland, with ephemeral drainage ditch
A few crops of prime roosting habitat; urban area

Habitat Map
~~50 m Radius~~



Trees: white oak
Boxelder

Shrubs: cornus, boxelder

Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub O- Other

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass Date: 8/13/15
Site #: B Observer: DM

Acoustic Site Information

Location: NAD 27 NAD83 UTM
Zone:_____ ~~Easting:~~ 43° 1'55.36"N ~~Northing:~~ 88° 17'9.66"W

Detector Type: SD1 (SD2) Other:_____
Serial Number_____
Detector #: B

Placement: (Ground) Raised Raised System: (N/A) Pulley Fixed

Microphone Height: ~5 0ft Microphone Direction: N
Station: Fixed (Temporary)

Microphone Location Type: (Plastic Bin) Bat Hat Other _____
Sound Reception: (PVC Elbow) Reflector Plate Other _____

Ag - ca. 450' from Arrest

Site Habitat Information

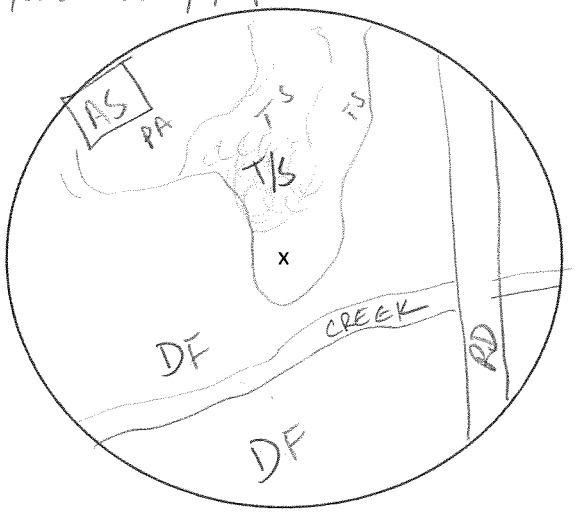
Habitat Primary: DF
Secondary: G/H
Tertiary:_____

Landform (hillslope, terrace, plains): Plain
Local Relief (concave, convex, none): None

Comments: Arrest located in semi-open area surrounded by deciduous forest. House w/ grassy backyard closeby; Ephemeral creek nearby (w/in 100ft), few large mass nearby. Site is urban/rural mix

NA

Habitat Map
~~50 m Radius~~



Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub O- Other H = herbaceous

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass Date: 8/13/15
Site #: C Observer: Om

Acoustic Site Information

Location: NAD 27 NAD83 UTM
Zone:_____ ~~Easting:~~ 43°01'19.30 N ~~Northing:~~ 88°17'11.52" W

Detector Type: SD1 (SD2) Other:_____
Serial Number_____
Detector #: C

Placement: (Ground) Raised Raised System: (N/A) Pulley Fixed

Microphone Height: ca. 5.0 ft Microphone Direction: SW
Station: Fixed (Temporary)

Microphone Location Type: (Plastic Bin) Bat Hat Other _____
Sound Reception: (PVC Elbow) Reflector Plate Other _____

Site Habitat Information

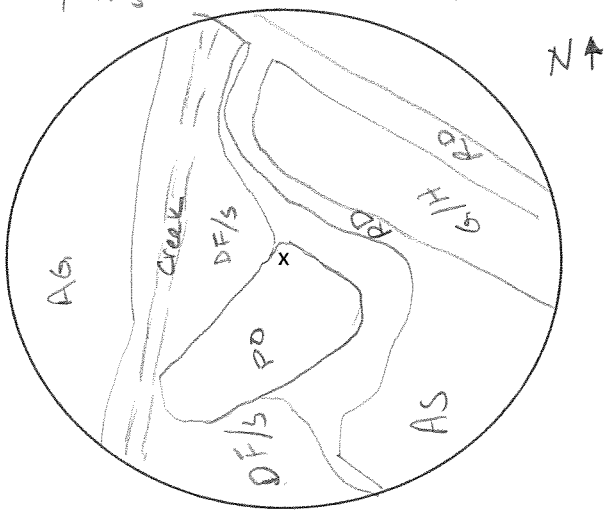
Habitat
Primary: W
Secondary: RF
Tertiary: AS

Ag- ca. 115 ft
H_2O - 0 ft, ca. 50 ft to perennial creek

Landform (hillslope, terrace, plains): plain
Local Relief (concave, convex, none): concave

Comments: Adjacent to detention pond (likely man-made) with perennial creek nearby (50ft) w/in Deciduous forest, many snags of which several suitable roosts

Habitat Map
~~50 m Radius~~



Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub O- Other

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass   Date: 8/13/15
Site #: D   Observer: ONR

Acoustic Site Information

Location: NAD 27   NAD83   UTM
Zone:______   ~~Easting~~: 43°00'58.34" N   ~~Northing:~~ 88°17'07.65" W

Detector Type: SD1   (SD2 circled)   Other:______
Serial Number______
Detector #:______

Placement: (Ground circled)   Raised   Raised System: (N/A circled)   Pulley   Fixed

Microphone Height: ca. 5 ft   Microphone Direction: NW
Station: Fixed   (Temporary circled)

Microphone Location Type: (Plastic Bin circled)   Bat Hat   Other ______
Sound Reception: (PVC Elbow circled)   Reflector Plate   Other ______

Site Habitat Information

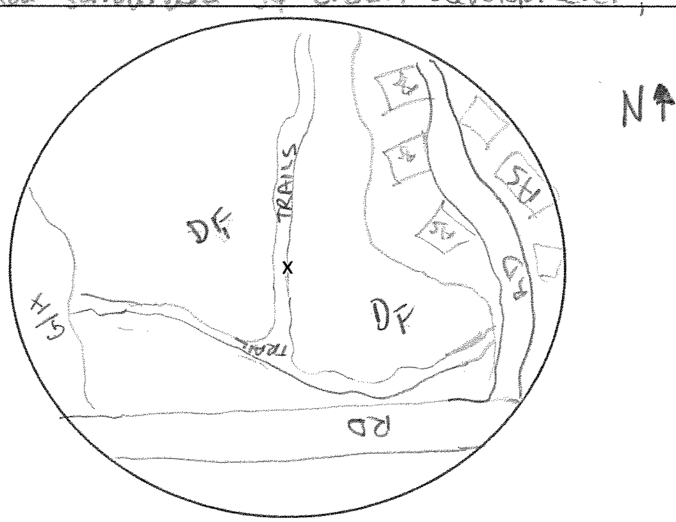
Ag - ca. 2,000 ft
Pond/lake - ca 1,300 ft
open area - 115 ft

Habitat   Primary: DF
Secondary: AS
Tertiary: G/H

Landform (hillslope, terrace, plains): plains
Local Relief (concave, convex, none): None

Comments: Urban trails; mature (mostly) hickory/oak forest; Anabat adjacent to trail; general area surrounded by urban development; A few snags/declining trees (white oak 1°)

Habitat Map
~~50 m Radius~~



Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub   O- Other

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass Date: 8/13/15
Site #: E Observer: ow

Acoustic Site Information

Location: NAD 27 NAD83 UTM
Zone: _____ ~~Easting~~: 43° 00' 37.49" N ~~Northing~~: 88° 17' 14.14" W

Detector Type: SD1 (SD2) Other: _____
Serial Number _____
Detector #: E

Placement: (Ground) Raised Raised System: (N/A) Pulley Fixed

Microphone Height: ca 5 ft Microphone Direction: NW
Station: Fixed (Temporary)

Microphone Location Type: (Plastic Bin) Bat Hat Other _____
Sound Reception: (PVC Elbow) Reflector Plate Other _____

Ag - ca 800 ft
creek - 0 ft (perennial)
open - 0 ft

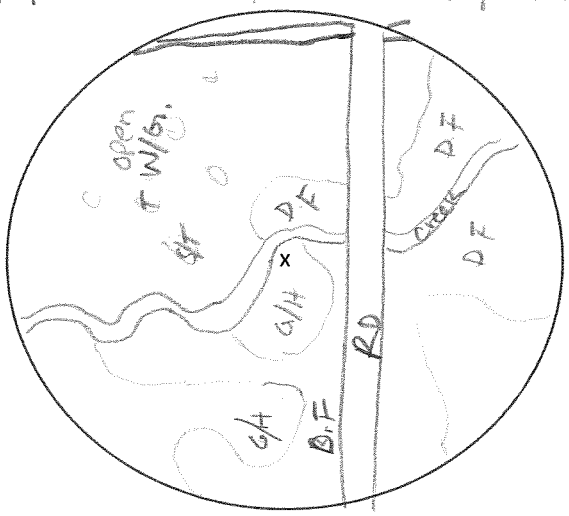
Site Habitat Information

Habitat Primary: G/H (Rip.)
Secondary: DF (Rip)
Tertiary: _____

Landform (hillslope, terrace, plains): plains
Local Relief (concave, convex, none): None

Comments: Area at in open area surrounded by patches of Deciduous/Riparian forest, Area part of Nature Preserve; open area mostly reed canary grass and other herb. plants.

Habitat Map
~~50-m Radius~~



Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub O- Other

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass　　　　　　　　　　Date: 8/14/15
Site #: F　(Extra site - 1 night only)　　　　　　　Observer: cwr

Acoustic Site Information

Location: NAD 27　NAD83　UTM
Zone: ______　~~Easting:~~ 42°59'38.75" N　~~Northing:~~ 88°17'30.82" W

Detector Type: SD1　(SD2 circled)　Other: ______
Serial Number ______
Detector #: F

Placement: (Ground circled)　Raised　Raised System: (N/A circled)　Pulley　Fixed

Microphone Height: ca. 5 ft　Microphone Direction: E
Station: Fixed　(Temporary circled)

Microphone Location Type: (Plastic Bin circled)　Bat Hat　Other ______
Sound Reception: (PVC Elbow circled)　Reflector Plate　Other ______

Site Habitat Information

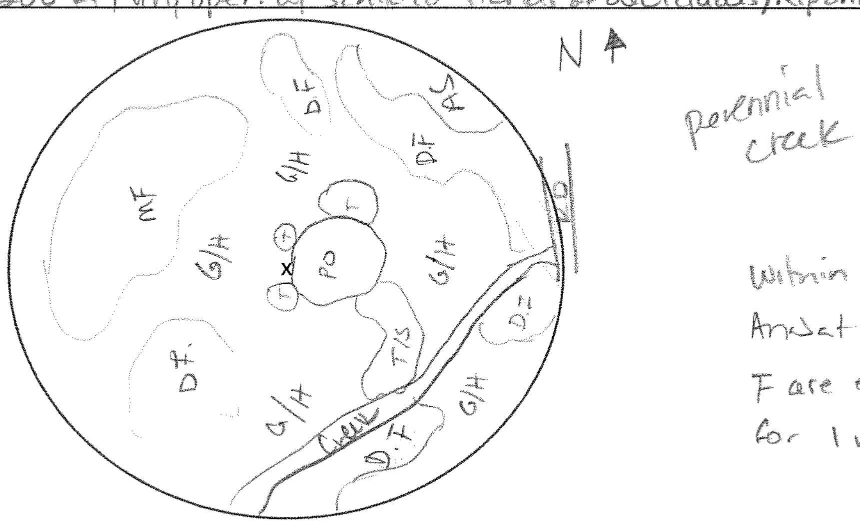
Ag - ca. 600 ft
H2O - 0 ft
Open area - 0 ft

Habitat　Primary: PO
Secondary: G/H
Tertiary: Mixed Forest

Landform (hillslope, terrace, plains): plains
Local Relief (concave, convex, none): none

Comments: Anabat in landscaper's nursery/yard; Adjacent to pond in open grassy fields, creek nearby. A few snags w/in 200 ft, very open w/ scattered stands of deciduous/Riparian forest or mixed forest

Habitat Map
~~50 m Radius~~



Within 650 ft of 2 other Anabat sites (L & G) but L and F are extra units and only out for 1 night due to landowner permission

Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub　O- Other

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass Date: 8/13/15
Site #: G Observer: DM

Acoustic Site Information

Location: NAD 27 NAD83 UTM
Zone:_____ ~~Easting~~: 42°59'36.08" N ~~Northing~~: 88°17'26.31" W

Detector Type: SD1 (SD2) Other:_____
Serial Number_____
Detector #: G

Placement: (Ground) Raised Raised System: (N/A) Pulley Fixed

Microphone Height: ca. 5 ft Microphone Direction: E
Station: Fixed (Temporary)

Microphone Location Type: (Plastic Bin) Bat Hat Other _____
Sound Reception: (PVC Elbow) Reflector Plate Other _____

Creek - ca. 150 ft
Ag - 410 ft

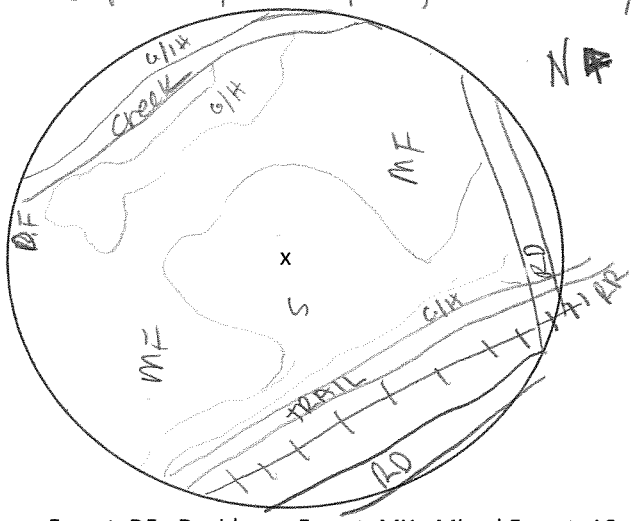
Site Habitat Information

Habitat Primary: S
Secondary: MF
Tertiary: AS

Landform (hillslope, terrace, plains): plains
Local Relief (concave, convex, none): none

Comments: Arcbat in shrubby area surrounded partially by mixed forest and on (S) side, Glacial Drumlin Trail, RR tracks & Development; semi-open; creek nearby (perennial)

Habitat Map
~~50 m Radius~~



Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub O- Other

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass Date: 6/13/15
Site #: H Observer: am

Acoustic Site Information

Location: NAD 27 NAD83 UTM
Zone:_____ Easting: 42°59'17.63"N Northing: 88°16'42.36"W

Detector Type: SD1 SD2 Other:_____
Serial Number_____
Detector #: H

Placement: Ground Raised Raised System: N/A Pulley Fixed

Microphone Height: ca. 5 ft Microphone Direction: E towards H_2O
Station: Fixed Temporary

Microphone Location Type: Plastic Bin Bat Hat Other _____
Sound Reception: PVC Elbow Reflector Plate Other _____

Site Habitat Information

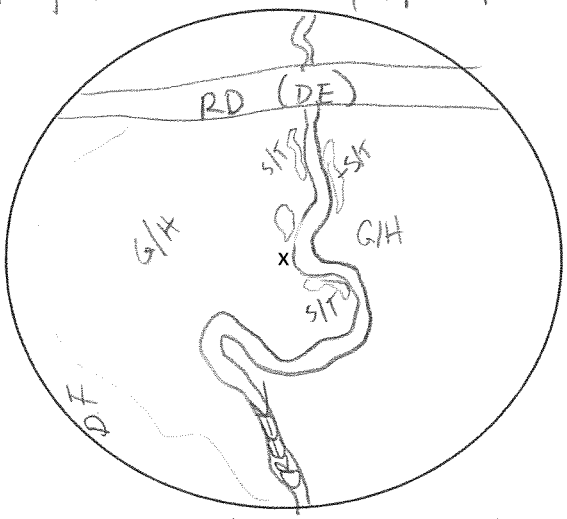
Ag - ca. 1,200 ft
open - 0 ft
H_2O - 0 ft

Habitat Primary: G/H
Secondary: DF
Tertiary: S

Landform (hillslope, terrace, plains): plains (floodplain)
Local Relief (concave, convex, none): None

Comments: Grassy/herbaceous riparian area with pockets of Dogwood shrubs and small trees (dead & alive), adjacent to creek, very open, mostly undeveloped surrounding the area
perennial creek
large snags in distance

Habitat Map
~~50 m Radius~~



Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub O- Other

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass Date: 8/13/15
Site #: I Observer: GM

Acoustic Site Information

Location: NAD 27 NAD83 UTM
Zone:_____ ~~Easting~~: 42° 58' 49.51" N ~~Northing~~: 88° 16' 33.52" W

Detector Type: SD1 (SD2) Other:_____
Serial Number_____
Detector #: I

Placement: (Ground) Raised Raised System: (N/A) Pulley Fixed

Microphone Height: ca. 5 ft Microphone Direction: NW
Station: Fixed (Temporary)

Microphone Location Type: (Plastic Bin) Bat Hat Other _____
Sound Reception: (PVC Elbow) Reflector Plate Other _____

Ag - ca. 3,900 ft
H_2O (perennial creek) - 930 ft
Open - 0 ft
cattail wetland - 120 ft

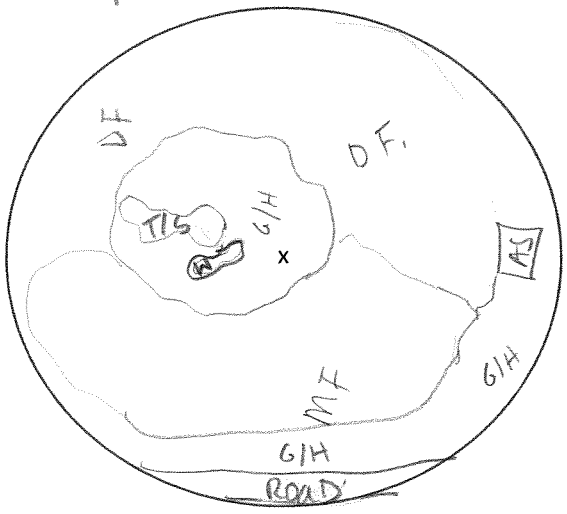
Site Habitat Information

Habitat
Primary: G/H
Secondary: MF
Tertiary: W

Landform (hillslope, terrace, plains):
Local Relief (concave, convex, none):

Comments: Arrayed in small grassy/herbaceous clearing with small cattail wetland, a stand of willow trees/shrubs surrounded by forest (both mixed and deciduous)

Habitat Map
~~50 m Radius~~



Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub O- Other

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass
Site #: J

Date: 8/13/15
Observer: DM

Acoustic Site Information

Location: NAD 27 NAD83 UTM
Zone: _____ ~~Easting~~: 42°58'55.07" N ~~Northing~~: 88°16'23.30" W

Detector Type: SD1 (SD2) Other: _____
Serial Number _____
Detector #: J

Placement: (Ground) Raised Raised System: (N/A) Pulley Fixed

Microphone Height: ca. 5 ft Microphone Direction: N
Station: Fixed (Temporary)

Microphone Location Type: (Plastic Bin) Bat Hat Other _____
Sound Reception: (PVC Elbow) Reflector Plate Other _____

Bridge - 70 ft
Creek - 0 ft
open area - 0 ft
Ag - 3,800 ft

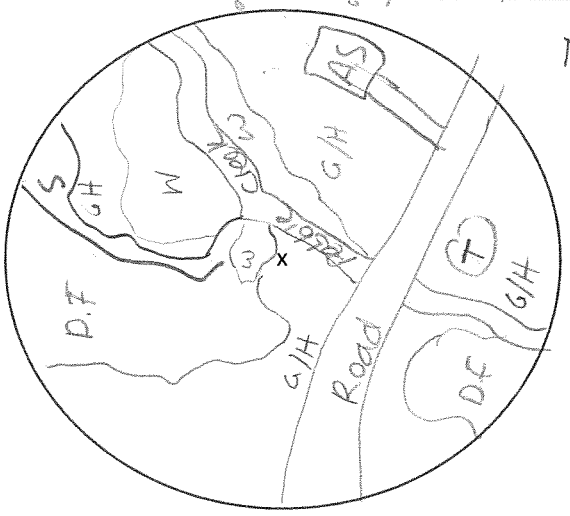
Site Habitat Information

Habitat Primary: G/H
Secondary: W
Tertiary: _____

Landform (hillslope, terrace, plains): plains (floodplain)
Local Relief (concave, convex, none): None

Comments: Area at adjacent to Perennial creek in dense grass/herb. veg and on edge of cattail wetland area. Near large bridge/Road. Few snags within 300 feet

Habitat Map
~~50 m Radius~~



Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub O- Other

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass Date: 8/13/15
Site #: K Observer: DM

Acoustic Site Information

Location: NAD 27 NAD83 UTM
Zone: _____ ~~Easting~~: 43°00'19.25"N ~~Northing~~: 88°17'24.69" W

Detector Type: SD1 (SD2) Other: _____
Serial Number _____
Detector #: K

Placement: (Ground) Raised Raised System: (N/A) Pulley Fixed

Microphone Height: ca. 5 feet Microphone Direction: S
Station: Fixed (Temporary)

Microphone Location Type: (Plastic Bin) Bat Hat Other _____
Sound Reception: (PVC Elbow) Reflector Plate Other _____

Ag - ca 420 ft
Creek - 1,850 ft ca

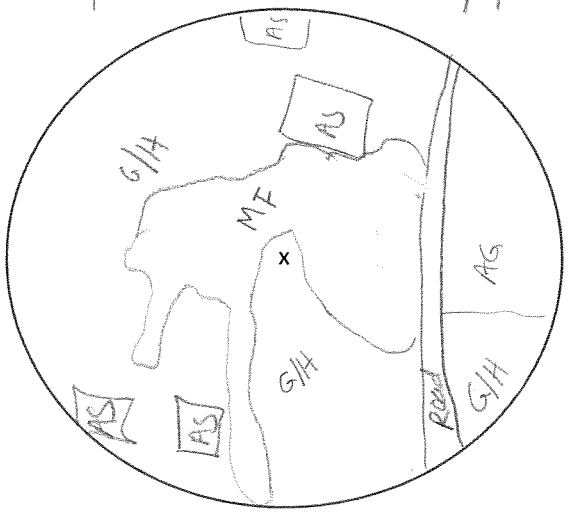
Site Habitat Information

Habitat
Primary: H/G
Secondary: MF
Tertiary: AS

Landform (hillslope, terrace, plains): plains
Local Relief (concave, convex, none): none

Comments: Semi-open area adjacent to small wood lot; urban/ag surround small wood lot; open area is grass and herbaceous veg primarily with some small shrubs

Habitat Map
~~50 m Radius~~



Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub O- Other

ACOUSTIC MONITORING FORM

Project Name: Waukesha Bypass
Site #: L (1 night)

Date: 8/14/15
Observer: am

Acoustic Site Information

Location: NAD 27 NAD83 UTM
Zone: _____
~~Easting:~~ 42° 59' 38.61" N Northing: 88° 17' 24.67" W

Detector Type: SD1 (SD2) Other: _____
Serial Number _____
Detector #: L

Placement: (Ground) Raised Raised System: (N/A) Pulley Fixed

Microphone Height: ca. 5 ft Microphone Direction: SW
Station: Fixed (Temporary)

Microphone Location Type: (Plastic Bin) Bat Hat Other _____
Sound Reception: (PVC Elbow) Reflector Plate Other _____

Ag - ca 230 ft
open - 0 ft
creek - 0 ft
pond - 350 ft

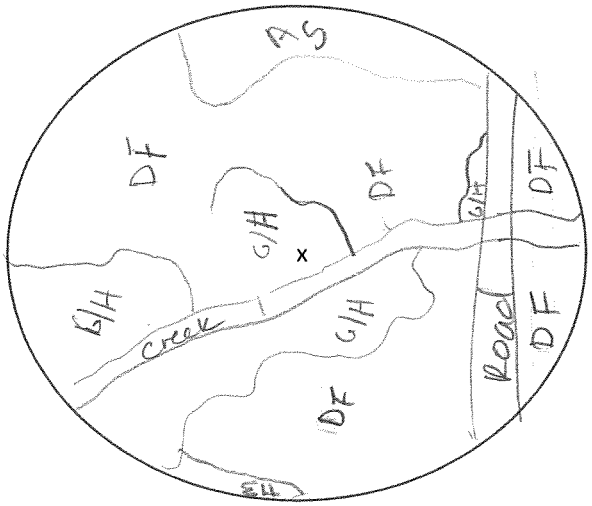
Site Habitat Information

Habitat Primary: G/H
Secondary: DF
Tertiary: AS

Landform (hillslope, terrace, plains): plains
Local Relief (concave, convex, none): none

Comments: Arrset in grassy/herbaceous habitat surrounded by deciduous forest, adjacent to perennial creek, a few snags w/in 200 ft

Habitat Map
~~50-m Radius~~



N A

Within 650 ft of Arrsets F & G but this was extra and put out for only 1 night due to landowner permissions

Habitat Types: CF - Coniferous Forest, DF - Deciduous Forest, MX - Mixed Forest, AS - Anthropogenic Structure
MN - Mine, CV - Cave, PO - Pond, W - Wetland, R - Riparian, G -grassland, PA - Pasture, AG - Agriculture
S - Shrub O- Other

DATE	COLLECTER	ID	PROP_OWNER	SPECIES	DBH	TREEHEIGHT	HABITAT	DIST_WATER	DNONFOREST	CONDITION	CANOPY_POS	DECAYSTATE	BARK_COVER	USABLEBARK	BARK_DESCR	ROOST_TYPE	CANOPY_COV	ROO_HEIGHT	ROO_ASPECT	NOTES1
8/12/2015	JL	rt1	Private	honey locust	8	56.8	Edge	395	0	Live-Damaged	Co-Dominant	2	98	1	Tight	Cavity	Open	20	n, ne	
8/12/2015	JL	rt2	Private	honey locust	21.2	63	Edge	350	0	Live-Damaged	Co-Dominant	2	98	3	Sloughing	Bark	Open	13	e	
8/12/2015	JL	rt3	Private	honey locust	14.4	45	Edge	300	0	Live-Damaged	Co-Dominant	2	98	3	Sloughing	Bark	Open	17	e	
8/12/2015	JL	rt4	Private	weeping willov	24.8	40	Edge	275	0	Live-Damaged	Co-Dominant	2	100	5	Tight	Bark	Open	16	e	
8/12/2015	JL	rt5	Private	bigtooth aspen	17.1	50	Edge	275	0	Live-Damaged	Dominant	2	99	1	Tight	Bark	Open	18	e	
8/12/2015	JL	rt6	Private	unknown	5.5	45	Edge	45	0	Snag	Suppressed	6	5	5	Sloughing	Bark	Intermediate	10-40	w	
8/12/2015	JL	rt7	Private	unknown	9.8	45	Edge	40	0	Snag	Co-Dominant	6	15	5	Sloughing	Bark	Open	30	e	
8/12/2015	JL	rt8	Private	unknown	11	45	Edge	30	25	Snag	Co-Dominant	6	70	15	Sloughing	Bark	Open	20-45	n, s, e, w	
8/12/2015	JL	rt9	Private	unknown	3	30	Interior	60	65	Snag		6	60	30	Sloughing	Bark	Closed	10-25	all	
8/12/2015	JL	rt10-20	Private	red pine	8	25	Interior	90	60	Snag	Suppressed	6	40	30	Sloughing	Bark	Closed	15-25	all	10 trees with 7-9dbh and 20-30 height
8/12/2015	JL	rt21	Private	black walnut	33	75	Interior	25	50	Live-Damaged	Dominant	2	98	2	Tight	Crevice	Closed	17	e	crevice where branch cracked and bark split
8/12/2015	JL	rt22	Private	black walnut	15.5	89	Interior	60	55	Live-Damaged	Dominant	2	85	5	Tight	Bark	Intermediate	25-80	e	bark flaking off also a large crack in bark
8/12/2015	JL	rt23	Private	black cherry	9.5	60	Interior	125	85	Live-Damaged	Co-Dominant	2	80	15	Platy		Intermediate	10-60	all	
8/12/2015	JL	rt24	Private	silver maple	9.5 - 9 trunks	61	Edge	190	30	Live	Dominant	1	100	2	Tight	Bark	Closed	10-50	all	
8/12/2015	JL	rt25	Private	silver maple	9.5 - 12 stems	61	Edge	240	0	Live	Dominant	1	100	2	Tight	Bark	Closed	15-25	all	
8/12/2015	JL	rt26	Private	silver maple	9.5 - 7 stems	61	Edge	260	0	Live	Dominant	1	100	2	Tight	Bark	Closed	15-60	all	
8/12/2015	JL	rt27	Private	boxelder	12	52	Interior	190	30	Live-Damaged	Co-Dominant	2	98	1	Tight	Cavity	Closed	10	w	
8/12/2015	JL	rt28	Private	oak?	21	65	Edge	300	0	Snag	Dominant	4	10	10	Sloughing	Crevice	Intermediate	10-50	all	
8/12/2015	JL	rt29	Private	mulberry			Interior	375	30	Live-Damaged	Co-Dominant	2	90	5	Tight	Crevice	Closed	10-50	w	
8/12/2015	JL	rt30	Private	silver maple	31	50	Edge	435	0	Live	Dominant	1	100	15	Tight	Bark	Closed	15-50	all	
8/12/2015	JL	rt31	Private	silver maple	24	50	Edge	455	0	Live-Damaged	Co-Dominant	2	95	25	Tight	Bark	Closed	20-50	all	
8/12/2015	JL	rt32	Private	American elm	22	60	Edge	805	0	Live-Damaged	Dominant	2	98	3	Tight	Bark	Intermediate	30	all	curly bark
8/12/2015	JL	rt33	Private	boxelder	22	50	Interior	905	25	Live-Damaged	Co-Dominant	2	80	10	Tight	Bark	Intermediate	10-40	all	sloughing bark in spots
8/12/2015	JL	rt34	State	boxelder	10	33	Interior	905	25	Snag	Suppressed	6	5	3	Sloughing	Cavity	Closed	30-50	e	
8/12/2015	JL	rt35	Private	unknown	26	40	Edge	590	0	Snag	Dominant	3	80	40	Sloughing	Bark	Open	20-40	all	
8/12/2015	JL	rt36	Private	black cherry	22	60	Edge	200	0	Live-Damaged	Dominant	2	90	5	Platy	Bark	Open	10-50	e	
8/12/2015	JL	rt37	Private	black cherry	17	50	Edge	115	0	Live-Damaged	Co-Dominant	2	99	1	Platy	Bark	Open	30-60	e	
8/12/2015	JL	rt38	Private	red pine	8	55	Interior	125	55	Snag	Co-Dominant	4	30	5	Sloughing	Cavity	Intermediate	50-60	all	holes throughout tree
8/12/2015	JL	rt39	Private	black cherry	15	75	Interior	90	15	Live-Damaged	Co-Dominant	2	90	10	Platy	Bark	Closed	30-50	all	flaky bark
8/12/2015	JL	rt40	Private	black cherry	12	65	Interior	90	10	Snag	Co-Dominant	3	95	5	Platy	Bark	Closed		all	
8/12/2015	JL	rt41	Private	black cherry	13	65	Edge	40	0	Snag	Co-Dominant	3	85	15	Platy	Bark	Closed	30	all	dead flaky bark
8/12/2015	JL	Waterway																10-70		10' wide
8/12/2015	JL	rt42	Private	green ash	15	50	Interior	210	20	Snag	Dominant	3	90	5	Platy	Bark	Closed	5-65	all	dead flaky bark
8/12/2015	JL	rt43	State	green ash	11	77	Interior	710	50	Live	Co-Dominant	1	100	3	Tight	Bark	Closed	10-50	all	bark is shaggy in some areas
8/12/2015	JL	rt44	Private	white oak	33		Edge	935	0	Live-Damaged	Dominant	2	99	10	Tight	Crevice	Closed	15-40	all	crevices where thick pieces of bark are separating
8/12/2015	JL	rt45	Private	unknown	14	60	Interior	980	30	Snag	Co-Dominant	3	50	15	Sloughing	Bark	Closed	3-25	all	dead flaky bark
8/12/2015	JL	rt46	Private	red oak	33	70	Edge	1100	35	Live-Damaged	Dominant	2	97	3	Tight	Crevice	Closed	3-30	e	crevices where branches have split off
8/12/2015	JL	rt47	Private	shagbark hicko	22	60	Open	1200	0	Live	Dominant	1	100	60	Tight	Bark	Open	20	all	shaggy bark
8/12/2015	JL	rt48	Private	shagbark hicko	22	60	Open	1070	0	Live	Dominant	1	100	50	Tight	Bark	Open	3-70	all	shaggy bark
8/12/2015	JL	rt49	Private	white oak	29	55	Open	1045	0	Live	Dominant	1	99	3	Tight	Crevice	Open	3-25	e	crack in trunk
8/12/2015	JL	rt50	Private	shagbark hicko	26	80	Interior	950	45	Live	Dominant	1	100	75	Tight	Bark	Closed	15	all	shaggy bark
8/12/2015	JL	rt51	Private	shagbark hicko	23	50	Edge	710	0	Live	Co-Dominant	1	100	20	Tight	Bark	Closed	20	s	shaggy bark
8/12/2015	JL	rt52	Private	boxelder	9	20	Edge	645	0	Snag	Suppressed	3	65	5	Sloughing	Cavity	Intermediate	10-50	n	
8/12/2015	JL	rt53	Private	unknown	25	40	Open	660	0	Snag	Dominant	3	90	5	Tight	Bark	Open	5-50	all	
8/13/2015	JL	rt54	Private	shagbark hicko	15	75	Interior	1075	230	Live	Co-Dominant	1	100	5	Tight	Bark	Closed	5-40	all	curls in shaggy bark
8/13/2015	JL	rt55	Private	red oak	40	60	Interior	980	150	Live-Damaged	Co-Dominant	2	95	5	Tight	Crevice	Closed	5-25	all	some cavities and crevices in bark and wood
8/13/2015	JL	rt56	Private	black cherry	5	55	Interior	995	130	Live	Suppressed	1	100	50	Platy	Bark	Closed	10-20	all	
8/13/2015	JL	rt57	Private	black cherry	4.5	40	Interior	1055	135	Live	Suppressed	1	100	25	Platy	Bark	Closed	5-50	all	
8/13/2015	JL	rt58	Private	quaking aspen	6	25	Edge	975	0	Snag	Co-Dominant	4	85	5	Tight	Bark	Intermediate	5-20	all	
8/13/2015	JL	rt59	Private	shagbark hicko	15	65	Interior	1080	60	Live-Damaged	Co-Dominant	2	95	65	Tight	Bark	Closed	5-35	all	shaggy bark
8/13/2015	JL	rt60	Private	shagbark hicko	4	40	Interior	1065	30	Live	Suppressed	1	100	5	Tight	Bark	Closed	5-40	all	some shaggy bark
8/13/2015	JL	rt61	Private	shagbark hicko	6	55	Interior	1085	65	Live	Co-Dominant	1	100	10	Tight	Bark	Closed	10-20	all	shaggy bark
8/13/2015	JL	rt62	Private	shagbark hicko	10	60	Interior	1085	50	Live	Co-Dominant	1	100	10	Tight	Bark	Closed	5-45	all	
8/13/2015	JL	rt63	Private	black cherry	21	35	Interior	1075	45	Live-Damaged	Suppressed	2	95	7	Tight	Crevice	Closed	20-30	n	
8/13/2015	JL	rt64	Private	shagbark hicko	11	60	Interior	1130	60	Live	Co-Dominant	1	100	10	Tight		Closed	5-45	all	3 trunks with all same attributes
8/13/2015	JL	rt65	Private	white oak	28	85	Interior	1185	100	Live	Dominant	1	99	1	Tight	Bark	Closed	25	ne	some curls in bark
8/13/2015	JL	rt66	Private	shagbark hicko	7	60	Interior	1180	110	Live	Co-Dominant	1	100	15	Tight	Bark	Closed	10-40	all	shaggy bark
8/13/2015	JL	rt67	Private	red oak	38.5	85	Interior	1230	160	Live	Dominant	1	100	15	Tight	Cavity	Closed	5-30	nw	multiple large cavities
8/13/2015	JL	rt68	Private	bigtooth aspen	12	55	Interior	1270	245	Snag	Co-Dominant	4	65	10	Sloughing	Bark	Closed	5-25	all	
8/13/2015	JL	rt69	Private	shagbark hicko	8	60	Interior	1260	255	Live	Co-Dominant	1	100	10	Tight	Bark	Closed	10-50	all	shaggy bark
8/13/2015	JL	rt70	Private	shagbark hicko	6.5	50	Interior	1290	290	Live	Co-Dominant	1	100	5	Tight	Bark	Closed	25	n	shaggy bark
8/13/2015	JL	rt71	Private	white oak	41	60	Interior	1310	320	Live-Damaged	Co-Dominant	2	95	7	Tight	Bark	Closed	5-50	all	lots of flaky bark and crevices
8/13/2015	JL	rt72	Private	red oak	36	90	Interior	1330	295	Live-Damaged	Dominant	1	95	2	Tight	Cavity	Closed	25	nw	cavities in broken off branches
8/13/2015	JL	rt73	Private	shagbark hicko	21	75	Interior	1320	265	Live	Co-Dominant	1	100	30	Tight		Closed	35-50	all	shaggy bark
8/13/2015	JL	rt74	Private	red oak	42	75	Interior	1250	235	Live-Damaged	Dominant	2	75	10	Tight	Cavity	Closed	10-25	all	cavity on south, crevices in bark all around
8/13/2015	JL	rt75	Private	white oak	27	85	Interior	1330	150	Live	Co-Dominant	1	97	7	Tight	Bark	Closed	10-25	all	large curls in some bark
8/13/2015	JL	rt76	Private	shagbark hicko	13	60	Interior	1335	135	Live	Co-Dominant	1	100	5	Tight		Closed	10-25	all	
8/13/2015	JL	rt77	Private	shagbark hicko	6	45	Interior	1110	75	Live	Co-Dominant	1	100	15	Tight	Bark	Intermediate	5-35	all	
8/13/2015	JL	rt78	Private	shagbark hicko	7	40	Interior	1110	75	Live	Co-Dominant	1	100	10	Tight	Bark	Intermediate	15-25	all	
8/13/2015	JL	rt79	Private	shagbark hicko	8	55	Interior	1130	95	Live	Co-Dominant	1	100	30	Tight	Bark	Intermediate	10-30	all	
8/13/2015	JL	rt80	Private	shagbark hicko	8	55	Interior	1110	100	Live	Co-Dominant	1	100	10	Tight	Bark	Intermediate	15-30	all	
8/13/2015	JL	rt81	Private	shagbark hicko	9	60	Interior	1195	235	Live	Co-Dominant	1	100	15	Tight	Bark	Intermediate	5-40	all	
8/13/2015	JL	rt82	Private	shagbark hicko	8	60	Interior	1195	235	Live	Co-Dominant	1	100	15	Tight	Bark	Intermediate	20	all	
8/13/2015	JL	rt83	Private	shagbark hicko	9	60	Interior	1205	215	Live	Co-Dominant	1	100	25	Tight	Bark	Closed	15	all	
8/13/2015	JL	rt84	Private	red oak	34	65	Interior	1120	100	Live-Damaged	Co-Dominant	2	90	5	Tight	Crevice	Closed	20	south	
8/13/2015	JL	rt85	Private	unknown	12	30	Open	435	0	Snag	Dominant	4	20	3	Sloughing	Cavity	Open	20	n	

8/13/2015	JL	rt86	Private	American elm?	13	35	Edge	820	0	Snag	Co-Dominant	3	90	3	Tight	Bark	Closed	20	n	dead flaky bark
8/13/2015	JL	rt87	Private	green ash	13	40	Edge	785	0	Snag	Co-Dominant	3	95	3	Tight	Bark	Closed	30	n	dead flaky bark
8/13/2015	JL	rt88	Private	silver maple	4 stems 20-40''	50	Open	30	0	Live	Dominant	1	100	10	Tight	Bark	Open	5-30	all	
8/13/2015	JL	rt89	Private	unknown	17	30	Open	10	30	Snag	Dominant	3	90	1	Tight	Cavity	Open	20	s	
8/13/2015	JL	rt90	Private	silver maple	28	60	Edge	20	20	Live	Dominant	1	100	10	Tight	Bark	Closed	10-55	all	
8/13/2015	JL	rt91	Private	silver maple	4 trunks 10-20''	65	Edge	20	0	Live	Dominant	1	100	3	Tight	Bark	Closed	10-55	n	
8/13/2015	JL	rt92	Private	silver maple	35	75	Edge	15	0	Live	Dominant	1	100	30	Tight	Bark	Closed	20	all	
8/13/2015	JL	rt93	Private	silver maple	multiple stems 10-25''	70	Edge	65	20	Live	Dominant	1	100	35	Tight	Bark	Closed	20	all	
8/13/2015	JL	rt94	Private	red oak	29	70	Interior	500	40	Live	Co-Dominant	1	100	1	Tight	Cavity	Closed	10-50	s	multiple small cavities
8/13/2015	JL	rt95	Private	boxelder	18	50	Interior	510	40	Live-Damaged	Co-Dominant	2	90	1	Tight	Cavity	Closed	10-50	s	1 small cavity