

# **Red-tail Biodiversity Survey Final Report**



**White River Woods and  
McVey Memorial Forest  
10–11 June 2017**

**RESULTS OF THE 2017 RED-TAIL LAND CONSERVANCY BIODIVERSITY SURVEY  
DELAWARE AND RANDOLPH COUNTIES, INDIANA**

Compiled from the Science Team Reports  
*Assembled by Don Ruch (Indiana Academy of Science)*

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*Cover Photo:* Upland mesic woodland located in the northeast corner of White River Wood. (Photo taken from the parking lot on April 5, 2018 by Don Ruch)

**RESULTS OF THE 2017 RED-TAIL LAND CONSERVANCY BIODIVERSITY SURVEY  
DELAWARE AND RANDOLPH COUNTIES, INDIANA**

The 2017 biodiversity survey, also known as a bioblitz, was held on two properties owned or maintained by the Red-tail Land Conservancy (RLC). The two sites are the White River Woods (WRW) in Delaware County and McVey Memorial Forest (MMF) in Randolph County; the sites being approximately 24 km (15 miles) apart (Figs. 1 & 2). Since east-central Indiana, the home of the RLC, is located in the Central Till Plain Natural Region (Homoya et al. 1994), most of the non-urban land is agricultural. As a result, natural areas in the region are small, scattered, and usually isolated islands. Therefore, in order to have a site large enough to conduct a bioblitz, two natural areas were included.

The two sites have a combined area of 365 acres (148 ha). **White River Woods**, a 117-acre (47-ha) site (Fig. 3), lies 9 km (5.6 miles) southeast of downtown Muncie, Indiana and 480 m (0.3 miles) north of Prairie Creek Reservoir. White River Woods, which borders the White River for one-half mile (0.8 km), is composed of riparian woodland, a small upland forest, and old fields in various stages of succession. **McVey Memorial Forest**, a 248-acre (101-ha) forest (Fig. 4), lies on State Road 1 approximately 11 km (7 miles) north of Farmland, Indiana. Edna McVey established this nature park in her will so that generations to come could enjoy it. McVey Memorial Forest is a wonderful example of upland forest, river bottom, prairie, and wetlands, as well as a 30-year restoration project along SR 1, i.e., tree and prairie plantings. Bush Creek meanders through the woods to the Mississinewa River which borders the forest on the north. McVey Memorial Forest is adjacent to hundreds of acres of Indiana Department of Natural Resources (IDNR) forest, making this area one of the largest wildlife corridors in east-central Indiana.

The biodiversity survey, the first held on RLC property, was conducted on 10–11 June 2017. The bioblitz attracted more than 70 scientists, naturalists, students, and others volunteering their time and expertise to make the event an enormous success. Food and lodging for the participants were provided through the generous support of the Red-tail Land Conservancy, the Indiana Academy of Science, the Robert Cooper Audubon Society, and the Oakwood Retreat Center.

The 19 taxonomic teams reported 1086 taxa, summarized in the table below. WRW = White River Woods; MMF = McVey Memorial Forest

<b>Team</b>	<b>Leader</b>	<b>Taxa Found</b>
Ants	Mathew Dittmann	15 species, all common
Aquatic macroinvertebrates	Paul McMurray	91 taxa, none of special concern in Indiana
Bats	Tim Carter	3 species (1 federally endangered species, 1 federally threatened species) at WRW; 3 species during the bioblitz and 8 species (including 3 noted during the bioblitz) at MMF from historical records
Bees	Robert P. Jean	36 species (32 from WRW and 20 from MMF); 18 Delaware County and 19 Randolph County records
Beetles (Coleoptera)	Jeffrey D. Holland	92 taxa, none unusual or unexpected
Birds	Kamal Islam	78 species (47 common to both sites); highlights included cerulean warbler and osprey (both state endangered species), bald eagle (state species of ‘Special Concern’), bobolink and dickcissel (species with declining populations rangewide), and 34 species of long-distance migrants that winter in Central and South America and breed in Indiana

<b>Team</b>	<b>Leader</b>	<b>Taxa Found</b>
Butterflies	Kirk Roth	22 species; 4 Delaware and 5 Randolph County records; range extension south for the eyed brown ( <i>Lethe eurydice</i> )
Odonates (dragonflies and damselflies)	Kirk Roth	28 species of odonates (18 dragonflies and 10 damselflies); 14 Delaware County and 15 Randolph County records
Fish	Brant E. Fisher	47 species (42 species from MMF and 37 from WRW); 2 non-native species; no state listed fish species were collected
Freshwater mussels	Brant E. Fisher	25 species; evidence of 3 federal/state endangered species and 3 species of state special concern were reported; although a relatively diverse freshwater mussel community still persists, both sites have lost around a third of their historic diversity.
Herpetofauna	Robert Brodman	12 species (5 reptile and 7 amphibian species); 2 Delaware County and 4 Randolph County records; 2 species of special concern.
Small Mammals	John Whitaker, Jr. and Angie Chamberlain	7 species, all common
Moths (Lepidoptera)	Megan McCarty	51 taxa (including 38 species, 3 to genus, and 10 unidentified); none unusual or unexpected
Mushrooms	Stephen Russell	56 species in total from both sites representing 46 genera, mostly wood rot fungi; interesting finds included the mushrooms <i>Rhodotus palmatus</i> , <i>Pluteus americanus</i> , and the slime mold <i>Reticularia (Enteridium) lycoperdon</i> , only the second report of this species from Indiana
Non-vascular plants	Linda Cole	30 species (29 mosses and 1 liverwort); 16 species occurred at both sites; the mosses are characteristic of shaded, moist, calcium-enriched sites
Singing and non-singing insects	Carl Strang	11 species (4 species of singing insects and 7 species of non-singing insects), all common
Snail-killing flies (Diptera: Sciomyzidae)	William L. Murphy	11 species: 2 species from the tribe Sciomyzini, 9 species from the tribe Tetanocerini; 6 Randolph County records; total number of Sciomyzidae species now known from Randolph County, 19.
Spiders	Marc Milne	81 taxa; 6 state records
Vascular plants	Donald Ruch	476 taxa (405 at MMF and 289 at WRW; 218 taxa occurred at both sites, 71 only at WRW, and 187 only at MMF); 22 potential Delaware County records and 24 potential Randolph County records; 1 endangered species at WRW.



Figure 1A. Map highlighting in red the counties of east-central Indiana. D = Delaware County; R = Randolph County. The dot in Delaware County illustrates the location of White River Woods and the dot in Randolph County illustrates the location of McVey Memorial Forest.

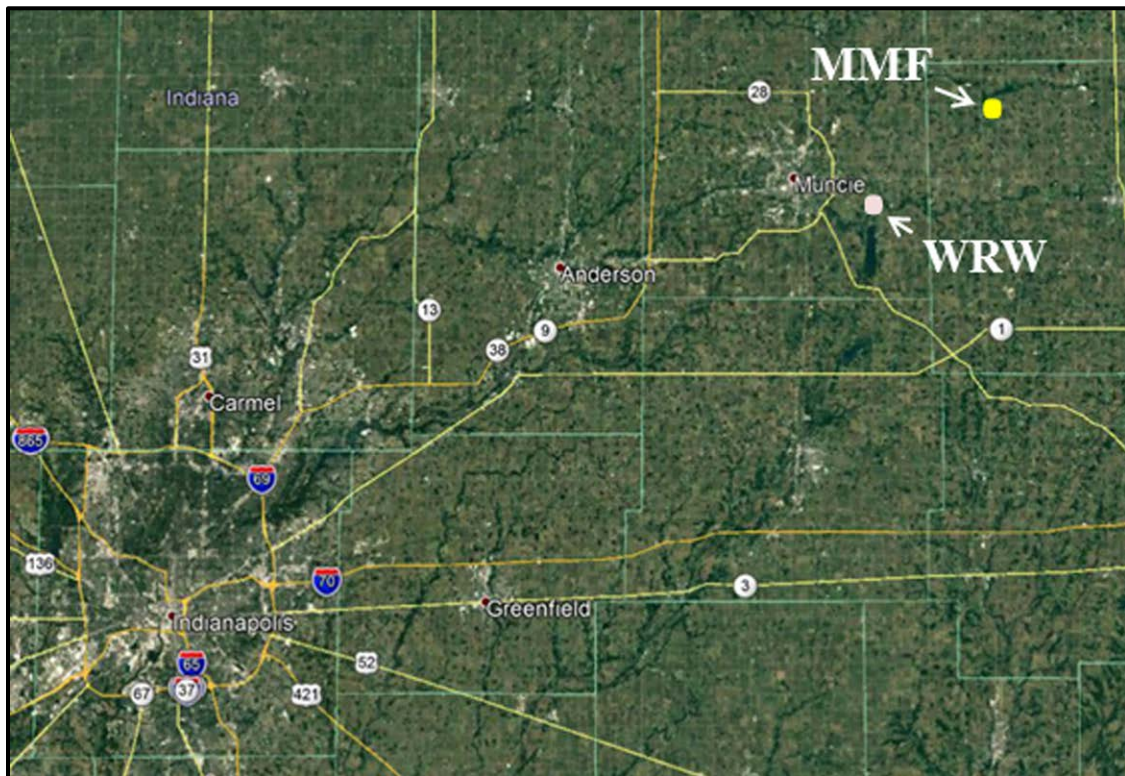


Figure 1B. East-central Indiana illustrating the location of McVey Memorial Forest (yellow dot labeled MMF) in Randolph County and White River Woods (pink dot labeled WRW) in Delaware County. Modified from GoogleEarth.

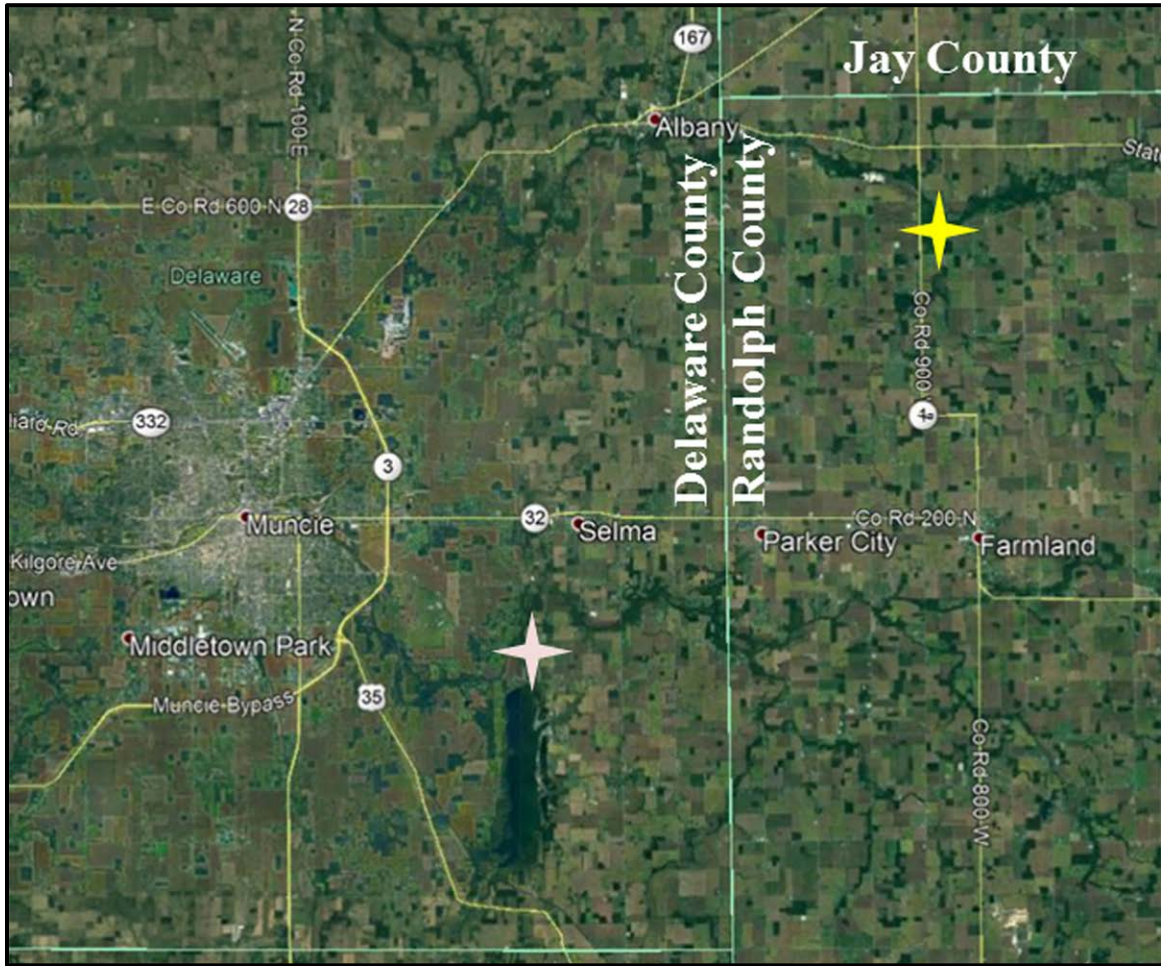


Figure 1C. Enlargement of Figure 1B. White River Woods (pink star) is located SE of Muncie and just north of Prairie Creek Reservoir in Delaware County. McVey Memorial Woods (yellow star) is located seven miles north of Farmland on State Road 1 (also know as County Road 900 W).

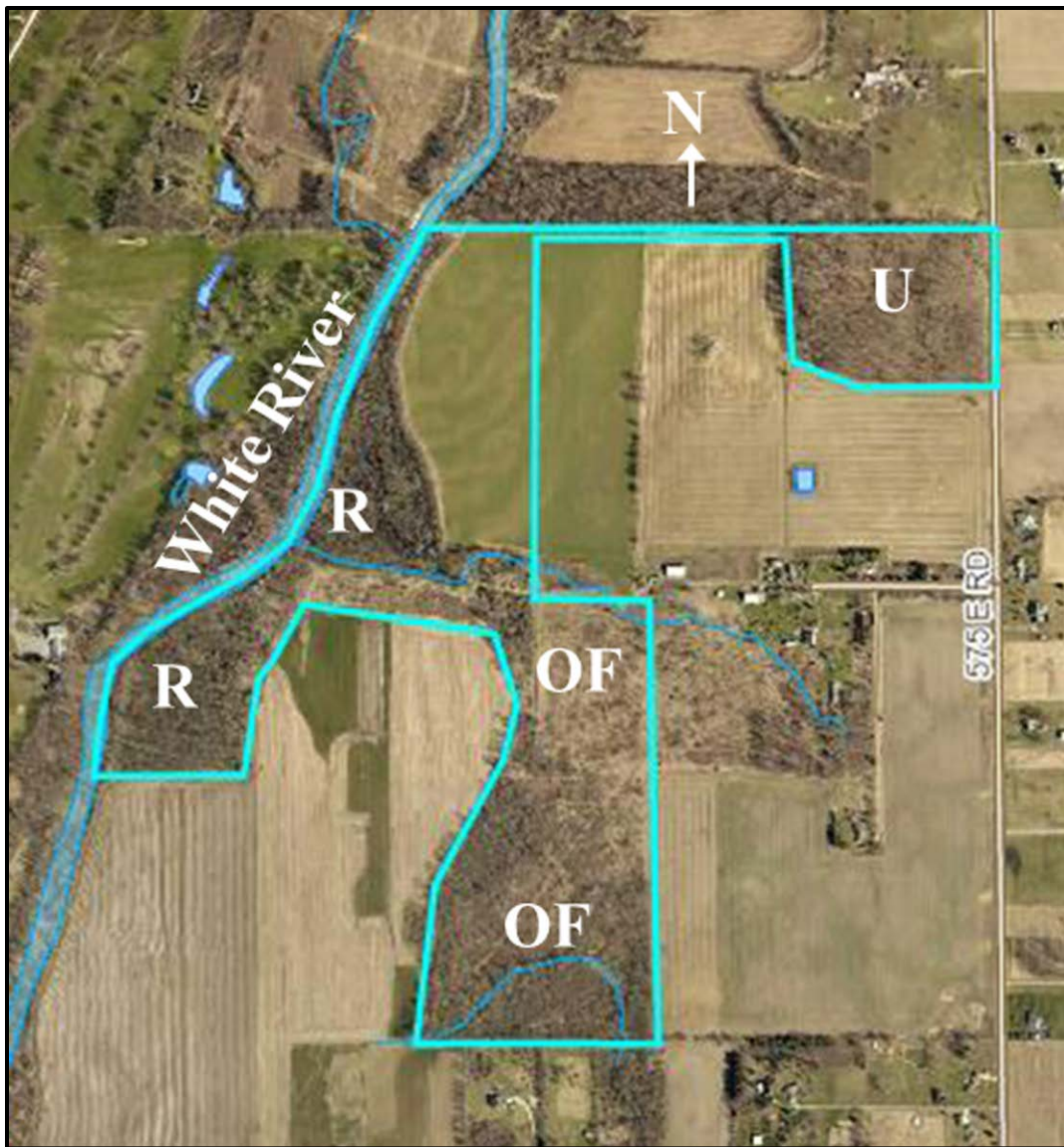


Figure 2. White River Woods (outlined in light green). North at the top; White River along the west border; R = riparian woodlands; U = upland forest; OF = old-fields in various stages of development. Figure modified from RLC image.

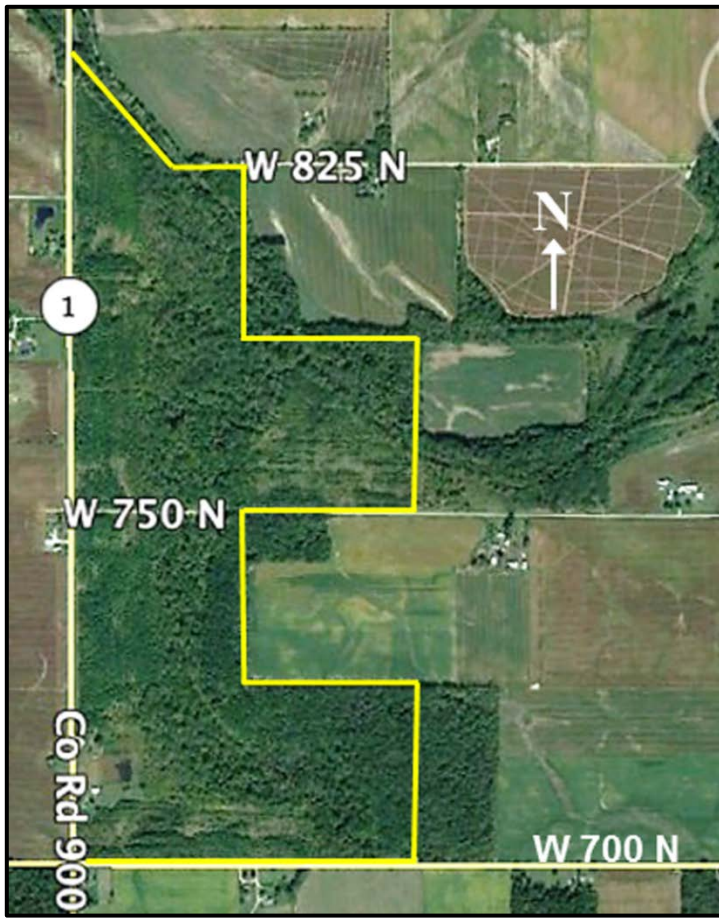
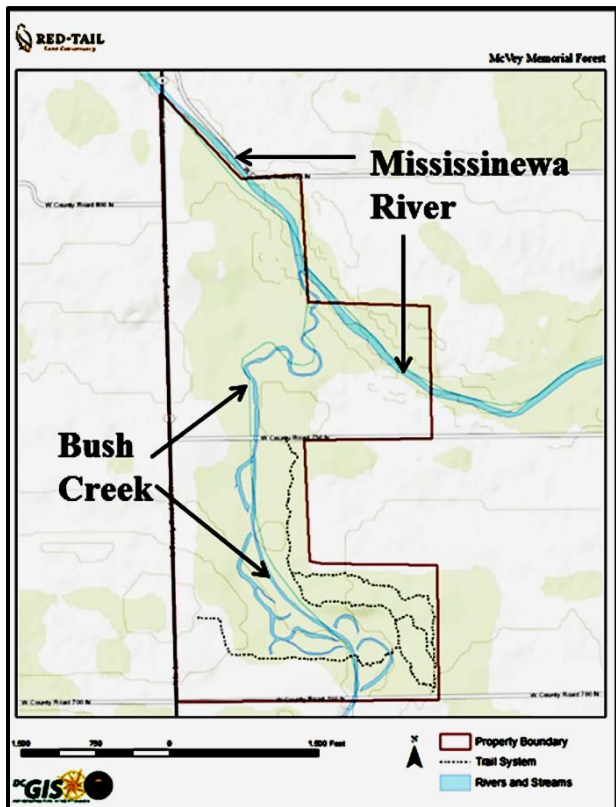


Figure 3. McVey Memorial Forest.

Top: McVey Memorial Forest outlined in yellow. North at the top; State Road 1 forms the west border; County Road W 700 N forms the south border.

Bottom: Map illustrating the location of Bush Creek and the Mississinewa River.





# **The Histories of McVey Memorial Forest and White River Woods**

**By Barry Banks, Emeritus (Retired in March 2018)**

Red-tail Land Conservancy (RLC) is a 501(c)3 land trust whose mission is to preserve, protect, and restore natural areas and farmland in east-central Indiana while increasing awareness of our natural heritage. RLC accomplishes its mission by offering conservation options to landowners and providing nature education programs and events to the general public. RLC was launched in March 1999. RLC's successes and accomplishments are well chronicled on its website at [www.fortheland.org](http://www.fortheland.org).

This treatise serves to briefly describe the history of the two RLC sites that were used for the 2017 bioblitz. These sites are McVey Memorial Forest in Randolph County and White River Woods in Delaware County.

McVey Memorial Forest is a 100.4 ha (248-acre) wildlife sanctuary along Indiana Highway 1 South and adjacent to the Mississinewa River. It shares a common property line with an IDNR Fish and Wildlife Preserve of 141.6 ha (350-acres) north of this river, making this the largest protected natural area in east-central Indiana.

In 1958, Edna McVey set up a perpetual trust under the authority of the Randolph Circuit Court with a number of Successor Trustees appointed by the court over the years. In September 2012, the Randolph Circuit Court appointed RLC the Successor Trustee to this nature park.

The site is open to the public and has a trail system, shelter, and off-road parking. In 2017, RLC designed and installed a new trail system on the northern section, north of CR 750N, which includes a third parking area and canoe launch on the river. The land types are quite diverse, with a riparian area along the Mississinewa River and Bush Creek, a mature upland wooded area dominated by shellbark hickory, and a 30 year-old planting of native hardwoods along the western side. Moreover, there are numerous wetland areas along the river and in the creek bottom.

The other 2017 bioblitz site is along the White River in Delaware County, just north of Prairie Creek Reservoir. This site permanently protects the east bank/riparian zone of a half-mile (0.8 km) stretch of the river along with a splendid 12.1 ha (30-acre) mature upland flatwoods that is open to the public with a trail system and parking lot. This site was brought to my attention by Rainbow Farm director Donna Blodget in 2004. She invited me to walk the woods at a time when the riparian area was sporting acres of Virginia bluebells in full bloom. I was thrilled by the natural beauty of that flood plain. The entire farm was owned at that time by Emissaries of Divine Light. Following years of negotiation with that organization, in 2009 they decided to sell a number of their real estate holdings around the world. RLC is most fortunate to have had funding available via the Bicentennial Nature Trust and the Land Conservation Fund with which it purchased 47.4 ha (117 acres) in December 2014.

Our good friends at the Oakwood Retreat Center, who bought their campus from the Emissaries, co-hosted the participants of the 2017 bioblitz in their equipment storage barn. It was the perfect setting for the morning gatherings and evening wrap-ups of the dozens of natural scientists who participated in this wonderful event.

As Founder and Executive Director of Red-tail Land Conservancy, I wish to express my sincere and deep gratitude to the organizers and participants in 2017 bioblitz. I found it quite invigorating to be in the presence of such talented scientists in the field as well as around the breakfast table. A special thank you and “tip of the hat” to Professor Don Ruch, who made this event happen in **Red-tail Land!**



# **A Summary Geomorphological Assessment of the White River Woods and McVey Memorial Forest**

**By Matthew Purtil**

Applied Anthropology Laboratories, Ball State University

Both the McVey Memorial Forest and White River Woods are located upon, geologically speaking, a young landscape still adjusting to its glacial past. As little as 16,000 years ago, both areas would have been directly beneath the Late Wisconsin glacial ice sheet associated with East White sublobe of the Huron-Erie Lobe. Both the White and Mississinewa Rivers that border the nature preserves have gravel-to-cobble dominated bedload, moderate sinuosity, low gradient, and moderate entrenchment ratios. These streams likely would be classified as a Type E or F stream following Rosgen methodology. LiDAR data reveal abundant relict braid bars and abandoned channels that reflect a time when both rivers were still transporting coarse bedloads associated with glacial outwash from retreating glaciers. The McVey Memorial Forest is situated on the edge of the Mississinewa Moraine that provides noticeable relief and well-drained soils. A prominent geomorphological feature at McVey is the remains of a large, now abandoned, meander bend of the ancient Mississinewa River. This infilled channel scar extends through the central portion of McVey and is characterized by gleyed soils indicative of high water-holding soil capacity. This meander undoubtedly provides a localized micro-habitat for modern plants and animals. Modern-day Bush Creek flows through a portion of this abandoned meander before it enters the Mississinewa River. Based on meander scars readily visible, and review of 1960s USGS topographic maps, it is apparent that portions of Bush Creek that run through McVey have been artificially straightened sometime over the last 50 years. Possible alteration in hydrology and erosion due to stream straightening were not studied.

# **A Summary Cultural Resources Assessment of the McVey Memorial Forest**

**By James Martin and J. Ryan Duddleson**

Orbis Environmental Consulting

Volunteers from Orbis Environmental Consulting conducted an above ground survey for potential archaeological and historical resources in the McVey Memorial Forest. The team identified known cultural resources such a pioneer cemetery but also located the original location of County Road West 750 North as it once followed the Mississinewa River. This original layout of the county road also crossed Bush Creek and the team found the remains of a bridge there. Historic records show an old pioneer town, known as Steubenville, in the McVey Forest. Our survey did not observe any remnants of historic structures in this area, but this location contains recently planted trees which might obscure historic foundations and/or artifacts. Additional survey may locate remnants of this former town. There are also known prehistoric archaeological sites within the forest property and the team was able to identify numerous areas in the forest that are likely to contain additional unidentified prehistoric sites.

# Results of the Biodiversity Survey

10-11 June 2017



**List of ant taxa (15 species) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Mathew Dittmann

Team Members: Jeffrey D. Holland, Ivan Grijalva, Ashley Kissick, Eoghan McCroskey

**Table 1: Ant taxa; Family Formicidae.**

Genus	Species	Subspecies	White River Woods	McVey Memorial Forest	Date (2017)
<i>Aphaenogaster</i>	<i>carolinensis</i>			X	June 10
<i>Aphaenogaster</i>	<i>rudis</i>		X	X	June 10
<i>Camponotus</i>	<i>chromaiodes</i>			X	June 10
<i>Camponotus</i>	<i>pennsylvanicus</i>		X	X	June 10
<i>Crematogaster</i>	<i>lineolata</i>		X	X	June 10
<i>Formica</i>	<i>argentea</i>			X	June 10
<i>Formica</i>	<i>fusca</i>		X		June 10
<i>Formica</i>	<i>pallidefulva</i>	<i>nitidiventris</i>	X		June 10
<i>Lasius</i>	<i>alienus</i>		X	X	June 10
<i>Lasius</i>	<i>claviger</i>		X		June 10
<i>Lasius</i>	<i>subglaber</i>			X	June 10
<i>Myrmica</i>	<i>punctiventris</i>			X	June 10
<i>Ponera</i>	<i>pennsylvanica</i>			X	June 10
<i>Tapinoma</i>	<i>sessile</i>		X		June 11
<i>Tetramorium</i>	<i>caespitum</i>		X	X	June 10

**Summary Overview**

There were no surprises in the ant species found at the sites, with all of them being either found across the country or in the eastern United States specifically. The taxa found at both sites tend to be either generalist species or ones that prefer forested environments, but there were some exceptions. *Lasius alienus* prefers open fields, but the presence of agricultural fields surrounding both survey sites explains its presence. Likewise, *Tapinoma sessile* thrives in disturbed habitats, so its presence at the White River site is unsurprising. The rest of the species occupying the White River site all tend to be more tolerant of the shrub and woodland ecosystems present there, while the species present solely at the McVey site all favor older, more pristine wooded habitats.

**List of aquatic macroinvertebrates taxa (91 taxa) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Paul McMurray

Team Members: None

**Table 2: Aquatic macroinvertebrate taxa. White River data from the White River Woods and Mississinewa River and Brush Creek data from McVey Memorial Forest.**

Taxa	White River Number	Mississinewa River Number	Bush Creek Number
<b>Ephemeroptera (Mayflies)</b>			
Baetidae (Small Minnow Mayflies)			
<i>Acerpenna pygmaea</i>	1	1	
<i>Anafroptilum album</i>	1		
<i>Baetis intercalaris</i>	3	2	
<i>Paracloedes minutus</i>	1		
Caenidae (Square Gilled Mayflies)			
<i>Caenis latipennis</i>	9	3	
Heptageniidae (Flathead Mayflies)			
<i>Leucrocuta</i> sp.	5		
<i>Maccaffertium mediopunctatum</i>	10		
<i>pulchellum</i>	1		
<i>terminatum</i>		1	
<i>Nixe inconspicua</i>	27	4	1
<i>Stenacron interpunctatum</i>		4	
<i>Stenonema femoratum</i>		1	
Isonychiidae (Brush-Legged Mayflies)			
<i>Isonychia (Isonychia)</i> sp.	1		
Leptohyphidae (Little Stout Crawler Mayflies)			
<i>Tricorythodes</i> sp.	2		
Potamanthidae (Hacklegill Mayflies)			
<i>Anthopotamus myops</i>	10		
<b>Plecoptera (Stoneflies)</b>			
Perlidae (Golden Stoneflies)			
<i>Perlesta</i> sp.	8	1	
<b>Trichoptera (Caddisflies)</b>			
Helicopsychidae (Snail-Case Caddisflies)			
<i>Helicopsyche borealis</i>		1	
Hydropsychidae (Net-Spinning Caddisflies)			
<i>Ceratopsyche</i> sp.	5		
<i>bronta</i>	12	3	

<i>Cheumatopsyche</i> sp.		19	7
<i>Hydropsyche betteni</i> grp. sp.			1
Leptoceridae (Long-horned Caddisflies)			
<i>Nectopsyche diarina</i>	1		
Philopotamidae (Finger-net Caddisflies)			
<i>Chimarra obscura</i>	1		
<b>Odonata (Dragonflies and Damselflies)</b>			
Aeshnidae (Darner Dragonflies)			
<i>Boyeria vinosa</i>	1	1	
Gomphidae (Clubtail Dragonflies)			
<i>Hagenius brevistylus</i>		1	
Macromiidae (Cruiser Dragonflies)			
<i>Macromia</i> sp.		2	1
Calopterygidae (Broad Wing Damselflies)			
<i>Calopteryx maculata</i>	1	1	1
<i>Hetaerina americana</i>	2		
Coenagrionidae (Narrow Wing Damselflies)			
<i>Argia translata</i>	1		
<i>Enallagma divagans</i>	1		
<i>exsulans</i>		1	
<b>Megaloptera (Dobsonflies and Alderflies)</b>			
Corydalidae (Dobsonflies)			
<i>Corydalus cornutus</i>	1	1	
<b>Coleoptera (Beetles)</b>			
Dryopidae (Long Toed Water Beetles)			
<i>Helichus lithophilus</i>	1		
Elmidae (Riffle Beetles)			
<i>Dubiraphia</i> sp. larvae		3	1
<i>minima</i>	4		
<i>quadrinotata</i>			3
<i>vittata</i>		4	7
<i>Macronychus glabratus</i>	1		
<i>Optioservus trivitattus</i>	1		
<i>Stenelmis</i> sp. larvae	20	6	2
<i>crenata</i>	9	16	4
<i>sexlineata</i>	17	6	1
Haliplidae (Crawling Water Beetles)			
<i>Peltodytes duodecimpunctata</i>	3	4	4
Hydrophilidae (Water Scavenger Beetles)			
<i>Berosus pergrinus</i>	1		
<i>Sperchopsis tessellata</i>	1		
<i>Tropisternus glaber</i>		1	



Psephenidae (Water Penny Beetle)			
<i>Psephenus herricki</i> larvae	1	5	2
<b>Hemiptera (True Bugs)</b>			
Corixidae (Water Boatmen)	1		
<i>Sigara</i> sp.			1
Pleidae (Pygmy Backswimmers)			
<i>Neoplea striola</i>	1		
Velidae (Broad-shouldered Water Striders)			
<i>Rhagovelia obesa</i>	2		
<b>Diptera (True Flies)</b>			
Ceratopogonidae (Biting Midges)			
<i>Atrichopogon</i> sp.		1	
Chironomidae (Midge Flies)		1	
Chironominae			
Chironomini	3	6	5
<i>Chironomus</i> sp.	2		
<i>Cryptochironomus</i> sp.		2	1
<i>Paratendipes albimanus</i>		1	1
<i>Phaenopsectra obediens</i> grp. sp.		1	
<i>Polypedilum flavum</i>	4	3	3
<i>illinoense</i> grp. sp.	25	10	29
<i>scalaneum</i> grp. sp.	2		
<i>Stictochironomus</i> sp.	12		1
Tanytarsini			
<i>Cladotanytarsus</i> sp.	2	2	
<i>Paratanytarsus</i> sp.	4	5	
<i>Stempellinella</i> sp.	1		
<i>Tanytarsus</i> sp.	4		
Orthoclaadiinae	10	3	
<i>Cricotopus bicinctus</i>	19	7	
<i>trifascia</i>	6	1	
<i>Rheocricotopus robacki</i>	1		
<i>Tvetnia vitracies</i>	1		
Tanypodinae	2		
<i>Telepelopia okobji</i>	3		
<i>Thienemannimyia</i> grp. sp.	2		
Simuliidae (Black Flies)			
<i>Simulium</i> sp.	9		
Tipulidae (Crane Flies)			
<i>Hexatoma</i> sp.	2		
<b>Decapoda (Crayfish and Shrimp)</b>			
Cambaridae			

<i>Orconectes</i> sp.	2		1
<i>rusticus</i>		1	
<b>Amphipoda (Scuds)</b>			
Crangonyctidae			
<i>Crangonyx</i> sp.		1	
Hyalellidae			
<i>Hyalella</i> sp.	2		1
<b>Isopoda (Aquatic Sow Bugs)</b>			
Asellidae			
<i>Lirceus lineatus</i>	2	7	
<b>Acari (Water Mites)</b>			
		2	
<b>Pelecypoda (Clams)</b>			
Corbiculidae (Basket Clams)			
<i>Corbicula fluminea</i>	3	3	3
Pisidiidae (Fingernail Clams)			
<i>Sphaerium striatinum</i>	1	9	
<b>Gastropoda (Snails)</b>			
Ancylidae			
<i>Ferissia rivularis</i>		1	1
Physidae			
<i>Physella</i> sp.	2	2	
Pleuroceridae			
<i>Elimia livescens</i>	5		12
<b>Planaria (Flatworms)</b>			
			1
<b>Oligochaeta (Worms)</b>			
Tubificidae (Aquatic Worms)			
<i>Limnodrilus hoffmeisteri</i>	1	1	
Tubificiadae with bifid chetae; no hair chetae	3	7	
<b>Branchiobdellida (Crayfish Leeches)</b>			
		6	
<b>Number of Individuals Collected</b>	<b>303</b>	<b>175</b>	<b>95</b>
<b>Number of Taxa Collected</b>	<b>67</b>	<b>50</b>	<b>27</b>
<b>Number of EPT Taxa Collected</b>	<b>17</b>	<b>11</b>	<b>3</b>

### Collecting Methods and Locations

A D-frame aquatic dipnet with 500 µm mesh was used to collect a sample from a riffle and then sample all additional in-stream habitats in a 50 m section of the stream at each site. These samples were combined, elutriated through a 500 µm mesh sieve and then picked in the field for 20 minutes. Collected

specimens were identified to lowest practical taxon by use of standard texts, i.e. Merritt et al. 2008; Thorp & Covich 2001.

Aquatic macroinvertebrates were collected from three locations, two in McVey Memorial Forest and one in White River Woods. The first site was located on the White River, approximately 500 m West of the Oakwood Retreat Center barn at White River Woods (40.159314, -85.290554). The White River at this location was approximately 15 m wide in the riffle, widening to 25 m in the slower run areas. Substrate within the sampled area was composed primarily of gravel, small cobble and sand with several submerged logs, emergent vegetation and rootwads located within 1 m deep pools along the left bank. The sample collected at this location on the White River was the most diverse with 67 taxa, including 17 taxa of the Ephemeroptera, Plecoptera, and Trichoptera (EPT; mayflies, stoneflies, and caddisflies). In terms of the macroinvertebrate diversity at this location, this sample from the White River contained a greater number of taxa than 98% of the macroinvertebrate samples collected by the Indiana Department of Environmental Management (IDEM) using this method from 2004-2013 (Todd Davis, IDEM Office of Water Quality, personal communication 11 August 2017); this site also ranked in the top 5% of IDEM samples in number of EPT taxa collected.

The second site was located on the Mississinewa River, approximately 150 m north of the parking area located on County Road West 750 North in McVey Memorial Forest (40.272957, -85.138877). The Mississinewa River at this location was approximately 15 m wide in the riffle, widening to 30 m upstream and downstream of the riffle. Substrates within the sampled area were composed of cobble, gravel and a greater amount of silt than was seen at the White River site. Pools were not present but there was a larger accumulation of woody debris on the shoreline. The sample at this location was relatively diverse with 50 taxa including 11 EPT taxa.

The third site was located on Bush Creek, approximately 50 m north of the County Road West 700 North, bridge crossing Bush Creek in McVey Memorial Forest (40.264831, -85.141323). Bush Creek at this location was much smaller than the other sites, narrowing from eight to two m wide over the length of the sampled zone. Substrate in this stream was composed entirely of sand with some gravel and silt in depositional areas and almost no additional habitat types. The macroinvertebrate community was reduced at this site with only 27 taxa and three EPT taxa.

### **Summary Overview**

Altogether from the three sites, 573 individuals were collected and identified, representing 91 macroinvertebrate taxa. None of the taxa are known to be species of special concern in Indiana.

### **References**

- Merritt, R.W., K.W. Cummins & M.B. Berg (Eds.). 2008. An Introduction to the Aquatic Insects of North America. Kendall/Hunt Publishing Company, Dubuque, Iowa. xvi + 1158 pp.
- Thorp, J.H. & A.P. Covich (Eds). 2001. Ecology and Classification of North American Freshwater Invertebrates, second edition. Academic Press, San Diego, California. xvi + 1056 pp.

**List of bat species (5 species) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017, and historical bat occurrence data (8 species).**

Team Leader: Tim Carter

Team Members: White River Woods: Tim and Logan Carter

McVey Memorial Forest: Jeremy Sheets and Aimee Bjornstod

**Table 3a: Bat data from the bioblitz: White River Woods, Delaware County (along the White River). Data reported by Tim and Logan Carter. All bats in Indiana are in the Order Chiroptera and all are in the Family Vespertilionidae.**

<u>Date Collected</u>	<u>Common Name</u>	<u>Species</u>	<u>Sex</u>	<u>Age/Status</u>
6/10/2017	Indiana Bat	<i>Myotis sodalis</i>	F	Pregnant
6/11/2017	Big Brown Bat	<i>Eptesicus fuscus</i>	M	Adult
6/11/2017	Big Brown Bat	<i>Eptesicus fuscus</i>	F	Pregnant
6/11/2017	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult

**Table 3b: Bat data from the bioblitz: McVey Memorial Forest, Randolph County. Data reported by Jeremy Sheets and Aimee Bjornstod. All bats in Indiana are in the Order Chiroptera and all are in the Family Vespertilionidae.**

<u>Date Collected</u>	<u>Common Name</u>	<u>Species</u>	<u>Number</u>
6/10/2017	Big Brown Bat	<i>Eptesicus fuscus</i>	14
6/10/2017	Hoary Bat	<i>Lasiurus cinereus</i>	1
6/10/2017	Eastern Red Bat	<i>Lasiurus borealis</i>	3

**Table 3c: Historical bat data from McVey Memorial Forest, Randolph County (along the Mississinewa River and Bush Creek). All bats in Indiana are in the Order Chiroptera and all are in the Family Vespertilionidae.**

<u>Date Collected</u>	<u>Common Name</u>	<u>Species</u>	<u>Sex</u>	<u>Age/Status</u>
7/20/2009	Hoary Bat	<i>Lasiurus cinereus</i>	F	JUV
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Preg
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac

7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	JUV
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Preg
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	JUV
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>		
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	JUV
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	JUV
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	JUV
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	JUV
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	JUV
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/20/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/20/2009	Northern Long-eared Bat	<i>Myotis septentrionalis</i>	F	Lac
7/20/2009	Northern Long-eared Bat	<i>Myotis septentrionalis</i>	M	JUV
7/20/2009	Indiana Bat	<i>Myotis sodalis</i>	F	Lac
7/20/2009	Indiana Bat	<i>Myotis sodalis</i>	F	Lac
7/20/2009	Indiana Bat	<i>Myotis sodalis</i>	F	Lac
7/27/2009	Hoary Bat	<i>Lasiurus cinereus</i>	M	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	JUV

7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Lac
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	M	Adult
7/27/2009	Little Brown Bat	<i>Myotis lucifugus</i>	F	JUV
7/27/2009	Northern Long-eared Bat	<i>Myotis septentrionalis</i>	F	Adult
7/27/2009	Indiana Bat	<i>Myotis sodalis</i>	F	Adult
7/27/2009	Indiana Bat	<i>Myotis sodalis</i>	F	Adult
7/27/2009	Indiana Bat	<i>Myotis sodalis</i>	F	Adult
7/27/2009	Evening Bat	<i>Nycticeius humeralis</i>	F	Adult
9/5/2015	Eastern Red Bat	<i>Lasiurus borealis</i>	N/A	N/A
9/5/2015	Eastern Red Bat	<i>Lasiurus borealis</i>	N/A	N/A
9/5/2015	Eastern Red Bat	<i>Lasiurus borealis</i>	N/A	N/A
9/5/2015	Eastern Red Bat	<i>Lasiurus borealis</i>	N/A	N/A
9/5/2015	Eastern Red Bat	<i>Lasiurus borealis</i>	N/A	N/A
9/5/2015	Seminole Bat	<i>Lasiurus seminolus</i>	N/A	N/A
9/5/2015	Big Brown Bat	<i>Eptesicus fuscus</i>	N/A	N/A
9/5/2015	Big Brown Bat	<i>Eptesicus fuscus</i>	N/A	N/A

9/5/2015	Little Brown Bat	<i>Myotis lucifugus</i>	N/A	N/A
9/7/2015	Big Brown Bat	<i>Eptesicus fuscus</i>	N/A	N/A
9/7/2015	Big Brown Bat	<i>Eptesicus fuscus</i>	N/A	N/A
9/7/2015	Big Brown Bat	<i>Eptesicus fuscus</i>	N/A	N/A
9/7/2015	Indiana Bat	<i>Myotis sodalis</i>	N/A	N/A

### **Collecting Methods & Effort**

Because there has been significant bat work conducted on McVey Memorial Forest in recent years, I focused my efforts on White River Woods for both Saturday and Sunday nights. Methods used at White River (2017) are the same that were used at McVey (2009 and 2015). The methods used to net bats are fairly standardized and typically involved large nets rigged across open corridors like rivers, streams or roads. These nets vary in length and height, but are typically 20 or 30 ft tall (6 or 9 M) and can vary in length from 15 to 60 ft (4 to 18m). Netting typically begins shortly after dark and continues till 1 or 2 AM. The length of effort is often correlated to capture success! While open, nets are checked every 10 minutes and captured bats are retrieved from the net and returned to the “work-up station” to be processed. Each bat is identified to species and a series of measurements are taken. All data is reported annually to Indiana DNR and US-FWS. The amount of effort needed to net bats is fairly high. At the White River Woods site, we took a few hours to setting up nets on Saturday afternoon. We returned to the site at 8:30 PM and ran nets to 12:30 AM . We returned on Sunday at 8:30 PM to resume netting and ended netting at 12:15 AM and then took another 1.5 hrs to take down nets and pack up.

### **Summary Overview**

Both of these sites support a wide array of bat species. Indiana bats are a federally endangered species and have been documented at both locations. Northern Long-eared Bats are a federally Threatened species and have been documented at McVey and are, or were likely present at White River. The capture of a Seminole bat at McVey in 2015 is a very unusual occurrence. This species is typical of the southeastern US and its range is usually the Gulf Coast States and SE Atlantic States. This is only the second record from Indiana of which I am aware.

The bat community in this region has been severely impacted by the disease White-Nose Syndrome (WNS). Historic netting efforts in McVey in 2009 prior WNS resulted in 70 bats in two nights. Those same sites were trapped post WNS in 2015 and only 13 bats were captured. Netting at White River Woods in 2017 resulted in only four bat captures in two nights. While both McVey and White River represent excellent bat habitat, WNS has greatly reduced the abundance of bats at both locations. Both sites still contain excellent roosting and foraging habitat for all bats. The rivers are in good condition with strong insect communities. Both sites will likely continue to support remnant populations of bat species that are affected by WNS and strong populations of bats not affected.



Bats in the net. (*Photos by Tim Carter*)





Another bat in the net. (*Photo by Tim Carter*)

**List of bee taxa (36 species) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Robert P. Jean

Team Members: Michelle Jean, Chloe Jean, Carlin Jean

**Table 4: Summary of bee taxa data.** (For the complete list of bee taxa data, see the Indiana Academy of Science’s Resource Center at <https://www.indianaacademyofscience.org/resource-center.>)

**McVey Memorial Forest, Randolph County**

<u>Family</u>	<u>Genus</u>	<u>Subgenus</u>	<u>Species</u>	<u>Exotic</u>
Andrenidae	<i>Andrena</i>	( <i>Tylandrena</i> )	<i>wilmattae</i>	
Apidae	<i>Apis</i>	( <i>Apis</i> )	<i>mellifera</i>	X
Apidae	<i>Ceratina</i>	( <i>Zadontomerus</i> )	<i>mikmaqi</i>	
Apidae	<i>Eucera</i>	( <i>Synhalonia</i> )	<i>hamata</i>	
Apidae	<i>Melissodes</i>	( <i>Eumelissodes</i> )	<i>illatus</i>	
Apidae	<i>Nomada</i>		<i>cressonii</i>	
Apidae	<i>Nomada</i>		<i>lepida</i>	
Colletidae	<i>Hylaeus</i>	( <i>Hylaeus</i> )	<i>mesillae</i>	
Colletidae	<i>Hylaeus</i>	( <i>Prosopsis</i> )	<i>modestus</i>	
Halictidae	<i>Augochlora</i>	( <i>Augochlora</i> )	<i>pura</i>	
Halictidae	<i>Augochlorella</i>		<i>aurata</i>	
Halictidae	<i>Halictus</i>	( <i>Odontalictus</i> )	<i>ligatus</i>	
Halictidae	<i>Lasioglossum</i>	( <i>Lasioglossum</i> )	<i>coriaceum</i>	
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>cressonii</i>	
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>hitchensi</i>	
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>lineatulum</i>	
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	sp.	
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>versatum</i>	
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>zephyrum</i>	
Megachilidae	<i>Megachile</i>	( <i>Litomegachile</i> )	<i>mendica</i>	
Megachilidae	<i>Megachile</i>	( <i>Callomegachile</i> )	<i>sculpturalis</i>	X

**White River Woods, Delaware County**

<u>Family</u>	<u>Genus</u>	<u>Subgenus</u>	<u>Species</u>	<u>Exotic</u>
Andrenidae	<i>Andrena</i>	( <i>Gonandrena</i> )	<i>persimulata</i>	
Andrenidae	<i>Andrena</i>	( <i>Tylandrena</i> )	<i>wilmattae</i>	
Andrenidae	<i>Calliopsis</i>	( <i>Calliopsis</i> )	<i>andreniformis</i>	
Apidae	<i>Apis</i>	( <i>Apis</i> )	<i>mellifera</i>	X
Apidae	<i>Bombus</i>	( <i>Pyrobombus</i> )	<i>bimaculatus</i>	
Apidae	<i>Bombus</i>	( <i>Thoracobombus</i> )	<i>fervidus</i>	
Apidae	<i>Bombus</i>	( <i>Cullumanobombus</i> )	<i>griseocollis</i>	

Apidae	<i>Ceratina</i>	( <i>Zadontomerus</i> )	<i>calcarata</i>
Apidae	<i>Ceratina</i>	( <i>Zadontomerus</i> )	<i>dupla</i>
Apidae	<i>Ceratina</i>	( <i>Zadontomerus</i> )	<i>mikmaqi</i>
Apidae	<i>Ceratina</i>	( <i>Zadontomerus</i> )	<i>mikmaqi/calcarata</i>
Apidae	<i>Ceratina</i>	( <i>Zadontomerus</i> )	<i>strenua</i>
Apidae	<i>Eucera</i>	( <i>Synhalonia</i> )	<i>hamata</i>
Apidae	<i>Nomada</i>		<i>lepida</i>
Apidae	<i>Xylocopa</i>	( <i>Xylocopoides</i> )	<i>virginica</i>
Colletidae	<i>Hylaeus</i>	( <i>Hylaeus</i> )	<i>mesillae</i>
Colletidae	<i>Hylaeus</i>	( <i>Prosopsis</i> )	<i>modestus</i>
Halictidae	<i>Agapostemon</i>	( <i>Agapostemon</i> )	<i>virescens</i>
Halictidae	<i>Augochlora</i>	( <i>Augochlora</i> )	<i>pura</i>
Halictidae	<i>Augochlorella</i>		<i>aurata</i>
Halictidae	<i>Halictus</i>	( <i>Seladonia</i> )	<i>confusus</i>
Halictidae	<i>Halictus</i>	( <i>Odontalictus</i> )	<i>ligatus</i>
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>coeruleum</i>
Halictidae	<i>Lasioglossum</i>	( <i>Lasioglossum</i> )	<i>coriaceum</i>
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>cressonii</i>
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>hitchensi</i>
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>imitatum</i>
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>lineatulum</i>
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>macoupinense</i>
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>pilosum</i>
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	sp.
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>versatum</i>
Halictidae	<i>Lasioglossum</i>	( <i>Dialictus</i> )	<i>zephyrum</i>
Megachilidae	<i>Osmia</i>	( <i>Melanosmia</i> )	<i>pumila</i>

### **Collecting Method and Effort**

Bee sampling was conducted on 27 June 2017. Bee surveys were performed at a later date than other taxonomic groups due to scheduling conflicts and weather conditions. Bees were collected using passive (bowl trapping) and active (netting at flowers) sampling techniques. We passively sampled White River Woods using 30–12 oz bowls (ten white, ten fluorescent blue and ten fluorescent yellow) separated by 5 m each in random color order (for a total of 60 bowls) along two-75 m transects. One transect was setup in an old field area with several flowering species and the other was positioned along a forest edge with flowers present. McVey Memorial Forest was sampled with a single 75 m transect comprised of 30 bowls along the open grassy area near the pond. Bowls were placed out in the morning and then collected in the late afternoon. Each site was net collected for approximately 3 hours for a total 6 hours across both sites.

## Voucher Specimens

Voucher specimens will be housed in the Environmental Solutions & Innovations, Inc. (ESI) entomology collection in Indianapolis.

## Summary Overview

Thirty-six species, approximately 8% of the Indiana bee fauna, representing all five common bee families in Indiana were collected. Overall floral diversity was moderate and bee activity was low. Flowering was mainly concentrated in openings, forest edges, old fields, and a prairie restoration (at McVey Memorial Forest) and these were the focus of the net collections. Thirty-two bee species were collected at White River Woods in Delaware County of which 18 species were new county records. Twenty bee species were collected at McVey Memorial Forest in Randolph County and included 19 county records as only one bee species had been vouchered from Randolph County in the past. In total, collections from both sites represented 36 bee species with 16 species collected only in Delaware County and 4 species collected only in Randolph County. Overall bees in the families Apidae and Halictidae represented a large portion of the species richness (13 spp. and 16 spp. respectively) and much of the bee abundance (44% and 49% respectively; 93% collectively). *Lasioglossum* (represented by 11 species) and *Ceratina* (represented by four species) were the dominant genera each representing 30 percent of the abundance. *Ceratina mikmaqi* Rehan and Sheffield, 2011 was the most common bee species collected (54 individuals, 15.6 % overall), followed closely by *Lasioglossum coriaceum* (Smith, 1853) (51 individuals, 13.5 % overall). Interesting species include *Andrena persimulata* Viereck, 1917, *Andrena wilmattae* Cockerell, 1906, and *Melissodes illatus* Lovell and Cockerell, 1906 all of which have been rarely recorded in Indiana. Overall, even with the relatively low diversity, a combined 37 new county records were noted demonstrating these areas had been little collected in the past. Two species were introduced bee species, including the honey bee (*Apis mellifera* Linnaeus, 1758) and the giant resin bee, *Megachile sculpturalis* Smith, 1853. For the latter species these are among the first records of this species using natural areas in the state as it is often found in urban settings. In addition, this is one of the first published records of the *Megachile sculpturalis* for the state although it has been collected in a few other counties and has been suspected of occurring throughout the state. These collections demonstrate the importance of White River Woods and McVey Memorial Forest for bee conservation and habitat and they help fill in some areas of the state that have been very poorly collected in the past. Further management to increase native wildflower diversity, expand prairie plantings, maintain some openings, and reduce invasive plant species will enhance bee populations even further. It should be noted that the forests in these areas likely provide valuable nesting and overwintering resources for native bees and likely provide floral resources for bees in the spring when flowering is lower in other habitats. Collections in these areas in spring and fall will likely add many more species and should be strongly considered to establish a baseline for these important pollinators.



Bee collecting habitat near the main entrance to McVey Memorial Forest, Randolph County, Indiana. The pond is located at the far end of the field (top center in the figure on the left and top left in the figure on the right) adjacent to the woodland. The field represents the remnants of a planted prairie. (*Photos by Robert Jean*)



Bee collecting habitat at White River Woods, Delaware County, Indiana. Photo on the left illustrated part of a transect with 30-12 oz bowls (ten white, ten fluorescent blue and ten fluorescent yellow) separated by 5 m each in random color order. The photo on the right illustrated the bee habitat where collecting occurred. (*Photos by Robert Jean*)

**List of beetle (Coleoptera) species (92 taxa) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup>–11<sup>th</sup>, 2017.**

Team Leader: Jeffrey D. Holland

Team Members: Mathew Dittmann, Ivan Grijalva, Ashley Kissick, Eoghan McCroskey

**Table 5: Beetle (Coleoptera) species.** Location: M = McVey Memorial Forest, W = White River Woods.

<b>Species [Listed by Family]</b>	<b>Location</b>	<b>Common Name</b>	<b>Exotic</b>
<b>Bostrichidae</b>			
<i>Lichenophanes bicornis</i> (Weber)	M, W	a powder-post beetle	
<b>Brentidae</b>			
<i>Arrenodes minutus</i> (Drury)	M	oak timberworm	
<b>Buprestidae</b>			
<i>Acmaeodera pulchella</i> (Herbst)	M	flat-headed bald cypress borer	
<b>Cantharidae</b>			
<i>Cantharis dentiger</i> LeConte	M	a soldier beetle	
<i>Chauliognathus marginatus</i> (Fabricius)	W	marginated leatherwing	
<i>Chauliognathus pennsylvanicus</i> (DeGeer)	W	goldenrod soldier beetle	
<i>Podabrus brunnicollis</i> (Fabricius)	M	a soldier beetle	
<i>Podabrus rugosulus</i> LeConte	M, W	a soldier beetle	
<i>Podabrus tomentosus</i> (Say)	M	a soldier beetle	
<i>Tryptherus latipennis</i> (Germar)	W	a soldier beetle	
<b>Carabidae</b>			
<i>Bembidion</i> sp.	W	a ground beetle	
<i>Chlaenius aestivus</i> Say	M	a ground beetle	
<i>Cicindela sexguttata</i> Fabricius	M, W	six-spotted tiger beetle	
<i>Harpalus</i> sp.	M	a ground beetle	
<i>Leptotrachelus dorsalis</i> (Fabricius)	M	a ground beetle	
<i>Notiophilis</i> sp.	W	a big-eyed beetle	
<i>Pterostichus melanarius</i> (Illiger)	W	common black ground beetle	
<i>Stenolophus</i> sp.	M	a seedcorn beetle	
<i>Trichotichnus vulpeculus</i> (Say)	W	a ground beetle	
<b>Cerambycidae</b>			
<i>Anelaphus villosus</i> (Fabricius)	W	twig pruner	
<i>Clytus ruricola</i> (Fabricius)	W	a longhorned beetle	
<i>Euderces picipes</i> (Fabricius)	W	a longhorned beetle	
<i>Gaurotes cyanipennis</i> (Say)	W	a longhorned beetle	
<i>Leptostylus transversus</i> (Gyllenhal)	M	a longhorned beetle	
<i>Lepturges confluens</i> (Haldeman)	M	a longhorned beetle	
<i>Neoclytus a. acuminatus</i> (Olivier)	W	red-headed ash borer	
<i>Obrium maculatum</i> Gahan	M	a longhorned beetle	
<i>Saperda discoidea</i> Fabricius	M	hickory saperda	
<i>Stenocorus cinnamopterus</i> (Randall)	M	a longhorned beetle	
<i>Tetraopes tetrophthalmus</i> (Forster)	W	red milkweed beetle	

<i>Xylotrechus colonus</i> (Fabricius)	W	a longhorned beetle
<i>Xylotrechus convergens</i> LeConte	W	a longhorned beetle
<b>Chrysomelidae</b>		
<i>Acanthoscelides alboscuteatus</i> (Horn)	W	a bean weevil
<i>Altica chalybea</i> (Illiger)	M	grape flea beetle
<i>Crepidodera violacea</i> Melsheimer	W	a leaf beetle
<i>Labidomera clivicollis</i> (Kirby)	M	swamp milkweed leaf beetle
<i>Orthaltica copallina</i> (Fabricius)	W	a leaf beetle
<i>Paria</i> sp.	M	a leaf beetle
<i>Paria</i> sp.	M	a leaf beetle
<i>Phyllecthris gentilis</i> LeConte	W	a leaf beetle
<b>Cleridae</b>		
<i>Enoclerus nigripes</i> (Say)	M, W	a checkered beetle
<i>Isohydnocera curtipennis</i> (Newman)	M	a checkered beetle
<i>Madoniella dislocate</i> (Say)	W	a checkered beetle
<b>Coccinellidae</b>		
<i>Coleomegilla maculata</i> Degeer	M, W	spotted lady beetle
<i>Cycloneda munda</i> (Say)	W	polished lady beetle
<i>Harmonia axyridis</i> (Pallas)	M, W	multi-colored Asian lady beetle
<i>Propylea quatuordecimpunctata</i> (Linnaeus)	M	a lady beetle
<b>Curculionidae</b>		
<i>Conotrachelus analglypticus</i> (Say)	M	a weevil
<i>Conotrachelus elegans</i> (Say)	M	a weevil
<i>Dryoxylon onoharaense</i> (Murayama)	M	a bark beetle
<i>Rhodoabaenus tredecimpunctatus</i> (Illiger)	W	ironweed curculio
<i>Rhyssomatus lineaticollis</i> (Say)	W	a weevil
<i>Stenoscelis brevis</i> (Boheman)	M	a bark beetle
<i>Xyleborinus saxeseni</i> (Ratzeburg)	M	fruit tree pinhole borer
<i>Xyleborus celsus</i> Eichhoff	M	a bark beetle
<i>Xylosandrus crassiusculus</i> (Motschulsky)	M	Asian ambrosia beetle
<b>Elateridae</b>		
<i>Ampedus nigricollis</i> (Herbst)	W	a click beetle
<i>Athous brightwelli</i> (Kirby)	W	a click beetle
<i>Lacon discoideus</i> (Weber)	M	a click beetle
<i>Melanotus</i> sp.	M	a click beetle
<b>Histeridae</b>		
<i>Hololepta aequalis</i> Say	W	a clown beetle
<i>Hololepta lucida</i> LeConte	W	a clown beetle
<i>Platylomalus aequalis</i> (Say)	W	a clown beetle
<b>Hydrophilidae</b>		
<i>Enochrus</i> sp.	M	a water scavenger beetle
<b>Lampyridae</b>		
<i>Lucidota atra</i> (Fabricius)	W	a firefly
<i>Photuris</i> sp.	M	a firefly



<b>Lucanidae</b>		
<i>Ceruchus piceus</i> (Weber)	W	a stag beetle
<b>Melandryidae</b>		
<i>Diceae liturata</i> (LeConte)	M	a false darkling beetle
<b>Mordellidae</b>		
<i>Mordella marginata</i> Melsheimer	W	a tumbling flower beetle
<b>Passandridae</b>		
<i>Catogenus rufus</i> (Fabricius)	W	a parasitic flat bark beetle
<b>Ptilodactylidae</b>		
<i>Ptilodactyla</i> sp.	M	a toe-winged beetle
<b>Ptinidae</b>		
<i>Hemicoelus carinatus</i> (Say)	M	eastern deathwatch beetle
<i>Trichodesma gibbosa</i> (Say)	W	a deathwatch beetle
<b>Pyrochroidae</b>		
<i>Dendroides canadensis</i> Latreille	M	a fire-colored beetle
<b>Scarabaeidae</b>		
<i>Ataenius</i> sp.	M	a scarab beetle
<i>Diplotaxis</i> sp.	M	a May beetle
<i>Phyllophaga</i> sp.	M	a May beetle
<i>Valgus canaliculatus</i> (Olivier)	W	a scarab beetle
<b>Scirtidae</b>		
<i>Cyphon</i> sp.	M	a marsh beetle
<b>Silvanidae</b>		
<i>Telephanus atricapillus</i> Erichson	W	a silvanid beetle
<i>Uleiota dubius</i> (Fabricius)	M	a silvanid beetle
<b>Staphylinidae</b>		
<i>Hesperus apicalis</i> (Say)	M	a rove beetle
<i>Philonthus rufulus</i> Erichson	M	a rove beetle
<i>Sepedophilus crassus</i> (Gravenhorst)	W	a rove beetle
<b>Synchroidae</b>		
<i>Synchroa punctata</i> Newman	M	a synchroa bark beetle
<b>Tenebrionidae</b>		
<i>Alobates pensylvanica</i> (DeGeer)	M	false mealworm beetle
<i>Bolitotherus cornutus</i> (Panzer)	M	forked fungus beetle
<i>Meracantha contracta</i> (Palisot de Beauvois)	M	a darkling beetle
<i>Neatus tenebroides</i> (Palisot de Beauvois)	M	a darkling beetle
<b>Tetratomidae</b>		
<i>Hallomenus scapularis</i> Melsheimer	M	a polypore fungus beetle

### **Trogossitidae**

*Tenebroides laticollis* (Horn)

M, W

a bark-gnawing beetle

*Tenebroides* sp.

M

a bark-gnawing beetle

### **Collecting Method and Effort**

The Coleoptera were surveyed using a variety of methods. Two flight intercept type traps were left for a week to collect beetles at both McVey Memorial Forest and White River Woods. The traps at each site consisted of a clear acrylic plastic window trap and a black panel trap (Advanced Pheromone Technologies, Inc., Marylhurst, USA) at each site. An ethanol lure was used in all traps. Beetles were also collected at a 175 W mercury vapor light at McVey Memorial Forest during 9 – 12 PM Saturday evening. During the day on Saturday and for approximately 3 hours Sunday morning the beetle team hand collected, aspirated small beetles from plants, and used sweepnets to sample beetles from vegetation. The collection effort is thus approximately 28 trap-days, three lighting hours, and 40 person-hours of collecting.

### **Summary Overview**

Ninety-two taxa (species or genera) were detected during the beetle surveys. These came from 29 different beetle families. None of the species were unusual or unexpected. By far, the most abundant species seen was a soldier beetle, *Chauliognathus pensylvanicus*. This species was very abundant on the flowering vegetation at both sites. Voucher specimens have been deposited in the Purdue Entomological Research Collection.

The number of species detected is slightly lower than expected for this amount of collecting effort. Mid-June is a very good time of year for beetle collecting with many species active in Indiana. The low number of species is likely due to the location of the conservation areas that were surveyed. The surrounding landscape is dominated by intensive row crop agriculture. This makes colonization of the habitat less likely, leading to a reduction in the number of species. As well, much of the forested area is recent second-growth forest. The actual forest area was much smaller approximately 40 years ago. The beetle fauna thus likely represents what would be found in a small, isolated forest and may increase over time.



Beetle team at work after sunset. (*Photos by John Taylor*)



*Cicindela sexguttata* Fabricius (family Carabidae), six-spotted tiger beetle, observed at White River Woods. (Photo by John Taylor)

**List of bird species (78 taxa) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Kamal Islam

Team Members: Micayla Jones, Jon Creek, Mary Ann Ross, Rosemarie Jeffery, Jim Jeffery, Bill Buskirk, Kim McKenzie, Timothy Rice, Barb Stedman, Martha Hunt, Barry Banks, Amy Rhodes

**Table 6: Bird data from the bioblitz. MMF = McVey Memorial Forest; WRW = White River Woods; \* = non-native species. (NOTE: green rows separate different orders and yellow rows separate different families of the Order Passeriformes).**

<u>Order and Family</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>MMF # Counted</u>	<u>WRW # Counted</u>
<b>Order Anseriformes</b>				
Anatidae	Canada Goose	<i>Branta canadensis</i>	25	3
Anatidae	Mallard	<i>Anas platyrhynchos</i>	1	0
<b>Order Galliformes</b>				
Phasianidae	Wild Turkey	<i>Meleagris gallopavo</i>	1	1
<b>Order Pelecaniformes</b>				
Ardeidae	Great Blue Heron	<i>Ardea herodias</i>	0	2
<b>Order Accipitriformes</b>				
Cathartidae	Turkey Vulture	<i>Cathartes aura</i>	6	3
Pandionidae	Osprey	<i>Pandion haliaetus</i>	0	1
Accipitridae	Bald Eagle	<i>Haliaeetus leucocephalus</i>	0	2
Accipitridae	Red-tailed Hawk	<i>Buteo jamaicensis</i>	2	2
<b>Order Charadriiformes</b>				
Charadriidae	Killdeer	<i>Charadrius vociferus</i>	2	1
<b>Order Columbiformes</b>				
Columbidae	Mourning Dove	<i>Zenaida macroura</i>	11	5
<b>Order Cuculiformes</b>				
Cuculidae	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	3	0
<b>Order Strigiformes</b>				
Strigidae	Barred Owl	<i>Strix varia</i>	0	1
<b>Order Caprimulgiformes</b>				
Apodidae	Chimney Swift	<i>Chaetura pelagica</i>	0	4
Trochilidae	Ruby-throated Hummingbird	<i>Archilochus colubris</i>	1	0
<b>Order Coraciiformes</b>				
Alcedinidae	Belted Kingfisher	<i>Megaceryle alcyon</i>	0	1
<b>Order Piciformes</b>				
Picidae	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	4	0

Picidae	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	16	3
Picidae	Downy Woodpecker	<i>Picoides pubescens</i>	7	2
Picidae	Hairy Woodpecker	<i>Picoides villosus</i>	1	0
Picidae	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1	1
Picidae	Northern Flicker (Yellow-shafted)	<i>Colaptes auratus</i>	1	2

### Order Passeriformes

Tyrannidae	Eastern Wood-Pewee	<i>Contopus virens</i>	6	5
Tyrannidae	Acadian Flycatcher	<i>Empidonax virescens</i>	6	4
Tyrannidae	Willow Flycatcher	<i>Empidonax traillii</i>	3	5
Tyrannidae	Eastern Phoebe	<i>Sayornis phoebe</i>	6	0
Tyrannidae	Great Crested Flycatcher	<i>Myiarchus crinitus</i>	3	3
Tyrannidae	Eastern Kingbird	<i>Tyrannus tyrannus</i>	1	0
Vireonidae	White-eyed Vireo	<i>Vireo griseus</i>	0	1
Vireonidae	Yellow-throated Vireo	<i>Vireo flavifrons</i>	5	0
Vireonidae	Warbling Vireo	<i>Vireo gilvus</i>	4	3
Vireonidae	Red-eyed Vireo	<i>Vireo olivaceus</i>	18	3
Corvidae	Blue Jay	<i>Cyanocitta cristata</i>	7	3
Corvidae	American Crow	<i>Corvus brachyrhynchos</i>	9	1
Hirundinidae	Purple Martin	<i>Progne subis</i>	7	0
Hirundinidae	Tree Swallow	<i>Tachycineta bicolor</i>	2	2
Hirundinidae	Barn Swallow	<i>Hirundo rustica</i>	1	6
Paridae	Carolina Chickadee	<i>Poecile carolinensis</i>	11	5
Paridae	Tufted Titmouse	<i>Baeolophus bicolor</i>	17	5
Sittidae	White-breasted Nuthatch	<i>Sitta carolinensis</i>	8	2
Troglodytidae	House Wren	<i>Troglodytes aedon</i>	11	9
Troglodytidae	Carolina Wren	<i>Thryothorus ludovicianus</i>	5	1
Poliopitilidae	Blue-gray Gnatcatcher	<i>Poliopitila caerulea</i>	10	3
Turdidae	Eastern Bluebird	<i>Sialia sialis</i>	2	0
Turdidae	Wood Thrush	<i>Hylocichla mustelina</i>	1	4
Turdidae	American Robin	<i>Turdus migratorius</i>	10	10
Mimidae	Gray Catbird	<i>Dumetella carolinensis</i>	9	10
Mimidae	Brown Thrasher	<i>Toxostoma rufum</i>	1	2
Sturnidae	European Starling	<i>Sturnus vulgaris*</i>	27	10
Bombycillidae	Cedar Waxwing	<i>Bombycilla cedrorum</i>	6	6
Parulidae	Ovenbird	<i>Seiurus aurocapilla</i>	1	0
Parulidae	Kentucky Warbler	<i>Geothlypis formosa</i>	1	0
Parulidae	Louisiana Waterthrush	<i>Parkesia motacilla</i>	0	1
Parulidae	Common Yellowthroat	<i>Geothlypis trichas</i>	10	8
Parulidae	American Redstart	<i>Setophaga ruticilla</i>	1	0

Parulidae	Cerulean Warbler	<i>Setophaga cerulea</i>	1	0
Parulidae	Northern Parula	<i>Setophaga americana</i>	5	3
Parulidae	Yellow Warbler	<i>Setophaga petechia</i>	2	6
Parulidae	Yellow-throated Warbler	<i>Setophaga dominica</i>	0	1
Icteriidae	Yellow-breasted Chat	<i>Icteria virens</i>	1	1
Passerellidae	Chipping Sparrow	<i>Spizella passerina</i>	9	4
Passerellidae	Field Sparrow	<i>Spizella pusilla</i>	12	8
Passerellidae	Song Sparrow	<i>Melospiza melodia</i>	3	13
Passerellidae	Eastern Towhee	<i>Pipilo erythrophthalmus</i>	7	2
Cardinalidae	Scarlet Tanager	<i>Piranga olivacea</i>	2	0
Cardinalidae	Northern Cardinal	<i>Cardinalis cardinalis</i>	14	10
Cardinalidae	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	0	1
Cardinalidae	Indigo Bunting	<i>Passerina cyanea</i>	22	15
Cardinalidae	Dickcissel	<i>Spiza americana</i>	1	0
Icteridae	Bobolink	<i>Dolichonyx oryzivorus</i>	2	0
Icteridae	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	42	20
Icteridae	Eastern Meadowlark	<i>Sturnella magna</i>	4	0
Icteridae	Common Grackle	<i>Quiscalus quiscula</i>	14	10
Icteridae	Brown-headed Cowbird	<i>Molothrus ater</i>	16	9
Icteridae	Orchard Oriole	<i>Icterus spurius</i>	0	1
Icteridae	Baltimore Oriole	<i>Icterus galbula</i>	9	3
Fringillidae	House Finch	<i>Haemorhous mexicanus</i>	0	3
Fringillidae	American Goldfinch	<i>Spinus tristis</i>	7	16
Passeridae	House Sparrow	<i>Passer domesticus</i> *	1	4
<b>TOTAL =</b>			<b>465</b>	<b>276</b>

### Summary Overview

A total of 78 species of birds were observed or heard on the 2-day, 2017 bioblitz event held on 10<sup>th</sup> & 11<sup>th</sup> June at two Red-tail Land Conservancy properties (McVey Memorial Forest & White Rivers Woods) with 47 species common to both properties. Reports of birds from individuals participating on other taxonomic teams were also included in the final tally. All birds observed or heard appeared to be on territory and were considered potential breeders. The number of individuals of each species was also recorded. Highlights of the count included Cerulean Warbler and Osprey (both state endangered species), Bald Eagle (state species of ‘Special Concern’), Bobolink and Dickcissel (species with declining populations rangewide), and 34 species of long-distance migrants that winter in Central and South America and breed in Indiana.

On 10<sup>th</sup> June, nine participants met at McVey Memorial Forest and were divided into two teams. One team surveyed the northern section of the property and the second team birded the southern portion. Each team recorded birds along designated trails and gravel roads. A total of 66 bird species were

detected during 72 person-hours of effort. Highlights of this count included all 6 resident species of woodpeckers, two long-distance grassland/fallow field specialists (Bobolink and Dickcissel), six species of migratory flycatchers, and eight species of long-distance migratory warblers. The most surprising find was a male singing Cerulean Warbler on territory; this species has declined by over 70% throughout its rangewide distribution during the last five decades and its stronghold in Indiana is restricted to the southern forested parts of the state. On 11<sup>th</sup> June, nine participants met at White River Woods and surveyed the property along mowed pathways and trails as a single team. A total of 59 species of birds were recorded during 63 person-hours of effort. Notable species included Osprey and Bald Eagle. A Rose-breasted Grosbeak was observed singing on territory; normally, this species breeds further north in the state.

More species (66) and more individuals (465) were observed at McVey Memorial Forest than at White River Woods (59 species, 276 individuals). This discrepancy in number of species recorded and individuals counted between the two properties is likely a result of a difference in acreage rather than effort. In addition, McVey Memorial Forest has a much larger contiguous block of mature forest with Bush Creek meandering its way into the Mississinewa River. Along Bush Creek and other areas of the property, several mature forest dependent species were detected and these species were largely absent at White River Woods, such as Yellow-billed Cuckoo (3 vs. 0), Yellow-throated Vireo (5 vs. 0), Red-eyed Vireo (18 vs. 3), Ovenbird (1 vs. 0), Kentucky Warbler (1 vs. 0), American Redstart (1 vs. 0), Cerulean Warbler (1 vs. 0), and Scarlet Tanager (2 vs. 0).

Forty-seven species were found at both properties consisting of many edge species or generalists such as Mourning Dove, Warbling Vireo, House Wren, American Robin, Common Yellowthroat, Yellow-breasted Chat, Field Sparrow, and Indigo Bunting among others. Five species with the highest count were Red-winged Blackbird (62), Indigo Bunting (37), European Starling (37), Canada Goose (28), and Brown-headed Cowbird (25). European Starlings are an introduced commensal that have successfully colonized North America. The Brown-headed Cowbird, a known brood parasite, has also benefitted from human modification of the landscape, especially with the removal of forests for agriculture.





Top: Bird team at work. (Photo by Martha Hunt)

Bottom: Cedar Waxwing (*Bombicilla cedrorum*). (Photo by Martha Hunt)





Yellow-breasted Chat (*Icteria virens*). (Photo by Martha Hunt)

**List of butterflies ( ; 22 species) and dragonflies and damselflies ( ; 28 species) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Kirk Roth

Team Members: Bill Cassel, Paul McMurray, Ben Hess

**Table 7: Butterfly taxa. MMF = McVey Memorial Forest; WRW = White River Woods.**

<u>Family</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>MMF</u> <u># counted</u>	<u>WRW</u> <u># counted</u>
Hesperiidae	Silver-spotted Skipper	<i>Epargyreus clarus</i>	15	31
	Zabulon Skipper	<i>Poanes zabulon</i>	2	12
	Delaware Skipper	<i>Anatrytone logan</i>	1	1
Papilionidae	swallowtail sp.	<i>Papilionidae</i>	1	1
	Black Swallowtail	<i>Papilio polyxenes</i>	0	2
	Tiger Swallowtail	<i>Papilio glaucus</i>	1	0
Pieridae	Clouded Sulphur	<i>Colias philodice</i>	0	3
	Cabbage White (exotic)	<i>Pieris rapae</i>	26	42
Lycaenidae	hairstreak sp.	<i>Satyrrium</i> sp.	0	1
	Banded Hairstreak	<i>Satyrrium calanus</i>	4	4
	White-M Hairstreak	<i>Parrhasius m-album</i>	0	1
	Eastern Tailed-blue	<i>Cupido comyntas</i>	0	4
	Summer Azure	<i>Celastrina neglecta</i>	30	53
Nymphalidae	Monarch	<i>Danaus plexippus</i>	0	2
	Red-spotted Purple	<i>Limenitis arthemis</i>	1	2
	Hackberry Emperor	<i>Asterocampus celtis</i>	4	1
	Painted Lady	<i>Vanessa cardui</i>	4	1
	Red Admiral	<i>Vanessa atalanta</i>	3	13
	anglewing sp.	<i>Polygonia</i> sp.	1	2
	Question Mark	<i>Polygonia interrogationis</i>	1	0
	Eastern Comma	<i>Polygonia comma</i>	1	2
	Common Buckeye	<i>Junonia coenia</i>	0	1
	Northern Pearly-eye	<i>Lethe anthedon</i>	2	2
	Eyed Brown	<i>Lethe eurydice</i>	0	1
	Little Wood Satyr	<i>Megisto cymela</i>	4	0
	<b>Total Observed =</b>			<b>101</b>
<b>Number of Species =</b>			<b>15</b>	<b>19</b>

**Table 8. Odonate (dragonflies and damselflies) taxa. MMF = McVey Memorial Forest; WRW = White River Woods.**

<u>Family</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>MMF # counted</u>	<u>WRW # counted</u>
Aeshnidae	Common Green Darner	<i>Anax junius</i>	0	2
	Swamp Darner	<i>Epiaeschna heros</i>	4	2
Gomphidae	Dragonhunter	<i>Hagenius brevistylus</i>	0	2
	Handsome Clubtail	<i>Gomphus crassus</i>	1	3
	Flag-tailed Spinyleg	<i>Dromogomphus spoliatus</i>	1	0
	Arrowhead Spiketail	<i>Cordulegaster obliqua</i>	1	0
Corduliidae	Illinois River Cruiser	<i>Macromia illinoensis</i>	1	5
	Prince Baskettail	<i>Epithea princeps</i>	0	1
	Common Baskettail	<i>Epithea cynosura</i>	0	2
Libellulidae	Widow Skimmer	<i>Libellula luctuosa</i>	11	9
	Common Whitetail	<i>Libellula lydia</i>	8	4
	Twelve-spotted Skimmer	<i>Libellula pulchella</i>	11	10
	Ruby Meadowhawk	<i>Sympetrum rubicundulum</i>	0	1
	Eastern Amberwing	<i>Perithemis tenera</i>	1	0
	Eastern Pondhawk	<i>Erythemis simplicicollis</i>	5	6
	Spot-winged Glider	<i>Pantala hymenaea</i>	0	1
	Black Saddlebags	<i>Tamea lacerata</i>	2	0
	Carolina Saddlebags	<i>Tamea carolina</i>	2	0
	Calopterygidae	Ebony Jewelwing	<i>Calopteryx maculata</i>	37
American Rubyspot		<i>Hetaerina americana</i>	0	1
Lestidae	Slender Spreadwing	<i>Lestes rectangularis</i>	1	0
Coenagrionidae	Variable Dancer	<i>Argia fumipennis</i>	6	1
	Blue-tipped Dancer	<i>Argia tibialis</i>	21	7
	Blue-fronted Dancer	<i>Argia apicalis</i>	0	3
	Powdered Dancer	<i>Argia moesta</i>	1	3
	Stream Bluet	<i>Enallagma exsulans</i>	1	4
	Turquoise Bluet	<i>Enallagma divagans</i>	1	0
	Eastern Forktail	<i>Ischnura verticallis</i>	6	0
<b>Total Observed =</b>			<b>122</b>	<b>108</b>
<b>Number of Species =</b>			<b>20</b>	<b>20</b>

### Collecting Methods and Effort

Most specimens in Lepidoptera and Odonata were observed visually, often with the use of 8×42 powered binoculars. Some individuals were photographed or captured in insect nets for inspection of close-up identification details. Except for photographs, no vouchers were taken. Fourteen person-hours were spent at White River Woods and 5.5 person-hours were spent at McVey Woods.

## **Special Interest Species**

### **County Record Butterflies:**

- Zabulon Skipper (*Poanes zabulon*) – Randolph
- Delaware Skipper (*Anatrytone logan*) – Randolph
- Banded Hairstreak (*Satyrium calanus*) – Delaware, Randolph
- White-M Hairstreak (*Parrhasius m-album*) – Delaware
- Hackberry Emperor (*Asterocampus celtis*) – Randolph
- Northern Pearly-eye (*Lethe anhedon*) – Delaware, Randolph
- Eyed Brown (*Lethe eurydice*) – Delaware

The occurrence of the Eyed Brown represents a range extension, occurring several counties south of the expected range. One individual was found in an open seep strongly dominated by *Carex stricta*, its caterpillar host plant, in the southeast end of the property.

All of these records have been photographed and the photos will be added to Jeff Belth's database (jeffreyselth@gmail.com).

### **County Record Odonates:**

- Swamp Darner (*Epiaeschna heros*) - Randolph
- Dragonhunter (*Hagenius brevistylus*) – Delaware
- Handsome Clubtail (*Gomphus crassus*) – Delaware, Randolph
- Flag-tailed Spinyleg (*Dromogomphus spoliatus*) – Randolph
- Arrowhead Spiketail (*Cordulegaster obliqua*) – Randolph
- Illinois River Cruiser (*Macromia illinoensis*) – Delaware, Randolph
- Prince Baskettail (*Epitheca princeps*) – Delaware
- Common Baskettail (*Epitheca cynosure*) – Delaware
- Common Whitetail (*Libellula lydia*) – Randolph
- Twelve-spotted Skimmer (*Libellula pulchella*) – Delaware
- Spot-winged Glider (*Pantala hymenaea*) - Delaware
- Carolina Saddlebags (*Tamea carolina*) – Randolph
- Ebony Jewelwing (*Calopteryx maculata*) – Delaware, Randolph
- American Rubyspot (*Hetaerina americana*) - Delaware
- Slender Spreadwing (*Lestes rectangularis*) - Randolph
- Variable Dancer (*Argia fumipennis*) – Delaware, Randolph
- Blue-tipped Dancer (*Argia tibialis*) – Delaware, Randolph
- Blue-fronted Dancer (*Argia apicalis*) - Delaware
- Powdered Dancer (*Argia moesta*) – Delaware, Randolph
- Stream Bluet (*Enallagma divagans*) – Delaware, Randolph
- Turquoise Bluet (*Enallagma divagans*) - Randolph
- Eastern Forktail (*Ischnura verticallis*) - Randolph

All of these have been photographed except for the counties underlined. Records will be recorded on Odonata Central (<http://www.odonatacentral.org/>).

## Summary Overview

**Butterflies:** Species diversity of butterflies was similar at both sites with 15 species at McVey Memorial Forest and 19 species at White River Woods. However, White River Woods had more individual butterflies detected (182) compared to McVey Memorial Forest (101), likely due to greater sampling effort. Abundant species at both sites included Silver-spotted Skipper (*Epargyreus clarus*), Cabbage White (*Pieris rapae*), Summer Azure (*Celastrina neglecta*), and Red Admiral (*Vanessa atalanta*). It is notable that the date of the bioblitz was between or before the main flights of several skipper species (Belth 2013), which may explain why only three species of skipper were detected. A surprising absence was that of Pearl Crescents (*Phyciodes tharos*), which are often abundant and easily found during butterfly surveys.

The most unexpected find was an Eyed Brown (*Lethe eurydice eurydice*) at White River Woods, several counties south of its expected range in Indiana (Belth 2013). One individual was found in an open seep dominated by *Carex stricta*, its larval host plant. The Eyed Brown is typically a northern species, so it is possible that this represents a remnant population, or simply that a small number have dispersed to Delaware County. This record indicates that other areas of *Carex stricta* in Indiana should be checked for this species in June and July. Other notable species found during the butterfly survey were the White-M Hairstreak (*Parrhasius m-album*) at White River Woods and four Banded Hairstreaks (*Satyrrium calanus*) at each location. The White-M Hairstreak is a canopy dwelling species, which is rarely observed closer to convenient observation level. Hairstreaks in general are often localized in distribution, so these sites may represent important local habitat for them. The Eyed Brown and both hairstreaks represent county records for each county in which they occurred. Other county records include Zabulon Skipper (*Poanes zabulon*) in Randolph, Delaware Skipper (*Anatrytone logan*) in Randolph, Hackberry Emperor (*Asterocampus celtis*) in Randolph, and Northern Pearly-eye (*Lethe anthedon*) in Delaware and Randolph counties. These likely represent lack of sampling rather than rarity, as these four species are not uncommon.

**Odonates:** A total of 28 species of Odonates, comprised of 18 dragonflies and 10 damselflies, were detected during the bioblitz, with 20 species at each location. Numbers of individuals were similar at both locations, with 122 at McVey Memorial Forest and 108 at White River Woods. Abundant species at both locations included Widow Skimmer (*Libellula luctuosa*), Twelve-spotted Skimmer (*Libellula pulchella*), Ebony Jewelwing (*Calopteryx maculata*), and Blue-tipped Dancer (*Argia tibialis*).

The diversity of aquatic habitats at both sites is a likely driver of the Odonate diversity observed, as species composition was typical of standing and running waterways. The pond at the southern end of McVey Memorial Forest was an excellent location for skimmer species (Libellulidae), as may be expected from a large, isolated, and shallow pond. Both sites have extensive running waterways which provide excellent habitat for the many damselflies detected during the bioblitz. However, many larger and interesting species were found in upland habitats, including Swamp Darner (*Epiaeschna heros*), Handsome Clubtail (*Gomphus crassus*), Illinois River Cruiser (*Macromia illinoiensis*) on both sites; Arrowhead Spiketail (*Cordulegaster obliqua*) at McVey Memorial Forest; and Ruby Meadowhawk

(*Sympetrum rubicundulum*) and Spot-winged Glider (*Pantala hymenaea*) at White River Woods. Delaware and Randolph Counties are not well represented for Odonate collection (see Curry 2001) so most species encountered represented county records. Most of these were photographed, and records will be documented at the Odonata Central website (Abbott 2006-2017).

### **References**

Abbott, J.C. 2006-2017. OdonataCentral: An online resource for the distribution and identification of Odonata. Available at <http://www.odonatacentral.org>.

Belth, Jeffrey E., 2013. Butterflies of Indiana –A Field Guide. Indiana University Press, Bloomington and Indianapolis, Indiana. 323 pp.

Curry, J.R. 2001. Dragonflies of Indiana. Indiana Academy of Sciences, Indianapolis, Indiana. 303 pp.



Red Admiral (*Vanessa atalanta*) seen at White River Woods. (Photo by Paul McMurray)



Red-spotted Purple (*Limenitis arthemis*) observed at McVey Memorial Forest. (Photo by Paul McMurray)



Eyed Brown (*Letho eurydice*) at White River Woods which represents a range extension for the species. (Photo by Kirk Roth)





Ebony Jewelwing (*Calopteryx maculata*) observed at White River Woods. (Photo by Paul McMurray)



Stream Bluet (*Enallagma divagans*) observed at White River Woods. (Photo by Paul McMurray)



Handsome Clubtail (*Gomphus crassus*) photographed at McVey Memorial Forest. (Photo by Paul McMurray)



Dragonhunter (*Hagenius brevistylus*) photographed along the White River. (Photo by Paul McMurray)

**List of fish species (47 species) observed during the Red-Tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Brant E. Fisher

Team Members: JoAnne Davis, Drew Holloway, Laura Bowley, Zack Laughlin, Jessica Bryzek, Ryan Seymour, Cole Baird, Matt Byrnes

**Table 9a: Fish species and their common names. All in the Class ACTINOPTERYGII. Species listed by order and family.**

<u>Scientific Name</u>	<u>Non-Native</u>	<u>Common Name</u>
<b>Order CYPRINIFORMES</b>		
<b>Family CYPRINIDAE (carps &amp; minnows)</b>		
	X	Central Stoneroller
		Spotfin Shiner
		<b>Steelcolor Shiner</b>
		Common Carp
		Striped Shiner
		Redfin Shiner
		<b>River Chub</b>
		Silverjaw Minnow
		<b>Silver Shiner</b>
		<b>Rosyface Shiner</b>
		Sand Shiner
		<b>Mimic Shiner</b>
		Suckermouth Minnow
		Bluntnose Minnow
		Creek Chub
<b>Order CYPRINIFORMES</b>		
<b>Family CATOSTOMIDAE (suckers)</b>		
		White Sucker
		<b>Western Creek Chubsucker</b>
		Northern Hog Sucker
		<b>Spotted Sucker</b>
		Black Redhorse
		Golden Redhorse
<b>Order SILURIFORMES</b>		
<b>Family ICTALURIDAE (North American catfishes)</b>		
		<b>Black Bullhead</b>
		Yellow Bullhead
		<b>Channel Catfish</b>
		Stonecat
		<b>Tadpole Madtom</b>
		<b>Brindled Madtom</b>

**Order SALMONIFORMES**

Family SALMONIDAE (trouts & salmon)

X

**Rainbow Trout**

**Order ESOCIFORMES**

Family ESOCIDAE (pikes & mudminnows)

Redfin Pickerel

**Order CYPRINODONTIFORMES**

Family FUNDULIDAE (topminnows)

Blackstripe Topminnow

**Order SCORPAENIFORMES**

Family COTTIDAE (sculpins)

Mottled Sculpin

**Order PERCIFORMES**

Family CENTRARCHIDAE (sunfishes)

Rock Bass

Green Sunfish

**Orangespotted Sunfish**

Bluegill

Longear Sunfish

Smallmouth Bass

Largemouth Bass

**Order PERCIFORMES**

Family PERCIDAE (perches & darters)

Greenside Darter

Rainbow Darter

Johnny Darter

**Least Darter**

Orangethroat Darter

Logperch

Blackside Darter

**Slenderhead Darter**

**Order PERCIFORMES**

Family SCIAENIDAE (drums & croakers)

**Freshwater Drum**

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**Species in blue** = unique to McVey Memorial Forest (see below)

**Species in yellow** = unique to White River Woods (see below)

**Site Information and Collecting Methods**

Site #	Waterbody & Location	Date(s) Sampled (June 2017)	Sampling Method Fish
BEF17029	Mississinewa River: at Brush Creek mouth	7 <sup>th</sup> , 10 <sup>th</sup>	backpack electro./seine
BEF17030	West Fork White River: at end of lane for Oakwood Retreat Center off CR 575E	7 <sup>th</sup>	backpack electro./seine
BEF17033	Bush Creek: at CR 700N bridge	10 <sup>th</sup>	backpack electro./seine
BEF17034	Bush Creek: at CR 750N bridge	10 <sup>th</sup>	backpack electro./seine

**Total Effort**

6/7/2017: (2.0 hours x 2 people) + (2.0 hours x 6 people) = 16.0 hours  
 6/8/2017: 3.5 hours x 5 people = 17.5 hours  
 6/10/2017: 6.0 hours x 2 people = 12.0 hours  
 Total Hours = 45.5 hours

**Table 9b: Fish species collecting information.**

COMMON NAME	Mississinewa River (BEF17029)	Bush Creek (BEF17033)	Bush Creek (BEF17034)	Total - McVey Memorial Forest	West Fork White River (BEF17030)	total sites
Central Stoneroller	X	X	X	X	X	4
Spotfin Shiner	X		X	X	X	3
Steelcolor Shiner	X			X		1
Common Carp	X		X	X	X	3
Striped Shiner	X	X	X	X	X	4
Redfin Shiner	X	X	X	X	X	4
River Chub					X	1
Silverjaw Minnow			X	X	X	2
Silver Shiner					X	1
Rosyface Shiner					X	1
Sand Shiner	X		X	X	X	3
Mimic Shiner					X	1
Suckermouth Minnow	X			X	X	2
Bluntnose Minnow	X	X	X	X	X	4
Creek Chub	X	X	X	X	X	4
White Sucker	X	X	X	X	X	4
Western Creek Chubsucker		X		X		1
Northern Hog Sucker	X	X	X	X	X	4

Spotted Sucker	X	X	X	X			3
Black Redhorse	X	X	X	X		X	4
Golden Redhorse	X	X	X	X		X	4
Black Bullhead	X			X			1
Yellow Bullhead	X	X	X	X		X	4
Channel Catfish						X	1
Stonecat	X			X		X	2
Tadpole Madtom	X	X	X	X			3
Brindled Madtom	X			X			1
Rainbow Trout	X			X			1
Redfin Pickerel	X	X	X	X		X	4
Blackstripe Topminnow	X	X	X	X		X	4
Mottled Sculpin	X	X	X	X		X	4
Rock Bass	X	X	X	X		X	4
Green Sunfish	X	X	X	X		X	4
Orangespotted Sunfish	X			X			1
Bluegill	X	X	X	X		X	4
Longear Sunfish	X	X	X	X		X	4
Smallmouth Bass	X	X		X		X	3
Largemouth Bass	X			X		X	2
Greenside Darter	X	X	X	X		X	4
Rainbow Darter	X	X	X	X		X	4
Johnny Darter	X	X	X	X		X	4
Least Darter			X	X			1
Orangethroat Darter	X	X	X	X		X	4
Logperch	X	X	X	X		X	4
Blackside Darter			X	X		X	2
Slenderhead Darter	X			X			1
Freshwater Drum	X			X			1
<b>Total Species:</b>	<b>38</b>	<b>26</b>	<b>29</b>	<b>42</b>		<b>36</b>	

Species in orange	=	Unique to White River Woods
Species in blue	=	Unique to McVey Memorial Forest

### Summary Overview

A total of 47 species of fish were collected from the four sites sampled in White River Woods (one site on the West Fork White River) and McVey Memorial Forest (one site on the Mississinewa River and two sites on Bush Creek). Fish diversity was slightly higher within McVey Memorial Forest, with 42 species collected compared to 36 from White River Woods. Eleven species were unique to McVey

Memorial Forest, including Steelcolor Shiner (*Cyprinella whipplei*), Western Creek Chubsucker (*Erimyzon claviformis*), Spotted Sucker (*Minytrema melanops*), Black Bullhead (*Ameiurus melas*), Tadpole Madtom (*Noturus gyrinus*), Brindled Madtom (*N. miurus*), Rainbow Trout (*Oncorhynchus mykiss*), Orangespotted Sunfish (*Lepomis humilis*), Least Darter (*Etheostoma microperca*), Slenderhead Darter (*Percina phoxocephala*), and Freshwater Drum (*Aplodinotus grunniens*). Western Creek Chubsucker, Spotted Sucker, Black Bullhead, and Tadpole Madtom do inhabit areas of the upper West Fork White River drainage, but with the limited aquatic habitat to sample in the White River Woods property, they were not encountered. Of the five species unique to White River Woods (River Chub (*Nocomis micropogon*), Silver Shiner (*Notropis photogenis*), Rosyface Shiner (*N. rubellus*), Mimic Shiner (*N. volucellus*), and Channel Catfish (*Ictalurus punctatus*)), only the Channel Catfish would be possible from the McVey Memorial Forest property; the other four minnow species are not known from the upper Mississinewa River drainage. Of the remaining 31 species found on both properties, 26 were found at least three of the four sites sampled and would be considered common inhabitants of central Indiana streams. No state listed fish species were collected from either property.



Freshwater Drum (*Aplodinotus grunniens*) – collected from the Mississinewa River, McVey Memorial Forest. (Photo by Brant Fisher)



Top: West Fork White River, White River Woods, Delaware County, location of fish and mussel sampling.

Bottom: Channel Catfish (*Ictalurus punctatus*) collected from the West Fork White River, White River Woods. Drew Holloway with the Muncie Bureau of Water Quality is holding the fish. (Photos by Brant Fisher)



**List of freshwater mussel species (25 species) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Brant E. Fisher

Team Members: JoAnne Davis, Drew Holloway, Laura Bowley, Zack Laughlin, Jessica Bryzek, Ryan Seymour, Cole Baird, Matt Byrnes

**Table 10a: Freshwater mussel species, their common names, and status. (\* = non-native)**

<u>Scientific Name</u>	<u>Status</u>	<u>Common Name</u>
<b>Order UNIONOIDA</b>		
<b>Family UNIONIDAE</b>		
		<b>Mucket</b>
		Elktoe
		Slippershell Mussel
		Threeridge
		Cylindrical Papershell
		Spike
	<b>federal/state endangered</b>	Northern Riffleshell
		Wabash Pigtoe
		Plain Pocketbook
	<b>special concern</b>	Wavyrayed Lampmussel
		Fatmucket
		<b>White Heelsplitter</b>
		Creek Heelsplitter
		Flutedshell
	<b>federal/state endangered</b>	Clubshell
		Round Pigtoe
	<b>special concern</b>	Kidneyshell
		Giant Floater
		<b>Mapleleaf</b>
		Creeper
	<b>special concern</b>	Purple Lilliput
		Paper Pondshell
	<b>federal/state endangered</b>	<b>Rayed Bean</b>
		Rainbow
<b>Order VENEROIDA</b>		
<b>Family CORBICULIDAE</b>		
		Asian Clam

**Species in blue = unique to McVey Memorial Forest (see below)**

**Species in yellow = unique to White River Woods (see below)**



**Site Information and Collecting Methods**

Site #	Waterbody & Location	Date(s) Sampled (June 2017)	sampling method mussels
BEF17029	Mississinewa River: at Brush Creek mouth	7 <sup>th</sup> , 10 <sup>th</sup>	physical search
BEF17031	Mississinewa River: at SR 1 bridge	8 <sup>th</sup>	physical search
BEF17032	West Fork White River: at end of lane for Oakwood Retreat Center off CR 575E	8 <sup>th</sup>	physical search
BEF17033	Bush Creek: at CR 700N bridge	10 <sup>th</sup>	physical search
BEF17034	Bush Creek: at CR 750N bridge	10 <sup>th</sup>	physical search

**Table 10b: Freshwater mussel species collecting information. L = live; FD = fresh dead; WD = weathered dead; SF = subfossil.**

	BEF 17029	BEF 17031	BEF 17033	BEF 17034	Total MMF	WRW BEF 17032	Best Condition	Total all sites
<b>COMMON NAME</b>								
<b>Mucket</b>						L	Live	1
<b>Elktoe</b>	WD	L			L	L	Live	3
<b>Slippershell Mussel</b>	WD	WD		WD	WD	SF	WD	4
<b>Threeridge</b>	L	L			L	L	Live	3
<b>Cylindrical Papershell</b>	WD	WD		FD	FD	L	Live	4
<b>Spike</b>	WD	WD	WD		WD	L	Live	4
<b>Northern Riffleshell</b>		WD			WD	SF	WD	2
<b>Wabash Pigtoe</b>	L	L		WD	L	L	Live	4
<b>Plain Pocketbook</b>	L	L		WD	L	L	Live	4
<b>Wavyrayed Lampmussel</b>	WD	WD			WD	L	Live	3
<b>Fatmucket</b>	L	L	WD	L	L	L	Live	5
<b>White Heelsplitter</b>	L	L			L		Live	2
<b>Creek Heelsplitter</b>		L			L	L	Live	2
<b>Flutedshell</b>	L	L			L	L	Live	3
<b>Clubshell</b>	WD	WD			WD	WD	WD	3
<b>Round Pigtoe</b>	WD	L			L	L	Live	3
<b>Kidneyshell</b>	WD	WD			WD	WD	WD	3
<b>Giant Floater</b>	L	L		WD	L	WD	Live	4
<b>Mapleleaf</b>	L	L			L		Live	2
<b>Creeper</b>	WD	L	WD		L	L	Live	4

<b>Purple Lilliput</b>	WD				WD	WD	WD	<b>2</b>
<b>Paper Pondshell</b>	WD	FD			FD	WD	FD	<b>3</b>
<b>Rayed Bean</b>						SF	SF	<b>2</b>
<b>Rainbow</b>	WD	WD			WD	L	Live	<b>3</b>
<b>Asian Clam</b>	L	L	L	L	L	L	Live	<b>5</b>
<b>Total Live Native Species:</b>	<b>8</b>	<b>12</b>	<b>0</b>	<b>1</b>	<b>12</b>	<b>14</b>	<b>17</b>	
<b>Total FD Native Species:</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>1</b>	
<b>Total WD/SF Native Species:</b>	<b>12</b>	<b>8</b>	<b>3</b>	<b>4</b>	<b>8</b>	<b>8</b>	<b>6</b>	
<b>Total Native Species:</b>	<b>20</b>	<b>21</b>	<b>3</b>	<b>6</b>	<b>22</b>	<b>22</b>	<b>24</b>	

 unique to McVey Memorial Forest  
 unique to White River Woods

### **Summary Overview**

Evidence of 24 native species of freshwater mussels and one non-native mollusk (Asian Clam – *Corbicula fluminea*) was found from the five sites sampled in White River Woods (one site on the West Fork White River) and McVey Memorial Forest (two sites on the Mississinewa River and two sites on Bush Creek). While fourteen native species of freshwater mussels were found live/fresh dead on both properties, Mucket (*Actinonaias ligamentina*), Spike (*Elliptio dilatata*), Wavyrayed Lampmussel (*Lampsilis fasciola*), and Rainbow (*Villosa iris*) were only found live in White River Woods. None of these four species are still found live anywhere in the upper Mississinewa River drainage. Live/fresh dead White Heelsplitter (*Lasmigona complanata*), Giant Floater (*Pyganodon grandis*), Mapleleaf (*Quadrula quadrula*) and Paper Pondshell (*Utterbackia imbecillis*) were only collected from the McVey Memorial Forest property. Giant Floater and Paper Pondshell are known to be live in the upper West Fork White River drainage near the White River Woods property and could be found there in future surveys. Shell material of the federal and state endangered Northern Riffleshell (*Epioblasma torulosa rangiana*), Clubshell (*Pleurobema clava*) and Rayed Bean (*Villosa fabalis*) was found but none are still known live on either property. Two live individuals and additional fresh dead shell material of the Wavyrayed Lampmussel, a state species of special concern, were collected from the White River Woods property; only weathered shell material was found on the McVey Memorial Forest property and it is likely not live there. Weathered shell material of two additional state species of special concern, Kidneyshell (*Ptychobranhus fasciolaris*) and Purple Lilliput (*Toxolasma lividum*), was found on both properties, but neither is likely still live. Overall, a relatively diverse freshwater mussel community, compared to other central Indiana streams, still persists on both the White River Woods and McVey Memorial Forest properties, even though both have lost around a third of their historic diversity.



Top: Mapleleaf (*Quadrula quadrula*) collected from the Mississinewa River, McVey Memorial Forest.

Bottom: Rainbow (*Villosa iris*) collected from the West Fork White River, White River Woods. (Photos by Brant Fisher)



Plain Pocketbook (*Lampsilis cardium*) – displaying female buried in the substrate – Mississinewa River, McVey Memorial Forest. (Photo by Brant Fisher)

**List of herpetofauna (12 species) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Robert Brodman

Team Members: Payton Kellenburger, Kristin Chelius, Alison Chandler, Mike Finkler, Megan Moss, Zach Laughin, McKayla Jones, Jessica Filer, Alex Filer.

**Table 11: Herpetofauna taxa data.**

**Site: White River Woods**

<u>Species</u>	<u>Common Name</u>	<u>Count</u>
<b>Reptiles</b>		
<i>Chrysemys picta</i>	Painted Turtle	1
<i>Nerodia sipedon</i>	Northern Watersnake	1
<b>Amphibians</b>		
<i>Ambystoma texanum</i>	Smallmouth Salamander	1
<i>Anaxyrus americanus</i>	American Toad	1
<i>Lithobates catesbeianus</i> *	Bullfrog	1
<i>Lithobates clamitans</i> *	Green Frog	1

\* = Delaware County Record

**Site: McVey Memorial Forest**

<u>Species</u>	<u>Common Name</u>	<u>Count</u>
<b>Reptiles</b>		
<i>Thamnophis sirtalis</i>	Eastern Gartersnake	3
<i>Nerodia sipedon</i>	Northern Watersnake	3
<i>Graptemys geographica</i> §	Map Turtle	1
<i>Chrysemys picta</i>	Painted Turtle	15
<i>Chelydra serpentina</i>	Common Snapping Turtle	1
<b>Amphibians</b>		
<i>Anaxyrus americanus</i> §	American Toad	2
<i>Acris blanchardi</i> §	Blanchard's Cricket Frog (many more calling)	9
<i>Hyla versicolor</i> §	Eastern Gray Treefrog	1
<i>Lithobates catesbeianus</i>	Bullfrog	4
<i>Lithobates clamitans</i>	Green Frog	6
<i>Lithobates pipiens</i>	Northern Leopard Frogs	2

§ = Randolph County Record

**TOTAL = 52**

### **Collecting Methods & Effort**

Amphibian and reptiles were surveyed by a combination of methods. Terrestrial and wetland habitats were sampled by visual searches and sampling cover objects. Calling frogs were identified and wetlands were sampled by dip-nets for larvae. Turtles and amphibian larvae were also sampled by turtle traps and minnow traps in wetlands, ponds, and the river. Effort was evenly split between the two sites. The complete effort was approximately 100 person-hours and 71 trap-days.

### **Voucher Specimens**

Voucher photos of *Graptemys geographica*, *Acris blanchardi*, *Hyla versicolor*, *Anaxyrus americanus*, *Lithobates catesbeianus*, and *Lithobates clamitans* are kept by Dr. Robert Brodman and Herp Mapper. Specimen of *Acris blanchardi* is also deposited in the Indiana State Museum.

### **Summary Overview**

The herp team found a total of 53 herps from 12 species including 25 reptiles representing 5 species and 28 amphibians representing 7 species. Two species [*Lithobates catesbeianus* and *Lithobates clamitans*] are listed by Minton (2001) as present but had never been vouchered in Delaware County. Two species [*Acris blanchardi* and *Anaxyrus americanus*] are listed by Minton (2001) as present but had never been vouchered in Randolph County. Two species [*Graptemys geographica* and *Hyla versicolor*] represent new Randolph County records. *Acris blanchardi* is a species of special concern in Indiana and has declined greatly throughout the northern half of its geographic range. They were common at each wetland and pond surveyed at McVey Memorial Forest. *Rana pipiens* is also a species of special concern.

### **References**

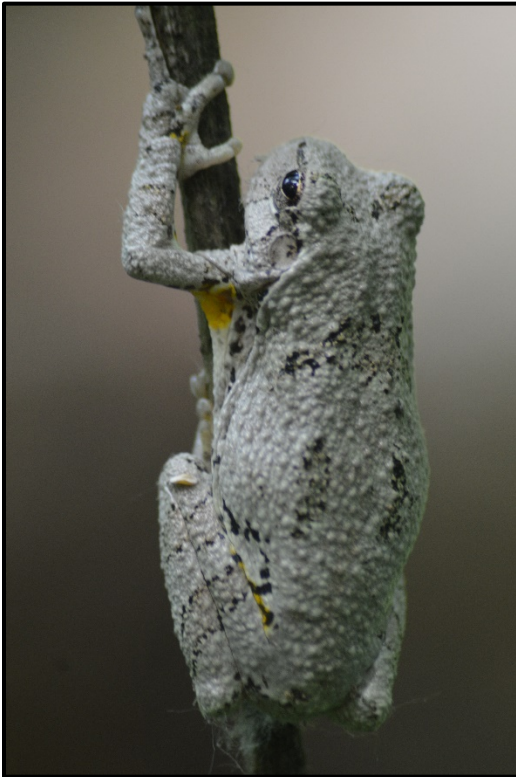
Minton, Sherman A., Jr. 2001. Amphibians and Reptiles of Indiana. Indiana Academy of Sciences Monograph, Indianapolis, Indiana. 404 pp.



Northern watersnake (*Nerodia sipedon*) in the White River at White River Woods.  
(Photo by Paul McMurray)



Herp team with turtles



*Hyla versicolor*



*Acris blanchardi*





*Anaxyrus americanus*



*Lithobates clamitans*



*Lithobates catesbeianus*



*Graptemys geographica*

**List of small mammal taxa (7 species) observed during the Red-tail Land Conservancy Biodiversity Survey, June 2017.**

Team Leader: John O. Whitaker, Jr.

Team Members: Angie Chamberlain

**Table 12a: Small mammals collected at Red-tail Conservancy bioblitz via snap trap lines and other mammals observed.**

Scientific Name	Common Name	Line Number														TOT	
		1	2	4	5	6	7	8	9	10	12	13	14	15	16		
<i>Peromyscus leucopus</i>	White-footed mouse	1		3	1	2	1		3		7				1	1	20
<i>Blarina brevicauda</i>	Northern short-tailed shrew	3	1			1	3	2	2	1		3	2	1			19
<i>Zapus hudsonius</i>	Meadow jumping mouse									1		2					3
<b>Total per line</b>		4	1	3	1	3	4	2	5	2	7	5	2	2	1		<b>42</b>

**Mammals observed**

<i>Tamias striatus</i>	Eastern chipmunk
<i>Marmota monax</i>	Woodchuck
<i>Procyon lotor</i>	Raccoon
<i>Scalopus aquaticus</i>	Eastern mole

**Table 12b: Capture data as related to habitat, Red-tail Conservancy Bioblitz, June 2017.**

Habitat Type	# of plots in habitat	Total individuals
Grassy Weedy Field	9	11
Edge of Woods	5	7
Marshy Field	1	1
Woods	1	1
		9
		7
		3
		1
		42

**Summary Overview**

Sixteen lines consisting of 50 snap-traps were set and maintained during the time period June 12-17, 2017. This work comprised 3400 trap nights and approximately 192 person-hours. Only three species of small mammals were taken in traps. Several mole burrows, chipmunks, raccoons, and a woodchuck were observed. In all, seven species of small mammal were reported (see Table 12a).

These numbers were lower than expected; mostly because of human interference. Four lines were run over, one line was flooded, one line was mowed, and most of the traps of one line were pulled out of the woods and deposited into the adjacent lane.

We classed the habitats into four types. There were nine lines in grassy weedy field, five lines were along the edge of woods, one line in woods, and one in marshy field. See Table 12b for capture data as related to habitat.

The diversity with regard to species caught was low with only three species taken. Species expected but not captured were: prairie deer mouse (*Peromyscus maniculatus bairdii*), meadow vole (*Microtus pennsylvanicus*), prairie vole (*Microtus ochrogaster*), and perhaps the masked shrew (*Sorex cinereus*). Species less likely to occur but possible are: the least shrew (*Cryptotis parva*) and the bog lemming (*Synaptomys cooperi*).



Participants relaxing in the barn at White River Woods. (Photo by John Taylor)

**List of moth (Lepidoptera) taxa (51 taxa) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Megan McCarty

Team Members: Jeffrey D. Holland and the beetle team

**Table 13: Moth data. All taxa from the Order Lepidoptera.** (NOTE: in addition to the 38 species and three taxa identified only to genus, 10 other taxa were collected, i.e., seven identified to the Family Tortricidae, one identified to the Family Crambidae, and two “micro” moth taxa that could not be identified to family.)

<u>Family</u>	<u>Species</u>	<u>Author, Year</u>	<u>Common Name</u>
Tortricidae	<i>Argyrotaenia juglandana</i>	(Fernald, 1879)	Hickory Leafroller Moth
Limacodidae	<i>Packardia elegans</i>	(Packard, 1864)	Elegant Tailed Slug Moth
Limacodidae	<i>Lithacodes fasciola</i>	(Herrich-Schäffer, 1854)	Yellow-shouldered Slug Moth
Limacodidae	<i>Apoda y-inversum</i>	(Packard, 1864)	Yellow-collared Slug Moth
Crambidae	<i>Scoparia biplagialis</i>	Walker, 1866	Double-striped Scoparia Moth
Crambidae	<i>Chrysendeton</i> sp.		
Crambidae	<i>Crocidophora tubercularis</i>	Lederer, 1863	Pale-winged Crocidophora Moth
Crambidae	<i>Palpita magniferalis</i>	(Walker, 1861)	Splendid Palpita Moth
Crambidae	<i>Urola nivalis</i>	(Drury, 1773)	Snowy Urola Moth
Pyralidae	<i>Pococera asperatella</i>	(Clemens, 1860)	Maple Webworm Moth
Pyralidae	<i>Aphomia sociella</i>	(Linnaeus, 1758)	The Bee Moth
Geometridae	<i>Mellilla xanthometata</i>	(Walker, 1862)	Orangewing Moth
Geometridae	<i>Speranza subcessaria</i>	(Walker, 1861)	Barred Angle Moth
Geometridae	<i>Hypagyrtis unipunctata</i>	(Haworth, 1809)	One-spotted Variant Moth
Geometridae	<i>Lomographa vestaliata</i>	(Guenée, [1858])	White Spring Moth
Geometridae	<i>Xanthotype urticaria</i>	Swett, 1918	False Crocus Geometer Moth
Geometridae	<i>Xanthotype sospeta</i>	(Drury, 1773)	Crocus Geometer Moth
Geometridae	<i>Campaea perlata</i>	(Guenée, [1858])	Pale Beauty Moth
Geometridae	<i>Nematocampa resistaria</i>	(Herrich-Schäffer, [1856])	Horned Spanworm Moth
Geometridae	<i>Scopula limboundata</i>	(Haworth, 1809)	Large Lace-border Moth
Geometridae	<i>Eulithis</i> sp.		
Geometridae	<i>Costaconvexa centrostrigaria</i>	(Wollaston, 1858)	Bent-line Carpet Moth
Geometridae	<i>Eubaphe mendica</i>	(Walker, 1854)	Beggar Moth
Geometridae	<i>Eupithecia miserulata</i>	Grote, 1863	Common Eupithecia Moth
Geometridae	<i>Heterophleps triguttaria</i>	Herrich-Schäffer, [1854]	Three-spotted Fillip Moth
Geometridae	<i>Calledapteryx dryopterata</i>	Grote, 1868	Brown Scoopwing Moth

Saturniidae	<i>Automeris io</i>	(Fabricius, 1775)	Io Moth
Sphingidae	<i>Amorpha juglandis</i>	(Smith, 1797)	Walnut Sphinx Moth
Notodontidae	<i>Ellida caniplaga</i>	(Walker, 1856)	Linden Prominent Moth
Erebidae	<i>Haploa</i> sp.		
Erebidae	<i>Halysidota tessellaris</i>	(Smith, 1797)	Banded Tussock Moth
Erebidae	<i>Pyrrharctia isabella</i>	(Smith, 1797)	Isabella Tiger Moth
Erebidae	<i>Zanclognatha cruralis</i>	(Guenée, 1854)	Early Zanclognatha Moth
Erebidae	<i>Zanclognatha pedipilalis</i>	(Guenée, 1854)	Grayish Zanclognatha Moth
Erebidae	<i>Palthis angularis</i>	(Hübner, 1796)	Dark-spotted Palthis Moth
Erebidae	<i>Spargaloma sexpunctata</i>	Grote, 1873	Six-spotted Gray Moth
Noctuidae	<i>Nigetia formosalis</i>	Walker, 1866	Thin-winged Owlet Moth
Noctuidae	<i>Protodeltote muscosula</i>	(Guenée, 1852)	Large Mossy Lithacodia Moth
Noctuidae	<i>Maliattha synochitis</i>	(Grote & Robinson, 1868)	Black-dotted Lithacodia Moth
Noctuidae	<i>Eudryas grata</i>	(Fabricius, 1793)	Beautiful Wood-nymph Moth
Noctuidae	<i>Xestia dolosa</i>	Franclemont, 1980	Greater Black-letter Dart Moth

### **Collecting Methods & Effort**

Moths were surveyed using lights (ultraviolet and mercury vapor lights) and white sheets from the beetle team. Surveying took place on June 10<sup>th</sup> from 8:30 pm to midnight in a forested area at McVey Memorial Forest. Total number of person-hours was approximately 3.5. Voucher specimens were collected and will be housed in the Purdue Entomological Research Collection.

### **Summary Overview**

A total of 51 taxa of moths (50 identified to at least family level) were found in McVey Memorial Forest. Nine different families of moths were recorded, but Geometridae (geometer moths or inchworm moths) made up the bulk of the moths present at the light sheets. Geometridae was also the most diverse family recorded, having 15 of the 51 taxa observed. The second most abundant family present (in terms of individuals) was Erebidae, with the majority of the moths belonging to the subfamily Herminiinae (litter moths). A total of seven erebid species were recorded. The abundance of these two groups was expected, given that they are commonly found in forested areas. However, erebid moths in the genus *Catocala* were noticeably absent, which was surprising, since they are a very diverse group with a preference for forested habitat. Other families found include Tortricidae (8 taxa), Limacodidae (3 species), Crambidae (6 taxa), Pyralidae (2 species), Saturniidae (1 species), Sphingidae (1 species), Notodontidae (1 species), and Noctuidae (5 species). There were two “micro” moth species that could not be identified to family level.

**List of mushroom taxa (54 taxa) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Stephen Russell

Team Members: Dylan Martin, Jason Eckstein, Don Ruch

**Table 14: Mushroom data.** For details on MycoPortal numbers, MycoMap numbers, and GenBank numbers, see the last paragraph of the summary overview below.

**White River Woods, Delaware County**

<u>Species</u>	<u>Fungarium Specimen</u>	<u>MycoPortal #</u>	<u>GenBank #</u>	<u>MycoMap #</u>
<i>Schizophyllum commune</i>	yes	4903396	MG748591	5662
<i>Stereum hirsutum</i>	yes	4903397	MG748592	5663
<i>Biscogniauxia</i>	yes	4903402	MG748590	5664
<i>Trichaptum biforme</i>				5665
<i>Stereum ostrea</i>	yes	4903404	MG748589	5666
<i>Ganoderma lobatum</i>				5667
<i>Trametes versicolor</i>				5668
<i>Xylobolus frustulatus</i>				5669
Fungi	yes	4903392		5670
<i>Ganoderma applanatum</i>				5671
<i>Polyporus varius</i>				5672
<i>Neofavolus alveolaris</i>				5673
<i>Fuligo septica</i>				5674
<i>Poronidulus conchifer</i>	yes	4903390		5675
<i>Phellinus gilvus</i>				5676
<i>Enteridium lycoperdon</i>				5677
<i>Kretzschmaria deusta</i>				5678
<i>Pleurotus ostreatus</i>	yes	4903405	MG748588	5679
<i>Coprinellus radians</i>	yes	4903389	MG748587	5680
<i>Cerrena unicolor</i>	yes	4903399		5681
Fungi	yes	4903391		5682
<i>Lentinus tigrinus</i>	yes	4903406		5683
<i>Daldinia childiae</i>	yes	4903401	MG748586	5684
<i>Ganoderma</i>	yes	4903394		5685
<i>Mycena niveipes</i>	yes	4903395		5686
<i>Auricularia angiospermarum</i>				5687
<i>Rhodotus palmatus</i>	yes	4903403	MG748585	5688
<i>Lycoperdon pyriforme</i>				5689
<i>Polyporus squamosus</i>				5690
<i>Gloeoporus dichrous</i>	yes	4903400	MG748583	5691
<i>Irpex lacteus</i>	yes	4903398	MG748584	5692
<i>Polyporus squamosus</i>				5694
<i>Phellinus</i>	yes	4903393		5695

*Trametes elegans*  
*Lycogala epidendrum*

**McVey Memorial Forest, Randolph County**

<u>Species</u>	<u>Fungarium Specimen</u>	<u>MycoPortal #</u>	<u>GenBank #</u>	<u>MycoMap #</u>
<i>Trichaptum biforme</i>	yes	4903325	MG748582	5696
<i>Xylaria</i>	yes	4903383		5697
<i>Coprinopsis variegata</i>	yes	4903384	MG748581	5698
<i>Rhodotus palmatus</i>	yes	4903388		5699
<i>Polyporus varius</i>				5700
<i>Marasmius rotula</i>	yes	4903387		5701
<i>Basidiomycota</i>	yes	4903329		5702
<i>Pluteus americanus</i>	yes	4903378	MG748580	5703
<i>Sarcoscypha occidentalis</i>	yes	4903385	MG748579	5704
<i>Ductifera pululahuana</i>				5705
<i>Enteridium lycoperdon</i>				5706
<i>Ductifera pululahuana</i>				5707
<i>Tyromyces galactinus</i>	yes	4903333	MG748578	5708
<i>Scutellinia scutellata</i>				5709
<i>Agrocybe acericola</i>	yes	4903381	MG748577	5710
<i>Lactarius</i>	yes	4903327	MG748576	5711
<i>Xylaria</i>	yes	4903379		5712
<i>Inocybe</i>	yes	4903380	MG748575	5713
<i>Rhodotus palmatus</i>				5714
<i>Royoporus badius</i>				5715
<i>Tubaria</i>				5716
<i>Gymnopus spongiosus</i>	yes	4903330	MG748574	5717
<i>Gymnopus foetidus</i>	yes	4903331	MG748573	5718
<i>Coprinellus micaceus</i>	yes	4903382	MG748572	5719
<i>Phellinus</i>	yes	4903328		5720
<i>Polyporus varius</i>	yes	4903386	MG748571	5721
<i>Mycena niveipes</i>			MG748570	5722
<i>Hohenbuehelia angustata</i>	yes	4903326	MG748568	5724
<i>Tyromyces galactinus</i>	yes	4903332	MG748569	5725
<i>Galiella rufa</i>				5726
<i>Coprinellus disseminatus</i>				5727
<i>Lentinus tigrinus</i>				5728
<i>Rhodotus palmatus</i>				5729
<i>Geastrum saccatum</i>				5750
<i>Schizophyllum commune</i>				
<i>Lycogala epidendrum</i>				

## Summary Overview

Team Fungi had three people surveying for the 2017 IAS Bioblitz. We went out Saturday, June 10<sup>th</sup>, morning/afternoon and encountered 68 observations of 54 different species at two different sites, i.e., the woodlands to the north and west of the Oakwood Retreat Center within the White River Woods and McVey Memorial Forest. These species ranged across 45 genera. There were very few mushrooms growing from the ground at the time of year this event was held, but we did encounter a fair number of species on wood. One aspect of particular interest was the number of times we encountered *Rhodotus palmatus*, also known as the Netted Rhodotus or Wrinkled Peach. It is one of the most stunningly beautiful mushrooms in North America, featuring a pinkish cap with a veined/ridged surface. We found this species at five different locations across our two survey sites. We also encountered a very interesting *Pluteus* (genus of wood-loving, pink-spored mushrooms) named *Pluteus americanus*. It is one of only a few *Pluteus* species known to contain the hallucinogenic chemical Psilocybin.

There were a number of other interesting specimens found during this survey. This event was our first encounter with *Reticularia (Enteridium) lycoperdon*, a slime mold known as a “False Puffball.” There is only one other record of this species from Indiana, with no current collections in fungaria. Slime molds are no longer classified as true fungi, but we still report on them as they are generally only studied by mycologists. Another species of note is *Tyromyces galactinus*. There is only one other record of this species in fungaria, dating back to 1917 in Sullivan County. Many collections of *Tyromyces* are documented under the name *Tyromyces chioneus* – a common species in field guides. However, the DNA results indicate that *Tyromyces galactinus* is the most common member of the genus found in Indiana and that many, if not most, collections of *T. chioneus* are likely misidentified specimens of *T. galactinus* (the present specimens included). We will be publishing updated information about this species group in future years. A final interesting species is *Hohenbuehelia angustata* – a genus that is often misidentified as belonging to *Crepidotus* or *Pleurotus* (Oyster Mushrooms). Despite being somewhat common across the state (personal observation), there is only one other record of this species in fungaria dating back to 1925 from Turkey Run State Park.

Physical specimens were collected and dried for 39 of the observations at this event. These specimens are housed at Purdue University’s Kriebel Herbarium (PUL). All of the specimen records have been uploaded to the NSF-funded MyCoPortal ([www.mycportal.org](http://www.mycportal.org)) – a consortium containing the records of North American fungaria. These records contain additional specimen information including PUL accession numbers. Color images for the species encountered at this event can be found on MycoMap ([www.mycomap.com](http://www.mycomap.com)). MycoMap record numbers can be found in Table 13. Finally, 25 of the specimens from this event underwent DNA sequencing of the ITS region. These DNA sequences have been made publicly available through GenBank ([www.ncbi.nlm.nih.gov/genbank](http://www.ncbi.nlm.nih.gov/genbank)). GenBank accession numbers are included with each species. Several of these sequences from this event represent the first time a DNA sequence for the species has been made publicly available. These include *Agrocybe acericola* (MG748577), *Gymnopus spongiosus* (MG748574), and *Mycena niveipes* (MG748570). A species name has not been finalized for the *Inocybe* (MG748575), but this record also represents the first time a sequence for the species has been made publicly available. Most of the other sequences that were generated represent the first publicly available DNA records for the species from Indiana.





*Rhodotus palmatus*, also known as the Netted Rhodotus or Wrinkled Peach, is one of the most stunningly beautiful mushrooms in North America, featuring a pinkish cap with a veined/ridged surface that forms a “netting” across the upper surface of the mushroom. (Photo by Stephen Russell)



*Pluteus americanus*. (*Pluteus* is a genus of wood-loving, pink-spored mushrooms.) *Pluteus americanus* is one of only a few *Pluteus* species known to contain the hallucinogenic chemical Psilocybin. (Photo by Stephen Russell)

**List of non-vascular plants (bryophyte) species (30 species: 29 mosses and 1 liverwort) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Linda Cole

Team Members: Myron Cole, Don Ruch

**Table 15a: Bryophyte (moss) survey for McVey Memorial Forest, June 17, 2017.**

<u>Genus</u>	<u>Species</u>	<u>Common Name</u>	<u>Habitat / Substrate</u>
<b>Acrocarps</b>			
<i>Atrichum</i>	<i>undulatum</i>	Wavy Starburst Moss	Moist soil
<i>Fissidens</i>	<i>osmundioides</i>	Fern Pocket Moss	Humus at side of trail
<i>Orthotrichum</i>	<i>strangulatum</i>	Shy Bristle Moss	Dry rocks
<i>Plagiomnium</i>	<i>cuspidatum</i>	Baby Tooth Moss	Moist soil
<b>Pleurocarps</b>			
<i>Anacamptodon</i>	<i>splachnoides</i>	Knothole Moss	Branch crotch, fallen tree
<i>Anomodon</i>	<i>attenuatus</i>	Poodle Moss	Tree skirts
<i>Anomodon</i>	<i>minor</i>	Rounded Tongue Moss	Tree trunk
<i>Anomodon</i>	<i>rostratus</i>	Yellow Yarn Moss	Tree base
<i>Brachythecium</i>	<i>salebrosum</i>	Golden Foxtail Moss	Log, moist soil
<i>Bryhnia</i>	<i>novae-angliae</i>	Bonsai Moss	Moist soil
<i>Campylophyllum</i>	<i>hispidulum</i>	Tiny Star Moss	Rotting log
<i>Campyliadelphus</i>	<i>chrysophyllus</i>	Brittle Star Moss	Log
<i>Entodon</i>	<i>cladorrhizans</i>	Flat Cord Glaze Moss	Rotting log
<i>Entodon</i>	<i>seductrix</i>	Cord Glaze Moss	Rotting log
<i>Herzogiella</i>	<i>striatella</i>	Tassel Moss	Rotting log
<i>Hygroamblystegium</i>	<i>varium</i>	Tangled Thread Moss	Rotting log
<i>Leskea</i>	<i>gracilescens</i>	Necklace Chain Moss	Rotting log
<i>Leskeela</i>	<i>nervosa</i>	Frayed String Moss	Rotting log
<i>Plagiocetecium</i>	<i>cavifolium</i>	Round Silk Moss	Rotting log and moist soil
<i>Plagiothecium</i>	<i>denticulatum</i>	Silk Moss	Rotting log
<i>Pohlia</i>	<i>nutaens</i>	Copper Wire Moss	Rotting log

<i>Pylasia</i>	<i>selwynii</i>	Paintbrush Moss	Bark
<i>Schwetschkeopsis</i>	<i>fabronia</i>	Rapunzel Moss	Rock
<b>Leafy Liverwort</b>			
<i>Geocalyx</i>	<i>graveolens</i>	None	Rotting log in a community of various mosses

**Table 15b: Bryophyte (moss) survey for the mature woodland at White River Woods, June 17, 2017.**

<u>Genus</u>	<u>Species</u>	<u>Common Name</u>	<u>Habitat / Substrate</u>
<b>Acrocarps</b>			
<i>Atrichum</i>	<i>undulatum</i>	Wavy Starburst Moss	Moist soil
<i>Dicranella</i>	<i>heteromalla</i>	Fine Hair Moss	Disturbed soil, side of trail
<i>Fissidens</i>	<i>osmundoides</i>	Fern Pocket Moss	Moist soil, side of trail
<i>Orthotrichum</i>	<i>strangulatum</i>	Shy Bristle Moss	Dry calcium enriched rocks
<i>Plagiomnium</i>	<i>cuspidatum</i>	Baby Tooth Moss	Humus
<i>Tetraphis</i>	<i>pellucida</i>	Four Tooth Moss	Rotting stump
<b>Pleurocarps</b>			
<i>Anacamptodon</i>	<i>splachnoides</i>	Knothole Moss	Moist decaying log
<i>Anomodon</i>	<i>attenuatus</i>	Poodle Moss	Tree skirts
<i>Anomodon</i>	<i>minor</i>	Rounded Tongue Moss	Tree trunk
<i>Brachythecium</i>	<i>oxycladon</i>	Pleated Foxtail Moss	Humus
<i>Brachythecium</i>	<i>salebrosum</i>	Golden Foxtail Moss	Rotting log
<i>Brynia</i>	<i>graminicolor</i>	Grass Colored Moss	Moist soil, side of trail
<i>Brynia</i>	<i>novae-angliae</i>	Bonsai Moss	Moist soil, side of trail
<i>Campyliadelphus</i>	<i>chrysophyllus</i>	Brittle Star Moss	Rotting log and moist soil
<i>Campylophyllum</i>	<i>hispidulum</i>	Tiny Star Moss	Decaying stump
<i>Entodon</i>	<i>seductrix</i>	Cord Glaze Moss	Rotting log
<i>Eurinchium</i>	<i>pulchellum</i>	Rug Moss	Rotting stump
<i>Herzogiella</i>	<i>striatella</i>	Tassel Moss	Decorticate log
<i>Leskea</i>	<i>gracilescens</i>	Necklace Chain Moss	Rotting log

<i>Leskeela</i>	<i>nervosa</i>	Frayed String Moss	Log
<i>Plagiothecium</i>	<i>denticulatum</i>	Silk Moss	Damp rotting log, moist soil
<i>Pylasia</i>	<i>selwynii</i>	Paintbrush Moss	Bark

### **Summary Overview**

The sampling of the bryophyte population in this study demonstrates a particular population of bryophytes suited to moist, enriched soils of temperate deciduous flatwoods located in the geographic region known as the Central Till Plains. This terrain has been scoured down, valleys filled and the whole surface pretty much smoothed over in a random mix of till. Along with wind-blown dust from pulverized stone and 10,000 years of humus from the decay of grasses, trees and herbaceous vegetation, and with the help of bryophytes, nature has created this swath of nearly flat, fertile landscape which contains the White River Woods and McVey Memorial Forest preserves, managed by the Red-tail Land Conservancy, where our survey was conducted. The specimens were collected in a brief manner spanning approximately three hours of field work followed by seven hours of microscopic study. The collection process was limited by the fact that both properties were thickly overgrown with vascular plants, conditions that restrict access and visibility of ground-level bryophytes. Such a survey would ideally be conducted in early spring to get a jump start on tall foliage which obscures the tiny bryophytes. Nevertheless, we obtained a substantial number of species from trees, stumps, rotting logs and humus, many of which are indicative of moist, calcium enriched sites such as those found in these mesic flatwoods.

It is interesting to note that mosses collected from humus growing under the massive growth of vascular vegetation appeared healthy and robust even though only about 3% of available sunlight reaches the forest floor in some of these areas; and the moist, shaded substrates provide the cooler habitats that bryophytes prefer. Although a few mosses access water and nutrients from the ground via primitive vascular systems (i.e. Polytrichaceae), we found only one of those acrocarps present, *Atrichum undulatum*, which was located in more open areas of the moist forest floor.

Most of our specimens were derived from trees, rotting logs, and stumps, which are important habitat substrates for bryophytes, especially in these deciduous flatwoods where they offer surfaces elevated above dense vascular vegetation and heavy leaf cover occurring in the fall. The food of these mosses basically comes from the air. As surrounding fields are plowed and harvested, dust is blown into the atmosphere and through the forests each year. A mature tree can filter out more than 200 pounds of dust, which rain flushes down the trunk. The minerals go easily into solution with rainwater, which is acidic; and as it washes through the canopy and down rain channels of tree trunks the mosses obtain what they need. Snowmelt also provides a flush of nutrients, dew and fog also contributing. In times of high temperatures and drought, the cells of these bryophytes may suffer damage as they desiccate or become senescent, leaching nutrients back into the ground for trees and other plants to benefit from. Mosses don't damage trees, but play many important roles in nutrient recycling and compensate for the small amounts of water they divert by releasing moisture as well. Also, in older trees where substantial moss growth has occurred, mosses often become colonized with cyanobacteria which captures nitrogen from

the air processing it into a form the trees can use; and rain washes it down the trunks making it available to the roots. In every moss sample viewed microscopically, many small invertebrates were encountered; most conspicuously among these were a diversity of arthropods. The influence of mosses on these forest environments is very positive indeed, where they act like a forest within a forest. It takes years for the slow growth of mosses to cover tree skirts, logs and stumps, showing that these amazingly adaptive organisms are perfectly suited to the slow rhythms of nature preserves where older trees are protected; and where mosses are enabled to occupy an important niche above the deciduous forest floor as well as upon it. These relationships also illustrate the importance of maintaining woodland properties in the midst of farmland for their many ecological contributions to the surrounding environment - there is a lot of nutrient/moisture recycling going on here.

In conclusion, both preserves were comparable in species diversity and composed generally of mosses considered homologous with shaded, moist, calcium enriched sites. A total of 30 species were identified, including 29 species of mosses and one species of leafy liverwort). Twenty-four species were identified from McVey Memorial Forest, while 22 species were identified from White River Woods. Sixteen of the 30 total species occurred at both sites. What we did not encounter were any that would probably be considered rare, and none of those which are considered indicators of acid, nutrient deficient soils. Most notably for me in this particular survey were the beautiful *Plagiothecium* mosses appearing to grow in abundance. These glossy, yellow-green pleurocarps, also known as “silk” mosses, are calciphiles, and were found frequently hugging the dark substrates of decaying logs. Also worth noting was a healthy specimen of *Anomodon attenuatus* growing on an oxidized metal stake sunk into the ground, which begs the question, ‘What is a calciphile doing here?’. Perhaps it only goes to show the remarkable ability of mosses to tolerate and adapt to substrates that would be impossible for vascular plants, maintaining their unique purpose evolved biochemically over millions of years. Certainly each species of moss is a variation on a theme, a unique creation designed for success in tiny niches in virtually every ecosystem. Therefore, knowing mosses adds depth and intimacy to our knowing the world.

**List of singing and non-singing insect taxa (11 taxa) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Carl Strang

Team Members: None

**Table 16: Singing and non-singing insects.**

**Singing Insects**

<u>Order</u>	<u>Family</u>	<u>Scientific Name</u>	<u>Common Name</u>
Orthoptera	Acrididae	<i>Chortophaga viridifasciata</i>	Green-striped grasshopper
	Gryllidae	<i>Anaxipha vernalis</i>	Spring trig
	Tettigoniidae	<i>Atlanticus testaceus</i>	Protean shieldback
	Tettigoniidae	<i>Roeseliana roeselii</i>	Roesel's katydid

**Non-singing Insects**

<u>Order</u>	<u>Family</u>	<u>Scientific Name</u>	<u>Common Name</u>
Orthoptera	Tetrigidae	<i>Tettigidea lateralis</i>	Black-sided pygmy grasshopper
Lepidoptera	Geometridae	<i>Scopula limboundata</i>	Large lace-border
	Erebidae	<i>Spilosoma virginica</i>	Virginian tiger moth
Hymenoptera	Apidae	<i>Bombus bimaculatus</i>	Two-spotted bumble bee
	Apidae	<i>Xylocopa virginica</i>	Eastern carpenter bee
	Ichneumonidae	<i>Megarhyssa atrata</i>	Giant ichneumon
Hemiptera	Pentatomidae	<i>Acrosternum hilare</i>	Green stink bug

**Collecting Methods & Effort**

I walked the trails of all the bioblitz areas, listening both unaided and with a SongFinder device, which lowers the frequency of high-pitched songs into a readily audible range. The total effort was approximately 9 person-hours over the 2 days.

**Summary Overview**

The timing of the 2017 bioblitz was early in the singing insects' season, as most species do not mature until mid- to late-summer. The four species identified all are common and expected: spring trigs (*Anaxipha vernalis*) abundant at both sites, the non-native Roesel's katydid (*Roeseliana roeselii*) at White River Woods, and the green-striped grasshoppers (*Chortophaga viridifasciata*) and protean shieldbacks (*Atlanticus testaceus*) at McVey Memorial Forest. There was an additional species of katydid singing at McVey that I was unable to see for identification. It had the pattern of a meadow katydid, with one or two quick ticks attached to the beginning of a buzz, but did not exactly match any species of my acquaintance. They may have been newly matured common meadow katydids, which had not fully developed their songs and were singing at a higher frequency than they will have when fully mature. The lack of spring field crickets, not only at the sites but in the area generally, was a surprising absence (I heard only four or so individuals along county roads and in Muncie). Other species of non-singing insects were observed and are entered in the table above.



Top: Green-striped grasshopper (*Chortophaga viridifasciata*). (Photo by Carl Strang)



Left: Roesel's katydid (*Roeseliana roeselii*). (Photo by Carl Strang)





Protean shieldback (*Atlanticus testaceus*). (Photo by Carl Strang)

**List of snail-killing flies (Diptera: Sciomyzidae) (11 species) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: William L. Murphy

Team Members: None

**Table 17: Snail-killing flies (Diptera: Sciomyzidae).**

<u>Species</u>	<u>#</u>	<u>County</u>	<u>Location</u>	<u>Lat/Long</u>	<u>Additional data</u>
<i>Dictya expansa</i> Steyskal	5	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin
<i>Dictya sabroskyi</i> Steyskal	2	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin
<i>Dictya stricta</i> Steyskal	4	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin
<i>Dictya texensis</i> Curran	3	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin
<i>Ditaeniella parallela</i> (Walker)	1	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin
<i>Limnia boscii</i> (Robineau-Desvoidy)	43	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin
<i>Pherbellia nana nana</i> (Fallén)	1	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin
<i>Sepedon armipes</i> Loew	1	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin
<i>Sepedon fuscipennis</i> Loew	2	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin
<i>Tetanocera plumosa</i> Loew	3	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin
<i>Tetanocera vicina</i> Macquart	3	Randolph	McVey Memorial Forest	40°15.981'N 85°8.818'W	sedges along pond margin

**Collecting Methods & Effort**

All specimens were collected over the course of two days by use of a sweep net from the margin of a pond at the extreme southwest corner of McVey Memorial Forest, in full sunlight. Aquatic habitats are found in both areas included in the Bioblitz (McVey Memorial Forest and White River Woods), but standing water was found only in the former, so collecting efforts were concentrated there. As expected, no sciomyzids were found in vegetation adjacent to either the Mississinewa or White rivers, where the muddy banks had been scoured by spring floods. The mature woodlands in both areas undoubtedly contain *Euthycera flavescens* (Loew) and *Trypetoptera canadensis* (Macquart), the larvae of which prey on land snails. Both species are found throughout Indiana in deciduous forests. In North America, *E. flavescens* has been found feeding within the land snails *Mesodon inflectus* (Say), *Stenotrema hirsutum* (Say), and *Ventridens ligera* (Say), while *T. canadensis* is known to feed on small pulmonate land snails.

Both species of sciomyzids rarely are collected by use of a sweep net. They are most often captured in Malaise traps, which were not used in this study.

### **Summary Overview**

Sixty-eight snail-killing flies (Diptera: Sciomyzidae) of 11 species were recorded (see table above). Two species (*Ditaeniella parallela* and *Pherbellia nana nana*) are members of the sciomyzid tribe Sciomyzini, larvae of which live chiefly as parasitoids in exposed aquatic, hygrophilous, and terrestrial snails. The other nine species are members of the tribe Tetanocerini, the aquatic larvae of which are overt predators of aquatic and semi-aquatic snails in fens, marshes, pond margins, and even roadside ditches. New for Randolph County are *Dictya expansa*, *D. sabroskyi*, *D. stricta*, *Ditaeniella parallela*, *Limnia boscii*, and *P. nana nana*, bringing to 19 the number of sciomyzid species known from Randolph County. All species are native. Surprisingly, when one considers the extensive expanses of tilled soil in Randolph County that is unsuitable habitat for sciomyzids, the county now ranks third in the state (after Tippecanoe and Marshall) for the greatest diversity of sciomyzid species.

In Indiana, nine of the species recorded are widespread, with *D. stricta* approaching its northern limit, whereas two species (*D. parallela* and *P. nana nana*) are far less common, being found mainly where falling water levels have stranded their snail hosts. All 11 species would be expected to occur in suitable habitat anywhere in Indiana. The two specimens of *S. fuscipennis* were of the southern form (*S. f. fuscipennis* Loew), which in Indiana generally is found from approximately the latitude of Indianapolis south; no individuals were of the northern form (*S. f. nobilis* Orth). These findings indicate a southern influence on the sciomyzid fauna in east-central Indiana. All specimens will be deposited in the U.S. National Museum of Natural History, Washington, DC.



*Limnia boscii* (Robineau-Desvoidy), the most abundant species of Sciomyzidae collected from the margin of the pond at McVey Memorial Forest. (Photo by Steve Marshall, used with permission)

**List of spider taxa (81 taxa) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

Team Leader: Marc Milne

Team Members: Lucas Frandsen and Emily Stern

**Table 18a: White River Woods and McVey Memorial Forest spider species list.**

#	Family	Genus	Species	Common name	Abundance
1	Agelenidae	<i>Agelenopsis</i>	sp.	American grass spider	Abundant
2	Agelenidae	<i>Coras</i>	sp.	Hackledmesh weaver	Common
3	Agelenidae	<i>Wadotes</i>	sp.	Hackledmesh weaver	Abundant
4	Anyphaenidae	<i>Anyphaena</i>	<i>fraterna</i>	Ghost spider	Common
5	Anyphaenidae	<i>Anyphaena</i>	<i>pectorosa</i>	Ghost spider	Common
6	Anyphaenidae	<i>Wulfila</i>	<i>saltabundus</i>	Ghost spider	Common
7	Araneidae	<i>Araneus</i>	<i>pratensis</i>	Orbweaver	Infrequent
8	Araneidae	<i>Cyclosa</i>	<i>turbinata</i>	Trashline orbweaver	Common
9	Araneidae	<i>Eustala</i>	<i>anastera</i>	Humpbacked orbweaver	Common
10	Araneidae	<i>Eustala</i>	<i>cepina</i>	Humpbacked orbweaver	Common
11	Araneidae	<i>Eustala</i>	<i>emertoni</i>	Humpbacked orbweaver	Infrequent
12	Araneidae	<i>Hyposinga</i>	<i>pygmaea</i>	Orbweaver	Rare
13	Araneidae	<i>Mangora</i>	<i>placida</i>	Tuftlegged orbweaver	Abundant
14	Araneidae	<i>Neoscona</i>	<i>arabesca</i>	Arabesque orbweaver	Abundant
15	Clubionidae	<i>Clubiona</i>	<i>abboti</i>	Sac spider	Infrequent
16	Corinnidae	<i>Castianeira</i>	<i>cingulata</i>	Twobanded antmimic	Infrequent
17	Dictynidae	<i>Dictyna</i>	<i>foliacea</i>	Meshweaver	Infrequent
18	Dictynidae	<i>Dictyna</i>	<i>volucripes</i>	Meshweaver	Infrequent
19	Dictynidae	<i>Emblyna</i>	<i>angulata</i>	Meshweaver	Rare
20	Dictynidae	<i>Emblyna</i>	<i>hentzi</i>	Meshweaver	Rare
21	Dictynidae	<i>Emblyna</i>	<i>sublata</i>	Meshweaver	Infrequent
22	Gnaphosidae	<i>Sergiolus</i>	<i>capulatus</i>	Stealthy ground spider	Common
23	Hahniidae	<i>Cicurina</i>	sp.	Meshweaver	Common
24	Linyphiidae	<i>Agyneta</i>	<i>micaria</i>	Sheetweb weaver	Rare
25	Linyphiidae	<i>Agyneta</i>	<i>semipallida</i>	Sheetweb weaver	Rare
26	Linyphiidae	<i>Erigone</i>	<i>autumnalis</i>	Dwarf weaver	Common
27	Linyphiidae	<i>Frontinella</i>	<i>communis</i>	Bowl and doily spider	Common
28	Linyphiidae	<i>Pityohyphantes</i>	<i>costatus</i>	Hammock spider	Infrequent
29	Linyphiidae	<i>Tenuiphantes</i>	<i>sabulosus</i>	Sheetweb weaver	Common

30	Lycosidae	<i>Gladicosa</i>	<i>bellamyi</i>	Wolf spider	Rare
31	Lycosidae	<i>Pirata</i>	<i>alachuus</i>	Pirate wolf spider	Abundant
32	Lycosidae	<i>Pirata</i>	<i>insularis</i>	Pirate wolf spider	Common
33	Lycosidae	<i>Pirata</i>	<i>sedentarius</i>	Pirate wolf spider	Infrequent
34	Lycosidae	<i>Pirata</i>	<i>triens</i>	Pirate wolf spider	Infrequent
35	Lycosidae	<i>Schizocosa</i>	<i>mccooki</i>	Wolf spider	Rare
36	Lycosidae	<i>Schizocosa</i>	<i>ocreata</i>	Wolf spider	Abundant
37	Lycosidae	<i>Tigrosa</i>	<i>helluo</i>	Wolf spider	Abundant
38	Mimetidae	<i>Mimetus</i>	sp.	Pirate spider	Infrequent
39	Oxyopidae	<i>Oxyopes</i>	<i>salticus</i>	Lynx spider	Abundant
40	Oxyopidae	<i>Oxyopes</i>	<i>scalaris</i>	Western lynx spider	Rare
41	Philodromidae	<i>Philodromus</i>	<i>marxi</i>	Agile running crab spider	Infrequent
42	Philodromidae	<i>Tibellus</i>	<i>maritimus</i>	Slender crab spider	Infrequent
43	Philodromidae	<i>Tibellus</i>	<i>oblongus</i>	Slender crab spider	Common
44	Phrurolithidae	<i>Phrurotimpus</i>	<i>alarius</i>	Antmimic spider	Abundant
45	Phrurolithidae	<i>Phrurotimpus</i>	<i>borealis</i>	Antmimic spider	Infrequent
46	Phrurolithidae	<i>Scotinella</i>	<i>redempta</i>	Antmimic spider	Common
47	Pisauridae	<i>Dolomedes</i>	sp.	Fishing spider	Common
48	Pisauridae	<i>Pisaurina</i>	sp.	Nursery web spider	Abundant
49	Salticidae	<i>Colonus</i>	<i>sylvanus</i>	Jumping spider	Common
50	Salticidae	<i>Hentzia</i>	<i>palmarum</i>	Jumping spider	Common
51	Salticidae	<i>Marpissa</i>	<i>formosa</i>	Jumping spider	Common
52	Salticidae	<i>Naphrys</i>	<i>pulex</i>	Jumping spider	Infrequent
53	Salticidae	<i>Pelegrina</i>	<i>galathea</i>	Peppered jumping spider	Abundant
54	Salticidae	<i>Pelegrina</i>	<i>insignis</i>	Jumping spider	Infrequent
55	Salticidae	<i>Pelegrina</i>	<i>proterva</i>	Jumping spider	Abundant
56	Salticidae	<i>Tutelina</i>	<i>elegans</i>	Jumping spider	Common
57	Salticidae	<i>Zygoballus</i>	<i>nervosus</i>	Jumping spider	Abundant
58	Salticidae	<i>Zygoballus</i>	<i>rufipes</i>	Hammerjawed spider	Common
59	Tetragnathidae	<i>Glenognatha</i>	<i>foxi</i>	Longjawed orbweaver	Common
60	Tetragnathidae	<i>Leucauge</i>	<i>venusta</i>	Orchard spider	Abundant
61	Tetragnathidae	<i>Tetragnatha</i>	<i>extensa</i>	Longjawed orbweaver	Common
62	Tetragnathidae	<i>Tetragnatha</i>	<i>laboriosa</i>	Longjawed orbweaver	Common
63	Tetragnathidae	<i>Tetragnatha</i>	<i>pallescens</i>	Longjawed orbweaver	Common
64	Tetragnathidae	<i>Tetragnatha</i>	<i>straminea</i>	Longjawed orbweaver	Common
65	Theridiidae	<i>Asagena</i>	<i>americana</i>	Twospotted cobweb spider	Rare
66	Theridiidae	<i>Dipoena</i>	sp.	Cobweb weaver	Common

67	Theridiidae	<i>Euryopis</i>	<i>argentea</i>	Cobweb weaver	Infrequent
68	Theridiidae	<i>Theridion</i>	<i>albidum</i>	Cobweb weaver	Abundant
69	Theridiidae	<i>Theridion</i>	<i>differens</i>	Cobweb weaver	Common
70	Theridiidae	<i>Theridion</i>	<i>frondeum</i>	Cobweb weaver	Common
71	Theridiidae	<i>Theridula</i>	<i>opulenta</i>	Cobweb weaver	Infrequent
72	Theridiidae	<i>Thymoites</i>	<i>unimaculata</i>	Cobweb weaver	Infrequent
73	Theridiidae	<i>Yunohamella</i>	<i>lyrica</i>	Cobweb weaver	Abundant
74	Theridiosomatidae	<i>Theridiosoma</i>	<i>gemmosum</i>	Ray spider	Rare
75	Thomisidae	<i>Mecaphesa</i>	<i>asperata</i>	Flower crab spider	Abundant
76	Thomisidae	<i>Mecaphesa</i>	<i>celer</i>	Flower crab spider	Abundant
77	Thomisidae	<i>Misumessus</i>	<i>oblongus</i>	Crab spider	Common
78	Thomisidae	<i>Tmarus</i>	<i>angulatus</i>	Running crab spider	Abundant
79	Thomisidae	<i>Xysticus</i>	<i>discursans</i>	Ground crab spider	Infrequent
80	Thomisidae	<i>Xysticus</i>	<i>fervidus</i>	Ground crab spider	Infrequent
81	Thomisidae	<i>Xysticus</i>	<i>triguttatus</i>	Threebanded crab spider	Common

**Table 18b: White River Woods and McVey Memorial Forest spider distribution.**

#	Family	Scientific Name	Location	
			White River Woods	McVey Memorial Forest
1	Agelenidae	<i>Agelenopsis</i> sp.		x
2	Agelenidae	<i>Coras</i> sp.		x
3	Agelenidae	<i>Wadotes</i> sp.		x
4	Anyphaenidae	<i>Anyphaena fraterna</i>		x
5	Anyphaenidae	<i>Anyphaena pectorosa</i>		x
6	Anyphaenidae	<i>Wulfila saltabundus</i>	x	x
7	Araneidae	<i>Araneus pratensis</i>		x
8	Araneidae	<i>Cyclosa turbinata</i>	x	x
9	Araneidae	<i>Eustala anastera</i>		x
10	Araneidae	<i>Eustala cepina</i>	x	
11	Araneidae	<i>Eustala emertoni</i>	x	
12	Araneidae	<i>Hyposinga pygmaea</i>		x
13	Araneidae	<i>Mangora placida</i>		x
14	Araneidae	<i>Neoscona arabesca</i>	x	x
15	Clubionidae	<i>Clubiona abboti</i>		x

16	Corinnidae	<i>Castianeira cingulata</i>			x
17	Dictynidae	<i>Dictyna foliacea</i>	x		x
18	Dictynidae	<i>Dictyna volucripes</i>	x		
19	Dictynidae	<i>Emblyna angulata</i>			x
20	Dictynidae	<i>Emblyna hentzi</i>			x
21	Dictynidae	<i>Emblyna sublata</i>			x
22	Gnaphosidae	<i>Sergiolus capulatus</i>			x
23	Hahniidae	<i>Circurina</i> sp.			x
24	Linyphiidae	<i>Agyneta micaria</i>			x
25	Linyphiidae	<i>Agyneta semipallida</i>	x		
26	Linyphiidae	<i>Erigone autumnalis</i>			x
27	Linyphiidae	<i>Frontinella communis</i>			x
28	Linyphiidae	<i>Pityohyphantes costatus</i>			x
29	Linyphiidae	<i>Tenuiphantes sabulosus</i>			x
30	Lycosidae	<i>Gladicosa bellamyi</i>			x
31	Lycosidae	<i>Pirataalachuus</i>	x		x
32	Lycosidae	<i>Pirata insularis</i>	x		
33	Lycosidae	<i>Pirata sedentarius</i>	x		
34	Lycosidae	<i>Pirata triens</i>	x		
35	Lycosidae	<i>Schizocosa mccooki</i>			x
36	Lycosidae	<i>Schizocosa ocreata</i>			x
37	Lycosidae	<i>Tigrosa helluo</i>			x
38	Mimetidae	<i>Mimetus</i> sp.			x
39	Oxyopidae	<i>Oxyopes salticus</i>			x
40	Oxyopidae	<i>Oxyopes scalaris</i>	x		
41	Philodromidae	<i>Philodromus marxi</i>			x
42	Philodromidae	<i>Tibellus maritimus</i>	x		
43	Philodromidae	<i>Tibellus oblongus</i>	x		x
44	Phrurolithidae	<i>Phrurotimpus alarius</i>			x
45	Phrurolithidae	<i>Phrurotimpus borealis</i>			x
46	Phrurolithidae	<i>Scotinella redempta</i>			x
47	Pisauridae	<i>Dolomedes</i> sp.			x
48	Pisauridae	<i>Pisaurina</i> sp.			x
49	Salticidae	<i>Colonus sylvanus</i>			x
50	Salticidae	<i>Hentzia palmarum</i>	x		
51	Salticidae	<i>Marpissa formosa</i>	x		
52	Salticidae	<i>Naphrys pulex</i>			x

53	Salticidae	<i>Pelegrina galathea</i>	x	x
54	Salticidae	<i>Pelegrina insignis</i>		x
55	Salticidae	<i>Pelegrina proterva</i>		x
56	Salticidae	<i>Tutelina elegans</i>	x	x
57	Salticidae	<i>Zygoballus nervosus</i>		x
58	Salticidae	<i>Zygoballus rufipes</i>		x
59	Tetragnathidae	<i>Glenognatha foxi</i>	x	
60	Tetragnathidae	<i>Leucauge venusta</i>		x
61	Tetragnathidae	<i>Tetragnatha extensa</i>	x	
62	Tetragnathidae	<i>Tetragnatha laboriosa</i>		x
63	Tetragnathidae	<i>Tetragnatha pallescens</i>	x	
64	Tetragnathidae	<i>Tetragnatha straminea</i>		x
65	Theridiidae	<i>Asagena americana</i>		x
66	Theridiidae	<i>Dipoena</i> sp.	x	
67	Theridiidae	<i>Euryopis argentea</i>		x
68	Theridiidae	<i>Theridion albidum</i>		x
69	Theridiidae	<i>Theridion differens</i>		x
70	Theridiidae	<i>Theridion frondeum</i>	x	
71	Theridiidae	<i>Theridula opulenta</i>		x
72	Theridiidae	<i>Thymoites unimaculata</i>		x
73	Theridiidae	<i>Yunohamella lyrica</i>		x
74	Theridiosomatidae	<i>Theridiosoma gemmosum</i>		x
75	Thomisidae	<i>Mecaphesa asperata</i>		x
76	Thomisidae	<i>Mecaphesa celer</i>	x	x
77	Thomisidae	<i>Misumessus oblongus</i>	x	x
78	Thomisidae	<i>Tmarus angulatus</i>		x
79	Thomisidae	<i>Xysticus discursans</i>	x	
80	Thomisidae	<i>Xysticus fervidus</i>		x
81	Thomisidae	<i>Xysticus triguttatus</i>		x

### **Collecting Methods & Effort**

During this bioblitz, the spider team employed a variety of methods to find and collect spiders. The most common collection method was sweep netting. This technique involved the use of a sweep net to collect spiders from low vegetation. A second technique employed was litter sifting. Litter sifting used a long canvas tube separated on the inside by metal screens (called a litter sifter). Leaf litter was put into the top of the litter sifter and the tube was held over a white sheet and shaken so that spiders that leave the leaf litter could then be collected on the sheet below. Finally, hand collecting was used to capture



spiders, especially at night when headlamps were used to find spiders by eye shine and then scooped up into vials. A total of 21 person-hours were spent collecting spiders.

### **Voucher Specimens**

All specimens are housed at the University of Indianapolis except for new state records, which are held at Indiana State University.

### **Summary Overview**

The White River Woods and McVey Memorial Forest bioblitz was considered a success by the spider team. We expected to find approximately 72 species through one day and night of searching. However, after spending two weeks identifying spiders back in the lab post-bioblitz, it was revealed that we found 81 species. Among the species found were many rare and infrequently collected species. Moreover, our collecting uncovered six new distribution records for Indiana (spiders that have never been recorded from the state). These notable species were as follows:

#### *Emblyna hentzi* – Meshweaver (Dictynidae):

This spider is known throughout the northeast, Midwest, and south to Texas. Indiana is well within its possible range as it has been collected before in Ohio and Illinois. Spiders of this family are generally litter-dwellers and commonly hunt small arthropods through the use of hackled, indistinct webs. We found one male and one female.

#### *Gladicosa bellamyi* – Wolf spider (Lycosidae):

This species has a disjunct distribution. It's only known from four states (OH, OK, MS, and FL) and one Canadian province (ON). It's likely that it's known from many more Eastern areas, but because it is so infrequently captured, the records are lacking. These spiders hunt for small arthropod prey on the forest floor and do not build webs. We found two females.

#### *Pirata triens* – Pirate wolf spider (Lycosidae):

Before this study was conducted, this small wolf spider was only known from Illinois. Therefore, we have expanded the range of this spider by hundreds of miles. Not much is known about the biology of this species. Although it has a small distribution, it seems to be rather common at White River Woods, since we found one male and four females.

#### *Schizocosa mccooki* – Wolf spider (Lycosidae):

This wolf spider is largely a Western species, being known from California and British Columbia all the way to the Midwest, including MI, WI, and IL. The discovery of this species in Eastern IN, is one of the most Eastern occurrences of this species throughout its range. Like other wolf spiders, this spider hunts for small arthropod prey on the forest floor. We found one female.

#### *Oxyopes scalaris* – Western lynx spider (Oxyopidae):

Although called the “Western lynx spider,” this species is known from California all the way to Maine and most states in between. Fairly common, *O. scalaris* is found on low vegetation, often

preying on insects or other spiders that also live in herbaceous habitats. We found one male at White River Woods.

*Xysticus fervidus* – Ground crab spider (Thomisidae):

This crab spider is very similar to *X. triguttatus* in everything except for the genitalia. *Xysticus fervidus* is largely a Western species, but has also been found in Illinois. It may be an introduced species from the West and may be spreading throughout the Great Lakes Region. It was found among tall weeds and low-lying vegetation near a pond at McVey Memorial Forest and commonly lives in this habitat, searching for small arthropods upon which to prey using its large, spiny anterior legs. We found four females.

We're certain that the spider species richness at White River Woods and McVey Memorial Forest is higher than what is reported here. It's estimated that it takes over 3,000 spider specimens to accurately gauge the species richness of a habitat and the ~500 specimens that we captured over our sampling period isn't nearly enough to accurately determine richness. However, as evidenced by the large number of new spider distribution records found through only 21 man-hours of collecting during this bioblitz, these areas may represent refuges for biodiversity in Eastern Indiana – an area where most of the land has been cleared for agriculture. White River Woods possesses habitats such as riparian woods, marshland, and temperate forest that are becoming rarer in this area and are therefore critically important for the conservation of a variety of animals. Although relatively young, McVey Memorial Forest possesses high spider species richness. Our prediction is that, through time, spider species richness will increase as the leaf layer increases, the canopy closes, and the area recovers from its recent disturbances. As leaf layer increases, smaller arthropods such as collembola will increase in prevalence, providing ideal living conditions for litter-dwelling spiders such as small linyphiids, dictynids, lycosids, and gnaphosids. Moreover, a closed canopy combined with a thick leaf litter will help retain moisture close to the soil, preventing the desiccation of small arthropods. The conservation of these two sites would be important in preserving arthropod biodiversity in Eastern Indiana.



*Dolomedes* sp. is from a genus of large spiders of the family Pisauridae. They are also known as fishing spiders, raft spiders, dock spiders or wharf spiders. Most *Dolomedes* species are semiaquatic. The photo was taken at McVey Memorial Forest. (Photo by Luke Frandsen)

**List of vascular plants (xx taxa) observed during the Red-tail Land Conservancy Biodiversity Survey, June 10<sup>th</sup> – 11<sup>th</sup>, 2017.**

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Team Members: Ben Hess, Neil Haaning, Nick Harby, Jessica Helmbold, Rachel, John Taylor, Kem Badger, Stephanie Schuck, Eyup Erdogan, Larry, Paul Rothrock, Kevin Tungsavick

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The overall results for the two sites demonstrated that east-central Indiana supports a richness of vascular plant species. A total of 476 taxa (405 at MMF and 289 at WRW) were reported. Of the total, 218 taxa occurred at both sites, 71 taxa only occurred at WRW, and 187 taxa only occurred at MMF. The details of each site are presented below.

**McVey Memorial Forest (MMF)**

**Table 19A: McVey Memorial Forest plant taxa list.** Location: South = species occurring south of CR 750 N; North = species occurring north of CR 750 N. Non-native (exotic) species are in capital letters. \* = potential Randolph County record; # = not reported previously in Randolph County, but is a planted species than has not naturalized; WL = state watch list.

<u>Scientific Name</u>	<u>Common Name</u>	<u>Location</u>	
		<u>North</u>	<u>South</u>
<i>ABUTILON THEOPHRASTI</i> Medik.	Velvetleaf		X
<i>Acalypha rhomboidea</i> Raf.	Three-Seeded Mercury	X	X
<i>Acer negundo</i> L.	Boxelder	X	X
<i>Acer rubrum</i> L. v. <i>rubrum</i>	Red Maple		X
<i>Acer saccharinum</i> L.	Silver Maple	X	X
<i>Acer nigrum</i> Michx. f.	Black Maple		X
<i>Acer saccharum</i> Marshall	Sugar Maple	X	X
<i>Achillea millefolium</i> L.	Common Milfoil		X
<i>Aesculus glabra</i> Willd. v. <i>glabra</i>	Ohio Buckeye		X
<i>Ageratina altissima</i> (L.) King & H. Rob.	White Snakeroot		X
<i>Agrimonia pubescens</i> Wallr.	Soft Agrimony		X
* <i>Agrostis hyemalis</i> (Walter) Britton, Sterns & Poggenb.	Hair Grass		X
<i>Alisma subcordatum</i> Raf.	Common Water Plantain		X
<i>ALLIARIA PETIOLATA</i> (M. Bieb.) Cavara & Grande	Garlic Mustard	X	X
<i>Allium canadense</i> L. v. <i>canadense</i>	Wild Garlic	X	X
<i>Allium burdickii</i> (Hanes) A.G. Jones	Wild Leek		X
<i>ALLIUM VINEALE</i> L. s. <i>VINEALE</i>	Field Garlic	X	

<i>Amaranthus tuberculatus</i> (Moq.) J.D. Sauer	Tall Water Hemp	X	X
<i>Ambrosia artemisiifolia</i> L.	Common Ragweed	X	X
<i>Ambrosia trifida</i> L.	Giant Ragweed	X	X
<i>Andropogon gerardii</i> Vitman	Big Bluestem Grass	X	X
<i>Andropogon virginicus</i> L. v. <i>virginicus</i>	Broom Sedge		X
<i>Anemone canadensis</i> L.	Meadow Anemone		X
<i>Anemone quinquefolia</i> L.	Wood Anemone		X
<i>Angelica atropurpurea</i> L.	Great Angelica		X
<i>Apocynum cannabinum</i> L.	Dogbane	X	X
<b>ARENARIA SERPYLLIFOLIA</b> L.	Thyme-Leaved Sandwort		X
<i>Arisaema dracontium</i> (L.) Schott	Green Dragon		X
<i>Arisaema triphyllum</i> (L.) Schott s. <i>triphyllum</i>	Indian Turnip		X
<i>Asarum canadense</i> L.	Canada Wild Ginger		X
<i>Asclepias syriaca</i> L.	Common Milkweed	X	X
<i>Asimina triloba</i> (L.) Dunal	Papaw		X
<b>ASPARAGUS OFFICINALIS</b> L.	Garden Asparagus	X	X
<b>BARBAREA VULGARIS</b> R. Br.	Yellow Rocket	X	X
# <i>Betula nigra</i> L.	River Birch	X	X
<i>Bidens cernua</i> L.	Nodding Bur Marigold		X
<i>Bidens frondosa</i> L.	Common Beggar's Ticks		X
<i>Bidens vulgata</i> Greene	Tall Beggar's Ticks		X
<i>Botrychium dissectum</i> Spreng.	Bronze Fern		X
<i>Botrypus virginianus</i> (L.) Michx.	Rattlesnake Fern		X
<b>BROMUS INERMIS</b> Leyss.	Hungarian Brome	X	X
<b>BROMUS JAPONICUS</b> Thunb.	Japanese Chess		X
<b>BROMUS TECTORUM</b> L.	Cheat Grass		X
* <i>Callitriche terrestris</i> Raf.	Terrestrial Water Starwort		X
<i>Calystegia sepium</i> (L.) R. Br.	American Bindweed	X	X
<i>Camassia scilloides</i> (Raf.) Cory	Wild Hyacinth		X
<i>Campanulastrum americanum</i> (L.) Small	American Bellflower		X
<i>Campsis radicans</i> Seem.	Trumpet Creeper		X
<b>CAPSELLA BURSA-PASTORIS</b> (L.) Medik.	Shepherd's Purse		X
<i>Cardamine bulbosa</i> (Schreb. ex Muhl.) Britton, Sterns, & Poggenb.	Bulb Bittercress		X
<i>Cardamine concatenata</i> (Michx.) O. Schwarz.	Toothwort		X
<i>Cardamine douglassii</i> (Torr.) Britton	Northern Bitter Cress		X
<i>Carex aggregata</i> Mack.	Smooth Clustered Sedge		X
* <i>Carex amphibola</i> Steud.	False Gray Sedge		X
<i>Carex blanda</i> Dewey	Common Wood Sedge	X	X
<i>Carex bromoides</i> Schkuhr ex Willd.	Brome Hummock Sedge		X
<i>Carex conjuncta</i> Booth	Green-Headed Fox Sedge		X
<i>Carex davisii</i> Schwein. & Torr.	Awne'd Graceful Sedge	X	X
<i>Carex frankii</i> Kunth	Bristly Cattail Sedge		X
<i>Carex gracilescens</i> Steud.	Slender Wood Sedge		X
<i>Carex gracillima</i> Schwein.	Purple-Sheathed Graceful Sedge		X

<i>Carex granularis</i> Muhl. ex Willd.	Pale Sedge		X
<i>Carex grayi</i> Carey	Common Bur Sedge	X	X
<i>Carex grisea</i> Wahlenb.	Wood Gray Sedge	X	X
<i>Carex hirtifolia</i> Mack.	Hairy Wood Sedge		X
<i>Carex jamesii</i> Schwein.	Grass Sedge		X
<i>Carex lacustris</i> Willd.	Common Lake Sedge		X
<i>Carex laxiculmis</i> Schwein. v. <i>laxiculmis</i>	Weak-Stemmed Wood Sedge		X
<i>Carex laxiflora</i> Lam.	Beech Wood Sedge		X
<i>Carex leavenworthii</i> Dewey	Dwarf Bracted Sedge		X
<i>Carex molesta</i> Mack. ex Bright	Field Oval Sedge	X	X
<i>Carex muskingumensis</i> Schwein.	Swamp Oval Sedge		X
<i>Carex radiata</i> (Wahlenb.) Small	Straight-Styled Bracted Sedge		X
<i>Carex shortiana</i> Dewey	Short's Sedge	X	X
<i>Carex sparganioides</i> Willd.	Loose-Headed Bracted Sedge		X
<i>Carex tribuloides</i> Wahlenb. v. <i>tribuloides</i>	Broad-Leaved Oval Sedge	X	X
<i>Carex vulpinoidea</i> Michx. v. <i>vulpinoidea</i>	Brown Fox Sedge		X
<i>Carpinus caroliniana</i> Walter s. <i>virginiana</i> (Marshall) Furlow	Blue Beech	X	X
<i>Carya cordiformis</i> (Wangenh.) K. Koch	Bitternut Hickory	X	X
<i>Carya glabra</i> Miller	Pignut Hickory		X
<i>Carya laciniosa</i> (Miller) K. Koch	Big Shellbark Hickory	X	X
<i>Carya ovata</i> (Miller) K. Koch	Shagbark Hickory	X	X
<i>Catalpa speciosa</i> (Warder) Warder ex Engelm.	Cigar Tree	X	
<i>Celtis occidentalis</i> L.	Hackberry	X	X
<b>CERASTIUM FONTANUM</b> Baumg. s. <b>VULGARE</b> (Hartm.) Greuter & Burdet	Common Mouse-Ear Chickweed	X	X
<i>Cercis canadensis</i> L. v. <i>canadensis</i>	Eastern Redbud		X
<b>CHAENORRHINUM MINUS</b> (L.) Lange	Dwarf Snapdragon		X
<i>Chaerophyllum procumbens</i> (L.) Crantz v. <i>procumbens</i>	Common Streambank Chervil		X
<b>CICHORIUM INTYBUS</b> L.	Chickory	X	X
<i>Cicuta maculata</i> L. v. <i>maculata</i>	Water Hemlock		X
<i>Cinna arundinacea</i> L.	Common Wood Reed		X
<i>Circaea lutetiana</i> L. s. <i>canadensis</i> (L.) Asch. & Magnus	Enchanter's Nightshade	X	X
<b>CIRSIUM ARVENSE</b> (L.) Scop.	Field Thistle	X	X
<i>Cirsium discolor</i> (Muhl. ex Willd.) Spreng.	Pasture Thistle	X	X
<b>CIRSIUM VULGARE</b> (Savi) Ten.	Bull Thistle		X
<i>Claytonia virginica</i> L. v. <i>virginica</i>	Spring Beauty		X
<b>COMMELINA COMMUNIS</b> L.	Common Day Flower		X
<b>CONIUM MACULATUM</b> L.	Poison Hemlock	X	X
<i>Conyza canadensis</i> (L.) Cronquist	Horseweed	X	X
* <i>Coreopsis lanceolata</i> L.	Sand Coreopsis		X
<i>Cornus drummondii</i> C.A. Mey.	Rough-Leaved Dogwood	X	X
<i>Cornus obliqua</i> Raf.	Pale Dogwood		X
<i>Crataegus crus-galli</i> L.	Cock-Spur Hawthorn	X	X
<i>Crataegus mollis</i> (Torr. & A. Gray) Scheele	Downy Hawthorn	X	X

<i>Crataegus punctata</i> Jacq.	Dotted Hawthorn	X	X
<i>Cryptotaenia canadensis</i> (L.) DC.	Honewort	X	X
<i>Cyperus esculentus</i> L. v. <i>leptostachyus</i> Boeckeler	Field Nut Sedge		X
<i>Cystopteris protrusa</i> (Weath.) Blasdell	Common Fragile Fern		X
<i>DACTYLIS GLOMERATA</i> L.	Orchard Grass	X	X
<i>DAUCUS CAROTA</i> L.	Queen Anne's Lace	X	X
* <i>Desmanthus illinoensis</i> (Michx.) MacMill. ex B.L. Rob. & Fernald	Illinois Bundle Flower		X
<i>DIANTHUS ARMERIA</i> L.	Deptford Pink	X	X
<i>Dicentra cucullaria</i> (L.) Bernh.	Dutchman's Breeches		X
<i>Dichantheium acuminatum</i> (Sw.) Gould & C.A. Clark v. <i>fasciculatum</i> (Torr.) Freckmann	Western Panic Grass		X
<i>DIGITARIA ISCHAEMUM</i> (Schreb.) Schreb. ex Muhl.	Smooth Crab Grass		X
<i>DIGITARIA SANGUINALIS</i> (L.) Scop.	Hairy Crab Grass		X
<i>Dioscorea villosa</i> L.	Common Wild Yam		X
<i>DIPSACUS FULLONUM</i> L.	Common Teasel	X	X
<i>ECHINOCHLOA CRUS-GALLI</i> (L.) P. Beauv.	Barnyard Grass		X
<i>Echinochloa muricata</i> (P. Beauv.) Fernald v. <i>muricata</i>	Rough Barnyard Grass		X
<i>Echinocystis lobata</i> (Michx.) Torr. & A. Gray	Wild Cucumber		X
<i>ELAEAGNUS UMBELLATA</i> Thunb.	Autumn Olive	X	X
<i>Eleocharis erythropoda</i> Steud.	Red-Rooted Spike Rush	X	
<i>Eleocharis obtusa</i> (Willd.) Schult.	Blunt Spike Rush		X
<i>Eleocharis palustris</i> (L.) Roem. & Schult.	Great Spike Rush		X
<i>ELEUSINE INDICA</i> (L.) Gaertn.	Crowfoot Grass		X
* <i>Elodea canadensis</i> Michx.	Common Waterweed		X
* <i>Elymus macgregorii</i> R.E. Brooks & J.J.N. Campb.	Early Wild Rye		X
<i>ELYMUS REPENS</i> (L.) Gould	Quack Grass		X
<i>Elymus riparius</i> Wiegand	Riverbank Wild Rye		X
<i>Elymus virginicus</i> L.	Virginia Wild Rye	X	X
<i>Enemion biternatum</i> Raf.	False Rue Anemone		X
<i>Epilobium coloratum</i> Biehler	Cinnamon Willow Herb		X
<i>Equisetum arvense</i> L.	Common Horsetail		X
<i>Equisetum hyemale</i> L. var. <i>affine</i> (Engelm.) A.A. Eaton	Tall Scouring Rush		X
<i>Eragrostis pectinacea</i> (Michx.) Nees ex Steud.	Small Love Grass		X
* <i>Erechtites hieraciifolia</i> (L.) Raf. ex DC. v. <i>hieraciifolius</i>	Fireweed		X
<i>Erigenia bulbosa</i> (Michx.) Nutt.	Harbinger-Of-Spring		X
<i>Erigeron annuus</i> (L.) Pers.	Annual Fleabane	X	X
<i>Erigeron philadelphicus</i> L. v. <i>philadelphicus</i>	Marsh Fleabane		X
<i>Erythronium albidum</i> L.	White Adder's Tongue		X
* <i>Erythronium americanum</i> Ker Gawl. s. <i>americanum</i>	Yellow Adder's Tongue		X
<i>Euonymus atropurpurea</i> Jacq. v. <i>atropurpurea</i>	Wahoo		X
<i>Euonymus obovata</i> Nutt.	Running Strawberry Bush		X
<i>Eupatorium perfoliatum</i> L.	Common Boneset		X
<i>Euphorbia maculata</i> L.	Spotted Spurge		X
<i>Euphorbia nutans</i> Lag.	Nodding Spurge		X

<i>Eutrochium purpureum</i> (L.) E.E. Lamont	Purple Joe Pye Weed		X
<i>Fagus grandifolia</i> Ehrh.	American Beech		X
<i>Fallopia scandens</i> (L.) Holub	Climbing False Buckwheat		X
<i>Festuca arundinacea</i> Schreb.	Tall Fescue	X	X
<i>Festuca subverticillata</i> (Pers.) E. Alexev.	Nodding Fescue	X	X
<i>Floerkea proserpinacoides</i> Willd.	False Mermaid Weed		X
<i>Fragaria virginiana</i> Mill. s. <i>virginiana</i>	Wild Strawberry		X
<i>Fraxinus americana</i> L.	White Ash	X	X
<i>Fraxinus pennsylvanica</i> Marshall	Green Ash	X	X
<i>Fraxinus quadrangulata</i> Michx.	Blue Ash	X	X
* <i>GALINSOGA QUADRIRADIATA</i> Ruiz & Pav.	Peruvian Daisy		X
<i>Galium aparine</i> L.	Annual Bedstraw	X	X
<i>Galium circaezans</i> Michx. v. <i>circaezans</i>	Smooth Wild Licorice		X
<i>Galium concinnum</i> Torr. & A. Gray	Shining Bedstraw		X
* <i>Galium obtusum</i> Bigelow v. <i>obtusum</i>	Wild Madder		X
<i>Galium triflorum</i> Michx.	Sweet-Scented Bedstraw	X	X
<i>Geranium maculatum</i> L.	Wild Geranium		X
<i>Geum canadense</i> Jacq. v. <i>canadense</i>	White Avens	X	X
<i>Geum laciniatum</i> Murray	Rough Avens	X	X
<i>Geum vernum</i> (Raf.) Torr. & A. Gray	Spring Avens	X	X
<b>GLECHOMA HEDERACEA</b> L.	Ground Ivy	X	X
<i>Gleditsia triacanthos</i> L.	Honey Locust	X	X
<i>Glyceria striata</i> (Lam.) Hitchc.	Fowl Manna Grass		X
<i>Gratiola neglecta</i> Torr.	Clammy Hedge Hyssop		X
<i>Hackelia virginiana</i> (L.) I.M. Johnst.	Stickseed		X
<i>Helenium autumnale</i> L. <i>autumnale</i>	Common Sneezeweed		X
<i>Helianthus decapetalus</i> L.	Pale Sunflower		X
<i>Helianthus tuberosus</i> L.	Jerusalem Artichoke		X
<i>Heliopsis helianthoides</i> (L.) Sweet v. <i>helianthoides</i>	False Sunflower		X
<b>HEMEROCALLIS FULVA</b> (L.) L.	Orange Day Lily	X	X
<i>Heracleum maximum</i> W. Bartram	Common Cow Parsnip		X
<b>HESPERIS MATRONALIS</b> L.	Dame's Rocket		X
<b>HIBISCUS TRIONUM</b> L.	Flower-of-an-Hour		X
<b>HORDEUM JUBATUM</b> L.	Squirrel-Tail Grass		X
<i>Hydrastis canadensis</i> L.	Golden Seal		WL
<i>Hydrophyllum macrophyllum</i> Nutt.	Large-Leaf Waterleaf		X
<i>Hydrophyllum virginianum</i> L. v. <i>virginianum</i>	Virginia Waterleaf		X
<i>Hypericum punctatum</i> Lam.	Spotted St. John's Wort		X
<i>Impatiens capensis</i> Meerb.	Spotted Touch-Me-Not	X	X
<i>Iodanthus pinnatifidus</i> (Michx.) Streud.	Violet Cress	X	X
<b>IPOMOEA PURPUREA</b> (L.) Roth	Common Morning Glory	X	
<i>Iris virginica</i> L. v. <i>shrevei</i> (Small) E.S. Anderson	Southern Blue Flag		X
<i>Juglans nigra</i> L.	Black Walnut	X	X
<i>Juncus dudleyi</i> Wiegand	Dudley's Rush		X
<i>Juncus tenuis</i> Willd.	Path Rush	X	X



<i>Juniperus virginiana</i> L. <i>virginiana</i>	Eastern Red Cedar	X	
<i>Lactuca canadensis</i> L.	Wild Lettuce		X
<i>Lactuca floridana</i> (L.) Gaertn.	Blue Lettuce	X	X
<i>LACTUCA SERRIOLA</i> L.	Prickly Lettuce	X	X
<i>LAMIUM AMPLEXICAULE</i> L.	Henbit		X
<i>Laportea canadensis</i> (L.) Weddell	Canada Wood Nettle	X	X
<i>LATHYRUS LATIFOLIUS</i> L.	Everlasting Pea		X
<i>Leersia oryzoides</i> (L.) Sw.	Rice Cut Grass		X
<i>Leersia virginica</i> Willd.	White Grass		X
<i>LEPIDIUM CAMPESTRE</i> (L.) W.T. Aiton	Field Cress	X	X
<i>Lepidium virginicum</i> L. v. <i>virginicum</i>	Common Pepper Grass	X	X
<i>LEUCANTHEMUM VULGARE</i> Lam.	Ox-Eye Daisy		X
<i>Lindera benzoin</i> (L.) Blume	Hairy Spicebush		X
<i>Lindernia dubia</i> (L.) Pennell var. <i>dubia</i>	Slender False Pimpernel		X
<i>Liquidambar styraciflua</i> L.	Sweet Gum	X	
<i>Liriodendron tulipifera</i> L.	Tulip Poplar	X	X
<i>Lobelia inflata</i> L.	Indian Tobacco		X
<i>Lobelia siphilitica</i> L.	Great Blue Lobelia		X
<i>LOLIUM PERENNE</i> L.	Perennial Rye Grass	X	
<i>LONICERA MAACKII</i> (Rupr.) Maxim.	Amur Honeysuckle	X	X
<i>LONICERA</i> × <i>BELLA</i> Zabel	Showy Fly Honeysuckle		X
<i>LOTUS CORNICULATUS</i> L.	Birdsfoot Trefoil		X
<i>Lycopus uniflorus</i> Michx.	Northern Bugle Weed		X
<i>Lysimachia ciliata</i> L.	Fringed Loosestrife		X
<i>LYSIMACHIA NUMMULARIA</i> L.	Moneywort	X	X
<i>MACLURA POMIFERA</i> (Raf.) C.K. Schneid.	Hedge Apple		X
<i>Maianthemum racemosum</i> (L.) Link	Feathery False Solomon Seal		X
<i>MALUS DOMESTICA</i> Borkh.	Apple		X
<i>MATRICARIA DISCOIDEA</i> DC.	Pineapple Weed		X
<i>MEDICAGO LUPULINA</i> L.	Black Medick	X	X
<i>MELILOTUS ALBA</i> Medik.	White Sweet Clover		X
<i>MELILOTUS OFFICINALIS</i> (L.) Lam.	Yellow Sweet Clover	X	X
<i>Menispermum canadense</i> L.	Moonseed	X	X
<i>Mertensia virginica</i> (L.) Pers. ex Link	Virginia Bluebells		X
<i>Mimulus alatus</i> Aiton	Winged Monkey Flower		X
<i>Moehringia lateriflora</i> (L.) Fenzl	Blunt-Leaf Sandwort	X	X
<i>Monarda fistulosa</i> L.	Wild Bergamot		X
* <i>Monotropa uniflora</i> L.	Indian Pipe		X
<i>MORUS ALBA</i> L.	White Mulberry	X	X
<i>Morus rubra</i> L. v. <i>rubra</i>	Red Mulberry		X
<i>Nabalus altissimus</i> (L.) Hook.	Tall White Lettuce		X
<i>Nabalus crepidineus</i> (Michx.) DC.	Great White Lettuce		X
* <i>Najas flexilis</i> (Willd.) Rostk. & Schmidt	Common Naiad		X
* <i>NEPETA CATARIA</i> L.	Catnip	X	
<i>Oenothera biennis</i> L.	Common Evening Primrose	X	X

<i>Onoclea sensibilis</i> L.	Sensitive Fern		X
<i>Osmorhiza longistylis</i> (Torr.) DC.	Anise Root		X
<i>Ostrya virginiana</i> (Miller) K. Koch	Hop Hornbeam		X
<i>Oxalis stricta</i> L.	Tall Wood Sorrel	X	X
<i>Packera aurea</i> (L.) Á. Löve & D. Löve	Golden Ragwort	X	
<i>Packera glabella</i> (Poir.) C. Jeffrey	Butterweed	X	X
<i>Packera obovata</i> (Muhl. ex Willd.) W.A. Weber & Á. Löve	Round-Leaved Ragwort		X
<i>Panicum dichotomiflorum</i> Michx. v. <i>dichotomiflorum</i>	Fall Panicum		X
<i>Panicum philadelphicum</i> Bernh.	Philadelphia Panic Grass		X
<i>Panicum virgatum</i> L. v. <i>virgatum</i>	Prairie Switch Grass		X
<i>Parthenocissus quinquefolia</i> (L.) Planch.	Virginia Creeper	X	X
<b>PASTINACA SATIVA</b> L.	Wild Parsnip	X	X
<i>Penstemon calycosus</i> Small	Smooth Beard Tongue	X	X
<i>Penthorum sedoides</i> L.	Ditch Stonecrop		X
<b>PERSICARIA LONGISETA</b> (de Bruijn) Kitag.	Creeping Smartweed		X
<b>PERSICARIA MACULOSA</b> Gray	Lady's Thumb		X
<i>Persicaria pensylvanica</i> (L.) M. Gómez	Pinkweed		X
<i>Persicaria punctata</i> (Elliott) Small	Smartweed		X
<i>Persicaria virginiana</i> (L.) Gaertn.	Virginia Knotweed	X	X
<b>PHALARIS ARUNDINACEA</b> L.	Reed Canary Grass	X	X
<i>Phegopteris hexagonoptera</i> (Michx.) Fée	Broad Beech Fern		X
<b>PHLEUM PRATENSE</b> L.	Timothy Grass	X	X
<i>Phlox divaricata</i> L.	Blue Phlox		X
<i>Phlox paniculata</i> L.	Garden Phlox		X
<i>Phryma leptostachya</i> L.	Lopseed		X
<i>Pilea fontana</i> (Lunell) Rydb.	Bog Clearweed		X
<i>Pilea pumila</i> (L.) A. Gray	Canada Clearweed	X	X
# <i>Pinus strobus</i> L.	White Pine	X	X
<b>PLANTAGO LANCEOLATA</b> L.	English Plantain	X	X
<i>Plantago rugelii</i> Decne.	Red-Stalked Plantain	X	X
<i>Platanus occidentalis</i> L.	Sycamore	X	X
<b>POA ANNUA</b> L.	Annual Blue Grass	X	X
<b>POA COMPRESSA</b> L.	Canadian Blue Grass	X	X
<b>POA PRATENSIS</b> L. s. <b>PRATENSIS</b>	Kentucky Blue Grass	X	X
<i>Poa sylvestris</i> A. Gray	Woodland Blue Grass	X	X
<b>POA TRIVIALIS</b> L.	Rough Blue Grass		X
<i>Podophyllum peltatum</i> L.	May Apple	X	X
<i>Polemonium reptans</i> L. v. <i>reptans</i>	Jacob's Ladder		X
<i>Polygonatum biflorum</i> (Walter) Elliott v. <i>biflorum</i>	Small Solomon's Seal		X
<i>Polygonatum pubescens</i> (Willd.) Pursh	Downy Solomon's Seal		X
<b>POLYGONUM AVICULARE</b> L. v. <b>AVICULARE</b>	Common Knotweed		X
# <b>POPULUS ALBA</b> L.	White Poplar	X	
<i>Populus deltoides</i> Marshall v. <i>deltoides</i>	Eastern Cottonwood	X	X
<b>PORTULACA OLERACEA</b> L.	Purslane		X

<i>*Potamogeton nodosus</i> Poir.	American Pondweed		X
<i>Potentilla norvegica</i> L.	Rough Cinquefoil		X
<b>POTENTILLA RECTA</b> L.	Sulfur Cinquefoil		X
<i>Potentilla simplex</i> Michx.	Common Cinquefoil		X
<i>Prunella vulgaris</i> L. s. <i>lanceolata</i> (W. Bartram) Hultén	Selfheal		X
<i>Prunus serotina</i> Ehrh. v. <i>serotina</i>	Wild Black Cherry	X	X
<i>Ptelea trifoliata</i> L.	Smooth Wafer Ash		X
<i>Quercus alba</i> L.	White Oak	X	X
<i>Quercus bicolor</i> Willd.	Swamp White Oak	X	
<i>Quercus macrocarpa</i> Michx.	Burr Oak	X	X
<i>Quercus muehlenbergii</i> Engelm.	Chinquapin Oak	X	X
<i>*Quercus palustris</i> Münchh.	Pin Oak	X	X
<i>Quercus rubra</i> L.	Northern Red Oak	X	X
<i>Ranunculus abortivus</i> L.	Little-Leaf Buttercup		X
<i>Ranunculus hispidus</i> Michx. v. <i>caricetorum</i> (Greene) T. Duncan	Hispid Swamp Buttercup		X
<i>Ratibida pinnata</i> (Vent.) Barnhart	Yellow Coneflower	X	X
<i>*RHODOTYPOS SCANDENS</i> (Thunb.) Makino	Jetbead		X
<i>Ribes cynosbati</i> L.	Prickly Wild Gooseberry		X
<i>Robinia pseudoacacia</i> L.	Black Locust		X
<i>Rorippa palustris</i> (L.) Besser s. <i>fernaldiana</i> (Butters & Abbe) Jonsell	Marsh Yellow Cress	X	X
<i>Rosa carolina</i> L.	Pasture Rose	X	
<b>ROSA MULTIFLORA</b> Thunb.	Japanese Rose	X	X
<i>Rosa setigera</i> Michx.	Illinois Rose	X	X
<i>Rubus allegheniensis</i> T.C. Porter	Common Blackberry	X	X
<i>Rubus occidentalis</i> L.	Black Raspberry		X
<i>Rubus pensilvanicus</i> Poirét	Pennsylvania Blackberry		X
<i>Rudbeckia hirta</i> L. v. <i>pulcherrima</i> Farw.	Black-Eyed Susan		X
<i>Rudbeckia laciniata</i> L. v. <i>laciniata</i>	Wild Golden Glow	X	X
<i>Rudbeckia triloba</i> L. v. <i>triloba</i>	Brown-Eyed Susan		X
<i>Ruellia strepens</i> L.	Smooth Ruellia	X	X
<i>Rumex altissimus</i> Alph. Wood	Pale Dock		X
<b>RUMEX CRISPUS</b> L.	Curly Dock	X	X
<i>Salix interior</i> Rowlee	Sandbar Willow		X
<i>Sambucus nigra</i> L. s. <i>canadensis</i> (L.) Bolli	Common Elderberry		X
<i>Sanguinaria canadensis</i> L.	Bloodroot		X
<i>Sanicula odorata</i> (Raf.) K.M. Pryer & L.R. Phillippe	Clustered Black Snakeroot	X	X
<i>Saururus cernuus</i> L.	Lizard's Tail		X
<i>Schizachyrium scoparium</i> (Michx.) Nash	Little Bluestem Grass	X	X
<i>Schoenoplectus tabernaemontani</i> (Gmel.) Palla	Great Bulrush		X
<i>Scirpus atrovirens</i> Willd.	Dark-Green Bulrush		X
<i>Scrophularia marilandica</i> L.	Late Figwort		X
<i>*Scutellaria nervosa</i> Pursh	Veiny Skullcap		X
<i>Securigera varia</i> (L.) Lassen	Crown Vetch		X

<i>SEDUM PRUPUREUM</i> (L.) J.A. Schultes	Live Forever		X
<i>Sedum ternatum</i> Michx.	Three-Leaved Stonecrop		X
* <i>SENECIO VULGARIS</i> L.	Common Groundsel		X
<i>SETARIA PUMILA</i> (Poir.) Roem. & Schult. s. <i>pumila</i>	Yellow Foxtail Grass		X
<i>SETARIA VIRIDIS</i> (L.) P. Beauv. v. <i>VIRIDIS</i>	Green Foxtail Grass		X
<i>SIDA SPINOSA</i> L.	Prickly Sida		X
<i>Silene stellata</i> (L.) W.T. Aiton	Starry Campion		X
<i>Silene virginica</i> L.	Fire Pink		X
* <i>Silphium laciniatum</i> L. v. <i>laciniatum</i>	Compass Plant	X	
<i>Sisyrinchium angustifolium</i> Miller	Stout Blue-Eyed Grass		X
<i>Sium suave</i> Walter	Water Parsnip		X
<i>Smilax ecirrhata</i> (Engelm. ex Kunth) S. Watson	Upright Carrion Flower		X
<i>Smilax hispida</i> Raf.	Bristly Green Brier	X	X
<i>Smilax lasioneura</i> Hook.	Midwestern Carrion Flower	X	
<i>Solanum carolinense</i> L.	Horse Nettle		X
<i>Solanum ptycanthum</i> Dunal	Black Nightshade		X
<i>Solidago altissima</i> L. s. <i>altissima</i>	Tall Goldenrod	X	X
<i>Solidago caesia</i> L.	Bluestem Goldenrod		X
<i>Solidago gigantea</i> Aiton	Late Goldenrod	X	X
* <i>Solidago rigida</i> L.	Rigid Goldenrod	X	
<i>SONCHUS ASPER</i> (L.) Hill	Prickly Sow Thistle		X
<i>Sorghastrum nutans</i> (L.) Nash	Indian Grass		X
<i>Sphenopholis intermedia</i> (Rydb.) Rydb.	Slender Wedge Grass	X	X
* <i>Sporobolus neglectus</i> Nash	Small Rush Grass		X
<i>Stachys hispida</i> Pursh	Hispid Hedge Nettle		X
<i>Staphylea trifolia</i> L.	Bladdernut		X
<i>STELLARIA MEDIA</i> (L.) Vill. <i>MEDIA</i>	Common Chickweed		X
<i>Stellaria pubera</i> Michx.	Great Chickweed		X
<i>Symphyotrichum cordifolium</i> (L.) G.L. Nesom	Heart-Leaved Aster	X	X
<i>Symphyotrichum lanceolatum</i> (Willd.) G.L. Nesom s. <i>lanceolatum</i>	Panicled Aster		X
<i>Symphyotrichum lateriflorum</i> (L.) Á. Löve & D. Löve	Side-Flowering Aster	X	X
<i>Symphyotrichum novae-angliae</i> (L.) G.L. Nesom	New England Aster		X
<i>Symphyotrichum pilosum</i> (Willd.) G.L. Nesom v. <i>pilosum</i>	Hairy Aster		X
<i>TARAXACUM OFFICINALE</i> F.H. Wigg.	Common Dandelion	X	X
<i>Taxodium distichum</i> (L.) Rich.	Bald Cypress [Planted]	X	X
<i>Teucrium canadense</i> L. v. <i>canadense</i>	American Germander		X
* <i>Thalictrum dasycarpum</i> Fisch. & Avé-Lall.	Purple Meadow Rue		X
<i>Thalictrum dioicum</i> L.	Early Meadow Rue		X
<i>Thalictrum revolutum</i> DC.	Waxy Meadow Rue		X
<i>Thaspium barbinode</i> (Michx.) Nutt.	Hairy Meadow Parsnip		X
<i>Thaspium trifoliatum</i> (L.) A. Gray v. <i>aureum</i> (L.) Britt.	Yellow Meadow Parsnip	X	X
<i>THLASPI ARVENSE</i> L.	Field Penny Cress	X	X
# <i>Thuja occidentalis</i> L.	Arbor Vitae		X

<i>Tilia americana</i> L. v. <i>americana</i>	American Linden	X	X
<i>Toxicodendron radicans</i> (L.) Kuntze s. <i>negundo</i> (Greene) Gillis	Eastern Poison Ivy	X	X
<i>Tradescantia subaspera</i> Ker Gawl.	Broad-Leaved Spiderwort		X
<b>TRAGOPOGON PRATENSIS</b> L.	Common Goat's Beard	X	X
<i>Tridens flavus</i> (L.) A. Hitchc. v. <i>flavus</i>	Common Purpletop		X
<b>TRIFOLIUM HYBRIDUM</b> L.	Alsike Clover	X	X
<b>TRIFOLIUM PRATENSE</b> L.	Red Clover	X	X
<b>TRIFOLIUM REPENS</b> L.	White Clover		X
<i>Trillium flexipes</i> Raf.	Declined Trillium		X
<i>Trillium sessile</i> L.	Sessile Trillium		X
<i>Trillium sessile</i> L. f. <i>luteum</i>	Sessile Trillium Yellow-form		X
<b>TYPHA ANGUSTIFOLIA</b> L.	Narrow-Leaved Cattail		X
<i>Typha latifolia</i> L.	Broad-Leaved Cattail		X
<i>Ulmus americana</i> L.	American Elm	X	X
<b>ULMUS PUMILA</b> L.	Siberian Elm	X	
<i>Ulmus rubra</i> Muhl.	Slippery Elm	X	X
<i>Urtica dioica</i> L. s. <i>gracilis</i> (Aiton) Seland	Tall Stinging Nettle		X
<i>Uvularia grandiflora</i> Sm.	Large-Flower Bellwort		X
<i>Valerianella umbilicata</i> (Sull.) Alph. Wood	Corn Salad	X	X
<b>VERBASCUM BLATTARIA</b> L.	Moth Mullein	X	
<b>VERBASCUM THAPSUS</b> L.	Woolly Mullein		X
<i>Verbena urticifolia</i> L.	Velvety White Vervain	X	X
<i>Verbesina alternifolia</i> (L.) Britton ex Kearney	Wingstem	X	X
<i>Vernonia gigantea</i> (Walter) Trel.	Tall Ironweed	X	X
<b>VERONICA ARVENSIS</b> L.	Corn Speedwell	X	X
<b>VERONICA SERPYLLIFOLIA</b> L. s. <b>SERPYPHYLLIFOLIA</b>	Thyme-Leaved Speedwell		X
<b>VIBURNUM LANTANA</b> L.	Wayfaring Tree		X
<i>Viburnum lentago</i> L.	Nannyberry		X
<b>VIBURNUM OPULUS</b> L. v. <b>OPULUS</b>	European High-Bush Cranberry	X	X
<i>Viburnum prunifolium</i> L.	Black Haw		X
<b>VIBURNUM RHYTIDOPHYLLUM</b> Hemsl.	Smooth Arrowwood		X
* <b>VICIA CRACCA</b> L.	Cow Vetch		X
<i>Viola palmata</i> L.	Cleft Violet		X
<i>Viola pubescens</i> Aiton v. <i>pubescens</i>	Downy Yellow Violet		WL
<i>Viola sororia</i> Willd.	Woolly Blue Violet	X	X
<i>Viola striata</i> Aiton	Common White Violet		X
<i>Vitis riparia</i> Michx.	Riverbank Grape	X	X
<i>Vitis vulpina</i> L.	Frost Grape	X	X
<i>Zanthoxylum americanum</i> Mill.	Prickly Ash		X

**Table 19B: Floristic quality data – McVey Memorial Forest.** # = number of; all plants = native + non-native species; FQI = Floristic Quality Index; mean C = average Coefficient of Conservatism. Location: South – species occurring south of CR 750 N; North – species occurring north of CR 750 N.

	<b>Both Sites Combined</b>	<b>McVey MF South</b>	<b>McVey MF North</b>
<b># native plants</b>	<b>312</b>	<b>303</b>	<b>111</b>
<b># non-native plants</b>	94	86	46
<b># all plants</b>	406	389	157
<b>FQI native plants</b>	<b>62.9</b>	<b>61.4</b>	<b>31.1</b>
<b>FQI all plants</b>	55.1	54.2	26.2
<b>Mean C native plants</b>	<b>3.6</b>	<b>3.5</b>	<b>3.0</b>
<b>Mean C all plants</b>	2.7	2.8	2.1

### **Interpretation of the Floristic Quality Index (FQI) and the Coefficient of Conservatism.**

The Floristic Quality Index (FQI) was determined using the program developed by the Conservation Design Forum in conjunction with Rothrock (2004). This program also calculates the mean Coefficient of Conservatism (mean C), and the mean Wetland Indicator Status (mean W). Additionally, it presents a detailed physiognomic analysis of the flora, both native and non-native species. For a detailed description of how the FQI is determined and an explanation of C-values, see Swink & Wilhelm (1994), Rothrock (2004), and Rothrock & Homoya (2005). Briefly, C-values, which range from zero to ten, are an index of the fidelity of an individual species to undisturbed plant communities characteristic of the region prior to European settlement. The higher the C-value the more conserved the species is to an undisturbed habitat. All exotics are given a C value of 0. The FQI is determined by multiplying the mean C for all species present by the square root of the total number of species. (For native FQI and mean C, only the native species are used.) A FQI greater than 35 suggests that a site has remnant natural quality and contains some noteworthy remnants of natural heritage of the region (Rothrock & Homoya 2005, Swink & Wilhelm 1994). Areas registering in the 50s and higher are considered of paramount importance and should be conserved (Swink & Wilhelm 1994).

**Table 19C: Physiognomic analysis of the vascular flora observed at McVey MF, Randolph County, Indiana.** A = annual; B = biennial; H = herbaceous; P = perennial; W = woody. Location: South – species occurring south of CR 750 N; North – species occurring north of CR 750 N.

	McVey MF South		McVey MF North		Total McVey MF (both sites combined)	
	# Native Species	# Non-native	# Native Species	# Non-native	# Native Species	# Non-native
# Species	303	86	111	46	312	94
Tree	43	3	35	3	46	5
Shrub	18	8	4	4	19	8
W-Vine	7	0	6	0	7	0
H-Vine	3	0	1	0	4	0
P-Forbs	131	22	34	14	134	24
B-Forbs	7	13	4	11	7	14
A-Forbs	34	21	13	5	34	23
P-Grass	18	10	6	8	18	11
A-Grass	5	9	0	1	5	9
P-Sedge	29	0	8	0	30	0
A-Sedge	1	0	0	0	1	0
Fern	7	0	0	0	7	0

**Summary of Physiognomic Data for Total McVey MF**

% Woody Species (tree, shrub, w-vine)	=	85 species/406 = 20.9%
% Herbaceous Species (h-vine, all forbs)	=	240 species/406 = 59.2%
% Graminoid Species (grass, sedge)	=	74 species/406 = 18.2%
% Ferns and Allies	=	7 species/406 = 1.7%

**Summary Overview of McVey Memorial Forest (MMF)**

A total of 406 species were observed at MMF. Of these 15 occurred only in the northern woodland, 142 occurred in both woodlands, and 249 species occurred only in the southern woodland (Table 19A). Of the 406 taxa, 312 (76.8%) were native and 94 (23.2%) were non-native. From the northern woodland,

157 taxa were reported of which 111 (70.7%) were native species and from the southern woodland, 388 taxa were reported of which 302 (77.8%) native species (Tables 19A & B).

Among the 406 species were 24 potential Randolph County records (Table 19A). Most notable among these were *Callitriche terrestris*, *Elodea canadensis*, *Erythronium americanum*, *Monotropa uniflora*, *Najas flexilis*, *Potamogeton nodosus*, *Quercus palustris*, *Scutellaria nervosa*, *Silphium laciniatum*, and *Solidago rigida*. In addition, there were four species that had not previously been reported from the county, i.e., *Betula nigra*, *Pinus strobus*, *Populus alba*, and *Thuja occidentalis*, and are not considered county records because they were planted and have not naturalized. Lastly, two species, *Hydrastis canadensis* and *Viola pubescens*, are on the state watch list (Table 19A; IDNA 2016). No endangered, rare, or threatened species were encountered.

The native FQI and mean C for MMF were 62.9 and 3.6, respectively, while the total (native + non-native species) FQI and mean C were 55.1 and 2.7, respectively (Table 19B). The vascular plant taxa documented and the native FQI at MMF were typical of other floristic inventories of vegetation in east-central Indiana (see Hubini et al. 2017 and Ruch et al. 2014). The native matrices suggest that MMF is of remnant natural quality and contains some noteworthy remnants of the natural heritage of the region (Rothrock & Homoya 2005; Swink & Wilhelm 1994). Although low for sites outside the Central Till Plain region, the native mean C for MMF is typical for sites within this region. See Hubini et al. (2017) for an explanation of the lower native mean C values in the Central Till Plain region, especially east-central Indiana. Of the 406 species reported from MMF, 33 (8.1%) had C-values equal to or greater than seven (C  $\geq$  7). There were 22 species with C = 7, most notably *Anemone quinquefolia*, *Carex gracillima*, *Euonymus obovatus*, *Fraxinus quadrangulata*, *Hydrastis canadensis*, *Monotropa uniflora*, *Phegopteris hexagonoptera*, *Silene virginica*, *Solidago caesia*, *S. rigida*, *Thaspium barbinode*, and *Uvularia grandiflora*. C = 8 species included *Carex amphibola*, *Carya laciniosa*, *Eleocharis palustris*, *Fagus grandifolia*, *Polygonatum pubescens*, and *Sedum ternatum*. Although there were no C = 9 species, there were five C = 10 species, i.e., *Carex bromoides*, *Ranunculus hispidus* var. *caricetorum*, *Silphium laciniata*, *Taxodium distichum*, and *Thuja occidentalis*. However, the later three species were likely planted.

For all species (native + non-native) at MMF, the FQI = 55.1 was 7.8 units lower than the FQI for native species alone. Likewise, for all species the mean C was 2.7 or 0.9 units lower than the mean C for native species alone. Rothrock & Homoya (2005) have suggested that natural quality of an area is compromised when non-native diversity lowers mean C  $\leq$  0.7 units. Based on these numbers, it would appear that the non-native flora is having a negative impact on the native flora. However, based on visual observations and species distribution, the negative impact is not equal across all habitats. Clearly, the non-native flora is negatively impacting the native flora along the roadside, in old fields, along drainage ditches, in tree plantations along SR 1, and in and around the man-made pond. However, within the older woodland, the impact is negligible. The non-native species exhibiting the greatest problem are *Alliaria petiolata*, *Bromus* spp., *Cirsium arvensis*, *Conium maculatum*, *Festuca arundinacea* (= *Schedonorus arundinaceus*), *Hemerocallis fulva* (in patches), *Leucanthemum vulgare*, *Lonicera*



*maackii*, *Melilotus officinalis*, *Phalaris arundinacea* (only the river), *Poa pratensis*, *Rosa multiflora*, *Setaria* spp., *Trifolium* spp., and *Vicia cracca*.

### White River Woods (WRW)

**Table 19D: White River Woods plant taxa list.** Location: OF = old fields; FW = floodplain woods; MW = mature woods in the northeast corner of the property. Non-native (exotic) species are in capital letters. \* = potential Delaware County record; SE = state endangered.

<u>Scientific Name</u>	<u>Common Name</u>	<u>Location</u>		
		<u>OF</u>	<u>FW</u>	<u>MW</u>
<i>ABUTILON THEOPHRASTI</i> Medik.	Buttonweed			X
<i>Acalypha rhomboidea</i> Raf.	Three-Seeded Mercury	X		X
<i>Acer negundo</i> L.	Boxelder	X	X	X
<i>Acer rubrum</i> L. v. <i>rubrum</i>	Red Maple	X	X	
<i>Acer saccharinum</i> L.	Silver Maple	X	X	
<i>Acer saccharum</i> Marshall	Sugar Maple	X		X
<i>Achillea millefolium</i> L.	Common Milfoil	X		X
<i>Aesculus glabra</i> Willd. v. <i>glabra</i>	Ohio Buckeye		X	
<i>Agastache nepetoides</i> (L.) Kuntze	Yellow Giant Hyssop	X	X	X
<i>Ageratina altissima</i> (L.) King & H. Rob.	White Snakeroot	X	X	
<i>Agrimonia parviflora</i> Aiton	Swamp Agrimony			X
<i>AGROSTIS GIGANTEA</i> Roth	Red Top		X	
<i>ALLIARIA PETIOLATA</i> (M. Bieb.) Cavara & Grande	Garlic Mustard	X	X	X
<i>Ambrosia artemisiifolia</i> L.	Common Ragweed	X	X	X
<i>Ambrosia trifida</i> L.	Giant Ragweed	X	X	X
<i>Amelanchier arborea</i> (Michx. f.) Fernald	Common Serviceberry	X		
<i>Angelica atropurpurea</i> L.	Great Angelica	X	X	
<i>Apocynum cannabinum</i> L.	Dogbane	X		X
<i>ARCTIUM MINUS</i> Bernh.	Common Burdock	X	X	
<i>Arisaema dracontium</i> (L.) Schott	Green Dragon			X
<i>Asarum canadense</i> L.	Canada Wild Ginger		X	
<i>Asclepias syriaca</i> L.	Common Milkweed	X	X	X
<i>ASPARAGUS OFFICINALIS</i> L.	Garden Asparagus	X		
<i>Asplenium platyneuron</i> (L.) Britton, Sterns & Poggenb.	Ebony Spleenwort	X		
<i>BARBAREA VULGARIS</i> R. Br.	Yellow Rocket			X
<i>Bidens cernua</i> L.	Nodding Bur Marigold		X	
<i>Bidens frondosa</i> L.	Common Beggar's Ticks			
<i>BROMUS COMMUTATUS</i> Schrad.	Hairy Brome	X	X	X
<i>BROMUS INERMIS</i> Leyss.	Hungarian Brome	X	X	X
<i>Calystegia sepium</i> (L.) R. Br.	American Bindweed	X	X	
* <i>Calystegia sylvatica</i> (Kit.) Griseb. s. <i>fraterniflora</i> (Mack. & Bush) Brummitt	Rectangular-Sinused Hedge Bindweed	X		
<i>Campanulastrum americanum</i> (L.) Small	American Bellflower		X	
<i>CAPSELLA BURSA-PASTORIS</i> (L.) Medik.	Shepherd's Purse		X	

<i>Cardamine pensylvanica</i> Muhl. ex Willd.	Pennsylvania Bitter Cress		X	
<i>Carex aggregata</i> Mack.	Smooth Clustered Sedge	X	X	X
<i>Carex amphibola</i> Steud.	False Gray Sedge		X	X
<i>Carex blanda</i> Dewey	Common Wood Sedge	X	X	X
<i>Carex davisii</i> Schwein. & Torr.	Awned Graceful Sedge	X		X
<i>Carex frankii</i> Kunth	Bristly Cattail Sedge		X	
<i>Carex granularis</i> Muhl. ex Willd.	Pale Sedge	X		X
<i>Carex grisea</i> Wahlenb.	Wood Gray Sedge			X
<i>Carex hirtifolia</i> Mack.	Hairy Wood Sedge			X
<i>Carex jamesii</i> Schwein.	Grass Sedge	X	X	X
<i>Carex laevivaginata</i> (Kük.) Mack.	Smooth-Sheathed Fox Sedge	X		
<i>Carex leavenworthii</i> Dewey	Dwarf Bracted Sedge	X		
<i>Carex lurida</i> Wahlenb.	Bottlebrush Sedge	X		
<i>Carex molesta</i> Mack. ex Bright	Field Oval Sedge	X	X	X
<i>Carex normalis</i> Mack.	Spreading Oval Sedge		X	X
* <i>Carex oligocarpa</i> Schkuhr ex Willd.	Few-Fruited Gray Sedge		X	
<i>Carex pensylvanica</i> Lam.	Pennsylvania Oak Sedge			X
<i>Carex radiata</i> (Wahlenb.) Small	Straight-Styled Bracted Sedge			X
<i>Carex shortiana</i> Dewey	Short's Sedge	X	X	X
<i>Carex sparganioides</i> Willd.	Loose-Headed Bracted Sedge			X
<i>Carex stipata</i> Muhl. ex Willd. v. <i>stipata</i>	Common Fox Sedge	X		X
<i>Carex stricta</i> Lam.	Common Tussock Sedge	X		
<i>Carex tribuloides</i> Wahlenb. v. <i>tribuloides</i>	Broad-Leaved Oval Sedge			X
<i>Carex trichocarpa</i> Muhl. ex Willd.	Hairy-Fruited Lake Sedge	X	X	
<i>Carex vulpinoidea</i> Michx.	Brown Fox Sedge	X	X	X
<i>Carya cordiformis</i> (Wangenh.) K. Koch	Bitternut Hickory		X	X
<i>Carya glabra</i> Miller	Pignut Hickory			X
<i>Carya laciniosa</i> (Miller) K. Koch	Big Shellbark Hickory			X
<i>Carya ovata</i> (Miller) K. Koch	Shagbark Hickory	X		X
<i>Catalpa speciosa</i> (Warder) Warder ex Engelm.	Cigar Tree		X	
<b>CELASTRUS ORBICULATA</b> Thunb.	Oriental Bittersweet	X	X	X
<i>Celtis occidentalis</i> L.	Hackberry	X	X	X
* <b>CENTAUREA STOEBE</b> L. s. <b>MICRANTHOS</b> (Gugler) Hayek	Spotted Centaurea		X	
<b>CERASTIUM FONTANUM</b> Baumg. s. <b>VULGARE</b> (Hartm.) Greuter & Burdet	Common Mouse-Ear Chickweed	X	X	
<b>CHENOPODIUM ALBUM</b> L.	Lamb's Quarters		X	
<b>CICHORIUM INTYBUS</b> L.	Chickory		X	X
<i>Cicuta maculata</i> L. v. <i>maculata</i>	Water Hemlock		X	
<i>Cinna arundinacea</i> L.	Common Wood Reed			X
<i>Circaea lutetiana</i> L. s. <i>canadensis</i> (L.) Asch. & Magnus	Enchanter's Nightshade	X		X
<b>CIRSIUM ARVENSE</b> (L.) Scop.	Field Thistle	X	X	X
<i>Cirsium discolor</i> (Muhl. ex Willd.) Spreng.	Pasture Thistle	X		
<b>CONIUM MACULATUM</b> L.	Poison Hemlock	X	X	X
<i>Conyza canadensis</i> (L.) Cronquist	Horseweed			X

<i>Cornus drummondii</i> C.A. Mey.	Rough-Leaved Dogwood	X	X	X
<i>Crataegus mollis</i> (Torr. & A. Gray) Scheele	Downy Hawthorn	X	X	X
<i>Crataegus punctata</i> Jacq.	Dotted Hawthorn			X
<i>Cryptotaenia canadensis</i> (L.) DC.	Honewort	X	X	X
<i>DACTYLIS GLOMERATA</i> L.	Orchard Grass	X	X	X
<i>DAUCUS CAROTA</i> L.	Queen Anne's Lace	X		X
<i>Desmodium canadense</i> (L.) DC.	Showy Tick Trefoil			X
* <i>Desmodium illinoense</i> A. Gray	Illinois Tick Trefoil	X		
<i>Desmodium paniculatum</i> (L.) DC.	Panicled Tick Trefoil			X
<i>DIANTHUS ARMERIA</i> L.	Deptford Pink	X		
<i>Dichanthelium acuminatum</i> (Sw.) Gould & C.A. Clark s. <i>fasciculatum</i> (Torr.) Freckmann	Old-Field Panic Grass			X
<i>DIPSACUS FULLONUM</i> L.	Common Teasel	X	X	
<i>Duchesnea indica</i> (Andrews) Teschem.	Indian Strawberry	X		
* <i>Echinacea purpurea</i> (L.) Moench	Broad-Leaved Purple Coneflower	X		
* <i>Echinocystis lobata</i> (Michx.) Torr. & A. Gray	Wild Cucumber	X	X	
<i>ELAEAGNUS UMBELLATA</i> Thunb.	Autumn Olive	X	X	
* <i>Elymus glabriflorus</i> (Vasey ex L.H. Dewey) Scribn. & C.R. Ball	Smooth-Flowered Wild Rye	X	X	X
<i>Elymus hystrix</i> L.	Bottlebrush Grass			X
<i>Elymus macgregorii</i> R. Brooks & J.J.N. Campb.		X		X
* <i>Elymus trachycaulus</i> (Link) Gould ex Shinnery s. <i>trachycaulus</i>	Slender Wheat Grass	X		
<i>Elymus villosus</i> Muhl. ex Willd.	Hairy Wild Rye	X	X	X
<i>Elymus virginicus</i> L.	Virginia Wild Rye	X	X	X
<i>Equisetum arvense</i> L.	Common Horsetail	X		X
<i>Erigeron annuus</i> (L.) Pers.	Annual Fleabane	X	X	X
<i>Erigeron philadelphicus</i> L. v. <i>philadelphicus</i>	Marsh Fleabane		X	
<i>Eutrochium purpureum</i> (L.) E.E. Lamont	Purple Joe Pye Weed			X
<i>Eupatorium perfoliatum</i> L.	Common Boneset	X	X	
* <i>Euphorbia obtusata</i> Pursh	Blunt-Leaved Spurge	SE		
<i>Fallopia scandens</i> (L.) Holub v. <i>scandens</i>	Climbing False Buckwheat		X	X
<i>Festuca arundinacea</i> Schreb.	Tall Fescue	X	X	X
<i>Festuca subverticillata</i> (Pers.) E. Alexev.	Nodding Fescue	X	X	X
<i>Fraxinus americana</i> L.	White Ash	X	X	X
<i>Fraxinus pennsylvanica</i> Marshall v. <i>lanceolata</i> (Borkh.) Sarg.	Green Ash		X	X
<i>Fraxinus pennsylvanica</i> Marshall v. <i>pennsylvanica</i>	Red Ash	X		
<i>Galium aparine</i> L.	Annual Bedstraw	X	X	X
<i>Galium circaezans</i> Michx. v. <i>circaezans</i>	Smooth Wild Licorice			X
<i>Galium concinnum</i> Torr. & A. Gray	Shining Bedstraw			X
<i>GALIUM MOLLUGO</i> L.	White Bedstraw	X	X	
<i>Galium triflorum</i> Michx.	Sweet-Scented Bedstraw			X
<i>Geum canadense</i> Jacq. v. <i>canadense</i>	White Avens	X	X	X
<i>Geum laciniatum</i> Murray	Rough Avens	X	X	X
<i>Geum vernum</i> (Raf.) Torr. & A. Gray	Spring Avens	X		X

<i>GLECHOMA HEDERACEA</i> L.	Ground Ivy	X	X	
<i>Gleditsia triacanthos</i> L.	Honey Locust	X	X	X
<i>Glyceria striata</i> (Lam.) Hitchc.	Fowl Manna Grass	X	X	X
<i>Hackelia virginiana</i> (L.) I.M. Johnst.	Stickseed	X	X	X
<i>Helianthus tuberosus</i> L.	Jerusalem Artichoke		X	
<i>Heliopsis helianthoides</i> (L.) Sweet v. <i>helianthoides</i>	False Sunflower		X	
* <i>Heracleum maximum</i> W. Bartram	Common Cow Parsnip		X	
<i>Hydrophyllum macrophyllum</i> Nutt.	Large-Leaf Waterleaf			X
<i>Hydrophyllum virginianum</i> L. <i>virginianum</i>	Virginia Waterleaf			X
<i>Hypericum punctatum</i> Lam.	Spotted St. John's Wort	X		X
<i>Impatiens capensis</i> Meerb.	Spotted Touch-Me-Not		X	X
<i>Impatiens pallida</i> Nutt.	Pale Touch-Me-Not		X	
<i>Iodanthus pinnatifidus</i> (Michx.) Steud.	Violet Cress		X	
<i>IPOMOEA PURPUREA</i> (L.) Roth	Common Morning Glory	X	X	
* <i>IRIS PSEUDACORUS</i> L.	Tall Yellow Iris	X	X	
<i>Juglans nigra</i> L.	Black Walnut	X	X	X
<i>Juncus dudleyi</i> Wiegand	Dudley's Rush	X		
<i>Juncus tenuis</i> Willd.	Path Rush	X	X	X
<i>Juncus torreyi</i> Coville	Torrey's Rush	X		
<i>Juniperus virginiana</i> L. <i>virginiana</i>	Eastern Red Cedar	X		
<i>Lactuca biennis</i> (Moench) Fernald	Tall Blue Lettuce		X	
<i>Lactuca floridana</i> (L.) Gaertn.	Blue Lettuce	X	X	X
<i>Laportea canadensis</i> (L.) Weddell	Canada Wood Nettle	X	X	
<i>Leersia oryzoides</i> (L.) Sw.	Rice Cut Grass	X		
<i>Leersia virginica</i> Willd.	White Grass			X
<i>LEONURUS CARDIACA</i> L. s. <i>CARDIACA</i>	Motherwort		X	
<i>LEPIDIUM CAMPESTRE</i> (L.) W.T. Aiton	Field Cress	X		
<i>Lepidium virginicum</i> L. v. <i>virginicum</i>	Common Pepper Grass		X	X
<i>LIGUSTRUM VULGARE</i> L.	Common Privet		X	
<i>Lindera benzoin</i> (L.) Blume v. <i>benzoin</i>	Hairy Spicebush			X
<i>Lobelia siphilitica</i> L. v. <i>siphilitica</i>	Great Blue Lobelia	X		
* <i>LOLIUM PERENNE</i> L.	Perennial Rye Grass			X
<i>LONICERA MAACKII</i> (Rupr.) Maxim.	Amur Honeysuckle	X	X	X
<i>LONICERA MORROWII</i> A. Gray	Morrow's Honeysuckle		X	
<i>Lycopus americanus</i> Muhl. ex W.P.C. Barton	Common Water Horehound	X	X	
<i>Lysimachia ciliata</i> L.	Fringed Loosestrife		X	
<i>LYSIMACHIA NUMMULARIA</i> L.	Moneywort	X	X	
* <i>LYTHRUM SALICARIA</i> L.	Purple Loosestrife	X		
<i>MALUS DOMESTICA</i> Borkh.	Apple	X		
<i>MATRICARIA DISCOIDEA</i> DC.	Pineapple Weed		X	
<i>MEDICAGO LUPULINA</i> L.	Black Medick	X	X	X
<i>MEDICAGO SATIVA</i> L. s. <i>SATIVA</i>	Common Alfalfa	X		
* <i>MEDICAGO</i> L. × <i>VARIA</i> Martyn	Hybrid Alfalfa		X	
<i>MELILOTUS ALBA</i> Medik.	White Sweet Clover	X		
<i>MELILOTUS OFFICINALIS</i> (L.) Lam.	Yellow Sweet Clover	X	X	X

<i>Menispermum canadense</i> L.	Moonseed			X
<i>Mentha arvensis</i> L. v. <i>villosa</i> (Benth.) S.R. Stewart	Wild Mint	X		
<i>Mimulus ringens</i> L.	Monkey Flower		X	
<b>MORUS ALBA</b> L.	White Mulberry	X	X	X
<i>Muhlenbergia schreberi</i> J.F. Gmel.	Nimblewill	X		
<i>Nabalus altissimus</i> (L.) Hook.	Tall White Lettuce	X		X
* <i>Nabalus crepidineus</i> (Michx.) DC.	Great White Lettuce		X	
<i>Oenothera biennis</i> L.	Common Evening Primrose	X		X
<i>Osmorhiza claytonii</i> (Michx.) C.B. Clarke	Hairy Sweet Cicely			X
<i>Osmorhiza longistylis</i> (Torr.) DC.	Anise Root	X	X	X
<i>Ostrya virginiana</i> (Miller) K. Koch	Hop Hornbeam			X
<i>Oxalis stricta</i> L.	Tall Wood Sorrel	X	X	X
<i>Packera glabella</i> (Poir.) C. Jeffrey	Butterweed	X	X	
<i>Parthenocissus quinquefolia</i> (L.) Planch.	Virginia Creeper	X	X	X
<b>PASTINACA SATIVA</b> L.	Wild Parsnip	X	X	X
<i>Polygonum amphibium</i> L. var. <i>emersum</i> Michx.	Water Heartsease		X	
<i>Persicaria virginiana</i> (L.) Gaertn.	Virginia Knotweed	X	X	
<b>PHALARIS ARUNDINACEA</b> L.	Reed Canary Grass	X	X	
<b>PHLEUM PRATENSE</b> L.	Timothy Grass	X	X	X
<i>Phlox paniculata</i> L.	Garden Phlox		X	
<i>Phryma leptostachya</i> L.	Lopseed			X
<i>Physalis heterophylla</i> Nees	Clammy Ground Cherry	X		
<i>Physalis longifolia</i> Nutt. var. <i>subglabrata</i> (Mack. & Bush) Cronquist	Smooth Ground Cherry		X	
<i>Phytolacca americana</i> L. v. <i>americana</i>	Pokeweed		X	X
<i>Pilea pumila</i> (L.) A. Gray	Canada Clearweed	X	X	
<b>PLANTAGO LANCEOLATA</b> L.	English Plantain	X	X	X
<i>Plantago rugelii</i> Decne.	Red-Stalked Plantain	X	X	X
<i>Platanus occidentalis</i> L.	Sycamore		X	
<b>POA COMPRESSA</b> L.	Canadian Blue Grass			X
<b>POA PRATENSIS</b> L. s. <b>PRATENSIS</b>	Kentucky Blue Grass	X		X
<i>Podophyllum peltatum</i> L.	May Apple		X	X
<i>Polemonium reptans</i> L.	Jacob's Ladder			X
<i>Polygonatum biflorum</i> (Walter) Elliott	Small Solomon's Seal		X	X
<i>Polymnia canadensis</i> L.	Pale Leafcup	X	X	
<i>Populus deltoides</i> Marshall v. <i>deltoides</i>	Eastern Cottonwood	X	X	
<i>Potentilla norvegica</i> L.	Rough Cinquefoil		X	X
<b>POTENTILLA RECTA</b> L.	Sulfur Cinquefoil	X	X	
<i>Potentilla simplex</i> Michx.	Common Cinquefoil			X
<i>Prunella vulgaris</i> L. s. <i>lanceolata</i> (W. Bartram) Hultén	Selfheal			X
<i>Prunus serotina</i> Ehrh. v. <i>serotina</i>	Wild Black Cherry	X	X	X
<i>Ptelea trifoliata</i> L.	Smooth Wafer Ash	X		
<b>PYRUS CALLERYANA</b> Decne.	Bradford Pear			X
<i>Quercus alba</i> L.	White Oak			X
<i>Quercus bicolor</i> Willd.	Swamp White Oak			X

<i>Quercus imbricaria</i> Michx.	Jack Oak			X
<i>Quercus macrocarpa</i> Michx.	Burr Oak		X	
<i>Quercus muehlenbergii</i> Engelm.	Chinquapin Oak			X
<i>Quercus rubra</i> L.	Northern Red Oak			X
<i>Quercus shumardii</i> Buckley	Shumard's Oak			X
<i>Ranunculus hispidus</i> Michx.	Bristly Buttercup			X
* <i>Robinia pseudoacacia</i> L.	Black Locust		X	
<i>Rosa carolina</i> L.	Pasture Rose			X
<i>ROSA MULTIFLORA</i> Thunb.	Japanese Rose	X	X	X
<i>Rosa setigera</i> Michx.	Illinois Rose	X		X
<i>Rubus allegheniensis</i> T.C. Porter	Common Blackberry	X		X
<i>Rubus occidentalis</i> L.	Black Raspberry	X	X	X
<i>Rudbeckia hirta</i> L. v. <i>hirta</i>	Black-Eyed Susan	X		
<i>Rudbeckia laciniata</i> L. v. <i>laciniata</i>	Wild Golden Glow		X	
<i>Ruellia strepens</i> L.	Smooth Ruellia		X	X
<i>RUMEX CRISPUS</i> L.	Curly Dock	X	X	X
<i>Salix interior</i> Rowlee	Sandbar Willow	X		
<i>Salix nigra</i> Marshall	Black Willow	X		
<i>Sambucus nigra</i> L. s. <i>canadensis</i> (L.) Bolli	Common Elderberry	X	X	X
<i>Sanguinaria canadensis</i> L.	Bloodroot			X
* <i>Sanicula marilandica</i> L.	Black Snakeroot	X		
<i>Sanicula odorata</i> (Raf.) K.M. Pryer & L.R. Phillippe	Clustered Black Snakeroot		X	X
* <i>Schoenoplectus acutus</i> (Muhl. ex Bigelow) Á. Löve & D. Löve	Heard-Stemmed Bulrush	X		
<i>Scirpus atrovirens</i> Willd.	Dark-Green Bulrush	X	X	
<i>Scirpus pendulus</i> Muhl.	Red Bulrush	X		X
<i>SILENE LATIFOLIA</i> Poir. ssp. <i>ALBA</i> (Mill.) Greuter & Burdet	White Campion	X	X	
* <i>Silphium perfoliatum</i> L.	Cup Plant		X	
* <i>SISYMBRIUM LOESELII</i> L.	Tall Hedge Mustard		X	
<i>SISYMBRIUM OFFICINALE</i> (L.) Scop.	Hedge Mustard		X	
<i>Sisyrinchium angustifolium</i> Miller	Stout Blue-Eyed Grass	X		
<i>Smilax ecirrhata</i> (Engelm. ex Kunth) S. Watson	Upright Carrion Flower			X
<i>Smilax hispida</i> Raf.	Bristly Green Brier	X	X	X
<i>Smilax lasioneura</i> Hook.	Common Carrion Flower		X	X
<i>Solanum carolinense</i> L.	Horse Nettle		X	
<i>Solidago altissima</i> L.	Tall Goldenrod	X	X	X
<i>Solidago canadensis</i> L.	Canada Goldenrod		X	
<i>Solidago gigantea</i> Aiton	Late Goldenrod		X	
<i>Sphenopholis intermedia</i> (Rydb.) Rydb.	Slender Wedge Grass	X		
<i>Stachys hispida</i> Pursh	Marsh Hedge Nettle		X	
<i>Staphylea trifolia</i> L.	Bladdernut		X	
<i>Stellaria longifolia</i> Muhl. ex Willd.	Stitchwort	X		
* <i>Symphoricarpos orbiculatus</i> Moench	Coralberry			X
<i>Symphotrichum cordifolium</i> (L.) G.L. Nesom	Heart-Leaved Aster		X	X

<i>Symphotrichum lanceolatum</i> (Willd.) G.L. Nesom s. <i>lanceolatum</i>	Panicled Aster	X	X	X
<i>Symphotrichum lateriflorum</i> (L.) Á. Löve & D. Löve	Side-Flowering Aster		X	X
<i>Symphotrichum novae-angliae</i> (L.) G.L. Nesom	New England Aster	X		
<i>Symphotrichum pilosum</i> (Willd.) G.L. Nesom v. <i>pilosum</i>	Hairy Aster	X	X	
<i>Symplocarpus foetidus</i> (L.) Salisb. ex W.P.C. Barton	Skunk Cabbage		X	
TARAXACUM OFFICINALE F.H. Wigg.	Common Dandelion	X	X	X
<i>Teucrium canadense</i> L. v. <i>canadense</i>	American Germander	X	X	
<i>Thalictrum dasycarpum</i> Fisch. & Avé-Lall.	Purple Meadow Rue		X	
<i>Thalictrum revolutum</i> DC.	Waxy Meadow Rue		X	
<i>Thalictrum thalictroides</i> (L.) Eames & B. Boivin	Rue Anemone			X
<i>Thaspium barbinode</i> (Michx.) Nutt.	Hairy Meadow Parsnip		X	
<i>Tilia americana</i> L. v. <i>americana</i>	American Linden			X
<i>Toxicodendron radicans</i> (L.) Kuntze s. <i>negundo</i> (Greene) Gillis	Eastern Poison Ivy	X	X	X
<i>Tradescantia subaspera</i> Ker Gawl.	Broad-Leaved Spiderwort		X	
TRAGOPOGON PRATENSIS L.	Common Goat's Beard	X	X	X
TRIFOLIUM HYBRIDUM L.	Alsike Clover	X	X	X
TRIFOLIUM PRATENSE L.	Red Clover	X	X	X
TRIFOLIUM REPENS L.	White Clover	X	X	X
<i>Trillium sessile</i> L.	Sessile Trillium		X	X
<i>Typha latifolia</i> L.	Broad-Leaved Cattail	X	X	
<i>Ulmus americana</i> L.	American Elm	X	X	X
ULMUS PUMILA L.	Siberian Elm	X		
<i>Ulmus rubra</i> Muhl.	Slippery Elm	X		X
<i>Urtica dioica</i> L. s. <i>gracilis</i> (Aiton) Seland	Tall Stinging Nettle	X	X	
<i>Valerianella umbilicata</i> (Sull.) Alph. Wood	Corn Salad		X	
VERBASCUM BLATTARIA L.	Moth Mullein	X		X
VERBASCUM THAPSUS L.	Woolly Mullein	X		
<i>Verbena hastata</i> L.	Blue Vervain	X		
<i>Verbena urticifolia</i> L.	White Vervain	X	X	X
<i>Verbesina alternifolia</i> (L.) Britton ex Kearney	Wingstem	X	X	X
<i>Vernonia gigantea</i> (Walter) Trel.	Tall Ironweed	X		X
VERONICA ARVENSIS L.	Corn Speedwell	X	X	
VERONICA POLITA Fr.	Dwarf Bird's-Eye Speedwell	X		
VERONICA SERPYLLIFOLIA L. s. <i>SERPYPHYLLIFOLIA</i>	Thyme-Leaved Speedwell	X		
VIBURNUM OPULUS L. v. <i>OPULUS</i>	European High-Bush Cranberry		X	
<i>Viburnum prunifolium</i> L.	Black Haw	X	X	X
*VICIA VILLOSA Roth s. <i>VILLOSA</i>	Winter Vetch	X	X	X
<i>Viola sororia</i> Willd.	Woolly Blue Violet	X	X	X
<i>Viola striata</i> Aiton	Common White Violet	X	X	X
<i>Vitis riparia</i> Michx.	Riverbank Grape	X	X	X
<i>Vitis vulpina</i> L.	Frost Grape	X	X	X

**Table 19E: Floristic quality data – White River Woods (WRW).** OF = old fields; FW = floodplain woods; MW = mature woods in the northeast corner of the property; # = number of; all plants = native + non-native species; FQI = Floristic Quality Index; mean C = average Coefficient of Conservatism.

	All Site Combined	WRW OF	WRW FW	WRW MW
# native plants	220	121	123	129
# non-native plants	69	51	50	32
# all plants	289	172	173	161
FQI native plants	46.3	28.3	31.1	33.4
FQI all plants	40.4	23.7	23.7	29.9
Mean C native plants	3.1	2.6	2.8	3.0
Mean C all plants	2.4	1.8	2.0	2.4

**Table 19F: Physiognomic analysis for (1) all vascular flora, (2) the mature woods, (3) the old fields of White River Woods, Delaware County, Indiana.** A = annual; B = biennial; H = herbaceous; P = perennial; W = woody.

	Total White River Woods		Mature Woods Only		Old Fields Only	
	# Native Species	# Non-native	# Native Species	# Non-native	# Native Species	# Non-native
# Species	220	69	129	32	121	51
Tree	35	4	23	2	18	3
Shrub	12	6	9	2	8	3
W-Vine	6	1	6	1	5	1
H-Vine	3	0	2	0	1	0
P-Forbs	98	21	50	8	48	18
B-Forbs	7	14	3	8	4	12
A-Forbs	17	13	9	3	9	7
P-Grass	13	9	9	7	9	6
A-Grass	0	1	0	1	0	1
P-Sedge	27	0	18	0	17	0
A-Sedge	0	0	0	0	0	0
Fern	2	0	0	0	2	0



## Summary of Physiognomic Data for Total White River Woods

% Woody Species (tree, shrub, w-vine)	=	64 species/406 = 22.2%
% Herbaceous Species (h-vine, all forbs)	=	173 species/406 = 59.7%
% Graminoid Species (grass, sedge)	=	50 species/406 = 17.4%
% Ferns and Allies	=	2 species/406 = 0.7%

## Summary Overview of White River Woods (WRW)

A total of 289 species were observed at WRW (Table 19D). Of the total 220 (76.1%) were native and 69 (23.9%) were non-native (Tables 19D & E). From the mature woods, 161 taxa were reported of which 129 (80.1) were native species; from the old fields, 172 taxa were reported of which 121 (70.3%) were native species; and from the floodplain woods, 173 taxa were reported of which 123 (71.1%) were native (Table 19D & E).

Among the 289 species reported from WRW were 22 potential Delaware County records (Table 19D). Most notable among these were *Carex oligocarpa*, *Desmodium illinoense*, *Echinocystis lobata*, *Euphorbia obtusata*, *Heracleum maximum*, *Iris pseudacorus* (non-native), *Prenanthes crepidinea*, *Robinia pseudoacacia* (surprisingly!), *Schoenoplectus acutus*, and *Vicia villosa*. In addition, *Euphorbia obtusata*, which was collected in an old field, is listed as state endangered, and *Prenanthes crepidinea*, which was collected in the floodplain woods, is listed on the state watch list.

The native FQI and mean C for WRW were 46.3 and 3.1, respectively, while the total (native + non-native species) FQI and mean C were 40.4 and 2.6, respectively (Table E). The flora observed and the native FQI and mean C at WRW were typical of other floristic inventories in east-central Indiana (see Hubini et al. 2017 and Ruch et al. 2014). Although these matrices represent observations and data collection for only one weekend, the numbers clearly indicate that WRW is of nature preserve quality (Rothrock & Homoya 2005; Swink & Wilhelm 1994).

As indicated in the summary overview for MMF, the mean C of 3.1 is typical for nature preserves in the Central Till Plain region. (See Hubini et al. (2017) for an explanation of the lower native mean C values in the Central Till Plain region, especially east-central Indiana.)

Of the 289 species reported from WRW, only 14 (4.8%) had C-values equal to or greater than seven (C e 7). There were no species with C-values of 9 or 10. Five species were C = 8, i.e., *Carex amphibola*, *Carex oligocarpa*, *Carya laciniosa*, *Elymus trachycaulus*, and *Symplocarpus foetidus*, and nine species were C = 7, i.e., *Carex laevivaginata*, *Galium circaezans*, *Hydrophyllum macrophyllum*, *Prenanthes crepidinea*, *Quercus bicolor*, *Q. shumardii*, *Stellaria longifolia*, *Thalictrum thalictroides*, and *Thaspium barbinode*.

For all species (native + non-native) at WRW, the FQI = 40.4 was ~ 6 units lower than the FQI for native species alone. Likewise, for all species the mean C was 2.4 or 0.7 units lower than the mean C for native species alone. As stated earlier, Rothrock & Homoya (2005) have suggested that natural quality of an area is compromised when non-native diversity lowers mean C e 0.7 units. Based on these numbers, it would appear that the non-native flora is having a negative impact on the native flora. However, based on visual observations and species distribution, the negative impact is not equal across all habitats. Clearly, the non-native flora is negatively impacting the native flora along the roadside and in old fields. The negative impact of exotics is negligible in the interior of the woodlands, especially the older woodland in the northeast corner of the property. The non-native species presenting the greatest

problem are *Bromus inermis*, *Cirsium arvense*, *Conium maculatum*, *Dipsacus fullonum*, *Elaeagnus umbellata*, *Festuca arundinacea*, *Galium mullugo*, *Iris pseudacorus*, *Lonicera maackii*, *Melilotus* spp., and *Vicia villosa*.

### **Literature Cited**

- Hubini, H.M.H., D.G. Ruch, M.E. Crecelius, J.F. Taylor, K.S. Badger & P.E. Rothrock. 2017. Floristic inventory of the Cooper Woods-Skinner Woods complex, Ball State University, Delaware County, Delaware. *Proceedings of the Indiana Academy of Science* 126:72–93.
- IDNR (Indiana Department of Natural Resources). 2016. Endangered, Threatened, Rare and Extirpated Plants of Indiana. At: <http://www.in.gov/dnr/naturepreserve/files/np-etrplants.pdf> (Accessed 17 March 2018).
- Rothrock, P.E. 2004. Floristic quality assessment in Indiana: The concept, use and development of coefficients of conservatism. Final Report for ARN A305 4 53, EPA Wetland Program Development Grant CD975586 01. 96 p. At: <http://www.in.gov/idem/water/planbr/401/publications.html>.
- Rothrock, P.E. & M.A. Homoya. 2005. An evaluation of Indiana's Floristic Quality Assessment. *Proceedings of the Indiana Academy of Science* 114:9–18.
- Ruch, D.G., K.S. Badger, J.E. Taylor, M.E. Smith & P.E. Rothrock. 2014. The vascular flora and vegetational communities of Coffman Woods Nature Preserve, Wayne County, Indiana. *Proceedings of the Indiana Academy of Science* 123:72–93.
- Swink, F. & G. Wilhelm. 1994. *Plants of the Chicago Region*, 4<sup>th</sup> edition. Indiana Academy of Science, Indianapolis, Indiana. 921 pp.



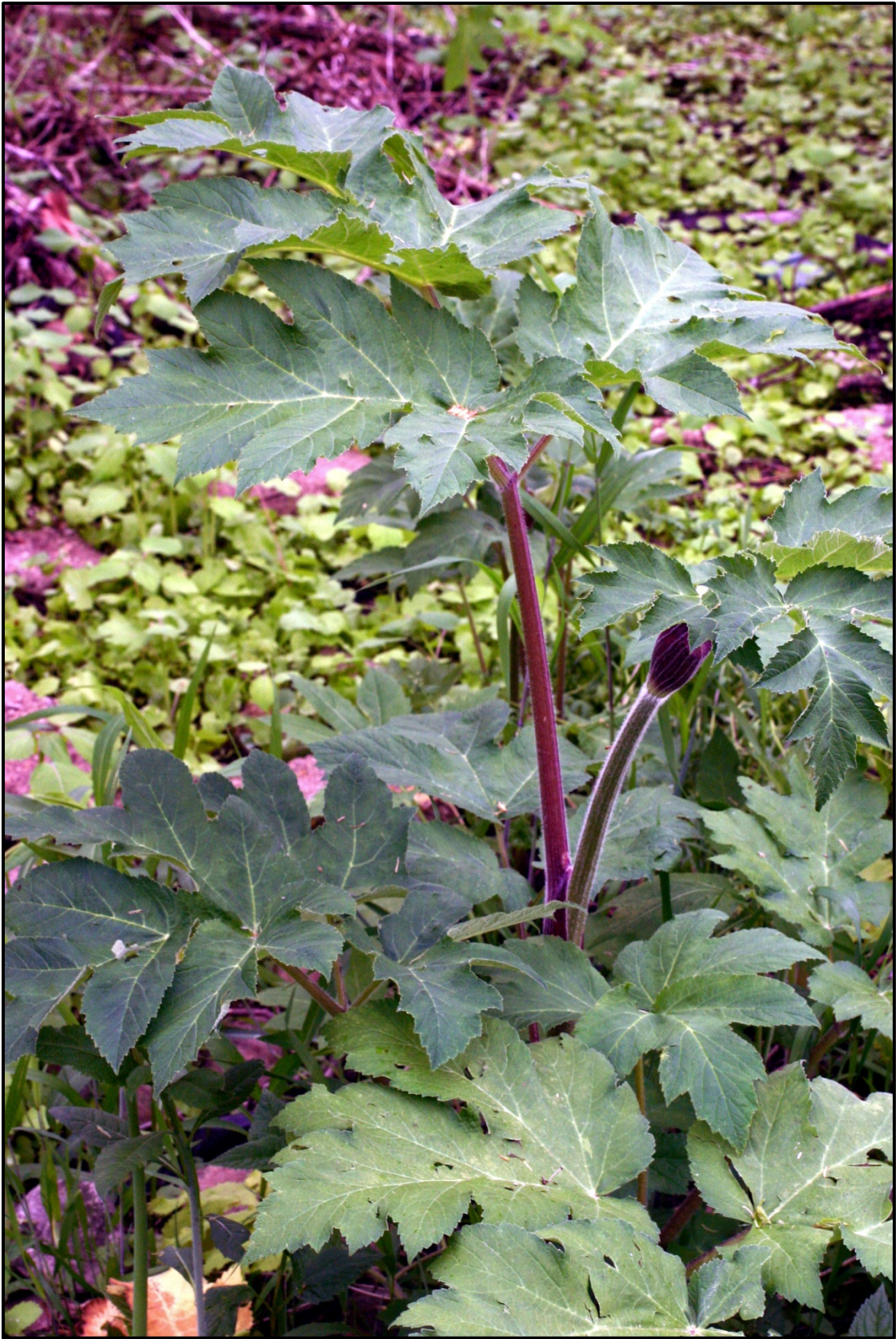
*Ptelea trifoliata* (common hop tree) in flower. (Photo by Ben Hess)



*Iris pseudacorus* (yellow iris, left) and *Elymus macgregorii* (early wild rye, right) at White River Woods. (Photos by Paul Rothrock)



*Rosa setigera* in flower at White River Woods. (Photo by Ben Hess)



*Heracleum maximum* (common cow parsnip, Indian celery, or Indian rhubarb) at White River Woods.  
(Photo by Paul Rothrock)



*Thalictrum revolutum* (skunk meadow-rue) at White River Woods. (Photo by Ben Hess)



*Angelica atropurpurea* (purplestem angelica) at White River Woods. (Photo by Ben Hess)



Images of old-field habitat from White River Woods. (*Photos by Ben Hess*)



Stephanie Schuck measuring the dbh of one of the larger trees at White River Woods. *(Photo by John Taylor)*



Plant team working along the river at White River Woods. *(Photo by John Taylor)*





From McVey Memorial Forest: *Silphium laciniatum* (compass plant, left) and *Solidago rigida* (stiff goldenrod, right). These plants were found in either a prairie remnant or an old prairie planting along State Road 1 just south of the Mississinewa River. Other prairie plants observed at the site included *Rudbeckia hirta* (black-eyed Susan), *Andropogon gerardii* (big bluestem), *Schizachyrium scoparium* (little bluestem), and *Elymus virginicus* (Virginia wild rye). (Photo by Nick Harby)

**Red-tail Land Conservancy Biodiversity Survey 2017**  
**Scientists, Naturalists, Students, Staff and Community Volunteers (75)**

<u>Name</u>	<u>Area</u>
Badger, Kem	Vascular Plants
Baird, Cole	Fish
Banks, Barry	Birds, RLC Founder and Executive Director, Emeritus
Bjornstod, Aimee	Bats
Bowley, Laura	Freshwater Mussels
Brodman, Robert (Bob)*	Herpetofauna
Bryzek, Jessica	Freshwater Mussels
Buskirk, Bill	Birds
Byrnes, Matt	Fish
Carter, Logan	Bats
Carter, Tim*	Bats
Cassel, Bill	Butterflies, Odonates (damselflies & dragonflies)
Chamberlain, Angie	Small Mammals
Chandler, Alison	Herpetofauna
Chelius, Kristin	Herpetofauna
Cole, Linda*	Non-vascular Plants (Mosses & Liverworts)
Cole, Myron	Non-vascular Plants (Mosses & Liverworts)
Creek, Jon	Birds
Davis, JoAnne	Fish & Freshwater Mussels
Dittmann, Mathew*	Ants, Beetles
Duddleson, J. Ryan	Cultural Resources Assessment
Eckstein, Jason	Mushrooms & Allies
Erdogan, Eyup	Vascular Plants
Filer, Alex	Herpetofauna
Filer, Jessica	Herpetofauna
Finkler, Mike	Herpetofauna
Fisher, Brant E.*	Fish & Freshwater Mussels
Frandsen, Lucas	Spiders
Grijalva, Ivan	Beetles, Moths
Haaning, Neil	Vascular Plants
Harby, Nick	Vascular Plants
Jessica Helmbold	Vascular Plants
Hess, Benn	Plants, Butterflies, Odonates
Holland, Jeffrey D.*	Beetles, Moths
Holloway, Drew	Fish
Hunt, Martha	Birds
Islam, Kamal*	Birds
Jean, Carlin	Bees
Jean, Chloe	Bees

Jean, Michelle	Bees
Jean, Robert P.*	Bees
Jeffery, Jim	Birds
Jeffery, Rosemarie	Birds
Jones, Micayla	Birds, Herpetofauna, RLC Stewardship Director
Kellenburger, Payton	Herpetofauna
Kissick, Ashley	Beetles, Moths
Larry	Vascular Plants
Laughin, Zach	Herpetofauna, Freshwater Mussels
Martin, Dylan	Mushrooms & Allies
Martin, James	Cultural Resources Assessment
McCarty, Megan*	Moths
McCroskey, Eoghan	Beetles, Moths
McKenzie, Kim	Birds
McMurray, Paul*	Aquatic Macroinvertebrates, Butterflies, Odonates
Milne, Marc*	Spiders
Moss, Megan	Herpetofauna
Murphy, William (Bill) L.*	Snail-killing Flies
Purtill, Matthew	Geomorphological Assessment
Rothrock, Paul	Vascular Plants
Rachel	Vascular Plants
Rhodes, Amy	Birds
Rice, Timothy	Birds
Ross, Mary Ann	Birds
Roth, Kirk*	Butterflies, Odonates (damselflies & dragonflies)
Ruch, Don*	Vascular Plants, Non-vascular Plants
Russell, Stephen*	Mushrooms & Allies
Schuck, Stephanie	Vascular Plants
Seymour, Ryan	Fish
Sheets, Jeremy	Bats
Stedman, Barb	Birds
Stern, Emily	Spiders
Strang, Carl*	Singing Insects
Taylor, John	Vascular Plants
Tungesvick, Kevin	Vascular Plants
Whitaker, John O., Jr.*	Small Mammals

\*Denotes team leader

## 2017 Red-tail Land Conservancy Biodiversity Survey Sponsors

