Biodiversity Survey
Final Report

Goose Pond Fish and Wildlife Area II

18 – 19 June 2016

RESULTS OF THE SECOND GOOSE POND FISH AND WILDLIFE BIODIVERSITY SURVEY GREENE COUNTY, INDIANA, 18 – 19 June 2016

Compiled from the Science Team's Reports
Assembled by Donald Ruch (Indiana Academy of Science)

Table of Contents

Cover Photo: Sunset over Goose Pond is from the Friends of Goose Pond calendar, April 2019. The sunset is over the Goose Pond Unit GP7 and GP16. (*Photo by Rober Wrenn*)

GOOSE POND FISH AND WILDLIFE AREA – THE SITE
BY TRAVIS TRAVIS STOELTING[1]

Goose Pond Fish and Wildlife Area (GPFWA) is a 9,018-acre restored wetland and grassland complex approximately two miles south of Linton, Indiana in southwestern Greene County. The property is owned and managed by the Indiana Department of Natural Resources (IDNR) – Division of Fish and Wildlife as a public outdoor recreation area, open to a wide variety of public uses compatible with the primary purpose of the property. The United States Department of Agriculture – Natural Resources Conservation Service (NRCS) has a permanent easement on approximately 7,200 acres of the property under the Wetlands Reserve Program. Restoration under this program took place from 2001-2008 in two sections, Goose Pond and Beehunter Marsh. Since the restoration, an additional 954 acres of adjacent land has been acquired which includes the 869-acre Thousand Islands unit. The diversity of habitat includes approximately 5,000 acres of wetlands, over 1,400 acres of grasslands, 800 acres of farmland, 600 acres of mixed woodlands, 400 acres of bottomland hardwood tree plantings, a 200-acre lake system, and a network of drainages. The property has over 35 miles of earthen levees and 42 water control structures.

As the property approaches 10 years post-restoration, many things have changed. Wetland units are fully developed emergent marsh habitat. Most restored wetlands on the property are dominated by perennial herbaceous wetland plants; although frequent planned disturbances have increased, providing a mosaic of annual moist soil vegetation, mudflats, open water, and emergent marsh. Similarly, grasslands have matured to a point in which their composition is dominated by perennial prairie plants, especially warm season grasses. However, frequent use of disturbances such as prescribed fire, disking, and herbicide applications have sustained a mosaic of structurally and compositionally diverse grassland communities including pockets of annual and biennial vegetation where soil disturbance has occurred. Both wetlands and grasslands continue to face challenges with invasive plant species. Patches of *Phragmites australis* ssp. *australis* (Phragmites), *Phalaris arundinacea* (reed canarygrass), and *Typha ×glauca* (hybrid cattails) are widespread, most commonly in areas that cannot be fully submerged or disked. Invasions of woody plants are also a constant threat to the early-successional habitat. A low level of woody encroachment and localized occurrences of exotic invasive plants are a reality to be expected in a modern Midwestern landscape. However, at 10 years post-restoration, Goose Pond Fish and Wildlife Area supports a substantial amount of biological diversity, including some of the most extensive quality early-successional prairie and marsh habitat in Indiana.

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Property Manager
Goose Pond FWA
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Indiana Department of Natural Resources

RESULTS OF THE 2016 GOOSE POND FISH AND WILDLIFE AREA BIODIVERSITY SURVEY
GREENE COUNTY, INDIANA

On 16–18 July 2010 the first biodiversity survey, also known as a bioblitz, was held at GPFWA, Indiana Department of Natural Resources, in Greene County, southwestern Indiana. Fifteen teams (14 taxonomic teams and a biogeochemistry team) surveyed the flora and fauna of ponds, marshes, fields, and forest of the 8,000+ acre site and reported 896 taxa: 862 species (20 amphibians and reptiles, 37 bees, 73 beetles, 122 birds, 48 butterflies, nine damselflies, 21 dragonflies, 39 species of fish, four freshwater mussels, five fungi and allies, 27 mammals, 74 moths, four snail-killing flies, 379 vascular plants, 16 families of aquatic macroinvertebrates, and 18 genera of plankton). A total of 215 new county records and numerous state-listed species were recorded. The baseline information provided by the survey indicated that the restoration was maturing rapidly and successfully capturing the biological diversity of this portion of southwestern Indiana (Karns et. al 2012)

There was a general consensus among participants that a repetition of the 2010 biodiversity study in approximately five years would be useful in assessing the progression of the restoration. Moreover, to continue to build upon the inventory of plants and animals begun with the first survey, another biodiversity study in a different season would be of benefit, recognizing that some early and late season species were undoubtedly missed. Thus, the Biodiversity and Natural Areas Committee of the Indiana Academy of Science initiated the second biodiversity survey of GPFWA.

The second biodiversity survey of GPFWA was conducted on 18–19 June 2016. The bioblitz attracted more than 95 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 Friends of Goose Pond, Indiana Academy of Science, Indiana Department of Natural Resources – Division of Fish and Wildlife, the Sassafras Audubon Society, and Duke Energy Foundation.

The 15 taxonomic teams reported 883 taxa, summarized in the table below.

Team	Leader	Taxa Found
Bats	Brianne Walters	5 species from the Thousand Islands unit and adjacent wetlands; one individual of the state endangered evening bat (*Nycticeius humeralis*)
Bees	Robert P. Jean	32 species representing the 5 common families in IN; largest species richness and abundance were sweat bees; *Lasioglossum hartii*—first collection in 50 years in IN; 15 Greene County records
Beetles (Coleoptera)	Jeffrey D. Holland	63 taxa from 23 families; none unusual or unexpected; most striking observation was not a beetle, but rather the sheer number of aquatic heteroptera at the light close to the ponds

Butterflies	Kirk Roth	32 taxa (31 species) from 5 families; none unusual or unexpected; Northern pearly-eye (*Lethe anthedon*) is listed as Rare in IN; overall number of individuals and species lower than expected
Fish	Brant E. Fisher	44 species including 2 non-native species; none are state/federal listed; no county or state records
Freshwater Mussels	Brant E. Fisher	13 species including 1 non-native species; all but 2 were represented by live individuals or fresh dead shell material; none are state/federal listed
Herpetofauna	Robert Brodman	20 species (12 reptile and 8 amphibian species); 1 Greene County record (*Plethodon cinereus*); 1 species of special concern (*Acris blanchardi*); 1 special protected species (*Terrepene carolina*)
Mammals (except bats)	John O. Whitaker, Jr.	23 species; most are widespread and common; most interesting species in the 2016 survey was the least shrew (*Cryptotis parva*) as it is rather rare
Moths	Carl Strang	29 taxa (28 species); widespread and common; most consume leaves of deciduous woody plants as larvae; 27 Greene County records
Mushrooms	Stephen Russell	30 taxa (4 slime molds and 26 mushrooms); all typical for the season; most were saprobes
Non-vascular plants	Linda Cole	50 species (36 mosses, 2 liverworts, 12 lichens); surprisingly diverse population of mosses; 2 species abundant in wetland/grasslands habitat were *Barbula convoluta* (bearclaw moss) and *Physcomitrium kellermani* (goblet or urn moss)
Odonates (dragonflies and damselflies)	Kirk Roth	33 species of odonates (22 dragonflies and 11 damselflies); 7 Greene County records plus a visual sighting of *Epiaeschnia heros* (swamp darner); 1 rare species in Indiana, *Arigomphus submedianus* (jade clubtail)
Singing Insects	Carl Strang	8 taxa (6 species); 4 Greene County records, i.e., southern ground cricket, spring trig, spring field cricket, and Roesel's katydid
Spiders	Marc Milne	84 taxa (78 species); 6 new distribution records for Indiana (i.e., state records) and 2 undescribed species (new to science); high spider biodiversity
Vascular Plants	Scott Namestnik	417 taxa (412 to species); 318 (76%) are native; 26 potential Greene County records; 1 potential state record (*Typha domingensis*); 7 state listed species with *Carex gravida* listed as state endangered; marsh community is still early successional with many dominant invasive species

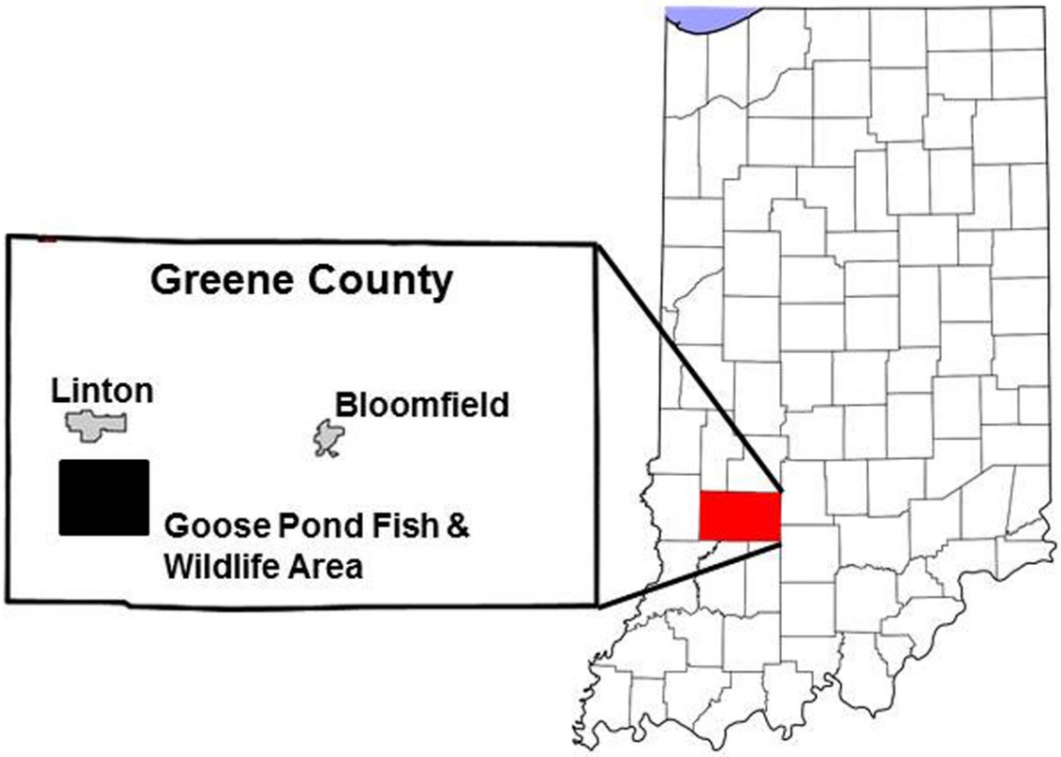


Figure 1.—Map illustrating the location of Greene County, highlighted in red, within the state of Indiana (right), and the location of Goose Pond Fish and Wildlife area within Greene County (left; see Figure 2).

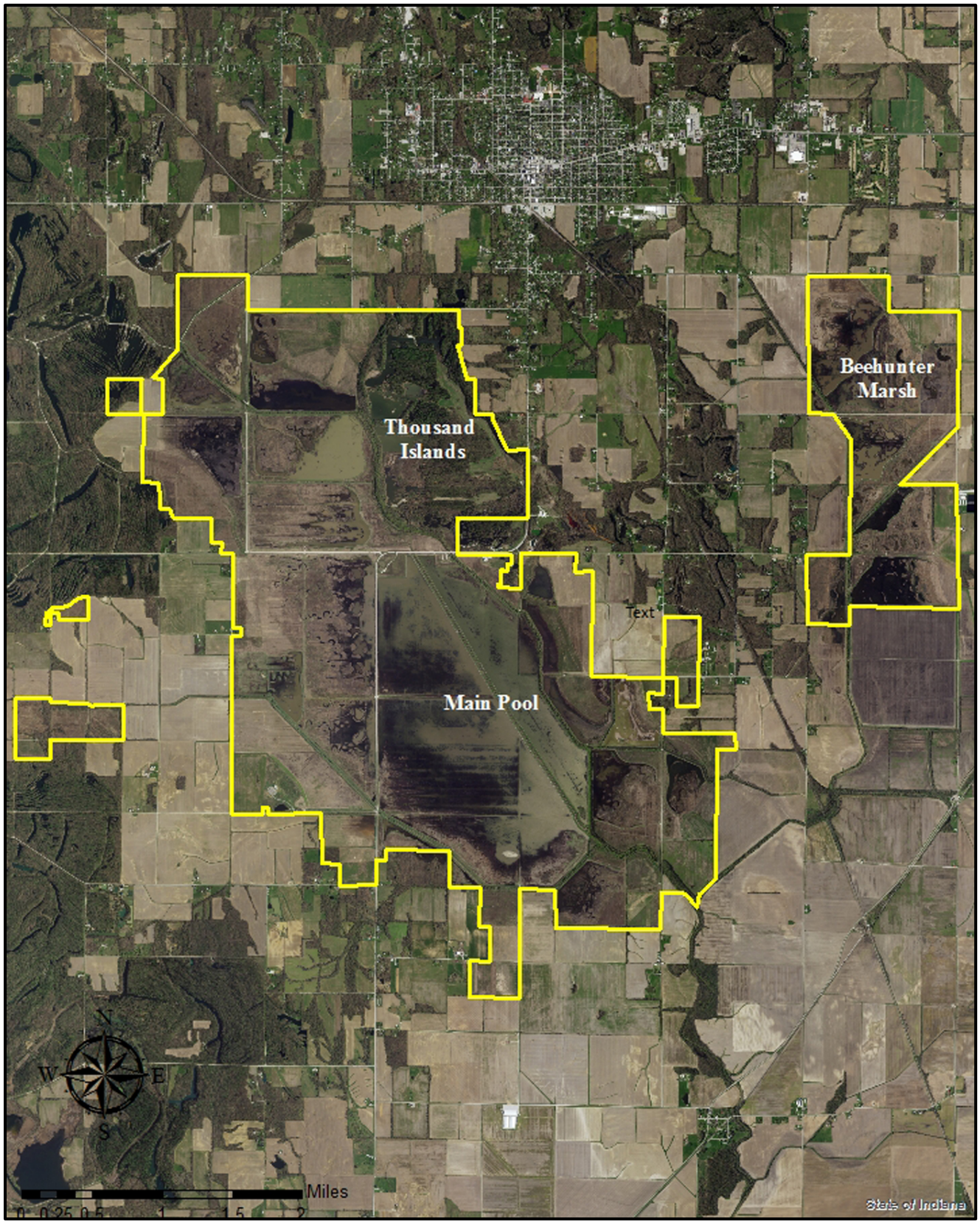


Figure 2.—Map illustrating the bounderies of Goose Pond Fish and Wildlife Area.

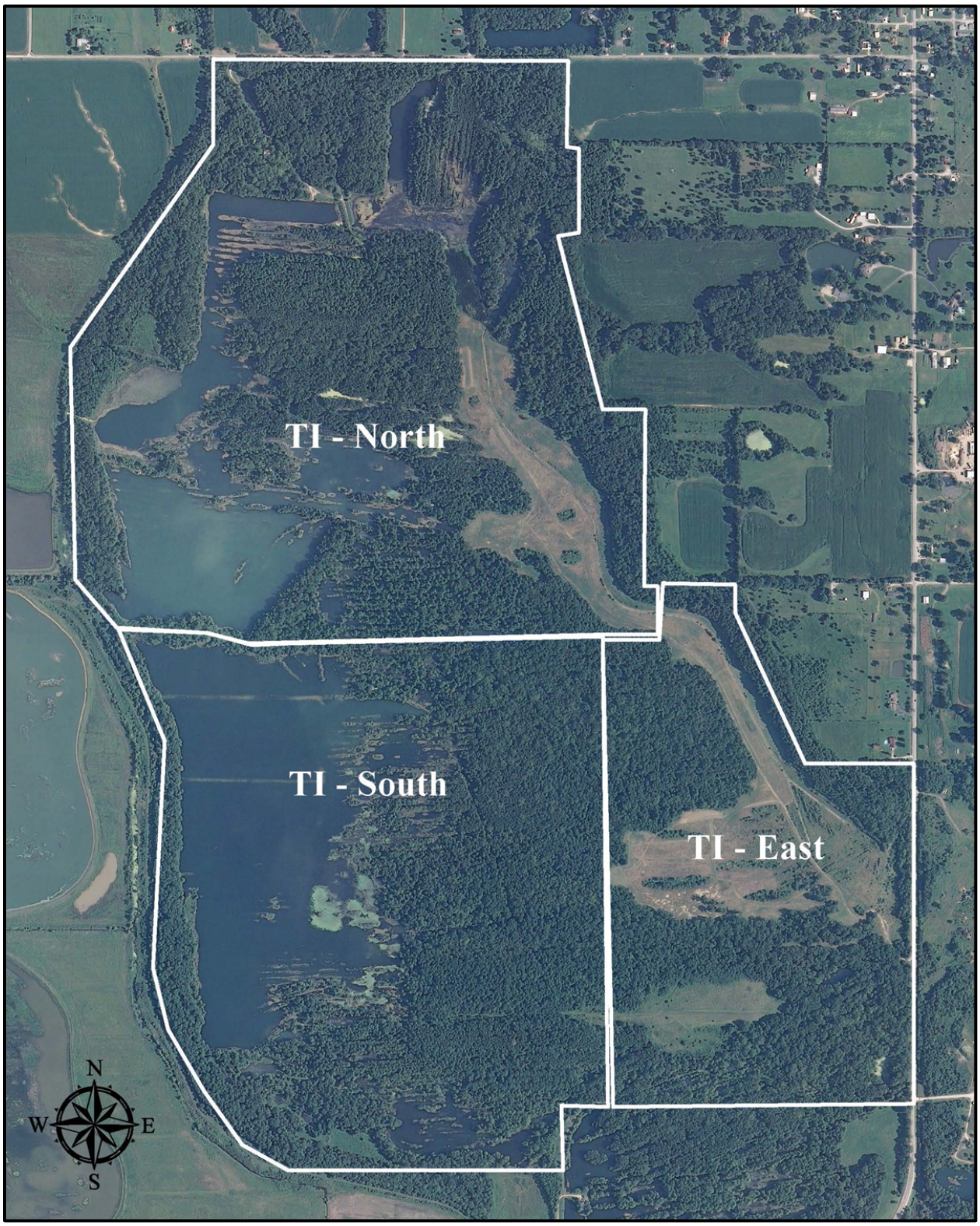


Figure 3.—Aerial view of the units of the recently acquired Thousand Islands property.

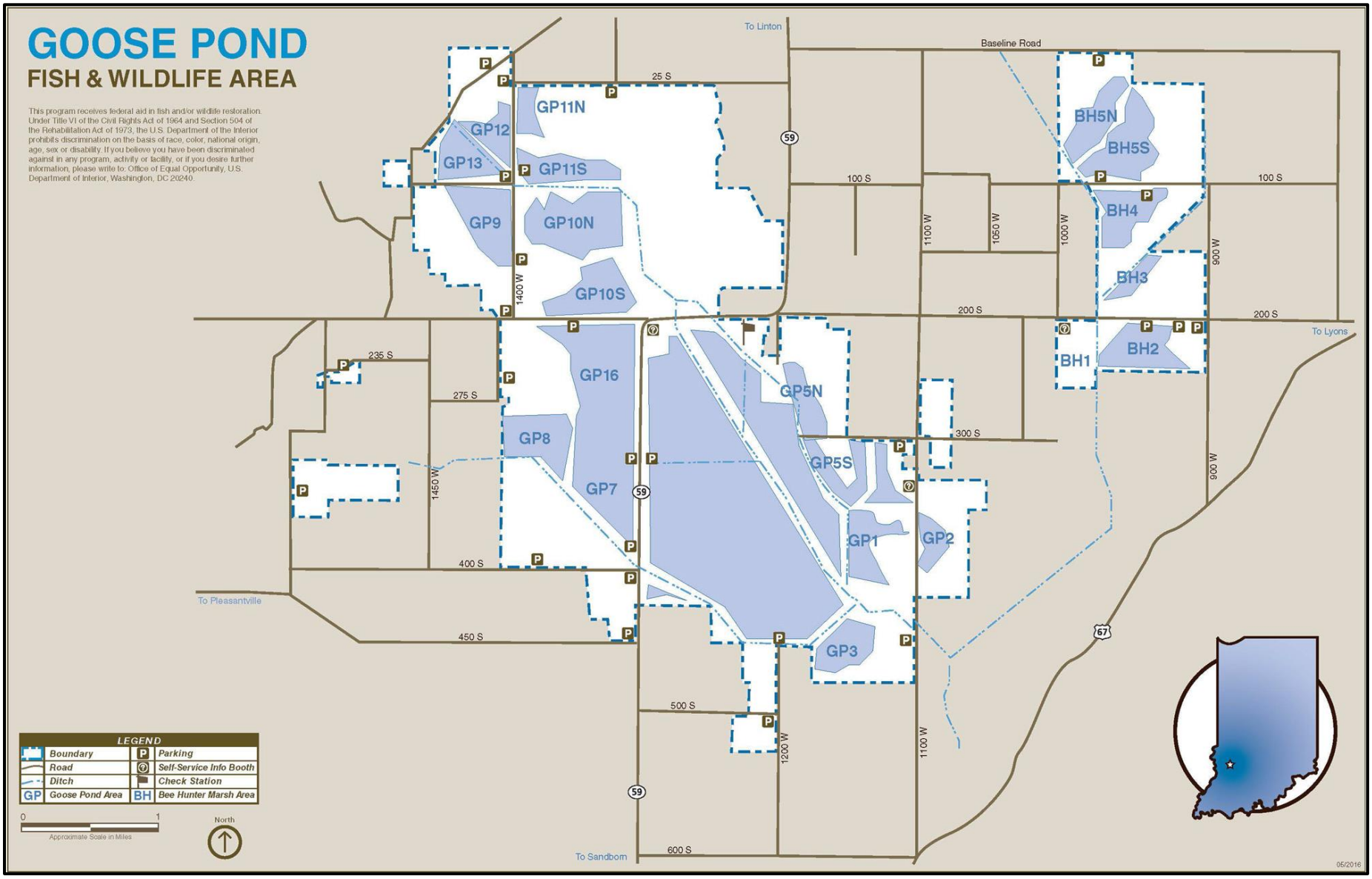


Figure 4.—Map of Goose Pond Fish and Wildlife Area indicating the location of units on the property.

Results of the Biodiversity Survey

18 – 19 June 2016

George Sly and Suzie Ronk under the Goose Poind FWA sign. George helped the Whitaker mammal team and is secretary of the Friends of Goose Pond Board of Directors. Suzie, a high school student at Linton Stockton High School, is founder/leader of Miner Monarchs club that works to restore monarch habitat. (Photo by *Dave W. Fox*)

List of bat species (5 species) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Brianne Walters

Team Members: Julia Hoeh, Sean Casler

Table 1a.—Detections of bats at six sites during the Goose Pond II bioblitz. Calls were analyzed using two automated classifiers; results are given for both. BCID reports total number of files identified to each species. EchoClass reports a p-value to indicate the significance of a maximum likelihood test for species presence. We report a 'P' where presence is likely (p-value < 0.05). See Table 1b for location of sites. All bats in Indiana are in the Order Chiroptera and all are in the Family Vespertilionidae.

		Site A		Site B		Site C	
Scientific Name	**Common Name**	**BCID**	**EchoClass**	**BCID**	**EchoClass**	**BCID**	**EchoClass**
Eptesicus fuscus	Big Brown Bat			2	P		P
Lasionycteris noctivagans	Silver-haired Bat					1	
Lasiurus borealis	Eastern Red Bat			10	P		
Lasiurus cinereus	Hoary Bat					1	
Nycticeius humeralis	Evening Bat			1			
	Unknown			59		6	
	Total	**0**		**72**		**8**	

Table 1a.—continued.

		Site D		Site E		Site F	
Scientific Name	**Common Name**	**BCID**	**EchoClass**	**BCID**	**EchoClass**	**BCID**	**EchoClass**
Eptesicus fuscus	Big Brown Bat						
Lasionycteris noctivagans	Silver-haired Bat					1	P
Lasiurus borealis	Eastern Red Bat						
Lasiurus cinereus	Hoary Bat	2				2	P
Nycticeius humeralis	Evening Bat						
	Unknown					2	
	Total	2		0		5	

Table 1b.—Location and description of sites.

Site Name	Time	Acoustic Device	File Numbers	Latitude	Longitude
A	21:00 - 21:28	Auc 69	M00002 - M00015	39.01965	-87.17814
B	21:33 - 21:53	Auc 69	M00016 - M00120	39.01902	-87.1794
C	22:30 - 22:50	Auc 68	M00002 - M00040	39.01843	-87.1836
D	22:30 - 22:50	Auc 69	M00121 - M00145	39.01709	-87.18211
E	23:43 - 00:03	Auc 68	M00041 - M00123	39.00939	-87.19887
F	23:30 - 00:00	Auc 69	M00146 - M00161	39.01169	-87.20622

Table 1b.—continued.

Site Name	UTM Datum	Easting	Northing	Description
A	16S	484579	4318972	Most eastern entrance off CR 25S. Trail to east from gravel road. Pine stand and mixed deciduous.
B	16S	484470	4318903	Same entrance as A. Along pond edge in open pine stand. Lots of bats flying in area.
C	16S	484106	4318838	Second entrance from east on CR 25S. Hunting kiosk at entrance to parking lot. Recorded walking along gravel road from parking lot to kiosk and back.
D	16S	484235	4318689	Same entrance as C. Along pond near parking lot and across grassy berm.
E	16S	482782	4317837	East side of CR 1400W. Wetlands habitat with trees along fence line.
F	16S	482146	4318094	West side of CR 1400W. Wetlands with tree fence line.

Collecting Methods & Effort

Two biologists from the Center for Bat Research, Outreach, and Conservation conducted an acoustic survey for bats during the bioblitz on 18 June 2016. We surveyed six sites at Goose Pond Fish and Wildlife Area, for 20–30 minutes per site. We recorded full spectrum bat call sequences using a Pettersson D500X detector (Pettersson Elektronik, Uppsala, Sweden). We conducted active monitoring, walking along flyways and near water sources orienting the microphone toward a bat when a call was detected. We chose recording sites based on attributes that would make them adequate as foraging habitat for bats and that would allow for high quality, identifiable recordings. We focused our survey efforts on the more recently acquired Thousand Islands unit and adjacent wetlands, to cover both forest and wetland habitat available in the area.

We converted calls from full-spectrum to zero-cross format using Bat Call ID software (BCID, v2.6a). Calls were then analyzed in AnalookW (v.3.9) and two automated bat call identification programs: EchoClass 3.0 and BCID. Calls were downloaded from flash cards and labeled each acoustic file with the site name, location, and survey date. EchoClass allows the user to select 1 of 3 possible species sets based on the known distribution of bats in the eastern U.S., whereas BCID allows the user to select a state species list or to customize the list. The list of species to which unknown calls are compared is important because using automated software to identify bat acoustic files is not infallible. We analyzed files using Species Set 1 in EchoClass; this set of 12 bat species included both northern long-eared bats and Indiana bats. The files were then processed with BCID using the species set for Indiana (this set matched the EchoClass Species Set 1). We also visually examined all potential bat calls for all sites in AnalookW.

The team worked a total of 14 person hours: (1) Scouting for sites – 2 hours × 2 people = 4 person-hours; (2) Collecting acoustic calls – 3 hours × 2 people = 6 person-hours; and (3) Analyzing acoustic calls – 4 hours × 1 person = 4 person-hours.

Summary Overview

Bat calls were recorded at four of the six sites sampled. Five bat species were detected during our survey: big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), Eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and evening bat (*Nycticeius humeralis*). The highest bat activity (72 calls identified by BCID) and highest diversity (3 species) were recorded at site B, which was along a pond edge in an open pine stand. Three species were also detected at site C. The state endangered evening bat was detected at site B. No *Myotis* species were detected.

These bat species were all expected in the Goose Pond area based on the available habitat. Evening bats have been detected in Sullivan County during mist-netting surveys; this species favors hollow trees as natural roosts and is patchily distributed throughout Indiana (Whitaker & Gummer 2003). Big brown bats and eastern red bats are the two species captured most often in summer surveys in Indiana, while silver-haired bats and hoary bats are rarely captured. The latter two species are adapted for flying in open spaces and likely forage over the vast open ponds in the Goose Pond area. *Myotis* bat populations have been in steep decline in Indiana due to white-nose syndrome (INDNR 2016), which may explain why we did not record any during this survey.

Literature Cited

INDNR (Indiana Department of Natural Resources). 2016. White-nose syndrome in bats. At: http://www.in.gov/dnr/fishwild/5404.htm on 27 July 2016.

Whitaker, J.O., Jr. & S.L. Gummer. 2003. Current status of the evening bat, *Nycticeius humeralis*, in Indiana. Proceedings of the Indiana Academy of Science 112:55–60.

List of bee (Hymenoptera, Apoides) species (32 species) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Robert Jean

Team Members: Chia-Hua Lin, Jay Elliott, Theresa Bordenkecher, Peter Scott, Michelle Jean, Carlin Jean, Chloe Jean

Table 2.—Summary of bee taxa data.

Genus	Species	Abundance	County Record	Special Interest Notes
Family Andrenidae				
Andrena	*commoda*	2	X	
Andrena	*personata*	1	X	
Andrena	*rudbeckiae*	5	X	
Andrena	*wilkella*	1	X	Non-native
Family Apidae				
Apis	*mellifera*	6		Non-native
Bombus	*bimaculatus*	10	X	
Bombus	*griseocollis*	27		
Bombus	*impatiens*	14		
Ceratina	*calcarata*	4		
Ceratina	*dupla*	9		
Ceratina	*strenua*	1		
Eucera	*hamata*	5	X	
Eucera	*rosae*	1		
Family Colletidae				
Hylaeus	*affinis*	2		
Family Halictidae				
Agapostemon	*virescens*	9		
Augochlorella	*aurata*	66		
Augochloropsis	*metallica*	1		
Halictus	*confusus*	2		
Halictus	*ligatus*	59		
Lasioglossum	*callidum*	2		
Lasioglossum	*cattellae*	1	X	
Lasioglossum	*hartii*	22	X	1st IN record in 50 years
Lasioglossum	*hitchensi*	23	X	
Lasioglossum	*imitatum*	1	X	
Lasioglossum	*obscurum*	1	X	
Lasioglossum	*paradmirandum*	3	X	

Genus	Species	Abundance	County Record	Special Interest Notes
Family Halictidae con't				
Lasioglossum	*versatum*	192		
Family Megachilidae				
Anthidium	*oblongatum*	1	X	Non-native
Heriades	*carinata*	1	X	
Hoplitis	*producta*	1	X	
Megachile	*brevis*	2		
Osmia	*pumila*	1		
Total		**477**		

Collecting Method and Effort

Bee sampling was conducted both days of the bioblitz. Thirty-two species, approximately 7% of the Indiana bee fauna, representing all five common bee families in Indiana were collected. Bees were collected using passive (bowl trapping) and active (netting at flowers) sampling techniques. Four transects were each sampled with 30 bowls (ten white, ten fluorescent blue and ten fluorescent yellow) for a total of 120 bowls across Goose Pond FWA. Bowls were separated by 5 meters along transects. Approximately 18 hours of net collecting was performed by the team on several flowering species.

Voucher Specimens

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

Summary Overview

Overall floral diversity was low and bee activity was low. Sweat bees in the family Halictidae represented a large portion of the species richness (13 spp.) and much of the bee abundance (80%). One species, *Lasioglossum hartii*, is a wetland species that has only one other record in Indiana from Posey County in 1966; thus, this is the first collection in 50 years in the state and 22 specimens were observed. Overall, even with the relatively low diversity, 15 new county records were noted. Three species were introduced, including the honey bee (*Apis mellifera*), *Andrena wilkella*, and *Anthidium oblongatum*. This is the first published record of the latter for the state although it has been collected in a few other counties. These collections demonstrate the importance of Goose Pond FWA for bee conservation and habitat. Further management to increase native wildflower diversity and reduce invasive plant species will enhance bee populations even further. Collections in these areas in May and August or September will likely add many more species.

Bee team arrives for the bioblitz. (*Photo by Peter Scott*)

Bee team at work. (*Photo by Peter Scott*)

A sample of bees net collected from Carolina rose (*Rosa carolina*; see figure below) and common chickory (*Cichorium intybus*) from area BH5S at Goose Pond in Greene County, Indiana during the bioblitz by the bee team. Specimens are mainly bumble bees and a honey bee collected on Carolina rose but there is also one green and black sweat bee (*Agapostemon virescens*) that was collected on common chickory. (*Photo by Peter Scott*)

Carolina rose (*Rosa carolina*) in flower. (*Photo by Peter Scott*)

List of beetle (Coleoptera) species (63 taxa) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Jeffrey D. Holland

Team Members: Eoghan McCroskey, Tim Anderson, Bridget Blood, Mathew Dittmann, Serena Gross

Table 3.—Beetle (Coleoptera) taxa data. HQ = headquarter; MPW3 = Main Pool West 3; MPE4 = Main Pool East 4 (see Figure 4 on page 9 for locations).

Species	Common Name	Location	Notes
Family Bostrichidae			
Lichenophanes bicornis (Weber)	a horned powder-post beetle	Thousand Islands	
Family Cantharidae			
Chauliognathus marginatus (Fabricius)	margined leatherwing	MPW3, Barn HQ	at lights
Podobrus tomentosus (Say)	a soldier beetle	Barn HQ	at lights
Family Carabidae			
Agonum decorum (Say)	a ground beetle	Barn HQ	at lights
Anisodactylus sanctaecrucius (Fabricius)	a ground beetle	Barn HQ	at lights
Brachinus sp.	a ground beetle	Thousand Islands	
Chlaenis niger Randall	a ground beetle	Barn HQ	at lights
Harpalus caliginosus (Fabricius)	murky ground beetle	Barn HQ	at lights
Harpalus sp.	a ground beetle	Barn HQ	at lights
Lebia analis Dejean	a ground beetle	Barn HQ	at lights
Lebia solea Hentz	a ground beetle	Barn HQ	at lights
Poecilus chalcites (Say)	a ground beetle	Barn HQ	at lights
Stenolophus comma (Fabricius)	a ground beetle	Barn HQ	at lights
Family Cerambycidae			
Lepturges confluens (Haldeman)	a longhorned beetle	Barn HQ	
Tetraopes tetrophthalmus (Forster)	red milkweed beetle	MPW3	on milkweed sp.
Xylotrechus s. *sagittatus* (Germar)	a longhorned beetle	Barn HQ	
Family Chrysomelidae			
Chelymorpha cassidea (Fabricius)	Argus tortoise beetle	MPW3, MPE4	
Chrysochus auratus (Fabricius)	dogbane leaf beetle	MPW3	
Chrysomela scripta Fabricus	cottonwood leaf beetle	Barn HQ	at lights
Diabrotica undecimpunctata Mannerhiem	spotted cucumber beetle	Barn HQ	at lights, important agricultural pest
Labidomera clivicollis (Kirby)	swamp milkweed beetle	MPE4	on swamp milkweed
Paria fragaria Wilcox	strawberry rootworm	Barn HQ	at lights
Systena frontalis (Fabricius)	red-headed flea beetle	MPW3	
Family Coccinellidae			
Coccinella septempunctata Linnaeus	seven-spotted lady beetle	MPW3	exotic
Coleomegilla maculata (Degeer)	spotted lady beetle	Thousand Islands	
Cycloneda munda (Say)	polished lady beetle	MPW3	

Species	Common Name	Location	Notes
Family Curculionidae			
Ceutorhynchus sp.	a weevil	MPW3	
Cossonus impressifrons	a weevil	Thousand Islands	
Cyrtepistomus castaneus	Asiatic oak weevil	Thousand Islands	exotic
Hypera nigrorostris (Fabricius)	lesser clover leaf weevil	Barn HQ	at lights
Lixus mucidus LeConte	a weevil	Barn HQ	at lights
Odontorynchus salebrosus (Casey)	a weevil	MPW3	
Rhyssomatus lineaticollis (Say)	milkweed stem weevil	MPW3	
Family Dytiscidae			
Copelatus glyphicus (Say)	a predacious diving beetle	Barn HQ, Thousand Islands	
Family Elateridae			
Melanotus sp.	a click beetle	Barn HQ	at lights
Family Heteroceridae			
Heterocerus sp.	variegated mud-loving beetle	Barn HQ	at lights, abundant
Family Hydrophilidae			
Berosus sp.	a water scavenger beetle	Barn HQ	at lights
Cercyon sp.	a water scavenger beetle	Barn HQ	at lights, abundant
Crenitis sp.	a water scavenger beetle	Barn HQ	at lights
Helophorus grandis (Illiger)	a water scavenger beetle	Thousand Islands	exotic
Hydrophilus ovatus (Gemminger & Harold)	a water scavenger beetle	Barn HQ	at lights
Tropisternus collaris (Fabricius)	a water scavenger beetle	Barn HQ	at lights, abundant
Tropisternus laterallis (Fabricius)	a water scavenger beetle	Barn HQ	at lights, abundant
Family Lampyridae			
Photinus sp.	a firefly	Barn HQ	at lights
Pyractomena angulata (Say)	a firefly	Thousand Islands	
Family Lucanidae			
Dorcus parallelus (Say)	a stag beetle	Barn HQ	at lights
Family Melandryidae			
Dircaea liturata LeConte	a false darkling beetle	Barn HQ	at lights
Family Meloidae			
Epicauta vittata (Fabricius)	a blister beetle	Barn HQ	at lights
Family Nitidulidae			
Epuraea sp.	a sap-feeding beetle	Thousand Islands	
Family Ptilodactylidae			
Ptylodactyla sp.	a toe-winged beetle	Thousand Islands	
Family Pyrochroidae			
Dendroides canadensis Latreille	a fire colored beetle	Thousand Islands	
Family Scarabidae			
Cyclocephala borealis Arrow	northern masked chafer	Barn HQ	at lights
Dyscinetus morator (Fabricius)	rice beetle	Barn HQ	at lights
Ephodius sp.	a scarab beetle	Thousand Islands	

Species	Common Name	Location	Notes
Family Scarabidae con't			
Pelidnota punctata (Linnaeus)	grapevine beetle	Barn HQ	
Phyllophaga sp.	a may beetle	Barn HQ	at lights
Family Scirtidae			
Cyphon sp.	a marsh beetle	Barn HQ	at lights
Scirtes sp.	a marsh beetle	Barn HQ	at lights
Family Staphylinidae			
Homaeotarsus bicolor Gravenhorst	a rove beetle	Barn HQ	at lights
Quedius peregrinus (Gravenhorst)	a rove beetle	Barn HQ	at lights
Family Tenebrionidae			
Alobates pensylvanicus (DeGeer)	a darkling beetle	Thousand Islands	
Uloma sp.	a darkling beetle	Thousand Islands	
Family Trogidae			
Trox sp.	a hide beetle	Thousand Islands	

Collecting Method and Effort

The Coleoptera were collected by searching for them during the day using hand collecting, beating sheets, and sweepnets. On Saturday evening of the survey, beetles, attracted to several lights, were hand collected from adjacent white sheets. The lights consisted of two 1000 W metal halide, one 175 W mercury vapor, and three small ultraviolet lights set together on one hanging sheet. The collecting effort was approximately 30 person-hours using the daytime survey methods, and 15 person-hours collecting at the lights.

Voucher Specimens

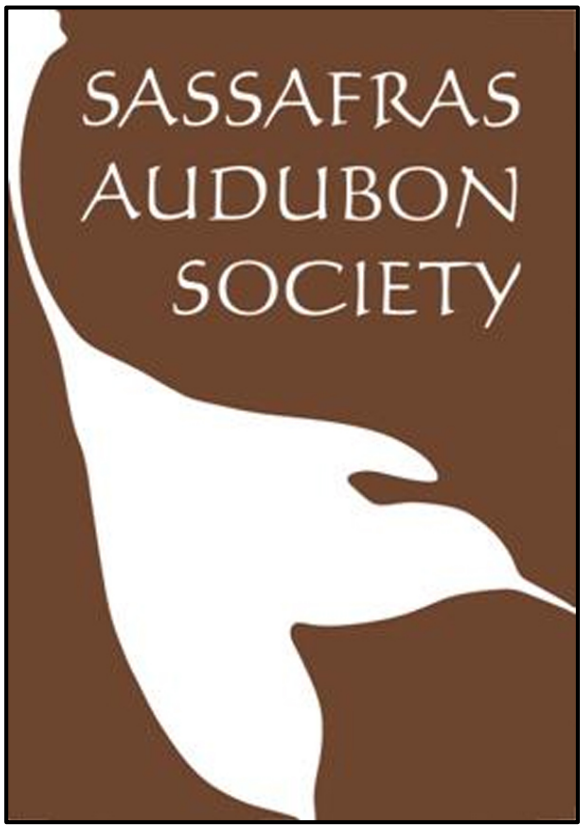
Voucher specimens of all beetle species have been deposited in the Purdue Entomological Research Collection in the department of Entomology at Purdue University.

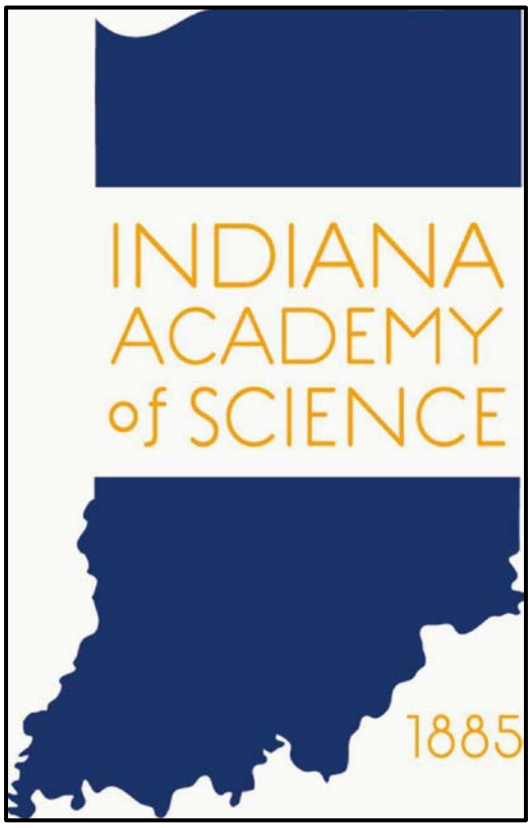
Summary Overview

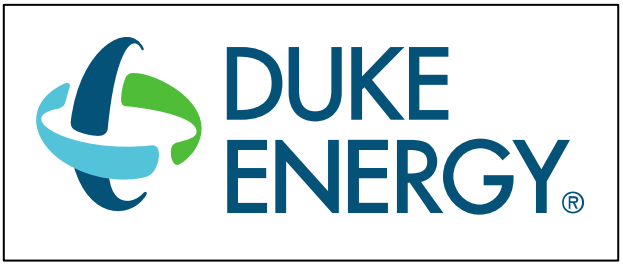
Beetles from 23 families and 63 taxa were found; most have been identified to species. The number of beetle taxa caught was not high and likely represents a small proportion of the species present. However, several of the species were abundant, e.g., members of the mud-loving variegated beetles (Heteroceridae) and the water scavenger beetles (Hydrophilidae). The hydrophilds had several species detected. Another group that showed a respectable number of species for a 24 hour survey was the ground beetles (Carabidae). These were found as they came in to the lights. We weren't sure if they were attracted to the light, attracted to the abundant prey insects at the lights, or both. One interesting find was a ground beetle that is unusual in the carabids in that it is covered with hairs that trap air against its body so that it can stay underwater and still breathe for several minutes through its spiracles. Such adaptations are common in families of the aquatic beetles, but a surprise in a carabid.

The most striking finding of the evening was not a beetle, but rather the sheer number of aquatic heteroptera at the light close to the ponds. The 1000 W metal halide light was on a 10 foot pole which was a placed on a truck loading ramp so that it was approximately 4 meters above ground level. This

height likely made it visible across most of the marsh and pond area. The resulting cloud of water boatmen (Heteroptera: Corixidae) flying around the light was quite dense and even gave pause to some otherwise enthusiastic beetle collectors. As the swarm of water boatmen on the ground grew to largely obscure the sheet placed below it, we wanted to estimate the number of individuals present, so at the end of the collecting evening we decided to measure the sheer volume of water bugs present. Thus, we folded the sheets in half and poured the living, writhing, mass of boatmen through a very large funnel into a half liter container. The container was filled three times in emptying the two sheets—one and a half liters of water boatmen!







Bird Team at the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Lee Sterrenburg

Team Members: Don Allen, Jim Brown, Michael R. Brown, Sadie Dainko, Jim Hengeveld, Susan Hengeveld, Gary Langell, Kathy McClain, Jeremy Ross

No report was issued due to a computer problem. However, several outstanding images were submitted.

American bittern (*Botaurus lentiginosus*). (*Photo by Sally Most*)

Merlin (*Falco columbarius*). (*Photo by Dan Kaiser*)

Sandhill cranes (*Grus canadensis*). (Photo by Mark Welter)

Lee Sterrenburg, leader of the bird team. (*Photo by Dave W. Fox*)

Members of the bird team at work. From left: Nancy Lighfoot, Jim Hengeveld, Susan Hengeveld. (*Photo by Dave W. Fox*)

List of butterflies (*Lepidoptera*: 32 taxa, 31 species) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Kirk Roth

Team Members: Sandy Belth, Don Gorney, Jess Gwinn, Jim Hengeveld, Susan Hengeveld

Table 4.—Butterfly taxa and number observed.

Scientific Name	Common Name	Number Observed
Family Hesperiidae		
Epargyreus clarus	Silver-spotted Skipper	25
Erynnis baptisiae	Wild Indigo Duskywing	1
Erynnis horatius	Horace's Duskywing	1
Eupyes vestris	Dun Skipper	22
Hylephila phyleus	Fiery Skipper	1
Family Papilionidae		
Battus philenor	Pipevine Swallowtail	2
Eurytides marcellus	Zebra Swallowtail	3
Papilio glaucus	Eastern Tiger Swallowtail	5
Papilio polyxenes	Black Swallowtail	15
Papilio troilus	Spicebush Swallowtail	2
Family Pieridae		
Colias eurytheme	Orange Sulphur	38
Colias philodice	Clouded Sulphur	23
Phoebis sennae	Cloudless Sulphur	1
Pieris rapae	Cabbage White	74
Pyrisitia lisa	Little Yellow	1
Family Lycaenidae		
Cupido comyntas	Eastern Tailed-Blue	55
Lycaena hyllus	Bronze Copper	1
Strymon melinus	Gray Hairstreak	4
Family Nymphalidae		
Asterocampa celtis	Hackberry Emperor	4
Chlosyne nycteis	Silvery Checkerspot	1
Danaus plexippus	Monarch	9
Junonia coenia	Common Buckeye	3
Lethe anthedon	Northern Pearly-eye	2
Limenitis archippus	Viceroy	3
Megisto cymela	Little Wood Satyr	4
Phyciodes tharos	Pearl Crescent	76

Scientific Name	Common Name	Number Observed
Family Nymphalidae con't		
Polygonia interrigationis	Question Mark	3
Speyeria cybele	Great Spangled Fritillary	29
Vanessa atalanta	Red Admiral	14
Vanessa cardui	Painted Lady	2
Vanessa sp.	lady species	1
Vanessa virginiensis	American Lady	1
		Total = 426

Abundance

A total of 426 individual butterflies from 32 taxa were observed during the bioblitz. See Table 4 above for numbers of individuals observed per species.

Location

Most butterflies did not show a particular location preference and seemed to congregate only where available nectar plants were located. Because these food resources are ephemeral and most butterflies are highly mobile "generalists," locations for large numbers of butterflies changes, often from week to week. That said, there were a few notable items.

- While overall butterfly numbers were low, there seemed to be a disproportionately greater abundance in the "Western Units" (i.e., those units west of CR 1450W and GP7/8) than other areas. These units collectively contributed 21 species whereas no other major sections (i.e., Beehunter – 16 species, Main Pool Complex – 15 species, 1400W complex and Thousand Islands – 18 species, 1100 W Complex – 11 species) had more than 18 species. The Western Units also had a high number of individual butterflies (115) than all other units except the Beehunter Marsh complex (122), despite having less area. The other area individual butterfly counts were Main Pool – 76, 1400W + Thousand Island – 38, and 1100 W Complex – 75. These geographic divisions mostly reflect our team locations.
- The Thousand Island unit had low individual abundance but high species diversity. This reflects the expected situation in a wooded area for butterflies. There are many species, such as Question Mark, Little Wood Satyr, Hackberry Emperor, and others which are relatively low density woodland specialists. These species would only be expected in the Thousand Island unit, some of the heavier wooded levee areas, the southern wooded border of GP6, and other shady areas.

Collecting Methods and Effort

Many butterfly counts in the past decades have relied less upon collection and butterfly nets, and more upon observation with binoculars and camera. The benefits of the latter approach are especially evident during a bioblitz situation, as the rapid pace can enable coverage of more ground and higher

species/individual counts. Most butterflies in Indiana have distinctive markings easily viewed from a distance, and those few which do not have distinctive markings are temporally separated throughout the year, so this taxon lends itself well to such an approach, whereas others, such as moths, bees, etc., require closer examination to ID to a species level. For this reason, no butterflies were collected, and all were identified via direct observation – often through 8-power binoculars.

The six group members spent a total of 43 person-hours in the field. Fourteen miles of distance is estimated for the entire group.

Special Interest Species

Only two species were detected during this bioblitz which were not observed during the 2010 bioblitz (Karns et al. 2012). These were Horace's Duskywing (*Erynnis horatius*) and Fiery Skipper (*Hylephila phyleus*). No new species for Greene County were observed, according to county maps provided in Belth (2013). The Northern Pearly-eye (*Lethe anthedon*) is listed as Rare in Indiana.

Summary Overview

The number of individuals (426) and species (32) of butterflies observed during the bioblitz were lower than expected, possibly related to the time of year of the study. The abundance of many skipper (Hesperidae) species in Indiana peaks in July (see Belth 2013) and this may help explain why this survey found far fewer than the 48 species and 2,705 individual butterflies during the 2010 Goose Pond bioblitz (Karns et al. 2012) in mid-July. In fact, the July 2010 survey included observations of 14 species of skippers, while the June 2016 survey detected only four species, and three of those were represented by only a single individual (Table 4).

Other factors may affect butterfly survey results as well, especially nectar sources and weather (although temperature measured between 32.7 and 16.7 C with sunshine during the bioblitz was normal for butterfly activity). Certain nectar species, especially Swamp Milkweed (*Asclepias incarnata*) and Butterflyweed (*Asclepias tuberosa*) were noticeably less abundant at Goose Pond than during past years. Slender Mountain-Mint (*Pycnanthemum tenuifolium*), a well-known favorite nectar source of butterflies, was observed to be almost in bloom, while many Common Milkweeds (*Asclepias syriaca*) were toward the end of their bloom. Most nectaring butterflies were found on Common Milkweed or Red Clover (*Trifolium pretense*).

Literature Cited

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Karns, D.R., D.G. Ruch, B. Simpson, B. Feaster, L. Sterrenburg, A. Bellian, B.E. Fisher, D. Gorney, J.D. Holland, R.P. Jean, W.W. Jones, M. McCarty, W.N. McKnight, W.J. Murphy, S. Namestnik, L.P. Tedesco & J.O. Whitaker, Jr. 2012. Results of a Biodiversity Survey at Goose Pond Fish and Wildlife Area, Greene County, Indiana. Proceedings of the Indiana Academy of Science 121:45–53.

Papilio polyxenes (Black Swallowtail) on *Asclepias syriaca* (Common milkweed). (*Photo by Kirk Roth*)

Lethe anthedon (Northern Pearly-eye) on grass. It is is listed as Rare in Indiana. (*Photo by Kirk Roth*)

Fish and Freshwater Mussels General Information for Goose Pond II Biodiversity Survey.

Team Leader: Brant E. Fisher

Team Members: JoAnne Davis

General Information

These two pages contain general information concerning the fish and freshwater mussel collecting. Table 5 gives information about the 15 sampling sites, including the body of water, site location, and the closest GP units. Table 6 lists dates of sampling and methods used. Finally, the total effort is described.

Table 5.—Sampling location and general information.

Site Number	Waterbody	Location	Closest Goose Pond Unit(s)
1 (BEF16034)	Buck Creek	at CR 100S bridge	BH5E, BH4
2 (BEF16035)	Beehunter Ditch	at CR 100S bridge	BH5N, BH5S, BH4
3 (BEF16036)	Beehunter Ditch	at CR 200S bridge	BH1, BH2, BH3
4 (BEF16037)	BH5S wetland	along CR 100S - southwest corner of wetland near outfall	BH5S
5 (BEF16038)	BH4 wetland	along CR 100S - north side of wetland	BH4
6 (BEF16039)	Hamilton Ditch	at SR 59 bridge	GP10S, MPW1
7 (BEF16040)	Black Creek	at CR 1400W bridge	GP13, GP11S, GP10N
8 (BEF16041)	GP11S wetland	along CR 1400W - southwest corner of wetland near parking lot	GP11S
9 (BEF16042)	GP13 wetland	along CR 1400W - northeast corner of wetland	GP13
10 (BEF16043)	GP5S wetland	along CR 300S - north side of wetland	GP5S
11 (BEF16044)	Black Creek	at end of CR 300S	GP5N, GP5S, MPE3, MPE2
12 (BEF16045)	Brewer Ditch	at SR 59 bridge	GP7, MPW3, GP6W, Field C, Field E
13 (BEF16046)	MPW2 wetland	along SR 59 - northwest corner of wetland along deep channel	MPW2
14 (BEF16047)	Black Creek	at CR 1100W bridge	GP1, GP3
15 (BEF16048)	GP4 wetland	along CR 1100W - east side of wetland	GP4

Total Collecting Effort

Total = 46 person hours (June 8th: 8 hours × 2 people = 16 hours; June 9th: 8 hours × 2 people = 16 hours; June 15th: 7 hours × 2 people = 14 hours).

Table 6.—Sampling dates and methods.

Site Number	Date Sampled (2016)	Sampling Method Fish	Sampling Method Mussels
1	June 8	backpack electro./seine	physical search
2	June 8	backpack electro./seine	physical search
3	June 8	backpack electro./seine	physical search
4	June 8	seine	physical search
5	June 8	backpack electro./seine/dip net	physical search
6	June 9	backpack electro./dip net	physical search
7	June 9	backpack electro./seine/dip net	physical search
8	June 9	backpack electro./dip net	physical search
9	June 9	backpack electro./seine/dip net	physical search
10	June 9	did not sample fish	physical search
11	June 9	did not sample fish	physical search
12	June 15	backpack electro./seine/dip net	physical search
13	June 15	seine	physical search
14	June 15	did not sample fish	physical search
15	June 15	seine	physical search

List of fish (44 species: 42 native) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016. (Do to prior commitments on the weekend of the bioblitz, the fish team actually sampled on Wednesday, June 8, Thursday, June 9, and Wednesday, June 15.)

Team Leader: Brant E. Fisher

Team Members: JoAnne Davis

Table 7a.—Fish species found during the bioblitz. Blue highlight = new species in 2016, not collected in the 2010 biodiversity survey. Pink Highlight = collected in 2010, but not in 2016.

Scientific Name	Common Name	Non-Native
Family Lepisosteidae: Gars		
Lepisosteus oculatus	**Spotted Gar**	
Lepisosteus platostomus	**Shortnose Gar**	
Family Amiidae: Bowfins		
Amia calva	**Bowfin**	
Family Clupeidae: Herrings		
Dorosoma cepedianum	**Gizzard Shad**	
Family Cyprinidae: Carps and Minnows		
Campostoma anomalum	**Central Stoneroller**	
Carassius auratus	**Goldfish**	X
Cyprinella spiloptera	**Spotfin Shiner**	
Cyprinella whipplei	**Steelcolor Shiner**	
Cyprinus carpio	**Common Carp**	X
Hybognathus nuchalis	**Mississippi Silvery Minnow**	
Lythrurus fumeus	**Ribbon Shiner**	
Lythrurus umbratilis	**Redfin Shiner**	
Notemigonus crysoleucas	**Golden Shiner**	
Notropis buccatus	**Silverjaw Minnow**	
Notropis stramineus	**Sand Shiner**	
Phenacobius mirabilis	**Suckermouth Minnow**	
Pimephales notatus	**Bluntnose Minnow**	
Semotilus atromaculatus	**Creek Chub**	
Family Catostomidae: Suckers		
Catostomus commersonii	**White Sucker**	
Ictiobus cyprinellus	**Bigmouth Buffalo**	
Minytrema melanops	**Spotted Sucker**	
Moxostoma erythrurum	**Golden Redhorse**	
Family Ictaluridae: North American Catfishes		
Ameiurus melas	**Black Bullhead**	
Ameiurus natalis	**Yellow Bullhead**	

Scientific Name	Common Name	Non-Native
Family Ictaluridae: North American Catfishes con't		
Ictalurus punctatus	**Channel Catfish**	
Noturus gyrinus	**Tadpole Madtom**	
Family Esocidae: Pikes and Mudminnows		
Esox americanus	**Redfin Pickerel**	
Family Aphredoderidae: Pirate Perches		
Aphredoderus sayanus	**Pirate Perch**	
Family Atherinopsidae: New World Silversides		
Labidesthes sicculus	**Brook Silverside**	
Family Fundulidae: Topminnows		
Fundulus notatus	**Blackstripe Topminnow**	
Family Poeciliidae: Livebearers		
Gambusia affinis	**Western Mosquitofish**	
Family Centrarchidae: Sunfishes		
Lepomis cyanellus	**Green Sunfish**	
Lepomis gulosus	**Warmouth**	
Lepomis humilis	**Orangespotted Sunfish**	
Lepomis macrochirus	**Bluegill**	
Lepomis megalotis	**Longear Sunfish**	
Lepomis microlophus	**Redear Sunfish**	
Micropterus punctulatus	**Spotted Bass**	
Micropterus salmoides	**Largemouth Bass**	
Pomoxis annularis	**White Crappie**	
Pomoxis nigromaculatus	**Black Crappie**	
Family Percidae: Perches		
Etheostoma asprigene	**Mud Darter**	
Etheostoma gracile	**Slough Darter**	
Etheostoma nigrum	**Johnny Darter**	
Percina sciera	**Dusky Darter**	
Family Sciaenidae: Drums and Croakers		
Aplodinotus grunniens	**Freshwater Drum**	

Table 7b.—Fish species site collection information. Fish collections did not occur at sites 10, 11, and 14 (highlighted in black). Total Sites = the number of sites (of the 12 sites sampled) that a species occurred. Total Species = the number of species (of the 44 observed) that occurred in one site. Blue highlight = new species in 2016, not collected in the 2010 biodiversity survey. Pink Highlight = collected in 2010, but not in the 2016 biodiversity survey.

Scientific Name	Site Number (See Table 5 for site details)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total Sites
Family Lepisosteidae: Gars																
Lepisosteus oculatus	X	X	X	X			X					X	X			**7**
Lepisosteus platostomus			X													**1**
Family Amiidae: Bowfins																
Amia calva	X	X	X		X	X	X					X				**7**
Family Clupeidae: Herrings																
Dorosoma cepedianum	X		X	X					X				X			**5**
Family Cyprinidae: Carps and Minnows																
Campostoma anomalum	X	X										X				**3**
Carassius auratus	X	X				X	X					X	X		X	**7**
Cyprinella spiloptera	X		X									X				**3**
Cyprinella whipplei	X		X													**2**
Cyprinus carpio	X	X	X			X	X					X	X			**7**
Hybognathus nuchalis	X															**1**
Lythrurus fumeus	X		X				X					X				**4**
Lythrurus umbratilis																**0**
Notemigonus crysoleucas					X			X								**2**
Notropis buccatus	X															**1**
Notropis stramineus	X															**1**
Phenacobius mirabilis												X				**1**
Pimephales notatus	X	X	X				X					X				**5**
Semotilus atromaculatus	X					X	X					X				**4**
Family Catostomidae: Suckers																
Catostomus commersonii	X	X	X													**3**
Ictiobus cyprinellus	X	X	X				X					X	X			**6**
Minytrema melanops	X	X														**2**
Moxostoma erythrurum	X															**1**
Family Ictaluridae: North American Catfishes																
Ameiurus melas									X							**1**
Ameiurus natalis						X	X		X			X	X			**5**
Ictalurus punctatus												X				**1**
Noturus gyrinus																**0**

Family Esocidae: Pikes and Mudminnows															
Esox americanus							X								**1**
Family Aphredoderidae: Pirate Perches															
Aphredoderus sayanus	X						X				X				**3**
Family Atherinopsidae: New World Silversides															
Labidesthes sicculus	X	X	X				X				X	X			**6**
Family Fundulidae: Topminnows															
Fundulus notatus	X						X				X				**3**
Family Poeciliidae: Livebearers															
Gambusia affinis	X	X	X	X	X	X	X	X	X		X	X		X	**12**
Family Centrarchidae: Sunfishes															
Lepomis cyanellus	X	X	X				X		X		X			X	**7**
Lepomis gulosus	X	X	X	X	X	X	X		X		X			X	**10**
Lepomis humilis			X	X		X		X			X				**5**
Lepomis macrochirus	X	X	X	X	X	X	X	X	X		X				**10**
Lepomis megalotis	X	X					X				X				**4**
Lepomis microlophus							X								**1**
Micropterus punctulatus	X		X				X								**3**
Micropterus salmoides	X	X	X	X	X	X	X	X	X		X	X			**11**
Pomoxis annularis		X		X	X				X		X	X			**6**
Pomoxis nigromaculatus	X	X	X	X	X	X	X		X		X	X			**10**
Family Percidae: Perches															
Etheostoma asprigene									X						**1**
Etheostoma gracile		X	X	X	X	X			X		X				**7**
Etheostoma nigrum	X	X	X				X				X				**5**
Percina sciera	X		X				X								**3**
Family Sciaenidae: Drums and Croakers															
Aplodinotus grunniens		X					X								**2**
Total Species:	**31**	**21**	**23**	**10**	**9**	**12**	**25**	**5**	**12**		**27**	**11**		**4**	

Summary Overview

Forty-four species of fish, representing 14 families, were recorded from the 12 locations sampled at the Goose Pond FWA in 2016. Thirty-nine species were collected in 2010; seven additional species were collected in 2016, i.e., Spotted Gar (*Lepisosteus oculatus*; see figure next page), Shortnose Gar (*L. platostomus*), Suckermouth Minnow, (*Phenacobius mirabilis*), Golden Redhorse (*Moxostoma erythrurum*), Redfin Pickerel (*Esox americanus*), Pirate Perch (*Aphredoderus sayanus*), and Mud Darter (*Etheostoma asprigene*). Most of the new species were relatively rare, with only a single individual being collected and/or the species only being collected at one site. The one exception was the Spotted Gar, which was ubiquitous on the property and found in all sizes from young-of-the-year to large adults. The Redfin Shiner (*Lythrurus umbratilis*) and Tadpole Madtom (*Noturus gyrinus*) were collected

in 2010, but were not seen this time. Both species were only collected from one location in 2010 and likely are still found on the property.

Eight of the 11 most common fish species collected in 2016 (all were found at seven or more of the 12 sites sampled) were also among the most common fish species collected in 2010, i.e., Goldfish (*Carassius auratus*), Common Carp (*Cyprinus carpio*), Western Mosquitofish (*Gambusia affinis*), Green Sunfish (*Lepomis cyanellus*), Warmouth (*L. gulosus*), Bluegill (*L. macrochirus*), Largemouth Bass (*Micropterus salmoides*), and Black Crappie (*Pomoxis nigromaculatus*). Spotted Gar, Bowfin (*Amia calva*), and Slough Darter (*Etheostoma gracile*) were the additional three most common species in 2016. Eleven fish species were only collected at one location in 2016, with most restricted to the lotic habitats. All 44 fish species collected in 2016 can be found in a variety of aquatic habitats and are tolerant of a wide range of environmental conditions. Forty-six fish species, of which none are state/federal listed, have now been documented to occur on the Goose Pond FWA.

Collecting site 4 at the BH5S wetland on CR 100S. Collection occurred in the southwest corner of the wetland near the outfall. (*Photo by Brant E. Fisher*)

Lepisosteus oculatus (Spotted Gar) was observed at Site 7 – Black Creek – at CR 1400W bridge – GP13, GP11S, GP10N. (*Photo by Brant E. Fisher*)

List of freshwater mussels (13 species: 12 native) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016. (Do to prior commitments on the weekend of the bioblitz, the fish team actually sampled on Wednesday, June 8, Thursday, June 9, and Wednesday, June 15.)

Team Leader: Brant E. Fisher

Team Members: JoAnne Davis

Table 8a.—Freshwater mussel species (plus Asian Clam) found during the bioblitz. Blue highlight = new species in 2016, not collected in the 2010 biodiversity survey.

Scientific Name	Common Name	Non-Native
Family Unionidae		
Anodonta suborbiculata	**Flat Floater**	
Anodontoides ferussacianus	**Cylindrical Papershell**	
Arcidens confragosus	**Rock Pocketbook**	
Lampsilis teres	**Yellow Sandshell**	
Leptodea fragilis	**Fragile Papershell**	
Potamilus ohiensis	**Pink Papershell**	
Pyganodon grandis	**Giant Floater**	
Quadrula quadrula	**Mapleleaf**	
Toxolasma parvum	**Lilliput**	
Tritogonia verrucosa	**Pistolgrip**	
Uniomerus tetralasmus	**Pondhorn**	
Utterbackia imbecillis	**Paper Pondshell**	
Family Corbiculidae		
Corbicula fluminea	**Asian Clam**	**X**

NOTE: Information concerning site collections of freshwater mussels is in Table 8b on the next page.

Summary Overview

Three freshwater mussel species and one non-native mollusk were collected on the Goose Pond FWA in 2010: Giant Floater (*Pyganodon grandis*), Lilliput (*Toxolasma parvum*), Pondhorn (*Uniomerus tetralasmus*), and the non-native Asian Clam (*Corbicula fluminea*). These same four species, along with an additional nine species were collected in 2016: Flat Floater (*Anodonta suborbiculata*), Cylindrical Papershell (*Anodontoides ferussacianus*), Rock Pocketbook (*Arcidens confragosus*), Yellow Sandshell (*Lampsilis teres*), Fragile Papershell (*Leptodea fragilis*), Pink Papershell (*Potamilus ohiensis*), Mapleleaf (*Quadrula quadrula*), Pistolgrip (*Tritogonia verrucosa*), and Paper Pondshell (*Utterbackia imbecillis*). The large increase in the number of freshwater mussel species in 2016 was the result of

Table 8b.—Freshwater mussel (plus Asian Clam) site collection information. Condition information: L = Live; FD = Fresh dead shell material; WD = Weather dead shell material. Best Condition = the best condition (L, FD, WD) a species was found at any site. Total Sites Occurred = the number of sites (of the 15) that a species occurred. Total Native Species = the number of native species (of the 12 observed) that occurred at each site. Blue highlight = new species in 2016, not collected in the 2010 biodiversity survey.

	Site Number (See Table 5 for site details)																
Scientific Name	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Best Condition**	**Total Sites Occurred**
Anodonta suborbiculata						FD										FD	1
Anodontoides ferussacianus	WD															WD	1
Arcidens confragosus												L		L		Live	2
Lampsilis teres	L						L				L	L		L		Live	5
Leptodea fragilis							L				FD	L		L		Live	4
Potamilus ohiensis												L		FD		Live	2
Pyganodon grandis					L	FD	WD			FD	L	L	WD	L		Live	8
Quadrula quadrula												L		L		Live	2
Toxolasma parvum						FD										FD	1
Tritogonia verrucosa											L			L		Live	2
Uniomerus tetralasmus												WD				WD	1
Utterbackia imbecillis						FD					L	WD				Live	3
Corbicula fluminea	L	L	WD				L				WD	L		L		Live	7
Total Native Species :	**2**	**0**	**0**	**0**	**1**	**4**	**3**	**0**	**0**	**1**	**5**	**8**	**1**	**7**	**0**		

additional sites being sampled in Black Creek. Most species were represented by live individuals or fresh dead shell material, except for Cylindrical Papershell and Pondhorn, for which only weathered dead shell material was collected. The additional species collected in 2016 are all 'mud-loving' species and many have Freshwater Drum (*Aplodinotus grunniens***)** or catfish species as hosts for reproduction. Thus, twelve native (and one non-native) freshwater mussel species, of which none are state/federal listed, have now been documented to occur on the Goose Pond FWA.

The freshwater mussel *Tritogonia verrucosa* (Pistolgrip) was observed at site 11 – Black Creek – at end of CR 300S – GP5N, GP5S, MPE3, MPE2. (*Photo by Brant E. Fisher*)

List of herpetofauna (20 species: 8 amphibian species and 12 reptile species) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Robert Brodman

Team Members: Bailey Bickel, Meg Carrie, Brittany Davis, Eyup Erdogan, Rickie Featherstone, Mike Finkler, Dantra Finkler, Andrew Hoffman, Jim Horton, Christian Krupke, Megan Moss, Danielle Myers, Allyson Roller, Ethan Weisgerber

Table 9.—Comparison of amphibians and reptiles found at Goose Pond during the 2010 and 2016 Biodiversity Surveys. The data for 2010 is presence (P) and absence (0), whereas the 2016 data shows the number of each species encountered.

Scientific Name	Common Name	2010	2016	Combined
Frogs				
Anaxyrus americanus	American Toad	0	1	P
Anaxyrus fowleri	Fowler's Toad	P	3	P
Lithobates clamitans	Green Frog	P	17	P
Lithobates sphenocephalus	Southern Leopard Frog	P	3	P
Lithobates catesbeianus	American bullfrog	P	6	P
Pseudacris crucifer	Spring Peeper	P	0	P
Pseudacris triseriata	Western Chorus Frog	P	0	P
Hyla chrysoscelis	Cope's Gray Treefrog	P	49	P
Acris blanchardi	Blanchard's Cricket Frog	P	21	P
Salamanders				
Plethodon cinereus	Red-backed Salamander	0	2	P
Lizards				
Plestiodon fasciatus	Five-lined Skink	P	0	P
Snakes				
Nerodia sipedon	Northern Watersnake	P	3	P
Thamnophis sirtalis	Eastern Gartersnake	P	2	P
Storeria dekayi	Brown Snake	P	0	P
Coluber constrictor	Black Racer	P	2	P
Pantherophis splioides	Gray Rat Snake	P	1	P
Lampropeltus calligaster	Prairie Kingsnake	P	1	P
Diadophis punctatus	Ringneck Snake	0	1	P
Turtles				
Chelydra serpentina	Common Snapping Turtle	P	2	P
Apalone spinifera	Spiny Softshell	P	0	P
Trachemys scripta	Red-eared Slider	P	2	P
Chrysemys picta	Painted Turtle	P	13	P
Graptemys geographica	Map Turtle	0	1	P
Terrapene carolina	Eastern Box Turtle	0	1	P
Stenotheros ordoratus	Musk Turtle	P	3	P
Total Number of Species:		**20**	**20**	**25**

Collecting Methods and Effort

Amphibian and reptiles were surveyed by a combination of methods. Terrestrial and wetland habitats were sampled by visual searches and sample cover objects. Calling frogs were identified, and wetlands were sampled by dipnet and by use of 26 turtle traps and 20 minnow traps placed in ponds. The complete effort totaled approximately 100 person-hours and 46 trap-days.

Summary Overview

The herp team found a total of 134 herps of 20 species, including 32 reptiles representing twelve species and 102 amphibians representing eight species. *Acris blanchardi* is a species of special concern in Indiana having declined throughout the northern half of its geographic range during the last two to three decades. *Acris blanchardi* was commonly heard at most of the ponds that visited. *Terrepene carolina* is a special protected species in Indiana and one was found in the Thousand Islands unit. Two *Plethodon cinereus* were found in the Thousand Island which represents a new Greene County record. Photo vouchers of the *P. cinereus* will be retained by Robert Brodman and sent them to Herp Mappers and the J.F. Bell Museum of Natural History. In addition to *T. carolina* and *P. cinereus*, three other species were found that were not found in the 2010 Goose Pond Biodiversity Survey. These included *Diadophis puntactis* and *Anaxyrus americanus* from the western wooded section and *Graptemys geographica* from the Beehunter section. There were five species that were found in 2010 that were not encounter in the current survey, i.e., *Pseudacris crucifer, Pseudacris triseriata, Plestiodon fasciatus, Storeria dekayi*, and *Apalone spinifera.* The herpetofauna is rich with the two biodiversity surveys combining for a total of 25 species of amphibian and reptiles at Goose Pond. Surveys in the wooded Thousand Island unit earlier in the season could yield some more species of pond-breeding salamanders. Our one concern is the large number of dead reptiles that were found along State Route 59 as it goes past the main pond.

Members of the herp team with the “catch of the day”. (*Photo by Bob Brodman*)

Herp team at work. (*Photo by Bob Brodman*)

Terrepene carolina, Eastern Box Turtle, is a special protected species in Indiana. (*Photo by Bob Brodman*)

Plethodon cinereus, red-backed salamander, a Green County Record. (*Photo by Bob Brodman*)

A baby common snapping turtle (*Chelydra serpentina*). (*Photo by Dave W. Fox*)

List of mammal species (23 species) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: John O. Whitaker, Jr.

Team Members: Angela Chamberlain, George Sly, Suzie Ronk

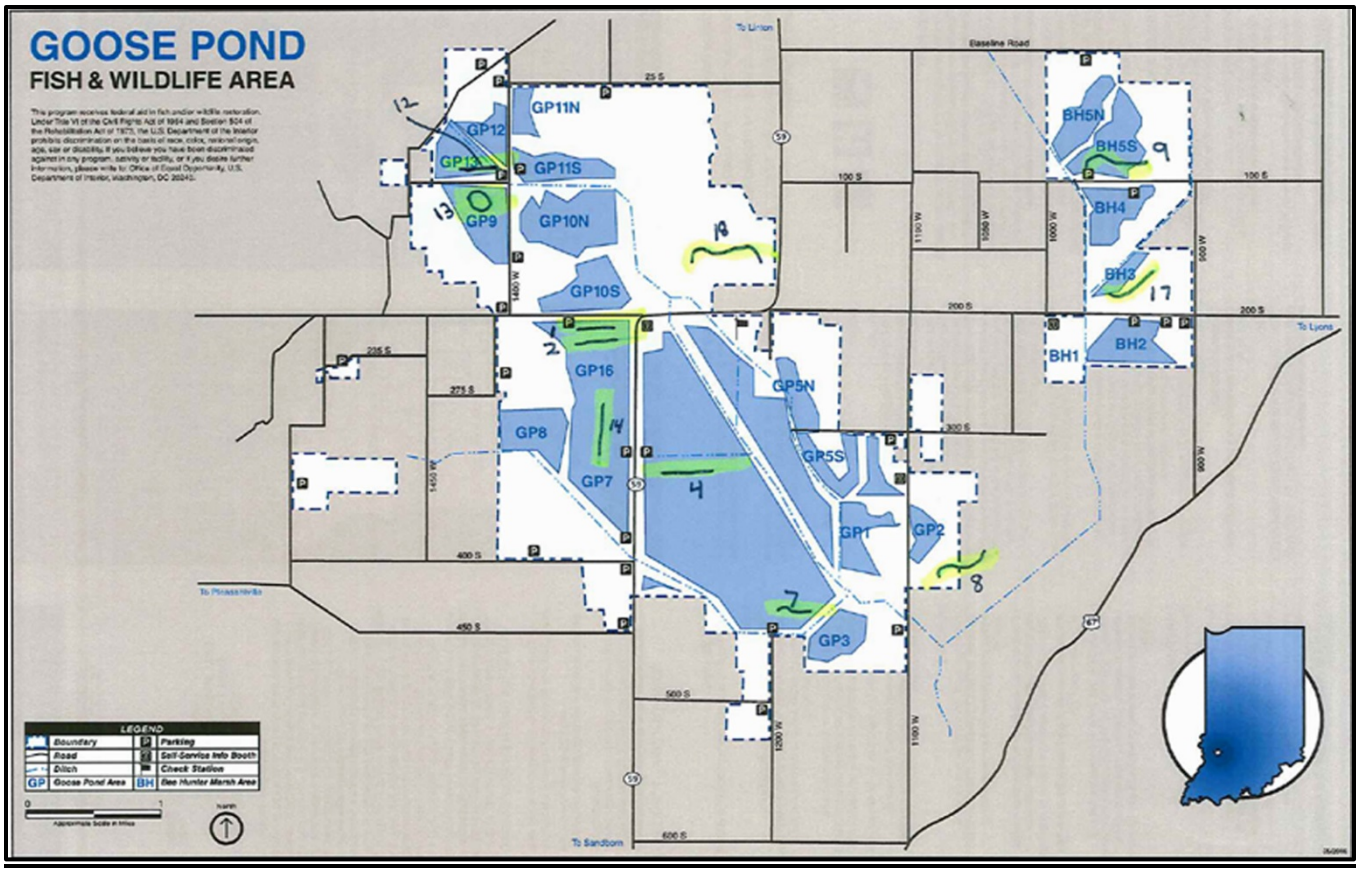
Table 10a.—Mammals observed or on record - Goose Pond Fish and Wildlife Area. * = invasive species.

Scientific Name	Common Name	Scientific Name	Common Name
Blarina brevicauda	Northern short-tailed shrew	*Mustela vison*	Mink
Canis latrans	Coyote	*Odocoileus virginianus*	White-tailed deer
Castor canadensis	Beaver	*Ondatra zibethicus*	Muskrat
Cryptotis parva	Least shrew	*Peromyscus leucopus*	White-footed mouse
Didelphis virginiana	Opossum	*Peromyscus maniculatus bairdii*	Prairie deer mouse
Lynx rufus	Bobcat	*Procyon lotor*	Raccoon
Marmota monax	Woodchuck	*Scalopus aquaticus*	Eastern mole
Mephitis mephitis	Striped skunk	*Sciurus niger*	Fox squirrel
Microtus ochrogaster	Prairie vole	*Sylvilagus floridanus*	Cottontail rabbit
Microtus pennsylvanicus	Meadow vole	*Tamias striatus*	Eastern chipmunk
*Mus musculus**	House mouse	*Vulpes vulpes*	Red fox
Mustela nivalis	Least weasel		

Table 10b.—Small mammals collected at Goose Pond June 2016- snap trap lines. * = invasive species.

Scientific Name	line 1	line 2	line 4	line 7	line 8	line 9	line 12	line 13	line 14	line 17	line 18	Species Total
Microtus pennsylvanicus	1	4	3			1			2	1		12
*Mus musculus**			7					1				8
Microtus ochrogaster		1		1	1	1		2		1		7
Cryptotis parva							6					6
Peromyscus leucopus				2		2		1				5
Peromyscus maniculatus bairdii			3		1					1		5
Blarina brevicauda		1										1
Total mammals/line:	1	6	13	3	2	4	6	4	2	3	0	**44**

A map indicting the location of the snap trap lines is on the next page.



A map of Goose Pond Fish and Wildlife Area indicating the location of the snap trap line, June 2016. (Provided by John O. Whitaker, Jr. and Angie Chamberlain)

Summary Overview

Eleven lines of snap-traps were set and maintained at Goose Pond during the time period June 13–19, 2016. This work comprised approximately 126 person-hours. Seven species of small mammals were taken (see Table 10b). The least shrew and prairie deer mouse were found in the open field areas while the white-footed mouse and short-tailed shrew were found primarily in woodland habitat. The bog lemming was taken during a similar survey in July of 2010. We are not sure why, but a much reduced number of the other seven species (captured during both surveys) were taken in the 2016 survey with the exception being that five prairie deer mice were captured in each year. It may be that the difference in time of year was a factor. The 2010 survey took place in July which means the spring young would have been included. The most interesting species in the 2016 survey was the least shrew as it is rather rare.

We would like to thank George Sly and Suzie Ronk who helped extend the time we could leave in some of the trap lines. They manned the weekend shift.

George Sly and Suzie Ronk assisting the mammal team. (*Photo by Dave W. Fox*)

List of moth (Lepidoptera) taxa (29 taxa) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Carl Strang

Team Members: Tim Anderson, assistance from the beetle team

Table 11.—Moth taxa observed at the bioblitz. All taxa from the Order Lepidoptera.

Family	Scientific Name	Common Name
Apatelodidae	*Apatelodes torrefacta*	Spotted Apatelodes
Cossidae	*Prionoxystus robiniae*	Carpenterworm Moth
Depressariidae	*Antaeotricha* sp.	
Erebidae	*Cisseps fulvicollis*	Yellow-collared Scape Moth
Erebidae	*Halysidota tessellaris*	Banded Tussock Moth
Erebidae	*Hypercompe scribonia*	Giant Leopard Moth
Erebidae	*Hypoprepia fucosa*	Painted Lichen Moth
Erebidae	*Spargaloma sexpunctata*	Six-spotted Gray
Erebidae	*Spilosoma virginica*	Virginian Tiger Moth
Geometridae	*Costaconvexa centrostrigaria*	Bent-line Carpet
Geometridae	*Eubaphe mendica*	The Beggar
Geometridae	*Eutrapela clemataria*	Curve-toothed Geometer
Geometridae	*Macaria bisignata*	Red-headed Inchworm
Geometridae	*Prochoerodes lineola*	Large Maple Spanworm
Geometridae	*Scopula limboundata*	Large Lace-border
Lasiocampidae	*Artace cribrarius*	Dot-lined White
Limacodidae	*Euclea delphinii*	Spiny Oak-Slug Moth
Limacodidae	*Lithacodes fasciola*	Yellow-shouldered Slug Moth
Noctuidae	*Protodeltote muscosula*	Large Mossy Glyph
Nolidae	*Baileya australis*	Small Baileya
Oecophoridae	*Epicallima argenticinctella*	Orange-headed Epicallima
Prodoxidae	*Prodoxus decipiens*	Bogus Yucca Moth
Saturniidae	*Anisota virginiensis*	Pink-striped Oakworm
Saturniidae	*Automeris io*	Io Moth
Sessiidae	*Synanthedon acerni*	Maple Callus Borer
Sphingidae	*Amorpha junglandis*	Walnut Sphinx
Sphingidae	*Ceratomia catalpae*	Catalpa Sphinx
Sphingidae	*Darapsa myron*	Virginia Creeper Sphinx
Tineidae	*Acrolophus plumifrontella*	Eastern Grass-tubeworm Moth

Methods and Effort

Apart from a few incidental observations made during the day, the primary survey method for moths was nighttime attraction to ultraviolet and mercury vapor lights projected onto white sheets (beetle team set up). One UV light was placed at the north end of the forested Thousand Islands unit and run by Carl Strang. Tim Anderson ran a UV light and a MV light at the south end of that forest. The effort was approximately 6 person-hours. Specimens were deposited in the Purdue University collection.

Summary Overview

The 29 observed taxa (28 species) generally are widespread and regarded as common. Most consume the leaves of deciduous woody plants as larvae, but a few are more specialized, i.e., the bogus yucca moth (*Prodoxus decipiens*) bores into yucca stalks, the catalpa sphinx (*Ceratomia catalpae*) specializes on catalpa leaves, the bent-line carpet (*Costaconvexa centrostrigaria*) feeds mainly on members of the herbaceous genus *Persicaria*, the red-headed inchworm (*Macaria bisignata*) eats pine needles, the painted lichen moth (*Hypoprepia fucosa*) feeds on lichens, and the six-spotted gray (*Spargaloma sexpunctata*) lives on dogbanes (*Apocynum* spp.).

According to the Mississippi State University database, as depicted in the Moth Photographers' Group website (http://mothphotographersgroup.msstate.edu/), all are county records except the giant leopard moth. This is a reflection mainly of limited past sampling effort in Greene County rather than abundance of these species.

Scopula limboundata, Large Lace-border. (*Photo by Carl Strang*)

List of mushroom and slime mold taxa (30 taxa: 4 slime molds and 26 mushrooms) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Stephen Russell

Team Members: None

Table 12.—Mushroom and slime mold taxa observed at the bioblitz.

Species Name	Total Observations	MyCoPortal Accession Number (www.mycoportal.org)	MycoMap Accession Number (www.mycomap.com)	GenBank Accession Number
Amanita flavoconia	5	4386775	336, 343, 428, 429, 431	MK397030
Ceratiomyxa fruticulosa	3		322, 329, 340	
Ductifera pululahuana	1		344	
Exidia glandulosa	1		338	
Exidia recisa	1			
Galiella rufa	1		332	
Gloeophyllum sepiarium	1	4903637	346	MK397031
Hymenochaete olivacea	1		335	
Hypomyces sp.	1		433	
Inocybe sp.	1	4386086	314	
Lactarius sp.	1	4387180	438	MK397034
Lycogala epidendrum	2		319, 324	
Panellus stipticus	1	4385958	339	MK399806
Phellinus gilvus	1		318	
Pluteus romellii	2		316, 342	
Polyporus alveolaris	1		436	
Polyporus arcularius	1	4903636	313	MK397028
Polyporus varius	1		334	
Russula aff. *recondita*	1	4386955	249	
Russula katarinae	1	4386933	434	MK397032
Russula pulverulenta	1	4386954	435	MK397033
Russula sp.	1	4386923	317	MK397026
Russula “sp-red”	1	4386920	439	MK397035
Russula variata	1	4386893	437	
Schizophyllum commune	1		337	
Scutellinia scutellata	2		323, 330	
Stereum complicatum	1		333	
Stereum ostrea	1		432	
Stereum sp.	1	4386001	260	MK397027
Trametes conchifer	1		345	
Tremella mesenterica	1	4903059	326	

Species Name	Total Observations	MyCoPortal Accession Number (www.mycoportal.org)	MycoMap Accession Number (www.mycomap.com)	GenBank Accession Number
Trichaptum biforme	2		327, 347	
Tricholomopsis decora	1	4386039	246	MK397025
Tubifera ferruginosa	1		321	
Tyromyces galactinus	1		315	MK397029

Location of Collection

Unit GP18, the woodlands located on the far west side of Goose Pond Fish and Wildlife Area.

Collecting Effort

One collector surveyed for approximately two hours in woodlands.

Voucher Specimens

Specimens were dried and deposited in Purdue's Kriebel Fungarium (PUL) in West Lafayette, Indiana. The fungarium metadata was uploaded to the NSF-funded MyCoPortal (Miller & Bates 2017). Color images and notes for each observation can be found at the MycoMap accession numbers (www.mycomap.com) in Table 12.

Molecular Methods

DNA extractions were performed using the Promega Wizard Purification Kit (Promega Corp., Madison, Wisconsin). DNA amplification utilized the primers ITS1F & ITS4 (Gardes & Bruns 1993; White et al. 1990) for the nuclear ribosomal internal transcribed spacer 1, 5.8S, and internal transcribed spacer 2 region (ITS; approximately 600-700 bases). Successful PCR amplification was verified by electrophoresis on a 1% agarose gel. Amplicons were sent to Genewiz (Genewiz, Inc., Boston, Massachusetts, USA) for sequencing. Both the forward and reverse strands were sequenced. The final sequences were deposited in GenBank. The accession numbers are reported in Table 12.

Summary Overview

While Goose Pond lacks a significant amount of woodlands, unit GP18 had a reasonable amount of diversity for the time of the year. Most of the species encountered were saprobes, with only a few mycorrhizals, e.g., *Russula* and *Amanita*. The most notable species was *Russula katarinae*. It was only recently described from New York state in 2015 (Adam•ík et al. 2015). DNA sequencing of the ITS region for the present collection yielded a 99.9% match to the type specimen. Other than the two collections listed in the original paper (both from 2003) and the present specimen, only one additional collection has been reported worldwide. It is also from Indiana – Griffy Lake in Bloomington (MushroomObserver.org #111411). A second *Russula* sp. encountered during this event was labeled

"*Russula* aff. *recondita*." The species is well documented locally and known to be novel. It awaits formal description. The DNA results from *Tricholomopsis decora* are also of note, as it appears there are two genetic species going under the same name in North America. Further study will be required to delineate which, if either, set of specimens the name should be properly applied to.

Literature Cited

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Mushrooms from the bioblitz. Left: *Russula katarinae*, a potential state record. Right: *Amanita flavoconia* is common and widespread throughout eastern North America; it grows on the ground in broad-leaved and mixed forests, especially in mycorrhizal association with hemlock. (*Photos by Stephen Russell*)

Ceratiomyxa fruticulosa is a plasmodial slime mold that is widely distributed on decaying logs. (*Photo by Stephen Russell*)

List of non-vascular plants (mosses, liverworts, lichens) species (50 species: 36 mosses, 2 liverworts, and 12 lichens) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Linda Cole

Team Members: Myron Cole, Deanna Ronk

Table 13a.—Bryophyte (moss) species observed at the bioblitz. AB = abundance (C = common, I = infrequent, R = rare).

Scientific Name	Common Name	Habitat	AB
Acrocarps			
Atrichum altecristatum	Wavy Starburst Moss	Forest soil	C
Atrichum angustatum	Slender Starburst Moss	Forest soil	C
Atrichum crispum	Oval Starburst Moss	Thin soil over moist sandstone in forest	I
Barbula unguiculata	Bear Claw Moss	Bare soil & concrete structure	C
Bryum caespiticium	Common Bryum	Soil shaded by grasses	I
Aulacomnium palustre	Ribbed Bog Moss	Damp bottomland forest soil	I
Dicranella heteromalla	Fine Hair Moss	Shaded soil bank	I
Dicranum montanum	Crispy Broom Moss	Tree base	R
Fissidens bryoides	Pocket Moss	On old brick, moist slope of mine pit	I
Fissidens osmundoides	Fern Pocket Moss	Clumps on soil on moist shaded forest border	C
Physcomitrium kellermani	Goblet or Urn Moss	Bare moist soil, open sun & in grasses	C
Plagiomnium ciliare	Sabertooth Moss	Moist forest soil	C
Plagiomnium cuspidatum	Baby Tooth Moss	Moist forest soil	C
Polytrichum commune	Common Haircap Moss	Damp soil margin of bottomland woods	I
Rhizomnium punctatum	Red Penny Moss	On old brick, moist slope of mine pit	R
Pleurocarps			
Anacamptodon splachnoides	Knothole Moss	Tree bark, moist forest	I
Brachythecium salebrosum	Golden Foxtail Moss	Forest humus	C
Brachythecium rivulare	River Foxtail Moss	Soggy soil bottomland wood	I
Brachythecium rutabulum	Rough Foxtail Moss	Forest soil	I
Bryhnia novae-angliae	Bonsai Moss	Shaded damp forest soil with other mosses	R
Bryoandersonia illecebra	Worm Moss	Soil & rotting wood on forest floor	C
Campylium stellatum	Yellow Star Moss	Damp soil around shallow pool in forest	I
Campyliadelphus chrisophyllus	Brittle Star Moss	Moist soil bank in forest	C
Campylophyllum hispidulum	Tiny Star Moss	Damp forest soil & on log	I
Entodon cladorrhizens	Flat Glaze Moss	Bark of rotting log, forest	I
Entodon seductrix	Cord Glaze Moss	Bark of rotting log, forest	C
Eurhynchiastrum pulchellum	Rug Moss	Forest soil	I

Scientific Name	Common Name	Habitat	AB
Pleurocarps con't			
Hygroamblystegium varium	Tangled Thread moss	Moist forest soil	C
Helodium paludosum	Narrow-leaved Beard Moss	Shaded damp soil bordering shallow water	R
Leskeella nervosa	Frayed String Moss	Bark on logs and trees	C
Plagiothecium cavifolium	Round Silk Moss	Sandstone, moist shaded forest	R
Platydictya cervoides	Algal Rock Moss	On old brick, moist shaded forest	R
Platydictya subtilis	Algal Thread Moss	Tree trunk base	I
Pylaisia selwynii	Paintbrush Moss	Hardwood tree trunks, forest	I
Rhynchostegium serrulatum	Beaked Comb Moss	Moist forest soil	C
Thuidium delicatulum	Delicate Fern Moss	Damp forest soil	I

Table 13b.—Liverwort species observed at the bioblitz.

Scientific Name	Common Name	Habitat
Trichocolea tomentella	Wooley liverwort	Moist Shaded soil, bottom woods
Lophocolea heterophylla	Variable-leaved crestwort	Rotting log in moist shaded woods

Table 13c.—Lichen species observed at the bioblitz.

Scientific Name	Common Name	Habitat	Abundance
Cladonia apodocarpa	Stalkless Cladonia	Damp soil, light shade	I
Physia milligrana	Mealy Rosette Lichen	Bark of deciduous trees	C
Cladonia chloraphae	Mealy Pixie Cup	Bare soil	I
Lepraria lobificans	Fluffy Dust Lichen	Tree bases	C
Parmotrema perforatum	Perforated Ruffle Lichen	Tree branch	C
Cladonia pyxidata	Pebbled Pixie Cup	Bare soil	R
Cladonia peziziformis	Turban Lichen	Growing among mosses, soil	R
Lecanora allophana	Brown-eyed Rim Lichen	Tree bark	
Xanthoria ulophyllodes	Powdery Sunburst Lichen	Tree bark	I
Parmelia sulcata	Hammered Sheild Lichen	Tree bark	C
Flavoparmelia caperata	Common Greenshield Lichen	Tree bark	C
Punctelia bolliana	Easter Speckled Shield Lichen	Tree bark	C

Summary Overview

Our survey of mosses in the Goose Pond Fish and Wildlife Area revealed an interesting and surprisingly diverse population of mosses with representative samplings from habitats including wetlands/prairie grasslands and bottomlands forest. Also included is the new Thousand Islands unit to the preserve. Although our focus was primarily mosses, it should be noted that there is a sizable population of

liverworts, most of which were found to be very tiny ‘leafy’ liverworts that escape notice by the unaided eye. Microscopic examination revealed many of those minuscule bryophytes growing among the mosses collected. Also included in this survey are lichens encountered while collecting mosses.

Collecting many specimens from a diversity of substrates and habitats required 14 person-hours in the field and 10 hours of microscopic examination which yielded 36 species of mosses. Being aware of bryophyte diversity requires much patience and inspection of the closest kind. We must always bear in mind that no canvas of such an area will be complete as there will always be many hidden nooks and crannies where bryophytes thrive and play out the many roles they undertake in shaping the environment.

The greatest diversity of moss species on this property was found in tree lines, damp, shaded areas around mining pits and woodland settings. It also bears noting that two main species are in abundance in the wetland/grasslands habitat, i.e., *Barbula unguiculata* (Bearclaw Moss) and *Physcomitrium kellermani* (Goblet or Urn Moss). This is the first time I had encountered such dominance of these species in a wetlands. However, both are typical mosses of periodically disturbed moist soils in open spaces and are well adapted in Goose Pond. As pioneer species, overall moss diversity in the prairie wetlands is limited by prolific seeding and coverage of grasses and other vascular plants with many invasive species on the increase. A maintenance trail in one of the bottomlands woods was covered by Japanese Stilt Grass where mosses would usually be found. Such is the case in many preserves and state parks these days. None the less, we were able to identify a thriving population of bryophytes at Goose Pond, reminding us that we should never overlook these smallest gifts of nature or underestimate their power to impact the environment.

All collected samples were returned to the environment.

List of dragonflies and damselflies (*Odonata*: 33 species—11 damselfly (Zygoptera) species and 22 dragonfly (Anisoptera) species) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Kirk Roth

Team Members: Jim Hengeveld, Susan Hengeveld

Table 14.—Odonate (dragonflies and damselflies) taxa and number observed or estimated.

Scientific Name	Common Name	Number Observed or Estimated
Family Aeshnidae		
Anax junius	Common Green Darner	>100
Epiaeschnia heros	Swamp Darner	1
Family Corduliidae		
Epitheca princeps	Prince Baskettail	3
Family Gomphidae		
Macromia illinoiensis	Illinois River Cruiser	1
Hagenius brevistylus	Dragonhunter	2
Arigomphus submedianus	Jade Clubtail	2
Gomphus externus	Plains Clubtail	1
Gomphus graslinellus	Pronghorn Clubtail	2
Progomphus obscurus	Common Sanddragon	3
Family Libellulidae		
Celithemis eponina	Halloween Pennant	>50
Erythemis cimplicicollis	Eastern Pondhawk	>1000
Libellula cyanea	Spangled Skimmer	3
Libellula incesta	Slaty Skimmer	>10
Libellula luctuosa	Widow Skimmer	>100
Libellula pulchella	Twelve-spotted Skimmer	>10
Pachydiplax longipennis	Blue Dasher	>1000
Pantala flavescens	Wandering Glider	>10
Pantala hymenea	Spot-winged Glider	>10
Perithemis tenera	Eastern Amberwing	>50
Plathemis lydia	Common Whitetail	>100
Sympetrum ambiguum	Blue-faced Meadowhawk	1
Tramea lacerata	Black Saddlebags	>100
Family Calopterygidae		
Calopteryx maculata	Ebony Jewelwing	3
Hetaerina americana	American Rubyspot	1
Family Coenagrionidae		
Argia apicalis	Blue-fronted Dancer	>100
Argia sedula	Blue-ringed Dancer	2

Family Coenagrionidae con't		
Argia tibialis	Blue-tipped Dancer	5
Enallagma civile	Familiar Bluet	5
Enallagma geminatum	Skimming Bluet	2
Enallagma traviatum	Slender Bluet	1
Enallagma signatum	Orange Bluet	2
Ischnura posita	Fragile Forktail	5
Ischnura verticalis	Eastern Forktail	>100

Abundance

Eleven species of damselfly (Zygoptera) and twenty-two species of dragonflies (Anisoptera) were observed during the bioblitz. See Table 14 above for estimates of individual species numbers and for scientific names.

Location

Most of the common Odonates were ubiquitous throughout the Goose Pond habitat areas. Wherever there is water (and many areas where there was not!), some species, such as Blue Dasher, Eastern Pondhawk, and Blue-fronted Dancer, could be expected. Below are certain specialized or exceptional sightings.

- Some species are riparian specialists and were encountered only along the running waterways – often preferring shade. These included the Illinois River Cruiser, Ebony Jewelwing, and American Rubyspot.
- There were some Odonates observed only at woodland edges. The wooded area just south of GP 6 has produced some interesting dragonflies, including Slaty Skimmer and the only observation of Swamp Darner during this count. During the 2010 bioblitz, a mating pair of Dragonhunters was observed at this location (pers. obs.). This year, a Dragonhunter was observed near the 1200W bridge south of Main Pool West. The north end of Thousand Islands produced Prince Baskettail, Jade Clubtail, and the only observations of Lancet Clubtail and Slender Bluet.
- Beehunter Marsh seemed to have fewer damselflies, but more species diversity. The only observations of Ebony Jewelwing, American Rubyspot, Blue-tipped Dancer, and Orange Bluet were from this marsh.

Collecting Methods and Effort

Much like with butterflies, Odonates can be readily observed and identified with binoculars and photography, although Odonates provide some challenges that Indiana butterflies do not. Dragonflies especially are fast-flying insects and are more prone to escaping sufficient observation, whether that is via binoculars or insect net. Furthermore, some Odonates species can be very similar in appearance and great care must be taken in their identification. Pertinent to this study is the similarity of the Familiar Bluet to Hagan's and Marsh Bluets in certain ages and sexes, and the similarity of Plains and Pronghorn Clubtails.

Despite potential difficulties, Odonates were surveyed using observation primarily with 8 power binoculars and/or photography. This approach allowed the benefit of rapid assessment and more distance covered than collection would have afforded. All members of the Odonate team were also engaged in survey for other taxa, so distant identification or photographs facilitated the overall effort a great deal. Also, the use of photography allowed contributions from "non-specialists." Members of other taxonomic groups were encouraged to share photographs of Odonates they happened to encounter. Importantly, the only observation of a Blue-faced Meadowhawk, a potential county record, during the bioblitz was made by someone not on the Odonate team, so cooperation between groups proves to be fruitful.

The methods used in the 2016 bioblitz contrast with those of the 2010 Goose Pond bioblitz (Karns et al. 2012) which used insect nets and dip netting for aquatic larval specimens. Due to more distance covered in a short period of time during the 2016 survey, it is possible that many Odonate species were not detected. Importantly, the 2016 survey might not include species which are primarily larval at the time of the survey, whereas dip netting may have detected some of these. Despite this impediment, the 2016 survey detected one more species of dragonfly and two more species of damselfly than the 2010 bioblitz. It should be noted that differences in the species counts should not be attributed only to survey methods, as many other differences, such as time of year and weather events, can affect odonate abundance.

Special Interest Species

While no endangered, threatened, or rare odonate species were observed during the bioblitz, eight potential records for Greene County, Indiana were noted. Swamp Darner, Illinois River Cruiser, Jade Clubtail, Plains Clubtail, Common Sanddragon, Blue-faced Meadowhawk, Skimming Bluet, and Slender Bluet are all unrecognized for Greene County in Curry (2001), Karns et al. (2012), and the records of Odonate Central (Abbott 2006-2016).

The Swamp Darner was viewed in flight, but unable to be photographed, so this sight record is unsatisfactory for a county record. The identification was made on the sighting of a very large dragonfly, near the size of a Dragonhunter, but mocha brown in overall color with thick green markings on the thorax and thinner green markings on the abdomen. Blue eyes were also noted. Swamp Darner is noted for counties both southwest and northeast of Greene County (Curry 2001). All other potential county records listed above were photographed.

Voucher Specimens

No Odonate vouchers were collected.

Summary Overview

Goose Pond FWA produced the diversity and abundance of Odonates that should be expected of a large area of such varied aquatic habitats. With only the two sampling events of the 2010 and 2016 bioblitzes, the Goose Pond complex has an odonate list that includes 28 dragonflies and 13 damselflies. This

represents 26% of the Indiana's known dragonflies (Curry 2001; Mauffray 2008), and 30% of the state's known damselflies (Williamson 1917), if incidentally or accidentally occurring species are included. Undoubtedly, more odonate surveys, especially in August or September, would have potential to add to this list.

Curry (2001) classifies the Jade Clubtail as "rare" and indeed only two counties are included in its range. Two individuals were noted during the bioblitz at different areas – GP6 and the north ponds of Thousand Islands. If a population occurs at Goose Pond, it may be significant to the state's biodiversity.

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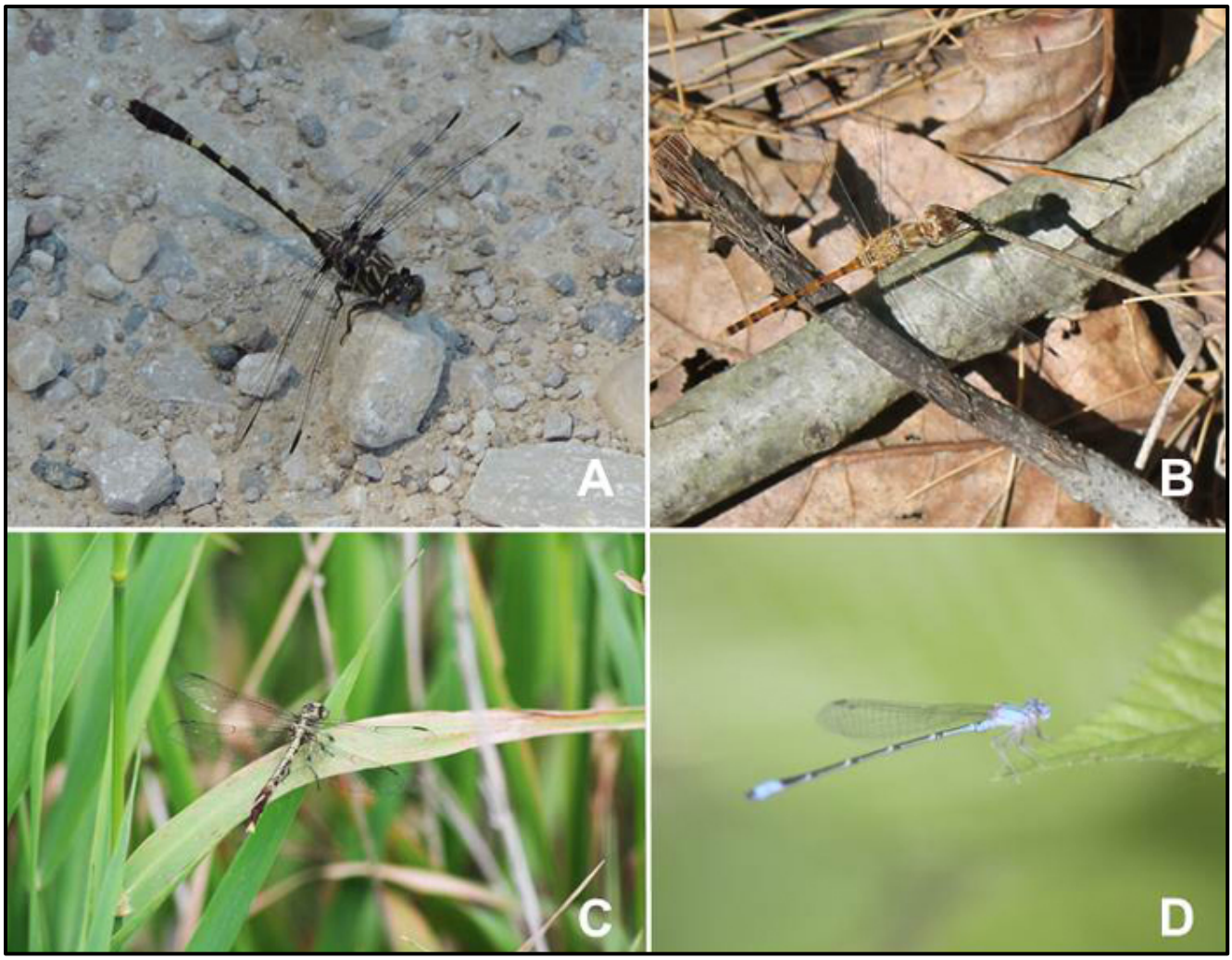
Enallagma geminatum or skimming bluet (*Photo by Kirk Roth*)



Various odonates. A. *Progomphus obscurus* or common sanddragon. (*Photo by Susan hengeveldt*) B. *Sympetrum ambiguum* or blue-faced meadowhawk. (*Photo by Terry Wise*) C. *Arigomphus submedianus* or jade clubtail. D. *Enallagma traviatum* or slender bluet. (*Photos* C & D *by Kirk Roth*)

List of singing insects (Orthoptera) taxa (8 taxa) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Carl Strang

Team Members: Tim Anderson, Scott Namestnik

Table 15.—Singing insect taxa observed at the bioblitz. All taxa are in the Order Orthoptera.

Family	Scientific Name	Common Name	Notes
Acrididae	*Chortophaga viridifasciata*	Green-striped grasshopper	Still a few displaying in dry meadow areas, but their season is nearly done for the year.
Gryllidae	*Allonemobius socius*	Southern ground cricket	Song identical to that of the striped ground cricket, which occurs farther north. Only a few heard, so they are just starting this year. Dry to moist open grassy areas.
Gryllidae	*Anaxipha vernalis*	Spring trig	This recently described species is identified by its song and early season timing. Common in moist to wet grassy areas.
Gryllidae	*Gryllus veletis*	Spring field cricket	Common on levees and other dry open grassy areas. One photographed, another recorded.
Tettigoniidae	*Conocephalus fasciatus*	Slender meadow katydid	A few scattered individuals in wet grassy areas and marsh edges. These are the first of what probably is a very abundant species later in the season at Goose Pond.
Tettigoniidae	*Conocephalus* sp.		A nymph photographed at the UV light. Probably *C. brevipennis*, short-winged meadow katydid, a common species.
Tettigoniidae	*Neoconocephalus* sp.		A nymph photographed at UV light. Too early an instar for identification. Likely possibilities in that habitat are *N. bivocatus*, *N. nebrascensis*, and *N. robustus*.
Tettigoniidae	*Roeseliana roeselii*	Roesel's katydid	Scott Namestnik heard and photographed a single individual. This is the first we have found south of Indianapolis. It is an introduced species that has spread south and west from Montreal, Canada.

Methods and Effort

I spent 10 hours over the two days, visiting representative areas of Goose Pond's various habitats, listening both unaided and with the SongFinder pitch-lowering device, as well as wading through grassy areas to see what species might be flushed into view. I also made incidental observations of two species, still in nymph form, which came to the ultraviolet light during the evening's moth survey. I took a few photographs but collected no specimens. Scott Namestnik of the botany team took a photograph that documented the most interesting find of the study (see below).

Summary Overview

This time of year is transitional, near the end of the period when the earliest singing insects are active. Relatively few species are in that category, so the eight taxa observed are only a small fraction of those which no doubt are present at the site. According to the database compiled by Tom Walker of the University of Florida, the following species previously had no Greene County records: southern ground cricket (*Allonemobius socius*), spring trig (*Anaxipha vernalis*), spring field cricket (*Gryllus veletis*), and Roesel's katydid (*Roeseliana roeselii*). All observed species are, however, common and widespread.

The spring trig was first described in 2014, and its status remains to be determined, but it was abundant at Goose Pond as well as at Connor Prairie, site of the biodiversity survey in 2013. The only other species worthy of further discussion is Roesel's katydid. This is an introduced European species which has been spreading south and west from the Montreal, Quebec, area since the mid-20th century. Scott Namestnik and I have documented it in counties throughout northern Indiana, but the single individual heard and photographed by Namestnik at Goose Pond represents our first observation south of Indianapolis. It is possible that the species is well established at Goose Pond, and that more of them emerged after the time of the survey, which took place close to the beginning of their season of maturity.

Chortophaga viridifasciata, green-striped grasshopper. (*Photo by Carl Strang*)

Nymph of a *Neoconocephalus* sp., a conehead katydid. Too early an instar for identification. (*Photo by Carl Strang*)

Gryllus veletis, spring field cricket. (Photo by Carl Strang)

List of spider taxa (84 taxa) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Marc Milne

Team Members: Brian Foster, Andrew Hofffman, Brittany Davis, Joe Dickson

Table 16a.—Spider taxa and frequency observed at the bioblitz .

Scientific Name	Comments	Common Name	Abundance
Family Agelenidae			
Agelenopsis sp.	Immature specimen	American grass spider	Abundant
Family Anyphaenidae			
Anyphaena pectorosa		Ghost spider	Infrequent
Family Araneidae			
Acanthepeira stellata		Starbellied orbweaver	Common
Argiope sp.	Immature specimen	Garden spider	Common
Cyclosa conica		Trashline orbweaver	Common
Eustala anastera		Humpbacked orbweaver	Common
Eustala cepina		Humpbacked orbweaver	Common
Gea heptagon		Orbweaver	Common
Mangora placida		Tuftlegged orbweaver	Common
Micrathena gracilis		Spined micrathena	Abundant
Neoscona arabesca		Arabesque orbweaver	Abundant
Family Clubionidae			
Clubiona abboti		Sac spider	Infrequent
Clubiona maritima		Sac spider	Infrequent
Family Dictynidae			
Dictyna volucripes		Meshweaver	Infrequent
Emblyna sublata		Meshweaver	Infrequent
Family Gnaphosidae			
Drassyllus dixinus		Stealthy ground spider	Infrequent
Drassyllus eremitus	New record for IN	Stealthy ground spider	Rare
Family Linyphiidae			
Agyneta spicula	New record for IN	Sheetweb weaver	Rare
Agyneta unimaculata		Sheetweb weaver	Rare
Bathyphantes pallidus		Pale sheetweb weaver	Common
Erigone atra		Post dwarf weaver	Infrequent
Erigone dentigera		Teethed dwarf weaver	Infrequent
Floricomus rostratus	New record for IN	Dwarf weaver	Rare
Florinda coccinea		Sheetweb weaver	Common
Grammonota ornata	New record for IN	Dwarf weaver	Infrequent

Scientific Name	Comments	Common Name	Abundance
Family Linyphiidae con't			
Mermessus maculatus		Dwarf weaver	Abundant
Wubana n. sp.	Undescribed species	?	?
Family Lycosidae			
Pardosa lapidicina		Thinlegged wolf spider	Infrequent
Pardosa milvina		Thinlegged wolf spider	Common
Pirata alachuus		Pirate wolf spider	Abundant
Pirata minuta		Pirate wolf spider	Common
Rabidosa rabida		Wolf spider	Abundant
Schizocosa ocreata		Wolf spider	Abundant
Schizocosa stridulans	New record for IN	Wolf spider	Infrequent
Tigrosa georgicola		Wolf spider	Infrequent
Tigrosa helluo		Wolf spider	Abundant
Trabeops aurantiacus		Wolf spider	Common
Trochosa sp.	Immature specimen	Wolf spider	Common
Family Oxyopidae			
Oxyopes salticus		Lynx spider	Abundant
Family Philodromidae			
Philodromus bimuricatus	New record for IN	Agile running crab spider	Rare
Philodromus cespitum		Agile running crab spider	Infrequent
Philodromus marxi		Agile running crab spider	Infrequent
Tibellus oblongus		Oblong running crab spider	Infrequent
Family Pholcidae			
Pholcus phalangioides		Long-bodied cellar spider	Abundant
Family Phrurolithidae			
Phrurotimpus alarius		Antmimic spider	Abundant
Phrurotimpus borealis		Antmimic spider	Infrequent
Phrurotimpus n. sp.	Undescribed species	Antmimic spider	?
Scotinella fratrella		Antmimic spider	Rare
Scotinella redempta		Antmimic spider	Common
Family Pisauridae			
Dolomedes albineus		White-banded fishing spider	Common
Dolomedes tenebrosus		Dark fishing spider	Common
Dolomedes triton		Six-spotted fishing spider	Common
Dolomedes vittatus		Lanceolate fishing spider	Common
Pisaurina dubia	New county record	Fishing spider	Infrequent
Pisaurina mira		Fishing spider	Abundant
Family Salticidae			
Hentzia palmarum		Jumping spider	Common
Maevia inclemens		Dimorphic jumping spider	Common

Scientific Name	Comments	Common Name	Abundance
Family Salticidae con't			
Marpissa formosa		Jumping spider	Common
Marpissa pikei		Pike slender jumping spider	Infrequent
Peckhamia americana	Ant-mimic	Ant-mimicing jumping spider	Rare
Pelegrina galathea		Peppered jumping spider	Abundant
Pelegrina proterva		Jumping spider	Abundant
Pelegrina tillandsiae		Jumping spider	Common
Phidippus sp.		Jumping spider	Common
Sassacus cyaneus	Beetle-mimic	Jumping spider	Infrequent
Zygoballus nervosus		Jumping spider	Abundant
Family Tetragnathidae			
Glenognatha foxi		Longjawed orbweaver	Common
Leucauge venusta		Orchard spider	Abundant
Tetragnatha caudata		Tailed longjawed orbweaver	Common
Tetragnatha guatemalensis		Longjawed orbweaver	Common
Tetragnatha laboriosa		Longjawed orbweaver	Common
Tetragnatha pallescens		Longjawed orbweaver	Common
Tetragnatha straminea		Longjawed orbweaver	Common
Family Theridiidae			
Crustulina altera		Cobweb weaver	Infrequent
Crustulina sticta		Cobweb weaver	Infrequent
Phyllonetta pictipes		Cobweb weaver	Common
Theridion albidum		Cobweb weaver	Abundant
Theridion pennsylvanicum		Cobweb weaver	Infrequent
Family Thomisidae			
Mecaphesa celer		Crab spider	Abundant
Misumessus oblongus		Crab spider	Common
Ozyptila monroensis		Leaflitter crab spider	Rare
Xysticus discursans		Ground crab spider	Infrequent
Xysticus elegans		Elegant crab spider	Abundant
Xysticus ferox		Wild crab spider	Abundant
Xysticus luctans		Ground crab spider	Common

Table 16b.—Spider taxa site collection information. See Figure 4, page 9, for location of sites.

	Location					
Scientific Name	**BH1**	**BH2**	**BH5N**	**GP10N**	**GPS5**	**Thousand Islands**
Family Agelenidae						
Agelenopsis sp.		X			X	X

Scientific Name	BH1	BH2	BH5N	GP10N	GPS5	Thousand Islands
Family Anyphaenidae						
Anyphaena pectorosa						X
Family Araneidae						
Acanthepeira stellata		X	X			X
Argiope sp.			X			
Cyclosa conica			X			
Eustala anastera						X
Eustala cepina					X	
Gea heptagon	X					
Mangora placida						X
Micrathena gracilis						X
Neoscona arabesca			X		X	
Family Clubionidae						
Clubiona abboti	X					
Clubiona maritima					X	
Family Dictynidae						
Dictyna volucripes			X			
Emblyna sublata					X	
Family Gnaphosidae						
Drassyllus dixinus					X	
Drassyllus eremitus						X
Family Linyphiidae						
Agyneta spicula					X	
Agyneta unimaculata						X
Bathyphantes pallidus			X			X
Erigone atra			X			X
Erigone dentigera			X			
Floricomus rostratus			X			
Florinda coccinea	X					
Grammonota ornata			X		X	
Mermessus maculatus						X
Wubana n. sp.					X	
Family Lycosidae						
Pardosa lapidicina			X	X		
Pardosa milvina						X
Pirata alachuus						X
Pirata minuta						X
Rabidosa rabida						X
Schizocosa ocreata					X	

Scientific Name	BH1	BH2	BH5N	GP10N	GPS5	Thousand Islands
Family Lycosidae con't						
Schizocosa stridulans						X
Tigrosa georgicola						X
Tigrosa helluo					X	
Trabeops aurantiacus			X			X
Trochosa sp.		X	X			
Family Oxyopidae						
Oxyopes salticus	X		X		X	
Family Philodromidae						
Philodromus bimuricatus					X	
Philodromus cespitum					X	
Philodromus marxi						X
Tibellus oblongus					X	
Family Pholcidae						
Pholcus phalangioides				X		
Family Phrurolithidae						
Phrurotimpus alarius						X
Phrurotimpus borealis					X	X
Phrurotimpus n. sp.						X
Scotinella fratrella					X	
Scotinella redempta						X
Family Pisauridae						
Dolomedes albineus				X		
Dolomedes tenebrosus						X
Dolomedes triton						X
Dolomedes vittatus						X
Pisaurina dubia				X		
Pisaurina mira						X
Family Salticidae						
Hentzia palmarum					X	
Maevia inclemens						X
Marpissa formosa			X		X	
Marpissa pikei	X		X		X	
Peckhamia americana					X	
Pelegrina galathea	X	X	X		X	
Pelegrina proterva			X		X	
Pelegrina tillandsiae		X				
Phidippus sp.					X	

Scientific Name	BH1	BH2	BH5N	GP10N	GPS5	Thousand Islands
Family Salticidae						
Sassacus cyaneus	X					
Zygoballus nervosus					X	X
Family Tetragnathidae						
Glenognatha foxi			X		X	
Leucauge venusta					X	
Tetragnatha caudata					X	
Tetragnatha guatemalensis					X	
Tetragnatha laboriosa					X	
Tetragnatha pallescens					X	
Tetragnatha straminea						X
Family Theridiidae						
Crustulina altera						X
Crustulina sticta		X				
Phyllonetta pictipes						X
Theridion albidum						X
Theridion pennsylvanicum						X
Family Thomisidae						
Mecaphesa celer	X	X			X	
Misumessus oblongus						X
Ozyptila monroensis						X
Xysticus discursans			X			
Xysticus elegans	X					
Xysticus ferox						X
Xysticus luctans			X			

Collecting Methods and Effort

During this biodiversity survey, the spider team employed a variety of methods to find and collect spiders. The most common collection method was sweep netting. This technique involves the use of a sweep net to collect spiders from low vegetation. A second technique employed was litter sifting. Litter sifting uses a long canvas tube separated on the inside by metal screens (called a litter sifter). Leaf litter is put into the top of the litter sifter and the tube is held over a white sheet and shaken so that spiders that leave the leaf litter can 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 35 person-hours were spent collecting spiders.

Voucher Specimens

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

Summary Overview

The Goose Pond bioblitz was considered a great success by the spider team. We expected to find approximately 40 species through one day and night of searching (~ 35 person-hours). However, after spending two weeks identifying spiders back in the lab post-bioblitz, it was revealed that we found 84 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) and two undescribed species (new to science). These notable species were as follows:

Drassyllus eremitus – Stealthy Ground Spider (Gnaphosidae): This spider is known throughout the east coast of the US and as far west as Texas. Indiana seems to be a gap in the knowledge of the distribution of this spider, however, as it has never been collected in the state. However, the state is well within its known range. Spiders of this family are generally litter-dwellers and commonly hunt small arthropods. They do not build webs. We found two females.

Agyneta spicula – Sheetweb weaver (Linyphiidae): This species is largely known from the central US. The closest state to Indiana from which it has been previously recorded was Iowa. The occurrence of this species in Indiana represents a large range extension. These spiders are known to live in low vegetation, about half a meter off the ground. They build small horizontal sheet webs and catch small arthropods for food. We found one female.

Floricomus rostratus – Dwarf weaver (Linyphiidae): This dwarf weaver is a small spider (1–2 mm in length). It lives near the ground, spinning a horizontal sheet web that it uses to catch tiny prey such as collembola (springtails). Interestingly, the males of this species have a horn on their head tipped with hairs. Evidence exists that supports the idea that these structures function in mating. This spider is rather widespread but is rarely found. We found one male.

Grammonota ornata – Dwarf weaver (Linyphiidae): Like *F. rostratus*, this spider is small (1–2 mm), spins a horizontal sheet web close to the ground, and preys upon small arthropods such as collembola. This species is known from northeastern US and Canada. We found two males and five females.

Schizocosa stridulans – Wolf spider (Lycosidae): This is an infrequently collected spider that was recently described in 1991. It's largely restricted to the southern US and the Midwest. Like most wolf spiders, this species does not build webs and instead wanders on top of the leaf litter searching for small arthropod prey items. We found one male.

Philodromus bimuricatus – Agile running crab spider (Philodromidae): This species occurs in the eastern US and the Midwest, though is found only rarely. The only way to distinguish females of this spider from its congeners is to dissect the genitalia, observe the ducts on the interior side of the body using a powerful dissecting scope, and compare those duct formations to known illustrations of other species. We found one female.

Wubana n. sp. – [No common name] (Linyphiidae): This specimen is a small adult female spider (1–2 mm) that is in the genus *Wubana*. However, the shape of its epigynum is unique and it is likely an undescribed species in this genus. Interestingly, another undescribed species of *Wubana* was found at Yellowwood State Forest this year as well. These spiders in *Wubana*, like other small linyphiids, build small sheet webs near the ground to catch small arthropods. We found one female.

Phrurotimpus n. sp. – [No common name] (Phrurolithidae): These specimens (four males and two females) are likely sister to *P. borealis*, as they resemble this species. However, the male reproductive parts are slightly different, morphologically, and the female reproductive parts are much more morphologically different than *P. borealis*. These specimens will be included in a revision of the Phrurolithidae family.

Clearly, Goose Pond Fish and Wildlife Area is a very diverse habitat when it comes to spiders. If we uncovered six new distribution records and one undescribed species after a single day of sampling, it's likely that an even higher amount of diversity would be discovered with prolonged sampling. Goose Pond FWA is an important area for spider diversity and is likely an important area for arthropod diversity in general as well. Conserving this area and areas in Indiana like Goose Pond FWA would be a great start towards preserving arthropod biodiversity in the state.

Members of the spider team. (*Photo by Brittany Davis*)

Members of the spider team at work.
(*Top photo by Brittany Davis; bottom photo by Dave W. Fox*)

List of vascular plants (417 taxa) observed during the Goose Pond II Biodiversity Survey, 18 – 19 June 2016.

Team Leader: Scott Namestnik

Team Members: Steve Dunbar, Eyup Erdogan, Danielle Follette, Molly Hacker, Nick Harby, Jessica Helmbold, Ben Hess, Collin Hobbs, Ahmed Hubini, Katie Kogler, Heather Osborn, Nathanael Pilla, Paul Rothrock, Don Ruch, Brian Stayte, Tony Troche, Terry Wise

List of Tables:

Table 17a.—Vascular Flora of Goose Pond and Beehunter Marsh listed by scientific name and common name. Scientific names are listed alphabetically first by common names of phyla (i.e., Pteridophytes = ferns and allies, Gymnosperms = cone-bearing seed plants, and Angiosperms = flowering plants), then alphabetically by families within the phyla groups, and lastly alphabetically by species within each family. Nomenclature follows The PLANTS Database (USDA, NRCS 2016); where family classifications differ from those of the Angiosperm Phlogeny Group (APG), APG classifications are included in brackets. Footnotes are located at the end of the table. C = Coefficient of Conservatism.

Scientific Name	Common Name	C	Native
PTERIDOPHYTES (ferns and allies)			
Aspleniaceae (Spleenwort Family)			
Asplenium platyneuron (L.) Britton, Sterns & Poggenb.	Ebony spleenwort	3	X
Dryopteridaceae (Wood Fern Family)			
Dryopteris carthusiana (Vill.) H.P. Fuchs	Spinulose woodfern	6	X
Onoclea sensibilis L.	Sensitive fern	4	X
Polystichum acrostichoides (Michx.) Schott	Christmas fern	5	X
Ophioglossaceae (Adder's-tongue Family)			
Botrychium virginianum (L.) Sw.	Rattlesnake fern	4	X
Ophioglossum vulgatum L.	Southern adderstongue	4	X
GYMNOSPERMS (cone-bearing seed plants)			
Cupressaceae (Cypress Family)			
Juniperus virginiana L.	Eastern redcedar	2	X
Pinaceae (Pine Family)			
Pinus strobus L.	Eastern white pine	5	X
Pinus sylvestris L.	Scots pine	0	

ANGIOSPERMS (flowering plants)			
Acanthaceae (Acanthus Family)			
Ruellia strepens L.	Limestone wild petunia	4	X
Aceraceae (Maple Family) [Sapindaceae]			
Acer negundo L.	Boxelder	1	X
Acer rubrum L. var. *rubrum*	Red maple	5	X
Acer saccharinum L.	Silver maple	1	X
Alismataceae (Water-plantain Family)			
Alisma subcordatum Raf.	American water plantain	2	X
Sagittaria brevirostra Mack. & Bush	Shortbeak arrowhead	3	X
Sagittaria latifolia Willd.	Broadleaf arrowhead	3	X
Sagittaria calycina Engelm. var. *calycina*	Hooded arrowhead	6	X
Sagittaria L. (*S. brevirostra* or *S. latifolia*)	Arrowhead	NA	X
Amaranthaceae (Amaranth Family)			
Amaranthus tuberculatus (Moq.) Sauer	Roughfruit amaranth	1	X
Anacardiaceae (Sumac Family)			
Rhus glabra L.	Smooth sumac	1	X
Toxicodendron radicans (L.) Kuntze ssp. *negundo* (Greene) Gillis	Eastern poison ivy	1	X
Annonaceae (Custard-apple Family)			
Asimina triloba (L.) Dunal	Pawpaw	6	X
Apiaceae (Carrot Family)			
Cicuta maculata L.	Spotted water hemlock	6	X
Conium maculatum L.	Poison hemlock	0	
Daucus carota L.	Queen Anne's lace	0	
Eryngium yuccifolium Michx.	Button eryngo	10	X
Hydrocotyle ranunculoides L. f.	Floating marshpennywort	0	
Pastinaca sativa L.	Wild parsnip	0	
Sanicula canadensis L.	Canadian blacksnakeroot	2	X
Sanicula odorata (Raf.) K.M. Pryer & L.R. Phillippe	Clustered blacksnakeroot	2	X
Apocynaceae (Dogbane Family)			
Apocynum cannabinum L.	Indianhemp	2	X
Apocynum sibiricum Jacq.[1]	Indianhemp	2	X
Araceae (Arum Family)			
Arisaema triphyllum (L.) Schott	Jack in the pulpit	4	X
Asclepiadaceae (Milkweed Family) [Apocynaceae]			
Asclepias incarnata L.	Swamp milkweed	4	X
Asclepias syriaca L.	Common milkweed	1	X
Asclepias tuberosa L.	Butterfly milkweed	4	X
Cynanchum laeve (Michx.) Pers.	Honeyvine	1	X

Asteraceae (Aster Family)			
Achillea millefolium L.	Common yarrow	0	X
Ageratina altissima (L.) R.M. King & H. Rob.	White snakeroot	2	X
Ambrosia artemisiifolia L. var. *elatior* (L.) Descourtils	Annual ragweed	0	X
Ambrosia trifida L.	Great ragweed	0	X
Arctium minus Bernh.	Lesser burdock	0	
Arnoglossum reniforme (Hook.) H. Rob.	Great indian plantain	8	X
Bidens bipinnata L.	Spanish needles	0	X
Bidens cernua L.	Nodding beggartick	2	X
Bidens frondosa L.	Devil's beggartick	1	X
Bidens L. (*B. aristosa* or *B. polylepis*)	Beggarticks	NA	X
Bidens L. (*B. comosa* or *B. connata*)	Beggarticks	NA	X
Bidens vulgata Greene	Big devils beggartick	0	X
Boltonia asteroides (L.) L'Hér. var. *recognita* (Fernald & Grisc.) Cronquist	White doll's daisy	5	X
Cirsium altissimum (L.) Hill	Tall thistle	4	X
Cirsium arvense (L.) Scop.	Canada thistle	0	
Cirsium discolor (Muhl. ex Willd.) Spreng.	Field thistle	3	X
Cirsium vulgare (Savi) Ten.	Bull thistle	0	
Conyza canadensis (L.) Cronquist	Canadian horseweed	0	X
Eclipta prostrata (L.) L.	False daisy	3	X
Erechtites hieraciifolius (L.) Raf. ex DC.	American burnweed	2	X
Erigeron annuus (L.) Pers.	Eastern daisy fleabane	0	X
Erigeron philadelphicus L.	Philadelphia fleabane	3	X
Erigeron strigosus Muhl. ex Willd.	Prairie fleabane	2	X
Eupatorium perfoliatum L.	Common boneset	4	X
Eupatorium serotinum Michx.	Lateflowering thoroughwort	0	X
Euthamia graminifolia (L.) Nutt.	Flat-top goldentop	3	X
Helianthus grosseserratus M. Martens	Sawtooth sunflower	3	X
Helianthus tuberosus L.	Jerusalem artichoke	2	X
Heliopsis helianthoides (L.) Sweet	Smooth oxeye	4	X
Iva annua L.	Annual marsh elder	0	X
Krigia caespitosa (Raf.) K.L. Chambers	Weedy dwarf dandelion	1	X
Lactuca canadensis L.	Canada lettuce	2	X
Lactuca floridana (L.) Gaertn.	Woodland lettuce	5	X
Lactuca saligna L.	Willowleaf lettuce	0	
Lactuca serriola L.	Prickly lettuce	0	
Leucanthemum vulgare Lam.	Oxeye daisy	0	
Matricaria discoidea DC.	Disc mayweed	0	
Oligoneuron rigidum (L.) Small var. *rigidum*	Stiff goldenrod	7	X
Packera glabella (Poir.) C. Jeffrey	Butterweed	0	X

Pyrrhopappus carolinianus (Walter) DC.	Carolina desert-chicory	2	X
Ratibida pinnata (Vent.) Barnhart	Pinnate prairie coneflower	5	X
Rudbeckia hirta L.	Blackeyed Susan	2	X
Rudbeckia laciniata L.	Cutleaf coneflower	3	X
Silphium integrifolium Michx. var. *integrifolium*	Wholeleaf rosinweed	7	X
Silphium laciniatum L.	Compassplant	10	X
Silphium perfoliatum L.	Cup plant	4	X
Solidago altissima L.	Canada goldenrod	0	X
Solidago canadensis L. var. *hargeri* Fernald	Harger's goldenrod	0	X
Sonchus asper (L.) Hill	Spiny sowthistle	0	
Symphyotrichum lanceolatum (Willd.) G.L. Nesom ssp. *lanceolatum*	White panicle aster	3	X
Symphyotrichum lateriflorum (L.) Á. Löve & D. Löve	Calico aster	3	X
Symphyotrichum ontarionis (Wiegand) G.L. Nesom	Bottomland aster	5	X
Symphyotrichum pilosum (Willd.) G.L. Nesom var. *pilosum*	Hairy white oldfield aster	0	X
Symphyotrichum pilosum (Willd.) G.L. Nesom var. *pringlei* (A. Gray) G.L. Nesom	Pringle's aster	5	X
Taraxacum officinale F.H. Wigg.	Common dandelion	0	
Tragopogon pratensis L.	Jack-go-to-bed-at-noon	0	
Verbesina alternifolia (L.) Britton ex Kearney	Wingstem	3	X
Vernonia gigantea (Walter) Trel.	Giant ironweed	2	X
Xanthium strumarium L.	Rough cocklebur	0	X
Balsaminaceae (Touch-me-not Family)			
Impatiens capensis Meerb.	Jewelweed	2	X
Berberidaceae (Barberry Family)			
Berberis thunbergii DC.	Japanese barberry	0	
Podophyllum peltatum L.	Mayapple	3	X
Betulaceae (Birch Family)			
Corylus americana Walter	American hazelnut	4	X
Bignoniaceae (Trumpet-creeper Family)			
Campsis radicans (L.) Seem. ex Bureau	Trumpet creeper	1	X
Boraginaceae (Borage Family)			
Hackelia virginiana (L.) I.M. Johnst.	Beggarslice	0	X
Myosotis sp.	Forget-me-not	NA	
Brassicaceae (Mustard Family)			
Alliaria petiolata (M. Bieb.) Cavara & Grande	Garlic mustard	0	
Barbarea vulgaris W.T. Aiton	Garden yellowrocket	0	
Brassica nigra (L.) W.D.J. Koch	Black mustard	0	
Capsella bursa-pastoris (L.) Medik.	Shepherd's purse	0	
Lepidium campestre (L.) W.T. Aiton	Field pepperweed	0	
Lepidium virginicum L.	Virginia pepperweed	0	X

Rorippa palustris (L.) Besser ssp. *fernaldiana* (Butters & Abbe) Jonsell	Fernald's yellowcress	2	X
Rorippa palustris (L.) Besser ssp. *hispida* (Desv.) Jonsell	Hispid yellowcress	2	X
Rorippa sessiliflora (Nutt.) Hitchc.	Stalkless yellowcress	3	X
Thlaspi arvense L.	Field pennycress	0	
Cabombaceae (Water-shield Family)			
Brasenia schreberi J.F. Gmel.	Watershield	4	X
Campanulaceae (Bellflower Family)			
Campanulastrum americanum (L.) Small	American bellflower	4	X
Triodanis perfoliata (L.) Nieuwl.	Clasping Venus' looking-glass	2	X
Cannabaceae (Hemp Family)			
Humulus lupulus L. var. *lupulus*	Common hop	0	
Caprifoliaceae (Honeysuckle Family)			
Lonicera japonica Thunb.	Japanese honeysuckle	0	
Lonicera maackii (Rupr.) Herder	Amur honeysuckle	0	
Sambucus nigra L. ssp. *canadensis* (L.) R. Bolli	American black elderberry	2	X
Viburnum prunifolium L.	Blackhaw	4	X
Caryophyllaceae (Pink Family)			
Dianthus armeria L.	Deptford pink	0	
Saponaria officinalis L.	Bouncingbet	0	
Silene antirrhina L.	Sleepy silene	0	X
Silene latifolia Poir. ssp. *alba* (Mill.) Greuter & Burdet	Bladder campion	0	
Stellaria media (L.) Vill. ssp. *media*	Common chickweed	0	
Celastraceae (Bittersweet Family)			
Celastrus orbiculatus Thunb.	Oriental bittersweet	0	
Euonymus alatus (Thunb.) Siebold	Burningbush	0	
Euonymus fortunei (Turcz.) Hand.-Maz.	Winter creeper	0	
Ceratophyllaceae (Hornwort Family)			
Ceratophyllum demersum L.	Coon's tail	1	X
Chenopodiaceae (Goosefoot Family) [Amaranthaceae]			
Chenopodium album L.	Lambsquarters	0	
Clusiaceae (Mangosteen Family) [Hypericaceae]			
Hypericum mutilum L.	Dwarf St. Johnswort	4	X
Hypericum perforatum L.	Common St. Johnswort	0	
Hypericum prolificum L.	Shrubby St. Johnswort	4	X
Hypericum punctatum Lam.	Spotted St. Johnswort	3	X
Commelinaceae (Spiderwort Family)			
Commelina communis L.	Asiatic dayflower	0	
Convolvulaceae (Morning-glory Family)			
Calystegia sepium (L.) R. Br.	Hedge false bindweed	1	X
Ipomoea hederacea Jacq.	Ivyleaf morning-flory	0	

Ipomoea lacunosa L.	Whitestar	2	X
Ipomoea pandurata (L.) G. Mey.	Man of the earth	3	X
Ipomoea purpurea (L.) Roth	Tall morning-glory	0	
Cornaceae (Dogwood Family)			
Cornus drummondii C.A. Mey.	Roughleaf dogwood	2	X
Cornus florida L.	Flowering dogwood	4	X
Cornus obliqua Raf.	Silky dogwood	5	X
Cornus racemosa Lam.	Gray dogwood	2	X
Nyssa sylvatica Marshall	Blackgum	5	X
Crassulaceae (Stonecrop Family) [Penthoraceae]			
Penthorum sedoides L.	Ditch stonecrop	2	X
Cyperaceae (Sedge Family)			
Bolboschoenus fluviatilis (Torr.) Soják	River bulrush	4	X
Carex annectens (E.P. Bicknell) E.P. Bicknell	Yellowfruit sedge	3	X
Carex blanda Dewey	Eastern woodland sedge	1	X
Carex brevior (Dewey) Mack.	Shortbeak sedge	4	X
Carex bushii Mack.	Bush's sedge	7	X
Carex caroliniana Schwein.	Carolina sedge	7	X
Carex cristatella Britton	Crested sedge	3	X
Carex frankii Kunth	Frank's sedge	2	X
Carex granularis Muhl. ex Willd.	Limestone meadow sedge	2	X
Carex gravida L.H. Bailey	Heavy sedge	5	X
Carex grisea Wahlenb.	Inflated narrow-leaf sedge	3	X
Carex lacustris Willd.	Hairy sedge	7	X
Carex leavenworthii Dewey	Leavenworth's sedge	1	X
Carex lupulina Muhl. ex Willd.	Hop sedge	4	X
Carex lurida Wahlenb.	Shallow sedge	4	X
Carex molesta Mack. ex Bright	Troublesome sedge	2	X
Carex muehlenbergii Schkuhr ex Willd. var. *muehlenbergii*	Muhlenberg's sedge	5	X
Carex normalis Mack.	Greater straw sedge	3	X
Carex pellita Muhl. ex Willd.	Woolly sedge	2	X
Carex radiata (Wahlenb.) Small	Eastern star sedge	4	X
Carex scoparia Schkuhr ex Willd.	Broom sedge	4	X
Carex shortiana Dewey	Short's sedge	3	X
Carex squarrosa L.	Squarrose sedge	4	X
Carex swanii (Fernald) Mack.	Swan's sedge	4	X
Carex tribuloides Wahlenb. var. *sangamonensis* Clokey	Blunt broom sedge	5	X
Carex tribuloides Wahlenb. var. *tribuloides*	Blunt broom sedge	5	X
Carex typhina Michx.	Cattail sedge	7	X
Carex vulpinoidea Michx.	Fox sedge	2	X

Cyperus acuminatus Torr. & Hook. ex Torr.	Tapertip flatsedge	2	X
Cyperus esculentus L. var. *leptostachyus* Boeckeler	Yellow nutsedge	0	X
Cyperus odoratus L.	Fragrant flatsedge	1	X
Cyperus strigosus L.	Strawcolored flatsedge	0	X
Eleocharis acicularis (L.) Roem. & Schult.	Needle spikerush	2	X
Eleocharis erythropoda Steud.	Bald spikerush	2	X
Eleocharis obtusa (Willd.) Schult.	Blunt spikerush	1	X
Eleocharis palustris (L.) Roem. & Schult.	Common spikerush	8	X
Eleocharis quadrangulata (Michx.) Roem. & Schult.	Squarestem spikerush	4	X
Eleocharis xyridiformis Fernald & Brack.[2]	Pale spikerush	NA	X
Schoenoplectiella mucronata (L.) J. Jung & H.K. Choi	Bog bulrush	0	
Schoenoplectus tabernaemontani (C.C. Gmel.) Palla	Softstem bulrush	4	X
Scirpus cyperinus (L.) Kunth	Woolgrass	4	X
Scirpus georgianus Harper	Georgia bulrush	3	X
Scirpus pendulus Muhl.	Rufous bulrush	2	X
Dioscoreaceae (Yam Family)			
Dioscorea villosa L.	Wild yam	4	X
Ebenaceae (Ebony Family)			
Diospyros virginiana L.	Common persimmon	2	X
Elaeagnaceae (Oleaster Family)			
Elaeagnus umbellata Thunb.	Autumn olive	0	
Euphorbiaceae (Spurge Family)			
Acalypha rhomboidea Raf.	Common threeseed mercury	0	X
Chamaesyce nutans (Lag.) Small	Eyebane	0	X
Euphorbia davidii Subils	David's spurge	0	
Fabaceae (Pea Family)			
Amphicarpaea bracteata (L.) Fernald var. *bracteata*	American hogpeanut	5	X
Apios americana Medik.	Groundnut	3	X
Chamaecrista fasciculata (Michx.) Greene	Partridge pea	2	X
Desmanthus illinoensis (Michx.) MacMill. ex B.L. Rob. & Fernald	Illinois bundleflower	3	X
Desmodium canadense (L.) DC.	Showy ticktrefoil	3	X
Desmodium glabellum (Michx.) DC.	Dillenius' ticktrefoil	3	X
Desmodium paniculatum (L.) DC.	Panicledleaf ticktrefoil	2	X
Gleditsia triacanthos L.	Honeylocust	1	X
Kummerowia stipulacea (Maxim.) Makino	Korean clover	0	
Kummerowia striata (Thunb.) Schindl.	Japanese clover	0	
Lespedeza cuneata (Dum. Cours.) G. Don	Sericea lespedeza	0	
Lotus corniculatus L.	Bird's-foot trefoil	0	
Medicago lupulina L.	Black medick	0	
Medicago sativa L. ssp. *sativa*	Alfalfa	0	

Melilotus alba Medik.[4]	White sweetclover	0	
Melilotus officinalis (L.) Lam.	Yellow sweetclover	0	
Robinia pseudoacacia L.	Black locust	1	X
Securigera varia (L.) Lassen	Crownvetch	0	
Senna marilandica (L.) Link	Maryland senna	4	X
Strophostyles helvola (L.) Elliott	Amberique-bean	3	X
Trifolium campestre Schreb.	Field clover	0	
Trifolium hybridum L.	Alsike clover	0	
Trifolium pratense L.	Red clover	0	
Trifolium repens L.	White clover	0	
Fagaceae (Beech Family)			
Quercus alba L.	White oak	5	X
Quercus imbricaria Michx.	Shingle oak	3	X
Quercus palustris Münchh.	Pin oak	3	X
Quercus rubra L.	Northern red oak	4	X
Quercus shumardii Buckley var. *shumardii*	Shumard oak	7	X
Geraniaceae (Geranium Family)			
Geranium carolinianum L.	Carolina geranium	2	X
Haloragaceae (Water Milfoil Family)			
Myriophyllum spicatum L.	Eurasian watermilfoil	0	
Hamamelidaceae (Witch-hazel Family) [Altingiaceae]			
Liquidambar styraciflua L.	Sweetgum	4	X
Iridaceae (Iris Family)			
Sisyrinchium angustifolium Mill.	Narrowleaf blue-eyed grass	3	X
Juglandaceae (Walnut Family)			
Carya cordiformis (Wangenh.) K. Koch	Bitternut hickory	5	X
Juglans nigra L.	Black walnut	2	X
Juncaceae (Rush Family)			
Juncus acuminatus Michx.	Tapertip rush	4	X
Juncus brachycarpus Engelm.	Whiteroot rush	4	X
Juncus dudleyi Wiegand	Dudley's rush	2	X
Juncus effusus L.	Common rush	3	X
Juncus interior Wiegand	Inland rush	3	X
Juncus tenuis Willd.	Poverty rush	0	X
Lamiaceae (Mint Family)			
Lamium amplexicaule L.	Henbit deadnettle	0	
Lycopus americanus Muhl. ex W.P.C. Barton	American water horehound	3	X
Lycopus uniflorus Michx.	Northern bugleweed	5	X
Monarda fistulosa L.	Wild bergamot	3	X
Physostegia virginiana (L.) Benth. ssp. *virginiana*	Obedient plant	5	X

Prunella vulgaris L. ssp. *lanceolata* (W. Bartram) Hultén	Lance selfheal	1	X
Pycnanthemum tenuifolium Schrad.	Narrowleaf mountainmint	4	X
Pycnanthemum virginianum (L.) T. Dur. & B.D. Jacks. ex B.L. Rob. & Fernald	Virginia mountainmint	5	X
Scutellaria lateriflora L.	Blue skullcap	4	X
Stachys tenuifolia Willd.	Smooth hedgenettle	4	X
Teucrium canadense L. var. *canadense*	Canada germander	3	X
Lauraceae (Laurel Family)			
Lindera benzoin (L.) Blume	Northern spicebush	5	X
Sassafras albidum (Nutt.) Nees	Sassafras	1	X
Lemnaceae (Duckweed Family) [Araceae]			
Lemna minor L.	Common duckweed	3	X
Spirodela polyrrhiza (L.) Schleid.	Common duckmeat	5	X
Liliaceae (Lily Family) [Alliaceae, Hemerocallidaceae, Ruscaceae]			
Allium canadense L.	Meadow garlic	1	X
Allium vineale L.	Wild garlic	0	
Hemerocallis fulva (L.) L.	Orange daylily	0	
Maianthemum racemosum (L.) Link	Feathery false lily of the valley	4	X
Polygonatum biflorum (Walter) Elliott	Smooth Solomon's seal	4	X
Lythraceae (Loosestrife Family)			
Ammannia coccinea Rottb.	Valley redstem	2	X
Lythrum alatum Pursh	Winged lythrum	5	X
Rotala ramosior (L.) Koehne	Lowland rotala	2	X
Magnoliaceae (Magnolia Family)			
Liriodendron tulipifera L.	Tuliptree	4	X
Malvaceae (Mallow Family)			
Abutilon theophrasti Medik.	Velvetleaf	0	
Hibiscus laevis All.	Halberdleaf rosemallow	4	X
Hibiscus moscheutos L.	Crimsoneyed rosemallow	4	X
Sida spinosa L.	Prickly fanpetals	0	
Menispermaceae (Moonseed Family)			
Menispermum canadense L.	Common moonseed	3	X
Molluginaceae (Carpet-weed Family)			
Mollugo verticillata L.	Green carpetweed	0	
Moraceae (Mulberry Family)			
Morus alba L.	White mulberry	0	
Najadaceae (Water-nymph Family) [Hydrocharitaceae]			
Najas minor All.	Brittle waternymph	0	
Nelumbonaceae (Lotus-lily Family)			
Nelumbo lutea Willd.	American lotus	4	X

Oleaceae (Olive Family)			
Fraxinus americana L.	White ash	4	X
Fraxinus pennsylvanica Marshall var. *lanceolata* (Borkh.) Sarg.[3]	Green ash	1	X
Ligustrum obtusifolium Siebold & Zucc.	Border privet	0	
Onagraceae (Evening Primrose Family)			
Circaea lutetiana L. spp. *canadensis* (L.) Asch. & Magnus	Broadleaf enchanter's nightshade	2	X
Epilobium coloratum Biehler	Purpleleaf willowherb	3	X
Ludwigia alternifolia L.	Seedbox	3	X
Ludwigia palustris (L.) Elliott	Marsh seedbox	3	X
Ludwigia peploides (Kunth) P.H. Raven ssp. *glabrescens* (Kuntze) P.H. Raven	Floating primrose-willow	2	X
Oenothera biennis L.	Common evening primrose	0	X
Orchidaceae (Orchid Family)			
Liparis liliifolia (L.) Rich. ex Ker Gawl.	Brown widelip orchid	3	X
Oxalidaceae (Wood-sorrel Family)			
Oxalis dillenii Jacq.	Slender yellow woodsorrel	0	X
Oxalis stricta L.	Common yellow oxalis	0	X
Phytolaccaceae (Pokeweed Family)			
Phytolacca americana L.	American pokeweed	0	X
Plantaginaceae (Plantain Family)			
Plantago aristata Michx.	Largebracted plantain	0	X
Plantago lanceolata L.	Narrowleaf plantain	0	
Plantago rugelii Decne.	Blackseed plantain	0	X
Plantago virginica L.	Virginia plantain	2	X
Platanaceae (Plane-tree Family)			
Platanus occidentalis L.	American sycamore	3	X
Poaceae (Grass Family)			
Agrostis gigantea Roth	Redtop	0	
Agrostis hyemalis (Walter) Britton, Sterns & Poggenb.	Winter bentgrass	2	X
Andropogon gerardii Vitman	Big bluestem	5	X
Andropogon virginicus L.	Broomsedge bluestem	1	X
Bromus racemosus L.	Bald brome	0	
Bromus inermis Leyss.	Smooth brome	0	
Bromus arvensis L.	Field brome	0	
Bromus tectorum L.	Cheatgrass	0	
Cinna arundinacea L.	Sweet woodreed	4	X
Dactylis glomerata L.	Orchardgrass	0	
Dichanthelium acuminatum (Sw.) Gould & C.A. Clark var. *fasciculatum* (Torr.) Freckmann	Western panicgrass	2	X
Dichanthelium clandestinum (L.) Gould	Deertongue	3	X
Echinochloa crus-galli (L.) P. Beauv.	Barnyardgrass	0	

Echinochloa muricata (P. Beauv.) Fernald	Rough barnyardgrass	1	X
Elymus repens (L.) Gould	Quackgrass	0	
Elymus villosus Muhl. ex Willd.	Hairy wildrye	4	X
Elymus virginicus L. var. *virginicus*	Virginia wildrye	3	X
Festuca rubra L.	Red fescue	0	
Festuca subverticillata (Pers.) Alexeev	Nodding fescue	4	X
Glyceria striata (Lam.) Hitchc.	Fowl mannagrass	4	X
Hordeum jubatum L.	Foxtail barley	0	
Hordeum pusillum Nutt.	Little barley	0	X
Leersia oryzoides (L.) Sw.	Rice cutgrass	2	X
Leersia virginica Willd.	Whitegrass	4	X
Muhlenbergia mexicana (L.) Trin.	Mexican muhly	4	X
Panicum dichotomiflorum Michx.	Fall panicgrass	0	X
Panicum virgatum L.	Switchgrass	4	X
Phalaris arundinacea L.	Reed canarygrass	0	
Phleum pratense L.	Timothy	0	
Phragmites australis (Cav.) Trin. ex Steud. ssp. *australis*	European common reed	0	
Poa compressa L.	Canada bluegrass	0	
Poa pratensis L.	Kentucky bluegrass	0	
Schedonorus arundinaceus (Schreb.) Dumort., nom. cons.	Tall fescue	0	
Schedonorus pratensis (Huds.) P. Beauv.	Meadow fescue	0	
Schizachyrium scoparium (Michx.) Nash	Little bluestem	4	X
Setaria faberi Herrm.	Japanese bristlegrass	0	
Setaria pumila (Poir.) Roem. & Schult.	Yellow foxtail	0	
Sorghastrum nutans (L.) Nash	Indiangrass	4	X
Sorghum halepense (L.) Pers.	Johnsongrass	0	
Sphenopholis obtusata (Michx.) Scribn.	Prairie wedgescale	5	X
Sporobolus heterolepis (A. Gray) A. Gray	Prairie dropseed	10	X
Tripsacum dactyloides (L.) L.	Eastern gamagrass	2	X
Polygonaceae (Buckwheat Family)			
Polygonum amphibium L. var. *emersum* Michx.	Longroot smartweed	4	X
Polygonum cespitosum Blume var. *longisetum* (Bruijn) A.N. Steward	Oriental lady's thumb	0	
Polygonum hydropiperoides Michx.	Swamp smartweed	3	X
Polygonum lapathifolium L.	Curlytop knotweed	0	X
Polygonum pensylvanicum L.	Pennsylvania smartweed	0	X
Polygonum punctatum Elliott var. *punctatum*	Dotted smartweed	3	X
Polygonum persicaria L.	Spotted ladysthumb	0	
Polygonum ramosissimum Michx.	Bushy knotweed	4	X
Polygonum virginianum L.	Jumpseed	3	X
Rumex altissimus Alph. Wood	Pale dock	2	X

Rumex crispus L.	Curly dock	0	
Rumex verticillatus L.	Swamp dock	5	X
Potamogetonaceae (Pondweed Family)			
Potamogeton crispus L.	Curly pondweed	0	
Potamogeton diversifolius Raf.	Waterthread pondweed	4	X
Potamogeton foliosus Raf.	Leafy pondweed	4	X
Potamogeton nodosus Poir.	Longleaf pondweed	4	X
Stuckenia pectinata (L.) Börner	Sago pondweed	3	X
Primulaceae (Primrose Family)			
Lysimachia ciliata L.	Fringed loosestrife	4	X
Lysimachia nummularia L.	Creeping jenny	0	
Ranunculaceae (Buttercup Family)			
Ranunculus abortivus L.	Littleleaf buttercup	0	X
Ranunculus bulbosus L.	St. Anthony's turnip	0	
Ranunculus repens L.	Creeping buttercup	0	
Ranunculus sceleratus L.	Cursed buttercup	3	X
Rosaceae (Rose Family)			
Agrimonia parviflora Aiton	Harvestlice	4	X
Amelanchier arborea (Michx. f.) Fernald	Common serviceberry	6	X
Crataegus sp. L.	Hawthorn	NA	X
Fragaria virginiana Duchesne	Virginia strawberry	2	X
Geum canadense Jacq.	White avens	1	X
Geum laciniatum Murray	Rough avens	3	X
Geum vernum (Raf.) Torr. & A. Gray	Spring avens	1	X
Potentilla norvegica L.	Norwegian cinquefoil	0	X
Potentilla simplex Michx.	Common cinquefoil	2	X
Prunus serotina Ehrh.	Black cherry	1	X
Pyrus calleryana Decne.	Callery pear	0	
Rosa multiflora Thunb.	Multiflora rose	0	
Rosa setigera Michx.	Climbing rose	4	X
Rubus flagellaris Willd.	Northern dewberry	2	X
Rubus occidentalis L.	Black raspberry	1	X
Rubus pensilvanicus Poir.	Pennsylvania blackberry	5	X
Rubiaceae (Madder Family)			
Cephalanthus occidentalis L.	Common buttonbush	5	
Galium aparine L.	Stickywilly	1	
Galium circaezans Michx.	Licorice bedstraw	7	X
Galium obtusum Bigelow	Bluntleaf bedstraw	5	X
Galium tinctorium (L.) Scop.	Stiff marsh bedstraw	6	X
Galium triflorum Michx.	Fragrant bedstraw	5	X
Spermacoce glabra Michx.	Smooth false buttonweed	3	X

Salicaceae (Willow Family)			
Populus deltoides W. Bartram ex Marshall	Eastern cottonwood	1	X
Salix interior Rowlee	Sandbar willow	1	X
Salix nigra Marshall	Black willow	3	X
Scrophulariaceae (Figwort Family) [Plantaginaceae, Linderniaceae, Phrymaceae, Scrophulariaceae]			
Gratiola neglecta Torr.	Clammy hedgehyssop	4	X
Gratiola virginiana L.	Roundfruit hedgehyssop	4	X
Lindernia dubia (L.) Pennell var. *anagallidea* (Michx.) Cooperr.	Yellowseed false pimpernel	3	X
Lindernia dubia (L.) Pennell var. *dubia*	Yellowseed false pimpernel	3	X
Mimulus alatus Aiton	Sharpwing monkeyflower	4	X
Mimulus ringens L.	Allegheny monkeyflower	4	X
Penstemon calycosus Small	Longsepal beardtongue	4	X
Penstemon digitalis Nutt. ex Sims	Foxglove beardtongue	4	X
Verbascum blattaria L.	Moth mullein	0	
Verbascum thapsus L.	Common mullein	0	
Veronica peregrina L. ssp. *peregrina*	Neckweed	0	X
Smilacaceae (Catbrier Family)			
Smilax tamnoides L.	Bristly greenbrier	3	
Solanaceae (Potato Family)			
Physalis longifolia Nutt. var. *subglabrata* (Mack. & Bush) Cronquist	Longleaf groundcherry	0	
Solanum carolinense L.	Carolina horsenettle	0	
Solanum ptycanthum Dunal	West Indian nightshade	0	
Sparganiaceae (Bur-reed Family) [Typhaceae]			
Sparganium eurycarpum Engelm.	Broadfruit bur-reed	5	
Typhaceae (Cat-tail Family)			
Typha ×*glauca* Godr.	Hybrid cattail	0	
Typha angustifolia L.	Narrowleaf cattail	0	
Typha domingensis Pers.	Southern cattail	0	
Typha latifolia L.	Broadleaf cattail	1	
Ulmaceae (Elm Family)			
Celtis occidentalis L.	Common hackberry	3	X
Ulmus americana L.	American elm	3	X
Ulmus pumila L.	Siberian elm	0	
Ulmus rubra Muhl.	Slippery elm	3	X
Urticaceae (Nettle Family)			
Boehmeria cylindrica (L.) Sw.	Smallspike false nettle	3	X
Laportea canadensis (L.) Weddell	Canadian woodnettle	2	X
Parietaria pensylvanica Muhl. ex Willd.	Pennsylvania pellitory	1	X
Pilea pumila (L.) A. Gray	Canadian clearweed	2	X

Urtica dioica L. ssp. *gracilis* (Aiton) Seland.	California nettle	1	X
Valerianaceae (Valerian Family) [Caprifoliaceae]			
Valerianella radiata (L.) Dufr.	Beaked cornsalad	1	X
Valerianella umbilicata (Sull.) Alph. Wood	Navel cornsalad	5	X
Verbenaceae (Verbena Family) [Verbenaceae, Phrymaceae]			
Phryma leptostachya L.	American lopseed	4	X
Phyla lanceolata (Michx.) Greene	Lanceleaf fogfruit	2	X
Verbena hastata L.	Swamp verbena	3	X
Verbena urticifolia L. var. *urticifolia*	White vervain	3	X
Violaceae (Violet Family)			
Hybanthus concolor (T.F. Forst.) Spreng.	Eastern greenviolet	6	X
Viola pubescens Aiton	Downy yellow violet	5	X
Viola sororia Willd.	Common blue violet	1	X
Vitaceae (Grape Family)			
Ampelopsis cordata Michx.	Heartleaf peppervine	3	X
Parthenocissus quinquefolia (L.) Planch.	Virginia creeper	2	X
Vitis aestivalis Michx.	Summer grape	4	X
Vitis riparia Michx.	Riverbank grape	1	X
Vitis vulpina L.	Frost grape	3	X

[1] Has been taxonomically included with *Apocynum cannabinum* L.

[2] Has been taxonomically included with *Eleocharis macrostachya* Britton

[3] Has been taxonomically included with *Fraxinus pennsylvanica* Marshall

[4] Has been taxonomically included with *Melilotus officinalis* (L.) Lam.

Table 17b.—Location and relative abundance of plant species at various units of Goose Pond and Beehunter Marsh. See Figure 4, page 9 for location of units. TI = Thousand Islands, southern section; CS = Check Station. Relative Abundances: 1 = Rare; 2 = Uncommon; 3 = Fairly common; 4 =Locally common; 5 = Common; 6 = Abundant. Total number of taxa observed at each unit is located in the first and last rows of the table. Footnotes are located at the end of the table.

	Location											
Scientific Name	**MPE1**	**MPW2**	**GP2**	**BH4**	**BH5S**	**BH2**	**GP11N**	**GP18**	**TI**	**GP8**	**GP16**	**CS**
Total Number of Taxa at a Site:	**142**	**154**	**134**	**110**	**85**	**111**	**143**	**139**	**155**	**139**	**114**	**59**
PTERIDOPHYTES (Ferns and their Allies)												
Aspleniaceae (Spleenwort Family)												
Asplenium platyneuron								4	3			
Dryopteridaceae (Wood Fern Family)												
Dryopteris carthusiana									2			
Onoclea sensibilis									1			
Polystichum acrostichoides									2			
Ophioglossaceae (Adder's-tongue Family)												
Botrychium virginianum								2	3			
Ophioglossum vulgatum								1	1			
GYMNOSPERMS (Cone-bearing Seed Plants)												
Cupressaceae (Cypress Family)												
Juniperus virginiana								1	1		1	
Pinaceae (Pine Family)												
Pinus strobus								1				
Pinus sylvestris								2	2			
ANGIOSPERMS (Flowering Plants)												
Acanthaceae (Acanthus Family)												
Ruellia strepens								2	4			
Aceraceae (Maple Family) [Sapindaceae]												
Acer negundo		1		2	1	2	1	2	3			

	Acer rubrum var. *rubrum*	2	1	1	2	2	2	1		2	2	2	
	Acer saccharinum	1	1		2	1			3	3			
Alismataceae (Water-plantain Family)													
	Alisma subcordatum	2		1	3	3	3				3	3	1
	Sagittaria brevirostra	2				2							
	Sagittaria latifolia							1			4	3	
	Sagittaria calycina var. *calycina*	2	3										
	Sagittaria sp.		3		3		3						
Amaranthaceae (Amaranth Family)													
	Amaranthus tuberculatus	6	1		1			3				2	
Anacardiaceae (Sumac Family)													
	Rhus glabra				2			1	1				
	Toxicodendron radicans	1	1	2		2	2	4	4	4	2	2	
Annonaceae (Custard-apple Family)													
	Asimina triloba									2			
Apiaceae (Carrot Family)													
	Cicuta maculata		1				2	2					
	Conium maculatum	1	1		4	4	4	2					
	Daucus carota	1			3	3	3	2	1	2	2	1	
	Eryngium yuccifolium			3									
	Hydrocotyle ranunculoides		5									3	
	Pastinaca sativa	5	5	3	3	3	3	1	1		4	3	
	Sanicula canadensis								1				
	Sanicula odorata								2	4			
Apocynaceae (Dogbane Family)													
	Apocynum cannabinum	3		3	3		3	2	1	3	4	4	2
	Apocynum sibiricum[1]		1	1									
Araceae (Arum Family)													
	Arisaema triphyllum									1			

Asclepiadaceae (Milkweed Family) [Apocynaceae]													
	Asclepias incarnata	2	3	3	3	2	3	2			3	3	1
	Asclepias syriaca	1	5	5	4	3	4	2		1	4	3	1
	Asclepias tuberosa			1									
	Cynanchum laeve	1	1		2	2		2			1		5
Asteraceae (Aster Family)													
	Achillea millefolium			1							2		
	Ageratina altissima								3	4			
	Ambrosia artemisiifolia var. *elatior*	2	2	5	3	3	3	2	2	3	3	2	4
	Ambrosia trifida	2	3	3	3	2	3	2	2	2	2	2	2
	Arctium minus								1	2			
	Arnoglossum reniforme									1			
	Bidens bipinnata										1		
	Bidens cernua	3	3				4					2	
	Bidens frondosa	1	3	2		3					3	3	
	Bidens sp. (*B. aristosa* or *B. polylepis*)		1	5									
	Bidens sp. (*B. comosa* or *B. connata*)	2		1									
	Bidens vulgata									2			
	Boltonia asteroides var. *recognita*	2	2										
	Cirsium altissimum			1					1	1			
	Cirsium arvense	1				2		2					
	Cirsium discolor	1	1					1	1		2	2	
	Cirsium vulgare				2		2	1		1			1
	Conyza canadensis	3	2					3	3	3	2	2	
	Eclipta prostrata	1	1										
	Erechtites hieraciifolius	5	2		3	2	3	2	1	1	4	3	
	Erigeron annuus	2	2	3	3	3	3	2	1	2	5	4	
	Erigeron philadelphicus									1			
	Erigeron strigosus				1								
	Eupatorium perfoliatum											1	

	Eupatorium serotinum	2	3	3	2	2	2	2		1	3	3	2
	Euthamia graminifolia			5			2				2		
	Helianthus grosseserratus			5									
	Helianthus tuberosus					2							
	Heliopsis helianthoides			2									
	Iva annua	3	3	2	2		2	5			4	4	3
	Krigia caespitosa											1	
	Lactuca canadensis		1	1				1	1				
	Lactuca floridana				1				2	2	1		
	Lactuca saligna												1
	Lactuca serriola	1	1		2	2	2	1	1			1	2
	Leucanthemum vulgare					2							
	Matricaria discoidea				1			1			2		
	Oligoneuron rigidum var. *rigidum*			1									
	Packera glabella	2	2		1			2		1	1		
	Pyrrhopappus carolinianus	1									1		
	Ratibida pinnata			1									
	Rudbeckia hirta		1	1				2	1				
	Rudbeckia laciniata					2							
	Silphium integrifolium var. *integrifolium*			6							1		
	Silphium laciniatum			1									
	Silphium perfoliatum			3				3					
	Solidago altissima	2		5									5
	Solidago canadensis var. *hargeri*		2	2	3	3	3	4	2	4			1
	Sonchus asper		2					1					
	Symphyotrichum lanceolatum ssp. *lanceolatum*			2			2	2					
	Symphyotrichum lateriflorum								3	3			
	Symphyotrichum ontarionis									1			
	Symphyotrichum pilosum var. *pilosum*	1	2	2	3			2	2		3	3	

	Symphyotrichum pilosum var. *pringlei*	2	2	2							2	3	
	Taraxacum officinale	1		1	2		2	1	1				1
	Tragopogon pratensis							1					
	Verbesina alternifolia	1			3				1				
	Vernonia gigantea							2			4	3	
	Xanthium strumarium		1					2					
Balsaminaceae (Touch-me-not Family)													
	Impatiens capensis					2			3	2			
Berberidaceae (Barberry Family)													
	Berberis thunbergii								1	1			
	Podophyllum peltatum								3				
Betulaceae (Birch Family)													
	Corylus americana								2				
Bignoniaceae (Trumpet-creeper Family)													
	Campsis radicans	2	1	2				1		2	2	2	
Boraginaceae (Borage Family)													
	Hackelia virginiana								3	3			
	Myosotis sp.											1	
Brassicaceae (Mustard Family)													
	Alliaria petiolata									3			
	Barbarea vulgaris	1	1		5	4	5	2	1	2	2	2	
	Brassica nigra		1										
	Capsella bursa-pastoris									2			
	Lepidium campestre											1	
	Lepidium virginicum	1	1	1				2	2				
	Rorippa palustris ssp. *fernaldiana*					2							
	Rorippa palustris ssp. *hispida*	3											
	Rorippa sessiliflora	5	2										
	Thlaspi arvense	1											

Cabombaceae (Water-shield Family)													
	Brasenia schreberi				2	1							
Campanulaceae (Bellflower Family)													
	Campanulastrum americanum									1			
	Triodanis perfoliata	1				2						1	
Cannabaceae (Hemp Family)													
	Humulus lupulus var. *lupulus*				2	2	2	1					
Caprifoliaceae (Honeysuckle Family)													
	Lonicera japonica	1						3	5	4			
	Lonicera maackii								3	3			
	Sambucus nigra ssp. *canadensis*		1		2			1	2		1		
	Viburnum prunifolium								2				
Caryophyllaceae (Pink Family)													
	Dianthus armeria			1	3			1	1	2	2		
	Saponaria officinalis							3					
	Silene antirrhina	1				3							
	Silene latifolia ssp. *alba*				1								
	Stellaria media ssp. *media*									2			
Celastraceae (Bittersweet Family)													
	Celastrus orbiculatus								1				
	Euonymus alatus								1				
	Euonymus fortunei								1	1			
Ceratophyllaceae (Hornwort Family)													
	Ceratophyllum demersum		3				1						
Chenopodiaceae (Goosefoot Family) [Amaranthaceae]													
	Chenopodium album			2	2	1	1			1			
Clusiaceae (Mangosteen Family) [Hypericaceae]													
	Hypericum mutilum				2	2	2					1	
	Hypericum perforatum				3			1			2	2	
	Hypericum prolificum							1					

	Hypericum punctatum			1						1			
Commelinaceae (Spiderwort Family)													
	Commelina communis								1	1			
Convolvulaceae (Morning-glory Family)													
	Calystegia sepium				3	2	3	1		1	2	2	
	Ipomoea hederacea			1	1								
	Ipomoea lacunosa	6	2	2									
	Ipomoea pandurata			1									
	Ipomoea purpurea										2		
Cornaceae (Dogwood Family)													
	Cornus drummondii	1	1	2	2		2	2	3	3	2	2	
	Cornus florida								1	1			
	Cornus obliqua									1			
	Cornus racemosa									1			
	Nyssa sylvatica								1	1			
Crassulaceae (Stonecrop Family) [Penthoraceae]													
	Penthorum sedoides	5	5	2	3	3	3				3		5
Cyperaceae (Sedge Family)													
	Bolboschoenus fluviatilis	2	4								2	5	
	Carex annectens	1	1	2						2	2	2	
	Carex blanda		1						3	2			
	Carex brevior	3	2		2								2
	Carex bushii			2									
	Carex caroliniana	1	1										
	Carex cristatella	3	1				2	4		1	2		3
	Carex frankii	3	1	5	4		4	2		3	3		3
	Carex granularis		1							1	3		1
	Carex gravida			3									
	Carex grisea								2				
	Carex lacustris								2				

	Carex leavenworthii												1
	Carex lupulina	3	1		3						5	3	4
	Carex lurida	1	1		2						3	5	
	Carex molesta	2		3									
	Carex muehlenbergii var. *muehlenbergii*		1								2		
	Carex normalis									1			
	Carex pellita								1				
	Carex radiata								3	4			
	Carex scoparia		1	5							2		
	Carex shortiana		1		1					2	2		1
	Carex squarrosa				1			2			3	3	
	Carex swanii									4			
	Carex tribuloides var. *sangamonensis*											3	
	Carex tribuloides var. *tribuloides*	2	1	3	3	2	3			2	4		3
	Carex typhina		1										
	Carex vulpinoidea	3	5	5	3	3	3	3	1	3	6	6	5
	Cyperus acuminatus		1	1	2			1					
	Cyperus esculentus var. *leptostachyus*	6	1										
	Cyperus odoratus	2											
	Cyperus strigosus				2		2						
	Eleocharis acicularis		1			2	1	2			2	3	
	Eleocharis erythropoda			2									
	Eleocharis obtusa	5	3	3	5	3	5	2			3	5	
	Eleocharis palustris	2		5	3	2	3	2			4	6	
	Eleocharis quadrangulata		3					2			4		
	Eleocharis xyridiformis[2]		1										
	Schoenoplectiella mucronata	1	1								1		
	Schoenoplectus tabernaemontani	2	2				2				2	3	
	Scirpus cyperinus	1	2	2	3	2	3			1	4	6	
	Scirpus georgianus		2	3	3		3	4	2	2	6	5	1

	Scirpus pendulus			3				3					
Dioscoreaceae (Yam Family)													
	Dioscorea villosa							1	1				
Ebenaceae (Ebony Family)													
	Diospyros virginiana	1	1				1	2	2	3	2	2	
Elaeagnaceae (Oleaster Family)													
	Elaeagnus umbellata							1	1	1			
Euphorbiaceae (Spurge Family)													
	Acalypha rhomboidea		1						3				
	Chamaesyce nutans		1	1	3	3	3	1					1
	Euphorbia davidii			1									
Fabaceae (Pea Family)													
	Amphicarpaea bracteata var. *bracteata*							1					
	Apios americana		2					1					
	Chamaecrista fasciculata			2							2		
	Desmanthus illinoensis												1
	Desmodium canadense			1	2	2	2		2	2			
	Desmodium glabellum			1							1		
	Desmodium paniculatum					1		2	1	2			
	Gleditsia triacanthos				2		2		1	2			
	Kummerowia stipulacea	1											
	Kummerowia striata			3									
	Lespedeza cuneata			6	2	2	2				4	4	
	Lotus corniculatus		1										
	Medicago lupulina			2	2		2	3	2	3	3	2	1
	Medicago sativa ssp. *sativa*										2		
	Melilotus alba[4]		2	1		3		1	1	2	3	3	
	Melilotus officinalis	5	2	2	3	2		1	1	2	3	3	3
	Robinia pseudoacacia									2			
	Securigera varia									2			

	Senna marilandica						1				1		
	Strophostyles helvola							3					
	Trifolium campestre			2				2		2			
	Trifolium hybridum		2	1				1		2	3	2	1
	Trifolium pratense			3		3	2	2	2	2	3	3	1
	Trifolium repens								1	2			
Fagaceae (Beech Family)													
	Quercus alba								1	1			
	Quercus imbricaria					1			1	3			
	Quercus palustris		1						2	3	2		
	Quercus rubra								1	3	1		
	Quercus shumardii var. *shumardii*									1			
Geraniaceae (Geranium Family)													
	Geranium carolinianum	1	1	2				2			2	2	1
Haloragaceae (Water Milfoil Family)													
	Myriophyllum spicatum	3	1								4	4	
Hamamelidaceae (Witch-hazel Family) [Altingiaceae]													
	Liquidambar styraciflua								2		1	1	
Iridaceae (Iris Family)													
	Sisyrinchium angustifolium		2						2		1		
Juglandaceae (Walnut Family)													
	Carya cordiformis								1				
	Juglans nigra			1		1			2	3			
Juncaceae (Rush Family)													
	Juncus acuminatus			5				2			2	1	
	Juncus brachycarpus			1									
	Juncus dudleyi							2	1		3	2	
	Juncus effusus	2	3	3	2	2	2	2			4	4	
	Juncus interior	2	1	5	4		4	4		3	2	2	
	Juncus tenuis	1	1	5					1	2	5	5	3

Lamiaceae (Mint Family)													
	Lamium amplexicaule			2									
	Lycopus americanus	2	2	3		2	3	3	2		4	4	
	Lycopus uniflorus						2						
	Monarda fistulosa			1									
	Physostegia virginiana ssp. *virginiana*			5									
	Prunella vulgaris ssp. *lanceolata*	1											
	Pycnanthemum tenuifolium			5				2	1		1		
	Pycnanthemum virginianum			1			2						
	Scutellaria lateriflora	1	1										
	Stachys tenuifolia	1				2		2					
	Teucrium canadense var. *canadense*	2	1		2	2		2			2	2	1
Lauraceae (Laurel Family)													
	Lindera benzoin								3	3			
	Sassafras albidum								2	3			
Lemnaceae (Duckweed Family) [Araceae]													
	Lemna minor		6		3	2	3	3	1	1	3	3	
	Spirodela polyrrhiza		5				2	2					
Liliaceae (Lily Family) [Alliaceae, Hemerocallidaceae, Ruscaceae]													
	Allium canadense								2	2			
	Allium vineale	3	2	5	3	3	3	1			4	3	3
	Hemerocallis fulva							1		1			4
	Maianthemum racemosum								1				
	Polygonatum biflorum							1	1	2			
Lythraceae (Loosestrife Family)													
	Ammannia coccinea	2	2										
	Lythrum alatum		1	2			2	2					
	Rotala ramosior						1						
Magnoliaceae (Magnolia Family)													
	Liriodendron tulipifera								2				

Malvaceae (Mallow Family)													
	Abutilon theophrasti	3											1
	Hibiscus laevis	2	2								3	3	2
	Hibiscus moscheutos		1		2	2	2						
	Sida spinosa	1											
Menispermaceae (Moonseed Family)													
	Menispermum canadense									4			
Molluginaceae (Carpet-weed Family)													
	Mollugo verticillata			1									
Moraceae (Mulberry Family)													
	Morus alba	1		1	3		3	1	2	2			
Najadaceae (Water-nymph Family) [Hydrocharitaceae]													
	Najas minor		3										
Nelumbonaceae (Lotus-lily Family)													
	Nelumbo lutea	1											
Oleaceae (Olive Family)													
	Fraxinus americana								2	2			
	Fraxinus pennsylvanica var. *lanceolata*[3]	2		1	2		2	1	2	2	2	2	2
	Ligustrum obtusifolium									1			
Onagraceae (Evening Primrose Family)													
	Circaea lutetiana ssp. *canadensis*								4	5			
	Epilobium coloratum		1					2					
	Ludwigia alternifolia			1	3		3				3	3	
	Ludwigia palustris		1	1	1		1	2					
	Ludwigia peploides ssp. *glabrescens*	6	6		4	6	4	5			5	5	
	Oenothera biennis	1	2	3	5	3	5	2			3	3	
Orchidaceae (Orchid Family)													
	Liparis liliifolia								1				
Oxalidaceae (Wood-sorrel Family)													
	Oxalis dillenii	1	2	2	2	2				2		1	1

	Oxalis stricta						2	2	2				
Phytolaccaceae (Pokeweed Family)													
	Phytolacca americana	1	1			2		1	1	2		1	
Plantaginaceae (Plantain Family)													
	Plantago aristata										1		
	Plantago lanceolata		2		5	3	5	1	1	2			1
	Plantago rugelii			1	5	4	5	1	2	2	2		1
	Plantago virginica			3									
Platanaceae (Plane-tree Family)													
	Platanus occidentalis		1						1	3			
Poaceae (Grass Family)													
	Agrostis gigantea			1			3	3	4	5	3	3	
	Agrostis hyemalis			2			1				3	2	
	Andropogon gerardii			3									
	Andropogon virginicus									2			
	Bromus racemosus		1	2									
	Bromus inermis			3	3	3	3	3		2			
	Bromus arvensis	3	2	3	3	3		2		2	2	3	1
	Bromus tectorum	1											2
	Cinna arundinacea								3				
	Dactylis glomerata	5				3		2		3	2		
	Dichanthelium acuminatum var. *fasciculatum*									1			
	Dichanthelium clandestinum								2	3			
	Echinochloa crus-galli	6	6	2									
	Echinochloa muricata	1											
	Elymus repens									1			
	Elymus villosus								3	4			
	Elymus virginicus var. *virginicus*	3	2	2			2		2	2	4	3	3
	Festuca rubra										4		

	Festuca subverticillata									3			
	Glyceria striata								3	3			
	Hordeum jubatum										2		3
	Hordeum pusillum	2											
	Leersia oryzoides	5	5	2	3		3	2			6	5	5
	Leersia virginica								3	4			
	Muhlenbergia mexicana				1								
	Panicum dichotomiflorum	2	5										
	Panicum virgatum		1	3	2		2			2			
	Phalaris arundinacea		5		5	5	5		5	4	5	5	
	Phleum pratense			1	3		3		2	3	2	2	
	Phragmites australis ssp. *australis*	1	2			2					2	1	
	Poa compressa			1									1
	Poa pratensis	5	2	3			3	3	3	3			5
	Schedonorus arundinaceus	5	2	3				4	3	3	5	4	5
	Schedonorus pratensis				5	3							
	Schizachyrium scoparium										3	2	
	Setaria faberi	1	2	3							3	3	3
	Setaria pumila	2		1									
	Sorghastrum nutans			5						2	3		
	Sorghum halepense	1		5	2					1	3		
	Sphenopholis obtusata									1			
	Sporobolus heterolepis	1		3									
	Tripsacum dactyloides						3						
Polygonaceae (Buckwheat Family)													
	Polygonum amphibium emersum	6	6		5	5	5	1			6	5	
	Polygonum cespitosum var. *longisetum*								3	3			
	Polygonum hydropiperoides										2		
	Polygonum lapathifolium	6	3		3	2	3						
	Polygonum pensylvanicum	6	2				3						

	Polygonum punctatum var. *punctatum*	1	1		4								
	Polygonum persicaria							3	1		3	3	
	Polygonum ramosissimum	1											
	Polygonum virginianum								3	4			
	Rumex altissimus	3	3	2	3	3	3			2	2	2	3
	Rumex crispus	2	4	3	2		2	2	1	2	3	3	
	Rumex verticillatus		1										
Potamogetonaceae (Pondweed Family)													
	Potamogeton crispus		1										
	Potamogeton diversifolius					2							
	Potamogeton foliosus		2								2		
	Potamogeton nodosus	6	5			3		4			3	3	
	Stuckenia pectinata	1	1										
Primulaceae (Primrose Family)													
	Lysimachia ciliata		1										
	Lysimachia nummularia	1						3			4	3	
Ranunculaceae (Buttercup Family)													
	Ranunculus abortivus			1	1					2			
	Ranunculus bulbosus		1										
	Ranunculus repens						1						
	Ranunculus sceleratus	1				2							
Rosaceae (Rose Family)													
	Agrimonia parviflora			1			2	3	2	2	2		
	Amelanchier arborea								1				
	Crataegus sp.								1				
	Fragaria virginiana					2			2				
	Geum canadense			1				2	3	3		2	
	Geum laciniatum			1	3	2	3	4			3	2	
	Geum vernum							2	3	3			
	Potentilla norvegica	1	1		2		2	2			1		

	Potentilla simplex									2			
	Prunus serotina				2		2	1	2	3			
	Pyrus calleryana	1	1				1	1		2		1	
	Rosa multiflora					2		1	2	2	2	1	
	Rosa setigera	1			1			1			1		1
	Rubus flagellaris								1	1	2	3	
	Rubus occidentalis								1	2			
	Rubus pensilvanicus	1		1	4		4	2	1	2	4	3	
Rubiaceae (Madder Family)													
	Cephalanthus occidentalis	1	2		2		2	1			3	3	
	Galium aparine	1					2		2			1	
	Galium circaezans								1				
	Galium obtusum		5										
	Galium tinctorium	2						2			3	3	
	Galium triflorum								3	4			
	Spermacoce glabra		1										
Salicaceae (Willow Family)													
	Populus deltoides	2	1	1			1	2		2	2		
	Salix interior	1	1					2					
	Salix nigra	2	3	1	3		3				3	2	
Scrophulariaceae (Figwort Family) [Plantaginaceae, Linderniaceae, Phrymaceae, Scrophulariaceae]													
	Gratiola neglecta			1			1						
	Gratiola virginiana										3		
	Lindernia dubia var. *anagallidea*				2	1	2						
	Lindernia dubia	4	5										
	Mimulus alatus							2					
	Mimulus ringens	1		1	2		2	2			3		
	Penstemon calycosus							2	2	1			
	Penstemon digitalis			5							4	3	
	Verbascum blattaria	1						1					5

	Verbascum thapsus	1	1			2	1	1	1				
	Veronica peregrina ssp. *peregrina*			1									
Smilacaceae (Catbrier Family)													
	Smilax tamnoides									2			
Solanaceae (Potato Family)													
	Physalis longifolia var. *subglabrata*	2	1				1	1					1
	Solanum carolinense	2	1	3	3	3	3	3		2	2	2	
	Solanum ptycanthum							2					
Sparganiaceae (Bur-reed Family) [Typhaceae]													
	Sparganium eurycarpum		1									2	
Typhaceae (Cat-tail Family)													
	Typha ×glauca	4	5	5	2	2	2				6	6	5
	Typha angustifolia							2			5	6	
	Typha domingensis	2	2										
	Typha latifolia		1										
Ulmaceae (Elm Family)													
	Celtis occidentalis								3	3			
	Ulmus americana			1			2		3	3	2	2	
	Ulmus pumila							1	1				
	Ulmus rubra								1				
Urticaceae (Nettle Family)													
	Boehmeria cylindrica		1		3		3	3	3	3	4	4	
	Laportea canadensis								2				
	Parietaria pensylvanica								1	1			
	Pilea pumila				3	2	3		3	3			
	Urtica dioica ssp. *gracilis*							1					
Valerianaceae (Valerian Family) [Caprifoliaceae]													
	Valerianella radiata	1									2	3	
	Valerianella umbilicata		1		1			2					

Verbenaceae (Verbena Family) [Verbenaceae, Phrymaceae]													
	Phryma leptostachya								1	2			
	Phyla lanceolata	2	2										
	Verbena hastata		1		2	2	3	2					
	Verbena urticifolia var. *urticifolia*	1	1	1	2		2	2		2	2	2	
Violaceae (Violet Family)													
	Hybanthus concolor								1				
	Viola pubescens								2				
	Viola sororia	1							3	2			
Vitaceae (Grape Family)													
	Ampelopsis cordata	1	1									3	2
	Parthenocissus quinquefolia	2			3	2	2	2	3	4		1	
	Vitis aestivalis									1			1
	Vitis riparia											2	
	Vitis vulpina							1		2			
Total Number of Taxa at a Site:		**142**	**154**	**134**	**110**	**85**	**111**	**143**	**139**	**155**	**139**	**114**	**59**

[1] Has been taxonomically included with *Apocynum cannabinum* L.

[2] Has been taxonomically included with *Eleocharis macrostachya* Britton

[3] Has been taxonomically included with *Fraxinus pennsylvanica* Marshall

[4] Has been taxonomically included with *Melilotus officinalis* (L.) Lam.

Collecting Locations

Vascular plant surveys were conducted within the following units: BH2 (marsh), BH4 (marsh), BH5S (marsh), GP2 (prairie), GP8 (marsh), GP11N (northern half; prairie), GP16 (marsh), GP18 (west side; woodlands), MPE1 (marsh), MPW2 (marsh), Thousand Islands (southern section; woodlands), and the Check Station (marsh). See Figure 4 on page 9 for location of these units.

Species of Conservation Concern

- *Carex bushii* Mack. [State Threatened] – uncommon in GP2 prairie. Apparently a spontaneous recurrence from the seed bank.
- *Carex gravida* L.H. Bailey [State Endangered] – fairly common in GP2 prairie. Apparently a spontaneous recurrence from the seed bank.
- *Cyperus acuminatus* Torr. & Hook. ex Torr. [State Watch List] – less than five individuals observed within MPW2, GP2 prairie and GP11 (northern half), and uncommon in BH4. Apparently a spontaneous recurrence from the seed bank.
- *Nelumbo lutea* Willd. [State Watch List] – less than five individuals observed within MPE1. Potentially introduced by waterfowl.
- *Pinus strobus* L. [State Rare] – less than 5 individuals observed in GP18 woodlands. Likely planted or an escape from cultivation.
- *Tripsacum dactyloides* (L.) L. [State Watch List] – fairly common in BH2. Likely introduced with native prairie seed.
- *Viola pubescens* Aiton [State Watch List] – uncommon in GP18 woodlands. Likely naturally occurring.

Collecting Methods & Effort

Meander surveys generally following the methods of Goff et al. (1982) were conducted. Approximately 192 person-hours were spent conducting the total survey. Additional time was spent identifying plants in the laboratory that were unidentifiable in the field.

Greene County and Indiana State Records

Twenty-six potential Greene County Records were recorded in the 2016 bioblitz. Potential new Greene County, Indiana records were determined by reviewing known county occurrences (USDA, NRCS 2016) and records from Friesner Herbarium at Butler University (BUT). These included *Brasenia schreberi* J.F. Gmel., *Carex brevior* (Dewey) Mack., *Carex gravida* L.H. Bailey, *Carex pellita* Muhl. ex Willd., *Celtis occidentalis* L., *Desmodium glabellum* (Michx.) DC., *Dichanthelium acuminatum* (Sw.) Gould & C.A. Clark var. *fasciculatum* (Torr.) Freckmann, *Eleocharis erythropoda* Steud., *Eleocharis xyridiformis* Fernald & Brack., *Euphorbia davidii* Subils, *Fraxinus pennsylvanica* Marshall var. *lanceolata* (Borkh.) Sarg., *Hydrocotyle ranunculoides* L. f., *Krigia caespitosa* (Raf.) K.L. Chambers, *Pinus sylvestris* L., *Polygonum cespitosum* Blume var. *longisetum* (Bruijn) A.N. Steward, *Ranunculus repens* L., *Ranunculus sceleratus* L., *Rorippa palustris* (L.) Besser ssp. *fernaldiana* (Butters & Abbe) Jonsell, *Solidago canadensis* L. var. *hargeri* Fernald, *Sparganium eurycarpum* Engelm., *Sporobolus*

heterolepis (A. Gray) A. Gray, *Stuckenia pectinata* (L.) Börner, *Tripsacum dactyloides* (L.) L., *Typha domingensis* Pers., *Valerianella radiata* (L.) Dufr., and *Valerianella umbilicata* (Sull.) Alph. Wood.

Typha domingensis Pers. [SAN 2948, BUT] may represent a first collected record for Indiana, thus representing an Indiana state record.

Voucher Specimens

Listed in the table below are voucher specimen collections. Collectors: SAN = Scott A. Namestnik; PER = Paul E. Rothrock; DGR = Don G. Ruch; BRH = Ben Hess. Collections will be deposited at Friesner Herbarium at Butler University (BUT), Indiana University Herbarium (IND), and the herbarium at Missouri Botanical Garden (MO) as designated.

Ampelopsis cordata	SAN 2962 [BUT]
Bromus arvensis	PER 5010 [IND]
Bromus racemosus	SAN 2959 [BUT]
Carex brevior	SAN 2950 [BUT]; SAN 2951 [BUT]
Carex bushii	SAN 2966 [BUT]; SAN 2967 [IND]
Carex cristatella	PER 5003 [MO]
Carex gravida L	SAN 2968 [BUT]
Carex lupulina.	PER 5008 [IND]
Carex molesta	SAN 2952 [BUT]; SAN 2953 [BUT]; SAN 2970 [BUT]; SAN 2971 [BUT]; SAN 2972 [BUT]
Carex tribuloides var. *tribuloides*	PER 5004 [MO]; SAN 2949 [BUT]; SAN 2958 [BUT]
Carex typhina	SAN 2961 [BUT]
Cyperus acuminatus	PER 5007 [MO]; SAN 2955 [BUT]; SAN 2973 [BUT]
Dryopteris carthusiana	PER 5012 [MO]
Eleocharis quadrangulata	DGR BSUH 20068 [BUT]
Eleocharis xyridiformis	SAN 2957 [BUT]
Elymus virginicus var. *virginicus*	PER 5011 [MO]
Hordeum pusillum	SAN 2954 [BUT]
Hydrocotyle ranunculoides	SAN 2964 [BUT]
Juncus interior	PER 5006 [IND]
Krigia caespitosa	SAN 2963 [BUT]
Plantago virginica	SAN 2965 [BUT]
Potamogeton diversifolius	PER 5002 [IND]
Ranunculus bulbosus	SAN 2956 [BUT]
Rorippa sessiliflora	SAN 2947 [BUT]
Rumex verticillatus	SAN 2960 [BUT]
Silene latifolia ssp. *alba*	PER 5009 [IND]
Spermacoce glabra	BRH SN [BUT]
Trifolium campestre	SAN 2969 [BUT]
Tripsacum dactyloides	PER 5005 [IND]
Typha domingensis	SAN 2948 [BUT]

Summary Overview

A total of 417 vascular plant taxa (412 identified to at least the species level), 318 (76%) of which are native to Indiana, were observed during the two-day 2016 Goose Pond Biodiversity Survey. The vascular plant families represented by the most taxa were the Aster Family (Asteraceae, 59 taxa), the Sedge Family (Cyperaceae, 43 taxa), and the Grass Family (Poaceae, 42 taxa); the sedge genus (*Carex*) was the most well represented genus, with 27 taxa observed. A total of 42 plants that represent potential Greene County, Indiana records were identified (including 16 taxa identified as potential Greene County, Indiana records during the 2010 Goose Pond Biodiversity Survey). One species that may represent a new record for Indiana (*Typha domingensis* Pers.) was identified. Seven species on the list of Indiana Endangered, Threatened, Rare and Watch List species were observed: Bush's Sedge (*Carex bushii* Mack. [State Threatened]), Heavy Sedge (*Carex gravida* L.H. Bailey [State Endangered]), Tapertip Flatsedge (*Cyperus acuminatus* Torr. & Hook. ex Torr. [State Watch List]), American Lotus (*Nelumbo lutea* Willd. [State Watch List]), Eastern White Pine (*Pinus strobus* L. [State Rare]), Eastern Gamagrass (*Tripsacum dactyloides* (L.) L. [State Watch List]) and Downy Yellow Violet (*Viola pubescens* Aiton [State Watch List]). Of these, Bush's Sedge and Heavy Sedge are of the most interest because they are likely to be naturally occurring at the site and their populations are actively tracked by the Indiana Department of Natural Resources – Division of Nature Preserves (plants listed as Watch List have enough known populations to have been removed from the Endangered, Threatened and Rare list).

With the exception of GP18 and the Thousand Islands unit, which were largely forested, the vascular plant communities surveyed at Goose Pond Fish and Wildlife Area (Goose Pond) consist primarily of early successional marsh and prairie communities dominated by common, disturbance-tolerant plant species. This is supported by the mean Coefficient of Conservatism (C) value of 2.2, as plant species with C values of 0–3 "provide little or no confidence that [their] inhabitance signifies remnant conditions" (Rothrock 2004). The Floristic Quality Index (FQI) for the surveyed portions of the site was 45.8. Swink & Wilhelm (1994) state that sites with FQI values greater than 45 likely possess natural area potential, but FQI is influenced by species richness as well as mean C value and often is not as accurate of an indicator of natural area quality as mean C value (pers. obs.). Species richness may be inflated in this survey as a result of the number of plant communities inventoried, which naturally increases species richness.

Invasive species often pose the greatest threat to new restoration areas. In the surveyed marsh-dominated units, the non-native invasive species Narrowleaf Cattail (*Typha angustifolia* L.) and Hybrid Cattail (*Typha ×glauca* Godr.) were abundant in places. Other non-native invasive species present in the marsh-dominated units included Canada Thistle (*Cirsium arvense* (L.) Scop.), Poison Hemlock (*Conium maculatum* L.), Sericea Lespedeza (*Lespedeza cuneata* (Dum. Cours.) G. Don), Japanese Honeysuckle (*Lonicera japonica* Thunb.), White Sweetclover (*Melilotus alba* Medik.), Yellow Sweetclover (*Melilotus officinalis* (L.) Lam.), Eurasian Watermilfoil (*Myriophyllum spicatum* L.), Reed Canarygrass (*Phalaris arundinacea* L.), European Common Reed (*Phragmites australis* (Cav.) Trin. ex Steud. ssp. *australis*), Callery Pear (*Pyrus calleryana* Decne.), Multiflora Rose (*Rosa multiflora* Thunb.), Johnsongrass (*Sorghum halepense* (L.) Pers.) and Southern Cattail (*Typha domingensis* Pers.). Of these species, Reed Canary Grass is of particular concern, being documented as common in nearly all of the

marsh-dominated units surveyed. The non-native invasive species Sericea Lespedeza was abundant in one of the surveyed prairie-dominated units. Other non-native invasive species present in the prairie-dominated units included Canada Thistle, Poison Hemlock, Autumn Olive (*Elaeagnus umbellata* Thunb.), Japanese Honeysuckle, White Sweetclover, Yellow Sweetclover, Callery Pear, Multiflora Rose, Johnsongrass, Narrowleaf Cattail and Hybrid Cattail. In the woodland communities surveyed the non-native invasive species Garlic Mustard (*Alliaria petiolata* (M. Bieb.) Cavara & Grande), Japanese Barberry (*Berberis thunbergii* DC.), Oriental Bittersweet (*Celastrus orbiculatus* Thunb.), Autumn Olive, Burningbush (*Euonymus alatus* (Thunb.) Siebold), Winter Creeper (*Euonymus fortunei* (Turcz.) Hand.-Maz.), Border Privet (*Ligustrum obtusifolium* Siebold & Zucc.), Japanese Honeysuckle, Amur Honeysuckle (*Lonicera maackii* (Rupr.) Herder), White Sweetclover, Yellow Sweetclover, Reed Canarygrass, Callery Pear, Multiflora Rose and Johnsongrass were documented; species of most concern include Japanese Honeysuckle, Amur Honeysuckle and Reed Canarygrass.

Sixteen (16) years after restoration of the site commenced, early successional plant species remain dominant in the marsh communities, and although moderate species richness is present, species diversity is overall low based on visual observations. This is in large part due to the fact that the marsh communities are actively managed for waterfowl. Native plant species such as Roughfruit Amaranth (*Amaranthus tuberculatus* (Moq.) Sauer), Fox Sedge (*Carex vulpinoidea* Michx.), Blunt Spikerush (*Eleocharis obtusa* (Willd.) Schult.), Common Spikerush (*Eleocharis palustris* (L.) Roem. & Schult.), Annual Marsh Elder (*Iva annua* L.), Poverty Rush (*Juncus tenuis* Willd.), Rice Cutgrass (*Leersia oryzoides* (L.) Sw.), Floating Primrose-willow (*Ludwigia peploides* (Kunth) P.H. Raven ssp. *glabrescens* (Kuntze) P.H. Raven), Ditch Stonecrop (*Penthorum sedoides* L.), Longroot Smartweed (*Polygonum amphibium* L. var. *emersum* Michx.), Curlytop Knotweed (*Polygonum lapathifolium* L.), Woolgrass (*Scirpus cyperinus* (L.) Kunth) and Georgia Bulrush (*Scirpus georgianus* Harper) are common to abundant within the marsh communities. Of these species, only Common Spikerush, Longroot Smartweed and Woolgrass have C values greater than 3, indicating that many of the common to abundant species in marsh communities on the site are not indicative of stable remnant conditions. These species are all pioneers, some of which have been intentionally seeded, and benefit from the manipulated water levels, whereas later successional species have not had an opportunity to become established due to the regular ponding and draining cycles in the marsh units. In addition, Floating Primrose-willow, although considered native, has been considered invasive in southern Indiana wetlands by some and is showing up with more frequency in central and northern Indiana restoration sites (pers. obs.).

As compared with the vascular plant results from the 2010 biodiversity survey at Goose Pond, 38 more vascular plant taxa were observed in 2016, but this is likely due in large part to the addition of forested areas to the survey units. The mean C value has not changed from 2010, and the FQI increased very slightly from 42.3 in 2010; again, this slight increase in FQI was likely a result of surveying forested areas in 2016 that were not surveyed in 2010. Early successional plant communities were noted in 2010 as well as in 2016. Invasive species were noted as a threat to the restoration in 2010 and remain a major threat in 2016. Hybrid Cattail was abundant in portions of the marsh communities in 2010 and appeared to have increased by 2016. Common Reed and Reed Canarygrass were observed in a few scattered

locations in 2010; Common Reed appeared to have increased slightly since 2010, but Reed Canary Grass was common in nearly all of the marsh units surveyed in 2016. The native but often invasive Floating Primrose-willow also appeared to have increased dramatically from 2010 to 2016. In the prairie units, Sericea Lespedeza seemed to have increased from 2010 to 2016. Invasive species clearly pose a serious threat to the long-term viability of the plant communities at Goose Pond and should be targeted for removal.

Acknowledgements

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Literature Cited

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Sagittaria calycina var. *calycina* (hooded arrowhead) in flower. (*Photo by Scott Namestnik*)

Some members of the plant team at work. Scott Namestnik, team leader, is on the left.
(*Photo by Dave W. Fox*)

Hydrocotyle ranunculoides, commonly called floating marshpennywort, is a glabrous, stoloniferous, perennial aquatic plant whose stems float in the water. This species was abundant in unit MPW2. (*Photo by Nick Harby*)

Paul Rotrock quizzing a student on her knowledge of wetland species at Bee Hunter Marsh. (*Photo by Dave W. Fox*)

Goose Pond II Biodiversity Survey 2016

Scientists, Naturalists, Students, Staff and Community Volunteers (95)

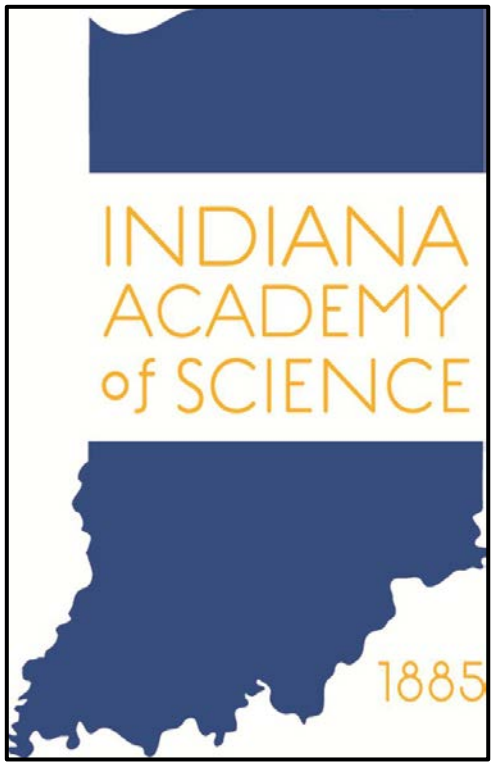
Name	Area
Allen, Don	Birds
Anderson, Tim	Beetles, Moths
Belth, Sandy	Butterflies
Bennett, James	Aquatic Macroinvertebrates
Bickel, Bailey	Herpetofauna
Blood, Bridget	Beetles
Bordenkecher, Theresa	Bees
Brodman, Robert*	Herpetofauna
Brown, Jim	Birds
Brown, Michael R.	Birds
Carrie, Meg	Herpetofauna
Casler, Sean	Bats
Chamberlain, Angela	Mammals (except bats)
Ciskowski, Nancy	Friends of Goose Pond Support Staff
Clark, Melissa Ann Laney*	Aquatic Macroinvertebrates
Cole, Linda*	Non-vascular Plants
Cole, Myron	Non-vascular Plants
Dainko, Sadie	Birds
Davis, Brittany	Herpetofauna, Spiders
Davis, JoAnne	Fish and Freshwater Mussels
Dickson, Joe	Spiders
Dittmann, Mathew	Beetles
Dunbar, Steve	Vascular Plants
Elliott, Jay	Bees
Erdogan, Eyup	Herpetofauna, Vascular Plants
Featherstone, Rickie	Herpetofauna
Finkler, Dantra	Herpetofauna
Finkler, Mike	Herpetofauna
Fisher, Brant E.*	Fish and Freshwater Mussels
Flanders, Marilyn	Friends of Goose Pond Support Staff
Follette, Danielle	Vascular Plants
Foster, Brian	Spiders
Ghreichi, Gabby	Aquatic Macroinvertebrates
Goodman, Cheryl	Friends of Goose Pond Support Staff
Gorney, Don	Butterflies
Graham, Lucas	Aquatic Macroinvertebrates
Gross, Serena	Beetles
Gwinn, Jess	Butterflies

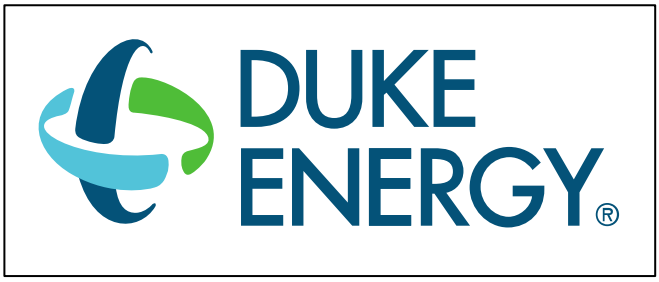
Hacker, Molly	Vascular Plants
Harby, Nick	Vascular Plants
Helmbold, Jessica	Vascular Plants
Hengeveld, Jim	Butterflies and Odonates, Birds
Hengeveld, Susan	Butterflies and Odonates, Birds
Hess, Ben	Vascular Plants
Hobbs, Collin	Vascular Plants
Hoeh, Julia	Bats
Hoffman, Andrew	Herpetofauna, Spiders
Holland, Jeffrey*	Beetles
Horton, Jim	Herpetofauna
Hubini, Ahmed	Vascular Plants
Jean, Carlin	Bees
Jean, Chloe	Bees
Jean, Michelle	Bees
Jean, Robert*	Bees
Kogler, Katie	Vascular Plants
Krupke, Christian	Herpetofauna
Langell, Gary	Birds
Lewellyn, Daryn	Friends of Goose Pond Support Staff
Lin, Chia-Hua	Bees
McClain, Kathy	Birds
McCroskey, Eoghan	Beetles
Milne, Marc*	Spiders
Moore, Bruce	Friends of Goose Pond Support Staff
Moss, Megan	Herpetofauna
Myers, Danielle	Herpetofauna
Namestnik, Scott*	Vascular Plants, Singing Insects
Osborn, Heather	Vascular Plants
Pilla, Nathanael	Vascular Plants
Powers, Sarah	Aquatic Macroinvertebrates
Reda, Oliva	Aquatic Macroinvertebrates
Rice, Tim	Herpetofauna
Roller, Allyson	Herpetofauna
Ronk, Deanna	Non-vascular Plants
Ronk, Suzie	Friends of Goose Pond Support Staff, Mammals
Ross, Jeremy	Birds
Roth, Kirk*	Butterflies and Odonates
Rothrock, Paul	Vascular Plants
Ruch, Don	Vascular Plants
Russell, Stephen*	Mushrooms
Scott, Peter	Bees

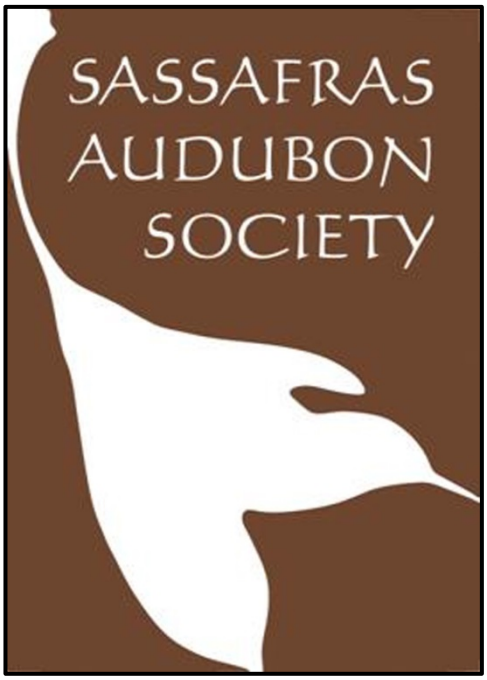
Simpson, Barbara	Friends of Goose Pond Support Staff, Co-organizer
Sly, George	Friends of Goose Pond Support Staff, Mammals
Stayte, Brian	Vascular Plants
Sterrenburg, Lee*	Birds
Stevenson, Leigh	Aquatic Macroinvertebrates
Stralhe, Dane	Friends of Goose Pond Support Staff
Strang, Carl*	Moths and Singing Insects
Troche, Tony	Vascular Plants
Walker, Erica	Aquatic Macroinvertebrates
Walters, Brianne*	Bats
Weisgerber, Ethan	Herpetofauna
Whitaker, John O., Jr.*	Mammals (except bats)
Wise, Terry	Vascular Plants
Wolfe, Peggy	Friends of Goose Pond Support Staff
Yung, Becky	Friends of Goose Pond Support Staff

*Denotes team leader

2016 Goose Pond Biodiversity Survey II Sponsors







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APPENDIX 1

In 2010, a report entitled "**Prairie Restoration and Initial Assessment of Goose Pond and Beehunter Marsh Prairies at Goose Pond Fish and Wildlife Area**" by Barbara E. Simpson documented the prairie installation and management history of the 1,317 acres of tall and short grass prairies at Goose Pond Fish and Wildlife Area. It should be noted that the prairie plantings occurred in 2002 and 2003. As a summary of the report, I have included the abstract here.

Abstract.—"This report documents the prairie installation and management history of the 1,317 acres of tall and short grass prairies that are part of Goose Pond Fish and Wildlife Area, and provides baseline data for future studies. A detailed assessment of one prairie unit was conducted to determine if the transect method was reasonable to use to assess all the prairie units, given the time and technical resources required, the total number of acres to be assessed, and the goals of a detailed assessment: 1) inventory as much of the flora as possible, 2) compare what was planted with what was found, 3) determine the general quality of the prairie restoration, and 4) identify any threats to the prairie quality. The detailed assessment identified 52 species of grasses and forbs, with *Sorghastrum nutans* the most abundant grass, comprising 14.7% of all individuals observed. The dominant forb was *Solidago canadensis*, at 48.4% of all plants identified. The species accumulation curve indicated that not enough transects were done to assure identification of the majority of species present. The Shannon diversity index was 2.24, showing moderate to low diversity. A qualitative assessment of prairie conditions and threats on all prairie units was also done. This qualitative approach gave an adequate baseline picture of invasive species threats and the degree of weed competition on each prairie unit; with fescue and tree encroachment the most frequently mentioned threats. Recommendations for reasonable approaches to large scale prairie assessments were made based on the experience with this first assessment, discussions with restoration experts, and reviewing the literature."

Anyone wanting to know more about this preliminary assessment of the prairies can find the previously mentioned report on the Indiana Academy of Science website with the Goose Pond Fish and Wildlife II bioblitz report.

To obtain a better understanding of prairie restoration and progress, I have attached the seed supplier, the year planted, the acreage planted, and the various seed mixes used in the following six tables.

1. Table 1. Seed mixes and acres planted by unit on Goose Pond (GP) and Beehunter Marsh (BH) including the seed supplier and year planted.
2. Table 2. Tall Grass Mix 1-GP: Grasses and Forbs Seed Mix Content and Application Rates.
3. Table 3. Short Grass Mix 1-GP: Grasses and Forbs Seed Mix Content and Application Rates.
4. Table 4. Tall Grass Mix 2-BH: Grasses and Forbs Seed Mix Content and Application Rates.
5. Table 5. Tall Grass Mix 3-BH: Grasses and Forbs Seed Mix Content and Application Rates.
6. Table 6. Short Grass Mix 1-BH: Grasses and Forbs Seed Mix Content and Application Rates.

Table 1.—Seed mixes and acres planted by unit on Goose Pond (GP) and Beehunter Marsh (BH) including the seed supplier and year planted.

	Tall Grass Mix 1-GP	**Short Grass Mix 1-GP**	**Tall Grass Mix 2-BH**	**Tall Grass Mix 3-BH**	**Short Grass Mix 1-BH**
Seed Supplier	Flick	Flick	Ernst	Ernst	Ernst
Year planted	2002	2002	2003	2003	2003
Unit					
BH1					3*
BH2			12		25
BH3				15	
BH4			30		
BH5B			51		
BH5C				5	
BH5D			41		
BH5E				18	
GP1	52				
GP2	31	28			
GP3	70				
GP4	27				
G5 N and S	193 (N)	40 (S)			
GP6 A and C	20 (6A)	27 (6C)			
GP8	83	42			
GP9	109	20			
GP11	182	23			
GP12	32				
GP14	25	20			
GP15	30				
GP17	23				
GP18	35				
GP19	5				
Total acres	**917**	**200**	**134**	**38**	**28**

Goose Pond = 1117 acres

Beehunter Marsh = 200 acres

TOTAL Prairie acres = 1317

* 2.5 acres rounded

Table 2.—Tall Grass Mix 1-GP: Grasses and Forbs Seed Mix Content and Application Rates.

Scientific Name	Common Name	Percent PLS*	Rate (lb. PLS/acre)
		in forb mix	
Grasses			
Andropogon gerardii	Big bluestem	100	1.5
Panicum virgatum	Switchgrass	100	0.5
Sorghastrum nutans	Indiangrass	100	1
Forbs			0.25
*Liatris spicata***	Marsh blazing star	23.64	
Liatris spicata	Spike gayfeather	7.39	
Silphium perfoliatum	Cup plant	13.67	
*Vernonia gigantia***	Giant ironweed****	10.27	
*Bidens cernua***	Nodding bur marigold	7.39	
*Liatris pychnostachya***	Prairie blazing star	7.39	
*Liatris pychnostachya***	Thick spike gayfeather	6.28	
Coreopsis tripteris	Tall coreopsis	2.95	
Pycnanthemum	Virginia mountain mint	2.59	
*Monarda fistulosa***	Wild bergamot	1.39	
*Lobelia cardinalis***	Cardinal flower	0.74	
Silphium terebinthinaceum	Prairie dock	0.62	
*Physostegia virginiana***	Obedient plant	0.55	
*Physostegia virginiana***	False dragonhead	0.55	
Helianthus grosseserratus	Sawtooth sunflower	0.46	
		100.00	

* Pure live seed

** Forbs in common with Tall Grass Mixes 2-BH and 3-BH.

*** Provided by the supplier as "tall ironweed" common name.

Note duplication-same species under two common names.

Table 3.—Short Grass Mix 1-GP: Grasses and Forbs Seed Mix Content and Application Rates.

Scientific Name	Common Name	Percent PLS*	Rate PLS (lb./acre)
Grasses			
Schizachyrium scoparium	Little bluestem	100	2.5
Bouteloua curtipendula	Sideoats grama	100	1
Forbs			
Kummerowia striate[§]	Kobe lespedeza		1
*Rudbeckia serotina***	Black-eyed susan	16.29	1 (forb mix)
*Cassia fasciculata***	Partridge pea	11.40	
*Echinacea purpurea***	Purple coneflower	9.61	
*Coreopsis lanceolata***	Lance-leaf coreopsis	7.65	
*Desmanthus illinoensis***	Illinois bundleflower	7.49	
*Lupinus perennis***	Wild blue lupine	5.25	
*Ratibida pinnata***	Gray-headed coneflower	4.64	
*Petalostemum purpureum***	Purple prairie clover	4.56	
*Ascelpias tuberosa***	Butterfly milkweed	3.91	
Liatris spicata	Marsh blazing star***	2.93	
Solidago rigida	Stiff goldenrod	2.54	
*Lespedeza capitata***	Roundheaded lespedeza	2.12	
*Silphium trifoliatum***	Rosinweed	1.93	
Liatris pychnostachya	Prairie blazing star****	1.73	
*Silphium terebinthinaceum***	Prairie dock	1.68	
*Amorpha canescens***	Lead plant	1.56	
Parthenium integrifolium	Wild Quinine	1.50	
Helianthus grosseserratus	Sawtooth sunflower	1.14	
Veronicastrum virginicum	Culver's root	1.09	
*Pycnanthemum virginianum***	Virginia mountain mint	1.07	
Coreopsis tripteris	Tall coreopsis	1.06	
Penstemon laevigatus	Smooth penstemon	1.02	
*Heliopsis helianthoides***	False (oxeye) sunflower	1.01	
Eryngium yuccifolium	Rattlesnake master	0.95	
*Silphium laciniatum***	Compass plant	0.88	
*Baptisia australis***	Blue false indigo	0.88	
*Silphium perfoliatum***	Cup plant	0.78	
Monarda punctata	Horse mint	0.72	
Lespedeza virginica	Slender lespedeza	0.72	

Scientific Name	Common Name	Percent PLS*	Rate PLS (lb./acre)
*Monarda fistulosa***	Wild bergamot	0.72	
Aquilegia canadensis	Columbine	0.63	
Liatris aspera	Button blazing star	0.38	
Baptisia leucophaea	Cream false indigo	0.08	
Lithospermum canescens	Hoary pucoon	0.08	
		100	

* Pure live seed

** Forbs in common with Short Grass Mix 1-BH

*** Provided by the supplier as "dense blazing star" common name.

**** Provided by the supplier as "thick spike gayfeather" common name.

§ Non-native species

Table 4.—Tall Grass Mix 2-BH: Grasses and Forbs Seed Mix Content and Application Rates.

Scientific Name	Common Name	Percent PLS*	Rate PLS (lb./acre)
Grasses			
Andropogon gerardii	Big bluestem	100	1.5
Tripsacum dactyloides	Eastern gammagrass	100	1.5
Elymus virginicus	Virginia wildrye	100	1
Elymus canadensis	Canada wildrye	100	1
Panicum virgatum	Switchgrass	100	0.5
Forbs			0.5
Verbena hastata	Blue vervain	13.51	
*Bidens cernua***	Nodding bur marigold	13.25	
*Liatris pychnostachya***	Prairie blazing star	8.84	
Cassia hebecarpa	Wild senna	8.84	
*Vernonia gigantia***	Giant ironweed	8.58	
Eupatorium maculatum	Spotted Joe Pyeweed	8.33	
*Liatris spicata***	Marsh blazing star	8.33	
*Lobelia cardinalis***	Cardinal flower	8.33	
*Monarda fistulosa***	Wild bergamot	8.33	
*Pycnanthemum virginianum***	Virginian mountain mint	8.33	
*Physostegia virginiana***	Obedient plant	5.33	
		100	

* Pure live seed

**Forbs in common with Tall Grass Mixes 1-GP and 3-BH

Table 5.—Tall Grass Mix 3-BH: Grasses and Forbs Seed Mix Content and Application Rates.

Scientific Name	Common Name	Percent PLS*	Rate PLS (lb./acre)
Grasses			
Andropogon gerardii	Big bluestem	100	1.5
Sorghastrum nutans	Indiangrass	100	1
Panicum virgatum	Switchgrass	100	0.5
Forbs			0.5
Kummerowia stipulacea[§]	Korean lespedeza	57.14	
Cassia fasciculata	Partridge pea	28.57	
Echinacea purpurea	Purple coneflower	2.86	
*Bidens cernua***	Nodding bur marigold	1.44	
*Liatris spicata***	Marsh blazing star	1.43	
*Monarda fistulosa***	Wild bergamot	1.43	
Lespedeza capitata	Roundheaded lespedeza	1.43	
*Physostegia virginiana***	Obedient plant	1.07	
Petalostemum purpureum	Purple prairie clover	1.07	
*Pycnanthemum virginianum***	Virginia mountain mint	1.07	
*Liatris pychnostachya***	Prairie blazing star	1.07	
*Vernonia gigantia***	Giant ironweed	0.71	
*Lobelia cardinalis***	Cardinal flower	0.71	
		100	

* Pure live seed

** Forbs in common with Tall Grass Mixes 1-GP and 2-BH

[§] Non-native species

Table 6.—Short Grass Mix 1-BH: Grasses and Forbs Seed Mix Content and Application Rates.

Scientific Name	Common Name	Percent PLS*	Rate PLS (lb./acre)
Grasses			
Schizachyrium scoparium	Little bluestem	100	2.5
Bouteloua curtipendula	Sideoats grama	100	1
Forbs			1 (forb mix)
Kummerowia stipulacea[§]	Korean lespedeza	57.14	
*Cassia fasciculata***	Partridge pea	14.3	
*Echinacea purpurea***	Purple coneflower	3.57	
*Rudbeckia serotina***	Black-eyed susan	3.57	
*Ratibida pinnata***	Gray-headed coneflower	3.21	
*Coreopsis lanceolata***	Lance leaved coreopsis	2.87	
*Lupinus perennis***	Wild blue lupine	2.5	
*Desmanthus illinoensis***	Illinois bundleflower	2.16	
*Heliopsis helianthoides***	Oxeye (false) sunflower	1.43	
*Lespedeza capitata***	Roundheaded bush clover	1.07	
*Pycnanthemum virginianum***	Virginia mountain mint	1.07	
*Silphium terebinthinaceum***	Prairie dock	1.07	
*Ascelpias tuberosa***	Butterfly milkweed	0.71	
*Baptisia australis***	Wild blue false indigo	0.71	
Echinacea pallida	Pale purple coneflower	0.71	
*Monarda fistulosa***	Wild bergamot	0.71	
*Petalostemum purpureum***	Purple prairie clover	0.71	
*Silphium trifoliatum***	Rosinweed	0.71	
*Silphium laciniatum***	Compass plant	0.71	
*Silphium perfoliatum***	Cup plant	0.71	
*Amorpha canescens***	Lead plant	0.36	
		100	

* Pure live seed

**Forbs in common with Short Grass Mix 1-GP

[§] Non-native species

End of Report – Completed 17 May 2019