Summary Report of the 2009 Jug Bay Bioblitz

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Introduction

A Bioblitz is a brief, intensive survey of plants, animals and other organisms that is conducted in a coordinated way by scientists and amateurs working together in a well-defined study area. Bioblitzes are educational and fun, and can provide us with a greater understanding about local biological diversity. The new knowledge gained about the occurrence, distribution and relative abundance of plants and animals can be critical for protecting rare or unusual species, and for developing effective habitat management plans. Ecologists, resource managers and students can use this information on the presence or absence of species in an area to initiate new studies or management plans. A Bioblitz can also attract scientists to a site which could lead to other projects in the future. Just as important, Bioblitzes are an excellent way to involve the public in an event that broadens their understanding of biological diversity, and gives them hands-on experience identifying organisms and recognizing the habitats where organisms live. Bioblitzes help citizens become citizen scientists.

Aerial (jet airplane) view of the Sanctuary, looking north and upriver. Photograph by Al Luckenbach

Summaries of Bioblitzes are now readily available as reports and some have been published in journals. For example, Hart et al. (2006) describe their Bioblitz surveys of hemlock forests in Nova Scotia and Meshaka et al. (2008) describe their rapid surveys of exotic reptiles in southern Florida. At the 2010 meeting of the Ecological Society of America, Zachary T. Brym and Maria M. Brym (University of Michigan) evaluated coordinated Bioblitzes carried out on university campuses (see http://eco.confex.com/eco/2010/techprogram/P24254.HTM). During the world's first marine Bioblitz in New Zealand, two new diatom species were described for the first time (Harper et al. 2009). A Google search reveals a number of web sites that include Bioblitz summaries.

The U.S. Geological Survey has a web page devoted to bioblitzes (http://www.pwrc.usgs.gov/blitz/), although it is not currently up to date.

The first Jug Bay Wetlands Sanctuary Bioblitz was held on 15 and16 September 2007. Results of that study have been summarized in Swarth et al (2008) and this report is available at http://www.jugbay.org/Research. Searchers on that survey concentrated on 19 groups of organisms and recorded a total of 501 species.

This report summarizes results of the second Jug Bay Bioblitz, held on 13 and14 June 2009, over a 24-hour period from 12:00 p.m. (noon) to 12:00 p.m. The purpose of this survey was to collect additional information on biological diversity and to add new sightings and records to those made in 2007 by concentrating on groups of organisms that were not surveyed then. We targeted the following groups of organisms in 2009:

- Mosses and liverworts
- Wetland plants
- Beetles
- Mosquitoes
- Night-flying insects
- Small mammals
- Bats

This report presents overviews of the surveyed groups and summary tables of all species that were observed. We also briefly discuss some differences and similarities among species observed at the Sanctuary and those observed on the western side of the Patuxent River at Patuxent River Park during a Bioblitz on May 2009.

Photographs of volunteers and some representative organisms are shown on pages 13 to 15, and data tables are presented on pages 16 to 33.

Acknowledgements
Forty-nine searchers participated in the Jug Bay BioBlitz. In addition to the experts listed in Table 1, the following individuals helped on the field teams: Susan Blackstone, Susan Brockman, Rachele Burns, Gordon Burton, Mary Burton, Jeff Campbell, Laura Coombs, Amy Croft, David Curson (plus 10 Johns Hopkins University graduate students), Niko Delgado, John Fletcher, Timothy Foard, Brian Gates, Diane Goebes, Bob Goebes, Kyle Maduro, Alan McKenzie, Steve McKindley-Ward, Sue Muller, Heidi Paulus, Dave Perry, Rebecca Reeves, Ken Riggleman, Jeff Shenot, Les Silva, Bill Sipple, Sean Sipple, Bob Smith, Emily Thorpe, Kerry Wixted, Rebecca Wolf, Andrew Wood, Kris Wood, Carol Yang and Mark Zimmerman.

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Jeff Campbell designed the field data sheets and the Access database program, and Karen Caruso collected and organized the data sheets.

We greatly appreciate the financial support of the Anne Arundel County Recreation and Parks Department, the Chesapeake Bay National Estuarine Research Reserve, Maryland, and the Friends of Jug Bay. Their help is crucial for our research program.

Sanctuary Location and Habitats

The Jug Bay Wetlands Sanctuary is a 1,500 acre ecological research station and environmental education center located in southern Anne Arundel County on the Patuxent River estuary. The Sanctuary is operated by the county's Recreation and Parks Department and is part of the Chesapeake Bay National Estuarine Research Reserve in Maryland. The Sanctuary is about 18 miles south of Annapolis and about 15 miles east of Washington, DC. The McCann Wetlands Center is located in the central part of the Sanctuary at about North 38° 47' 05"; West -76° 42' 06"

Jug Bay is a shallow embayment located in the tidal freshwater region of the estuary. Tidal amplitude is about 0.75m, and salinity varies from 0 ppt for most of the year to a maximum of about 2 ppt in late summer and early fall. The Sanctuary contains about 430 acres of freshwater tidal wetlands (200 acres in south and north Glebe Marsh and 230 acres in the marsh west of Glendening Preserve). Habitats within the Sanctuary have been protected since the 1970s and they consist of tidal marsh, scrub wetland and swamp; non-tidal wetlands; mixed hardwood forests; managed meadows; recovering horse pastures; and stream valleys. Much of the uplands were logged or farmed during the past 250 years. The forests are about 50 to 75 years old, with a few trees surpassing 100 years along the slopes of stream valleys. A railroad bed (now abandoned) was built through the wetlands and forest in 1896. The Sanctuary contains about fifteen miles of hiking trails, boardwalks and roads. For descriptions of the aquatic and upland habitats in the Sanctuary, go to www.jugbay.org/About.

Methods

For a description of the methods employed to organize and coordinate the Bioblitz, see Swarth et al (2008). As with the first Bioblitz in 2007, we recruited experts, colleagues, volunteers, and friends in the weeks leading up to the Bioblitz. Our objective in 2009 was to devote more effort to surveying organisms (especially invertebrates) that were not well known in the Sanctuary and to devote less effort to the better-studied groups of organisms such as birds, upland plants, mammals, amphibians and reptiles. Therefore, we made a special effort to recruit experts from the entomological community and to tap other invertebrate specialists. We also had opportunities to learn about mosses thanks to the participation of a moss expert with the Maryland Society of Natural History, and to learn more about tidal wetland plants from an expert field botanist from the Audubon Naturalist Society. Team leaders and experts are shown in Table 1.

Table 1. Team leaders, affiliations and areas of expertise.

Team Leader	Organization	Area of Expertise
Daniel Kjar	Elmira College, Elmira, New York	Ants
Ben Hollister	Prince George's Community College	Bees, Beetles, Night Insects
Philip J. Kean		Butterflies and other Insects
Fred Paraskevoudakis	Maryland Entomological Society	Tidal Wetland Insects
Dana Limpert	Maryland Department of Natural Resources' Natural Heritage Program	Bats
Harry Coulombe	Jug Bay Wetlands Sanctuary	Small Mammals
Chris Swarth	Jug Bay Wetlands Sanctuary	Small Mammals; Wetland Plants
Mike Quinlan	Jug Bay Wetlands Sanctuary	Reptiles and Amphibians
Susan Matthews	Jug Bay Wetlands Sanctuary	Reptiles and Amphibians
Chuck Saunders	DC Public Schools	Reptiles and Amphibians
Mike Quinlan & Danny Bystrak	Patuxent Wildlife Research Center	Songbird banding - MAPS
David Curson	Johns Hopkins University	Bird Surveys
Linda Davis	Natural History Society of Maryland	Mosses and Liverworts
Karyn Molines	Recreation and Parks Department	Plants (Riggleman Preserve)
Cris Fleming	Audubon Naturalist Society	Tidal Wetland Plants
Pati Delgado	Chesapeake Bay National Estuarine Research Reserve	Tidal Wetland Plants

Teams covered 19 of 39 designated search areas, representing about 30% of the Sanctuary. Search areas 1-12, 20, 33, 34 (a, b, and c) 37, and 39 were covered (see maps in Sanctuary library for details).The tidal wetlands along the Marsh Boardwalk and the wetlands near the mouth of Two Run Branch (including the north edge of the beaver pond there) were well surveyed for wetland plants. The Railroad Bed trail and River Pier areas were searched intensively for insects. Night-flying insects were attracted to an illuminated white sheet with a light behind it which made it possible to capture insects by hand. One survey team covered the Riggleman Preserve to identify plants.

Approximately 12 teams comprised of 1 to10 searchers conducted the Bioblitz. A typical team included 5 searchers. Over 250 search-hours were devoted to the overall effort (Table 2). One search-hour is equivalent to one person searching for one hour. Most teams searched for 3-hour search periods on Saturday or Sunday.

Table 2. Search effort by field teams.
(A search-hour is equal to one searcher searching for one hour)

Species Groups	Number of Searchers	Search-Hours
Mosses and Liverworts	11	33
Upland Plants (Riggleman Preserve)	6	12
Tidal Wetland Plants	8	24
Ants	3	9
Bees	6	18
Beetles	2	6
Mosquitoes	3	NA
Night Flying Insects	2	4
Tidal Wetland Insects	3	9
Reptiles and Amphibians	14	42
Bats	12	48
Small Mammals	12	48
Songbirds (MAPS -bird banding)	3	[72 net-hours (June 14)]
Total	**85**	**253**

Teams searched mainly by walking slowly and inspecting the leaf litter, shrubs, and trees, or by looking under logs and through the soil. Insect sweep nets were used to capture butterflies, dragonflies, damselflies and other insects. Plywood and sheet metal cover boards were placed in meadows to attract snakes and other animals. Sherman live traps were used to capture small mammals in meadows, deciduous forests, and riparian and mixed pine forest habitats. Mist nets for capturing songbirds were opened for five hours on Sunday morning as part of the long-term MAPS study in the forest between Otter Point Trail and Two Run Trail. Several volunteers also surveyed birds throughout the period, and during the mist netting session on Sunday morning, Dr. David Curson and his graduate students from Johns Hopkins University surveyed and kept a bird list in the field. Mist nets for capturing bats were opened at dusk near water at three locations within the Sanctuary.

The greatest field effort in terms of hours of effort was made by the five “nocturnal mammal teams” (96 search-hours), which surveyed for bats and other nocturnal mammals. Forty Sherman live traps were set on Saturday evening in several areas to capture small mammals: 10 along Meadow edge; 10 in the forest; 10 along stream edge; 10 in “mixed vegetation community.” A single large “Have-a-Heart” trap was set near a known Southern Flying Squirrel (*Glaucomys volans*) nest near the Two Run Trail (15m west to grid pole 513-K).

Invertebrates were surveyed by five teams, which devoted 46 search-hours in the field. Three separate “plant teams” concentrated on tidal wetland plants, mosses and liverworts, or on upland plants at the Riggleman Preserve. Ants and bees were collected and preserved in order to determine their specific identity at a later time. The specific identity of some organisms was confirmed later.

A team of ornithologists that studied West Nile Virus and songbirds at the River Farm collected mosquitoes in special traps in the month of June. They shared the results of their mosquito studies with us.

Air temperature was recorded throughout much of the Bioblitz at a weather station in the meadow about 100m northeast of the Wetlands Center.

The scientific nomenclature used in this report for plants, birds, reptiles and amphibians is based primarily on the following systematic reference works:

- ITIS. Integrated Taxonomic Information System (http://www.itis.gov/)
- USDA Plants Database (http://plants.usda.gov/).
- American Ornithologist's Union Checklist of North American Birds. 1998. 7th edition.
- Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, with Comments Regarding Confidence in our Understanding. Crother, et al. 2008. 6th Edition.

Weather Conditions

Weather conditions on 13 and 14 June 2009 were ideal for the Bioblitz. Saturday was clear with a light wind, and Sunday was partly cloudy and calm. On Saturday evening a brief thunderstorm dropped 0.12 inches of rain. The warmest part of the Bioblitz period occurred at 4:00 p.m. on 13 June (31.1°C; 88°F) and it was coolest at 6:40 a.m. on 14 June (20.6°C; 69°F). In Maryland, the mean, long-term high air temperature for June is 28°C (83°F) and the mean long-term low temperature is 15°C (59°F). In June, the greatest rainfall was recorded on June 5th (1.13"). The 24-hour record of air temperature throughout the 24-hour survey period is shown in Table 3.

Weather for June 2009 in Maryland was described by the Atlantic Coast Observer's Network as, "wet with pleasant temperatures."
www.jhuapl.edu/weather/education/ACONdata.html.
ACON summarized the weather for the first half of June 2009 in this way:

- The month began with unseasonal cool temperatures and was wet.
- Temperature in the mid 80s to lower 90s on 9 June fueled thunderstorms, some of which were intense.
- Humid, warm conditions, with temperatures in the mid 70s to mid 80s, along with some showers and thundershowers, occurred from 10 to 16 June.

Table 3. Hourly air temperature; June 13-14, 2009. Data from the Jug Bay weather station.

June 13		June 14	
Time	**Temp (C)**	**Time**	**Temp (C)**
09:00	25.6	6:40	20.6
10:00	27.2	7:45	21.1
11:00	27.2		
12:30	28.9		
13:00	29.4		
14:00	30.0		
15:00	30.6		
16:00	31.1		
17:00	30.6		
18:00			
19:00			
20:00			
21:00			
22:35	22.8		
23:15	22.2		

Results and Highlights

A total of 334 species of plants and animals were identified during the 2009 Bioblitz, including 196 species that had not observed during the 2007 Bioblitz (Table 4). The total species diversity is considerably lower than the 501 species that were observed in 2007. The difference between the 2007 and 2009 surveys is due, in part, to our focus on different groups of organisms, some of which (for example, mosses and liverworts) required more time for collection and detailed inspection in the field. The "Moss" team surveyed the Sanctuary on Saturday and again on Sunday.

Observers recorded 112 "new" (species not been observed on the 2007 Bioblitz) plant species. Other groups with high numbers of "new" species were: ants (14 new species in 2009), beetles (14 species), and birds (11species). A total of 18 species of mosquito were identified by the research team working here throughout the month of June.

Species lists for each group are shown in Tables 5 to17. In 2009, we concentrated field surveys on several groups of organisms that were not targeted in 2007 (Table 2). New groups surveyed in 2009 were:

- mosses and liverworts
- wetland plants
- nocturnal insects
- beetles
- mosquitoes
- bats
- small mammals

Organisms ranked as rare, threatened, or unusual are shown in Table 5.

Amber Marsh Snail parasitized by the flatworm *Leucochloridium paradoxum*

On the first morning of the Bioblitz (June 13), Chris Swarth and Rebecca Reeve made an unusual sighting along the Marsh Boardwalk. On a cattail stalk they discovered an Amber Marsh Snail (*Oxyloma effusa*) that had been parasitized by the flatworm *Leucochloridium paradoxum* (Helminthes). *Oxyloma* and other snails in the family Succineadae occasionally serve as hosts to this flatworm. The snail initially ingests the flatworm eggs while it is feeding on a plant leaf. Inside the snail's gut the eggs develop into a green-banded broodsac or sporocyst that is filled with hundreds of cercaria (the motile, larval life stage). The broodsac migrates from the gut into one of the snail's antenna or eye stalks (usually the left one) where it begins to pulsate rhythmically. This conspicuous structure embedded inside the unwitting snail serves the purpose of attracting an avian predator such as a Red-winged Blackbird (*Agelaius phoeniceus*) which is the definitive host. The bird ingests the snail along with the flatworm cercaria. The larvae develop into adults which lay eggs that are shed from the bird when it defecates, continuing the life cycle. Whereas we often see Amber Marsh Snails on marsh vegetation (especially on cattails and Arrow Arum), only very rarely do we see one that is parasitized. This is probably because any parasitized snails are soon eaten by birds that had been attracted to the tasty, pulsating broodsac.

Amber Marsh Snail with *Leucochloridium paradoxum* broodsac in left antenna.

According to the account on *Leucochloridium paradoxum* in Wikipedia,
"This flatworm in its larval, miracidia stage, travels into the digestive system of a snail to develop into the next stage, a sporocyst. The sporocyst grows into long tubes to form swollen "broodsacs" filled with tens to hundreds of cercariae. These broodsacs invade the snail's tentacle (preferring the left, when available), causing a brilliant transformation of

the tentacle into a swollen, pulsating, colorful display that mimics the appearance of a caterpillar or grub. The broodsacs seem to pulsate in response to light intensity, and in total darkness do not pulse at all. The infection of the tentacles of the eyes seems to inhibit the perception of light intensity. Whereas uninfected snails seek dark areas to prevent predation, infected snails have a deficit in light detection, and are more likely to become exposed to predators, such as birds. Birds are the definitive hosts where the cercariae develop into adult distomes in the digestive system of the bird. These adult forms sexually reproduce and lay eggs that are released from the host via the bird's excretory system. These droppings are then consumed by snails to complete the life cycle of this parasitic worm.

The resulting behavior of the flatworm is a case of aggressive mimicry, where the parasite vaguely resembles the food of the host. This gains the parasite entry into the host's body; this is unlike most other cases of aggressive mimicry, in which only a part of the host resembles the target's prey and the mimic itself then eats the duped animal.

For the first time we surveyed vascular plants at the Riggleman Preserve in the south part of the Sanctuary. Although habitats in the Riggleman Preserve are similar to other Sanctuary areas that were surveyed in 2007, it was exciting for the search teams to investigate an areas where botanical surveys had not been conducted before.

Mosses and Liverworts

These inconspicuous and interesting plants were the subject of two days of intensive field work by Linda Davis. Linda and her team discovered 21 species of mosses and five species of liverworts (Table 6). The liverwort *Nowellia curvifolia* was observed in the Sanctuary and at Patuxent River Park. Several clubmosses were also identified.

Wetland plants

A total of 62 wetland plant species were observed in 2007 & 2009; including 44 new wetland plant species observed in 2009. Twenty eight species of wetland plants were in common at JBWS and PRP. A list of the wetland plants is shown in Table 7.

Trees

Of particular interest on the 2009 Bioblitz was a Cherrybark Oak, a new record for the Sanctuary. White Fringetree (*Chionanthus virginicus*) was noted in 2007 and again in 2009. This short, inconspicuous tree is obvious only during the brief period when it flowers. At other times, its foliage is not easily distinguished from the other shrubs or riparian trees that share its habitat. One specimen grows along the lower slope, just above the high tide line on the Marsh Boardwalk in the area where the “swamp” boardwalk section meets the “marsh” boardwalk section. See Table 8 for a list of trees observed. Pumpkin Ash (*Fraxinus profunda*) has been noted growing in tidal swamps on both sides of the Patuxent River in the Jug Bay area.

Ants

The ant fauna in the Jug Bay area consists of at least 52 species, based on the results of three Bioblitzes (Table 9). Almost exactly the same number of species (34) were observed in

2009 as in 2007 (33). The ant total for the Sanctuary now stands at 49 species. The genera with the most species were *Camponotus* (7 species), *Formica* (6 sp.), *Aphaenogaster* (5 sp.), *Myrimica* (4 sp.), and *Pheidole* (4 sp.). Of the 33 species observed in 2009, 12 were new species not observed in 2007 (Tables 4 and 6). Twenty three ant species were seen in both years. Twenty nine ant species were observed at Patuxent River Park (PRP) and 24 species were in common at JBWS and PRP. *Formica vinculans*, a possible new record for Maryland, was identified by Fred Paras. Dan Kjar identified two subspecies of *Formica pallidifulva— F.p. nitidiventris* and *F.p. pallidifulva.* At the nearby Smithsonian Environmental Research Center, 15 miles away, research zoologist Jim Lynch collected 60 ant species over a period of ten years. According to Lynch (1987), 102 ant species are known or expected to occur in the Chesapeake Bay region.

Bees and Wasps
Seven new species of bees and wasps were added to our list on the 2009 Bioblitz. See Table 10 for a list of all species seen in 2007 and 2009.

Beetles
Sixteen beetle species were observed in 2009, 12 of which were not observed in 2007. The total beetle diversity based on both surveys now stands at 30 species (Table 11). Forty three species were identified at Patuxent River Park in 2008. These totals are likely a small fraction of the total coleopteran fauna of the Jug Bay area.

Four species of *Cicindela* (Tiger Beetle) were found. According to Mawdsley (2007) eight species of Tiger Beetles occur in the Sanctuary. *Cicindela scutellaris* was observed in 2007 and 2009. This beetle has been placed on Maryland's Watch List because suitable habitat in the state is disappearing due to development (Mawdsley 2007).

Wetland insects and night-flying insects
The wetlands at Jug Bay cover about 100 hectares yet there has been little effort to document the insects that use this habitat. Several groups spent hours on Saturday working the margins of the wetlands using sweep nets to capture and identify insects on wetland vegetation. As regards night-flying insects, we have a detailed record of the microlepidoptera based on extensive night-light trapping by the late Tibby Stevenson in the early 1990s.

Mosquitoes
We did not survey for mosquito diversity during the Bioblitz; however, ecologists with the University of California, Santa Cruz, and the Migratory Bird Center (National Zoological Park) were engaged in fieldwork throughout the month of June in the Sanctuary studying the incidence of West Nile Virus in breeding songbirds. As part of that study they captured large numbers of mosquitoes and identified 18 species (Table 12). Their study site was in the River Farm area near grid poles 508-T and 508-U (UTM Easting 353169; Northing 4293527).

Butterflies and Moths
Several species were identified in 2009 that had not been observed in 2007: Banded Tussock Moth, Carpenter Moth, Tulip-tree Beauty Moth, Zebra Swallowtail, Red-Spotted Purple, Peck's Skipper, and Banded Hairstreak. See Table 13 for species in this group.

Damselflies and Dragonflies
A new species for the Sanctuary was the Basket Tail (*Epitheca* sp.). The Ebony Jewelwing was recorded for the first time on a Bioblitz; they are common in the shady, moist stream floodplains. See Table 14 for species in this group.

Miscellaneous Insects
See Table 15 for a list of miscellaneous insects.

Reptiles and Amphibians
A variety of reptiles and amphibians was observed and captured, but no species were observed for the first time in 2009. Thirty-six of the 46 native species of amphibians and reptiles known to occur in the Sanctuary have been observed on the two Bioblitzes (Table 16).

Birds
Organized bird surveys were not conducted on the Bioblitz owing to the fact that the bird fauna of the Sanctuary has been very well documented over the past 25 years of research and recreational birding. The bird fauna of the Jug Bay Wetlands Sanctuary consists of more than 275 species, with a breeding avifauna of about 91 species (source: Jug Bay Wetlands Sanctuary bird checklist. www.jugbay.org/Research/SpeciesLists).

Volunteers operated 14 mist nets, and captured and banded a total 21 birds (9 species) on Sunday, June 14. An additional 16 previously-banded birds were captured.

- Downy Woodpecker (1 banded)
- Acadian Flycatcher (4 banded; 1 recapture)
- Carolina Wren (5 banded; 1 recaptures)
- Red-eyed Vireo (2 banded; 5 recaptures)
- Wood Thrush (3 banded; 5 recaptures)
- Louisiana Waterthrush (1 banded)
- Common Yellowthroat (2 banded; 2 recaptures)
- Northern Cardinal (2 banded; 2 recaptures)
- Common Grackle (1 banded)

These species were observed or heard in 2009, but were not detected in 2007:

- Spotted Sandpiper
- Eastern Screech Owl
- Yellow-billed Cuckoo
- Great-crested Flycatcher
- Barn Swallow
- Purple Martin
- Marsh Wren
- Yellow-throated Vireo
- Yellow-throated Warbler
- Louisiana Waterthrush
- Prothonotary Warbler
- Orchard Oriole
- Eastern Towhee

Mammals
The forty Sherman live traps captured a total of 9 White-footed Mice (*Peromyscus leucopus*). No other small mammals were captured. The large Have-a-Heart trap set near the flying squirrel nest held a Virginia Opposum. We had hoped to trap a Southern Flying Squirrel, but were unable to. A variety of other mammals were also seen (Table 17). No bats were captured at River Pier or Observation Blind.

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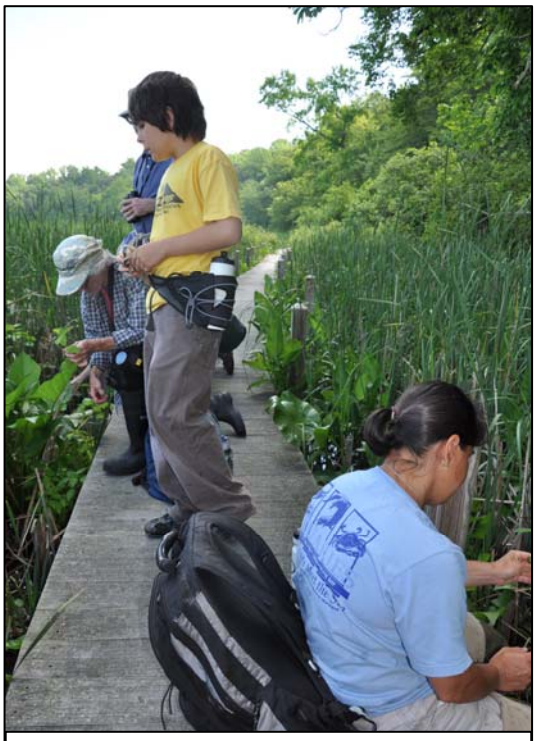
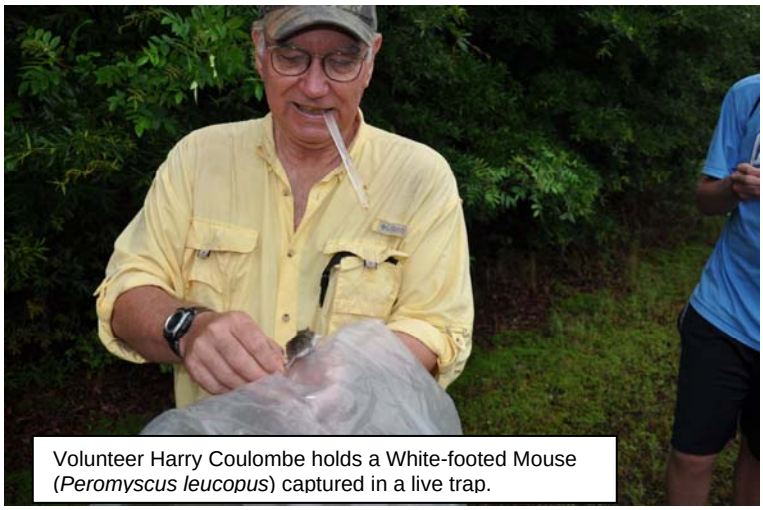
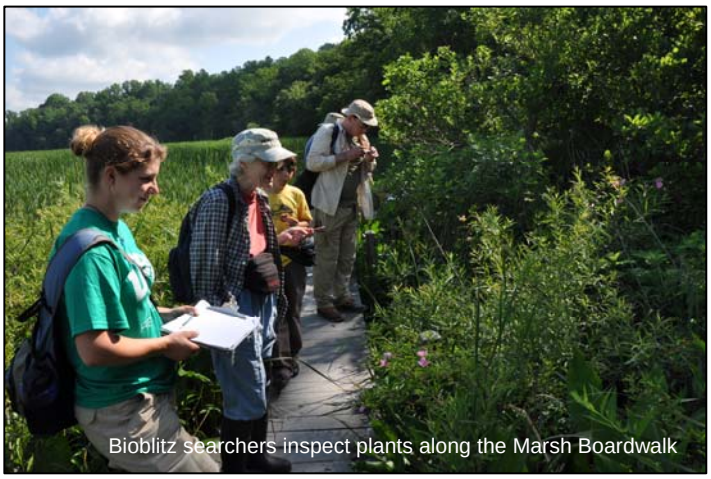
Volunteer Mike Quinlan leads a group on the 2009 Bioblitz



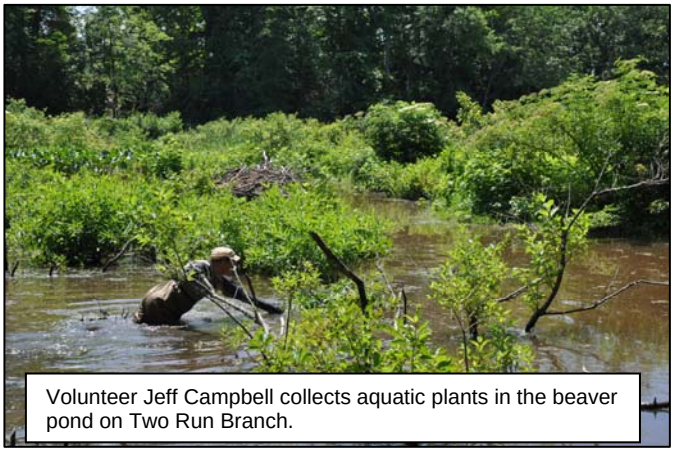
Bioblitz searchers inspect plants along the Marsh Boardwalk



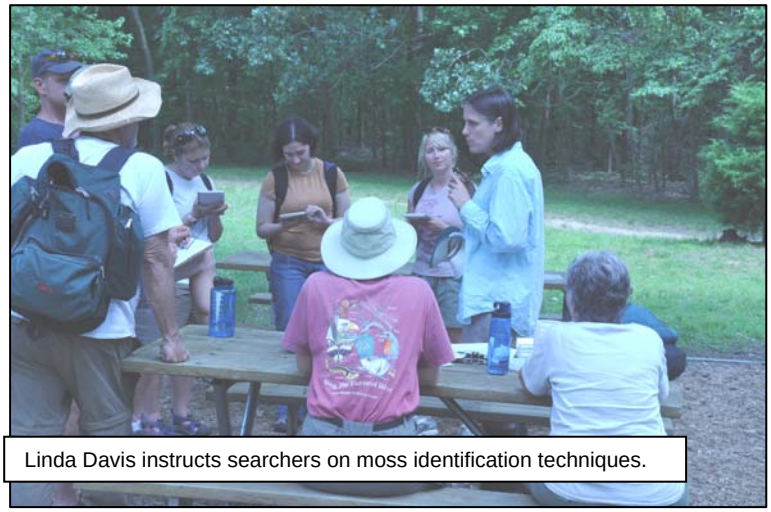
Volunteer Harry Coulombe holds a White-footed Mouse (*Peromyscus leucopus*) captured in a live trap.



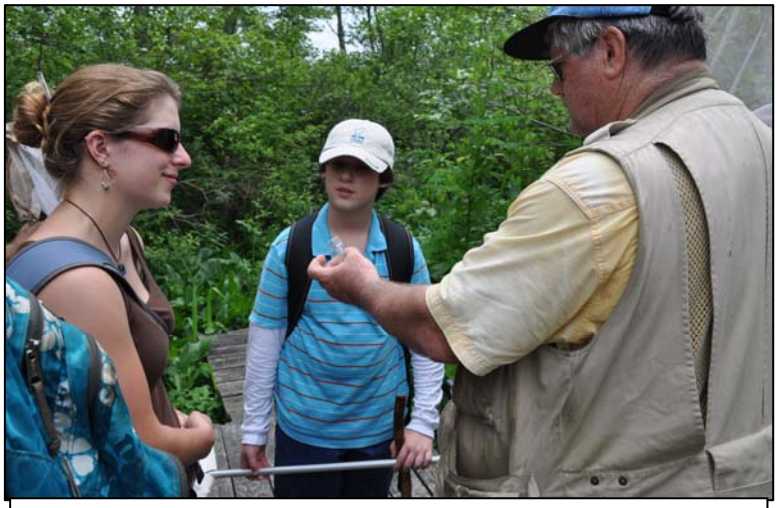
Bioblitz searchers inspect plants along the Marsh Boardwalk



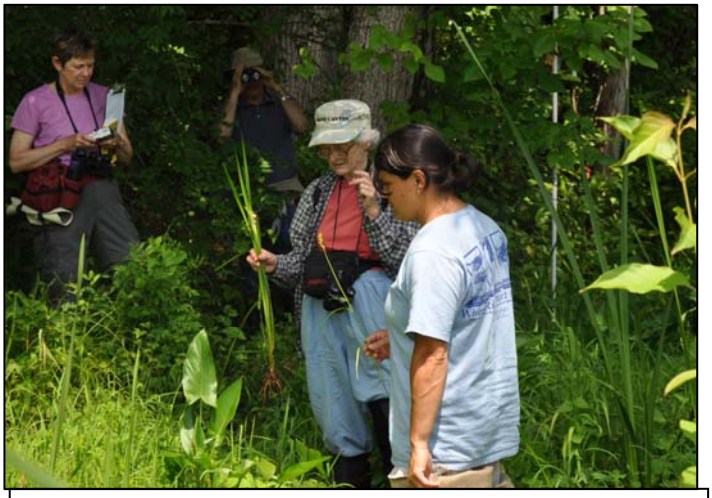
Volunteer Jeff Campbell collects aquatic plants in the beaver pond on Two Run Branch.



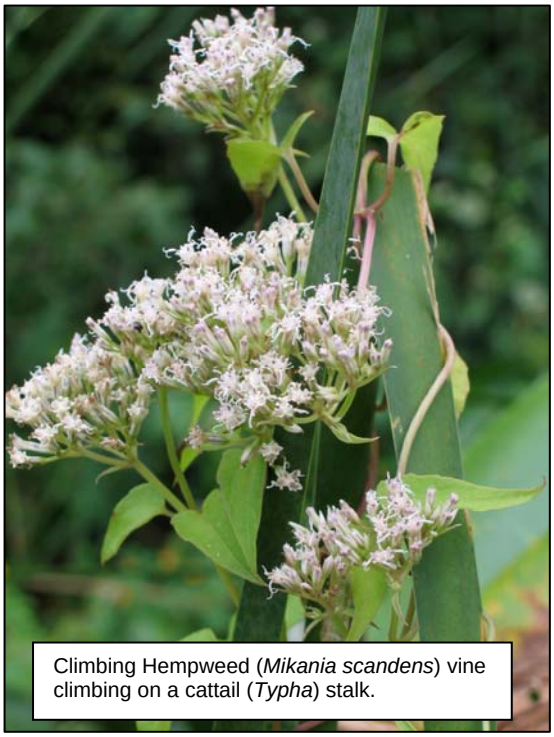
Linda Davis instructs searchers on moss identification techniques.



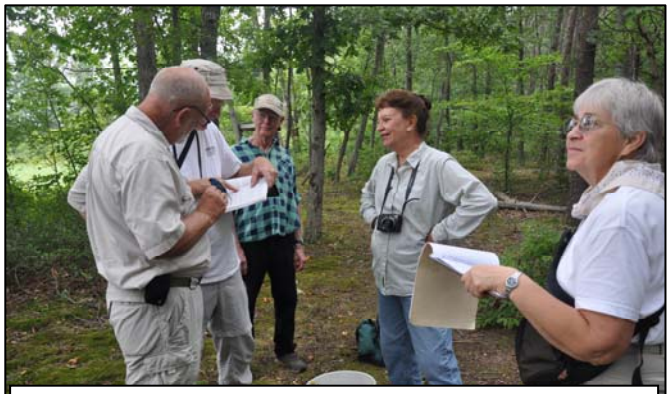
Rebecca Reeves (left) and another volunteer look at captured insects.



Botanist Cris Fleming (left) and Patricia Delgado identify wetland plants.

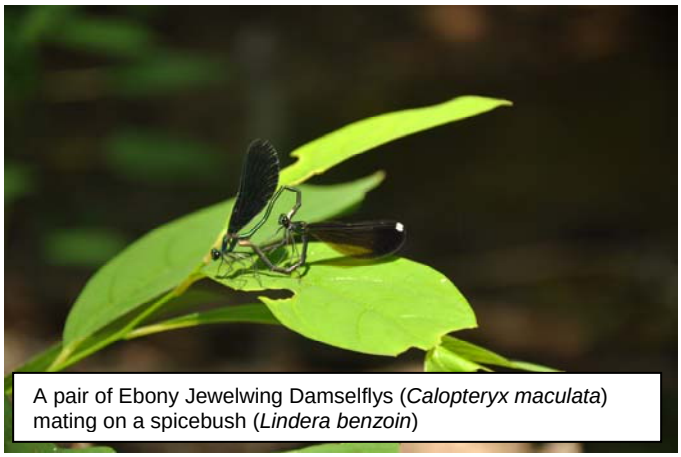


Climbing Hempweed (*Mikania scandens*) vine climbing on a cattail (*Typha*) stalk.

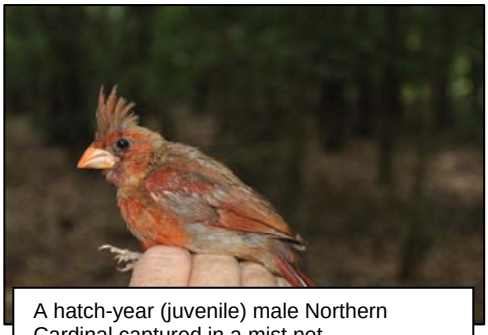


Volunteer bird banders at the mist nets.

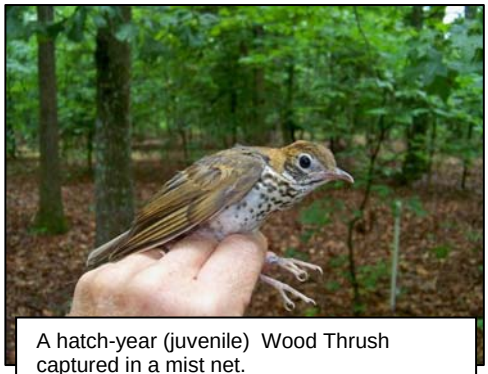
Pickerel Frog (*Lithobates palustris*) captured on the Bioblitz.



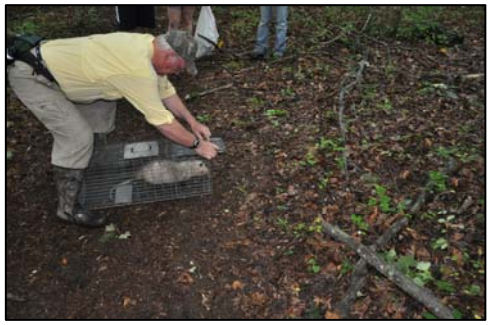
A pair of Ebony Jewelwing Damselflys (*Calopteryx maculata*) mating on a spicebush (*Lindera benzoin*)

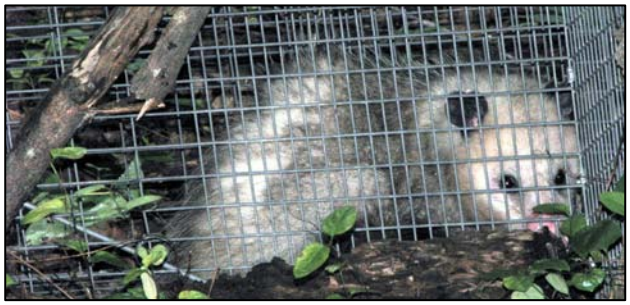


A hatch-year (juvenile) male Northern Cardinal captured in a mist net.



A hatch-year (juvenile) Wood Thrush captured in a mist net.





Clockwise from top, White-footed Mouse; Harry Coulombe releasing a Virginia Opposum; White-footed Mouse up a tree; Virginia Opposum in trap.

Table 4. Species observed during the Jug Bay Wetlands Sanctuary (JBWS) 2007 and 2009 Bioblitzes and the Patuxent River Park (PRP) 2009 Bioblitz.

Groups of Organisms	2007 JBWS Species Observed	2009 JBWS Species Observed	2007 & 2009 JBWS Species Observed	2009 New Species Observed	2009 Species at PRP	Species at JBWS Only	Species at PRP Only	Species In Common JBWS & PRP
Ants	34	33	49	12	30	12	10	24
Beetles	14	16	30	14	43	28	41	2
Bees & Wasps	26	8	33	7	27	30	25	3
Butterflies & Moths	50	15	60	10	49	52	23	8
Damselflies & Dragonflies	18	8	19	2	21	9	12	10
Other Insects	16	19	32	16	9	29	6	3
Earthworms	5	0	5	0	9	2	6	3
Isopod Crustaceans	3	0	3	0	5	1	2	2
Amphipod Crustaceans	0	0	0	0	1	0	1	0
Spiders	13	0	13	0	0	13	0	0
Flatworms and Mollusks	0	1	1	1	17	1	17	0
Fish	11	6	12	1	0	12	0	0
Birds	100	54	120	11	80	51	11	69
Mammals	7	8	10	3	11	1	2	9
Reptiles & Amphibians	27	24	28	5	25	11	7	17
Wetland Plants	0	65	65	44	34	28	6	28
Upland Vascular Plants (ferns, herbs and shrubs)	96	32	123	30	91	72	50	41
Submerged Aquatic Vegetation (SAV)	0	0	0	0	5	0	5	0
Trees	59	10	61	3	31	38	2	29
Ferns	1	10	10	9	13	2	5	8
Clubmosses, Mosses and Liverworts	0	26	26	26	6	24	4	2
Plankton	5	0	5	0	0	5	0	0
Mushrooms	16	0	16	0	36	12	29	4
Total Species	501	334	718	196	543	433	264	262

Table 5. Rare species observed during the JBWS (2007 & 2009) and PRP (2009) Bioblitzes.

Species Name	Status, notes, and observer	JBWS	PRP
Basidiomycetes Fungus *(Hygrocybe unguinosa)*	"A rare mushroom"; Lance Biechele		X
Red turtlehead *(Chelone oblique)*	Global Rank: G4, State Rank: S1, State Status: T		X
Wild Yam *(Dioscorea hirticaulis)*	Global Rank: G3Q, State Rank: SH		X
Dwarf Rattlesnake-plantain *(Goodyera repens)*	Global Rank: G5, State Rank: SH, State Status: X		X
Maroon Carolina Milkvine (*Matelia carolinensis*)	Maryland status, "Highly State Rare"	X	
Pumpkin Ash (*Fraxinus profunda)*	Maryland status, "Highly State Rare"	X	X
Earthworm (*Diplocardia patuxentis*)	"A recently-described species", Dr. Kathy Szlavecz	X	
Brown Spiketail Dragonfly *(Cordulegaster bilineata)*	Global Rank: G5; State Rank: S3		X
Sable Clubtail Dragonfly *(Gomphus rogersi)*	Global Rank: G4, State Rank: S2, State Status: I		X
Gray Petaltail Dragonfly *(Tachopteryx thoreyi)*	Global Rank: G4, State Rank: S3		X
Mocha Emerald Damselfly *(Somatochlora linearis)*	Maryland status: "Watch List"	X	
Fungus-gardening Ant (*Trachymyrmex septentrionalis)*	"Unusual this far north" Timothy Ford	X	
Ant (*Formica vinculans)*	"Possible new state record", Fred Paras	X	
Ant (*Hypoponera opacior)*	"Rare west of the Chesapeake Bay", Fred Paras	X	
Ground bee *(Epoelus autumnalis)*	"Very rare", Sam Droege	X	
Ground bee *(Epeolus pusillus)*	"Very rare", Sam Droege	X	
Ground bee *(Perdita bequaerti)*	"New state record", Sam Droege	X	
Ground bee *(Perdita boltoniae)*	"A sand specialist; rare", Sam Droege	X	
Ground bee *(Pseudopanurgus rugosa)*	"Rare" Sam Droege	X	
Hymenoptera *(Nomada affabilis)*	"New State Record'' Gary Hevel & Sam Droege		X
Mining Bee *(Andrena illicis)*	"Uncommon"; Sam Droege		X
Mining Bee *(Andrena morissonella)*	"Regular near Chesapeake Bay", Sam Droege		X
Mining Bee *(Andrena thaspii)*	"Uncommon", Sam Droege		X
Mining Bee *(Andrena tridens)*	"Uncommon", Sam Droege		X
Mining Bee *(Anthophora abrupta)*	Usually only seen near nesting cliffs		X
Tiger Beetle *(Cicindela scutellaris)*	Maryland status: "Watch List"	X	
Wedge-shaped Beetle (Rhipiphoridae: *Pelecotoma lavipes*)	"New state record", Gary Hevel		X
Least Bittern *(Ixobrychus exilis)*	Maryland status: "State Rare"	X	X
Sora *(Porzana Carolina)*	Maryland status: "Highly State Rare"	X	
Bald Eagle (*Haliaeetus leucocephalus)*	Maryland status: "State Threatened"	X	X
Common Nighthawk *(Chordeiles*	Maryland status: "Watch List"	X	

minor)			
Magnolia Warbler (*Dendroica magnolia)*	Maryland status: "Watch List"	X	
Black-throated Blue Warbler (*Dendroica caerulescens*)	Maryland status: "Watch List"	X	

(Status: Maryland Natural Heritage Program, Global and State Ranks, 2010)

Table 6. Clubmosses, mosses and liverworts observed and identified on the Bioblitz.

Scientific Name	JBWS Species Observed 2009	PRP Species Observed 2009
Clubmosses		
Lycopodium digitatum		X
Lycopodium obscurum	X	X
Mosses and Liverworts		
Anomodon attenuatus	X	
Anomodon rostratus	X	
Atrichum angustatum	X	
Atrichum crispum	X	
Bryhnia graminicolor	X	
Bryoandersonia illecebra	X	
Bryum argenteum	X	
Calypogeja fissa	X	
Frullania eboracensis		X
Frullania inflate	X	
Huperzia lucidula		X
Isopterygium tenerum	X	
Leskea polycarpa	X	
Leucobryum sp.	X	
Lophocolea heterophylla	X	
Nowellia curvifolia	X	X
Odontoschisma prostratum		X
Pallavicinia lyellii	X	
Plagiomnium ciliare	X	
Plagiomnium cuspidatum	X	
Platygyrium repens	X	
Polytrichastrum ohioense	X	
Polytrichum commune	X	
Pseudotaxiphyllum elegans	X	
Sphagnum palustre	X	
Steerecleus serrulatum	X	
Tetraphis pellucida	X	
Thuidium delicatulum	X	

Table 7. Wetland plant species observed and identified on the Bioblitz.

Common Name	Scientific Name	JBWS Species Observed 2007 or 2009	PRP Species Observed 2009
Sweetflag	*Acorus calamus*	X	
American Waterplantain	*Alisma subcordatum*		X
Common Marshmallow	*Althaea officinalis*	X	
Canadian Serviceberry	*Amelanchier arborea*	X	
Groundnut	*Apios americana*	X	X
Common Dogbane	*Apocynum cannabinum*		X
Devil's Walkingstick	*Aralia spinosa*	X	X
Jack-In-The-Pulpit	*Arisaema trphyllum*	X	
Clasping Milkweed	*Asclepias amplexicaulis*	X	
Smallspike False Nettle	*Boehmeria cylindrica*	X	X
Fringed Sedge	*Carex crinita*	X	
Shallow Sedge	*Carex lurida*	X	
Squarrose Sedge	*Carex squarrosa*	X	
Common Buttonbush	*Cephalanthus occidentalis*	X	X
White Turtlehead	*Chelone glabra*	X	
Pink Turtlehead	*Chelone obliqua*	X	X
Spotted Water Hemlock	*Cicuta maculata*	X	
Coastal Sweetpepperbush	*Clethra alnifolia*	X	
Asiatic Dayflower	*Commelina communis*	X	
Scaldweed	*Cuscuta gronovii*	X	
Swamp Loosestrife	*Decodon verticillatus*	X	
Wild Yam	*Dioscorea villosa*	X	X
Stiff Marsh Bedstraw	*Galium tinctorium*	X	
Jewelweed	*Impatiens capensis*	X	X
Whitestar	*Ipomoea lacunosa*	X	
Harlequin Blueflag	*Iris versicolor*	X	
Rice Cutgrass	*Leersia oryzoides*	X	
Fetterbush	*Leucothoe racemosa*	X	X
Turk's Cap Lily	*Lilium superbum*	X	X
Northern Spice Bush	*Lindera benzoin*	X	X
American Water Horehound	*Lycopus americanus*	X	
Wild Mint	*Mentha arvensis*	X	
Climbing Hempvine	*Mikania scandens*	X	
Wartremoving Herb	*Murdannia keisak*	X	
Spatterdock	*Nuphar lutea*	X	
Green Arrowarum	*Peltandra virginica*	X	X
Common Reed	*Phragmites australis*	X	
Clearweed	*Pilea pumila*	X	X

Pickerelweed	*Pontederia cordata*	X	X
Ivy Buttercup	*Ranunculus hederaceus*	X	
Swamp Azalea	*Rhododendron viscosum*	X	
Swamp Rose	*Rosa palustris*	X	X
Brambles	*Rubus* sp.	X	X
Broadleaf Arrowhead	*Sagittaria latifolia*	X	X
Common Elderberry	*Sambucus canadensis*	X	X
Lizard's tail	*Saururus cernuus*	X	X
Sedge	*Scirpus* sp.	X	
Blue Skullcap	*Scutellaria lateriflora*	X	
Hemlock Waterparsnip	*Sium suave*		X
Roundleaf Greenbriar	*Smilax rotundifolia*	X	X
Broadfruit Bur-Reed	*Sparganium eurycarpum*	X	
Skunk Cabbage	*Symplocarpus foetidus*	X	X
King of the Meadow	*Thalictrum pubescens*	X	
Poison Ivy	*Toxicodendron radicans*	X	X
Narrowleaf Cattail	*Typha angustifolia*	X	
Broadleaf Cattail	*Typha latifolia*	X	X
Highbush Blueberry	*Vaccinium corymbosum*	X	
Arrowwood	*Viburnum dentatum*	X	X
Blackhaw	*Viburnum prunifolium*	X	X
Common Blue Violet	*Viola sororia*		X
Frost Grape	*Vitis vulpina*	X	
Annual Wildrice	*Zizania aquatica*	X	X

Table 8. Tree species observed and identified on the Bioblitz.

Common Name	Scientific Name	JBWS Species Observed 2007 or 2009	PRP Species Observed 2009
Red Maple	*Acer rubrum*	X	X
Boxelder	*Acer negundo*		X
Norway Maple	*Acer platanoides*	X	
Tree of Heaven	*Ailanthus altissima*	X	
Silktree	*Albizia julibrissin*	X	
Hazel Alder	*Alnus serrulata*	X	X
Pawpaw	*Asimina triloba*	X	
River Birch	*Betula nigra*	X	X
American Hornbeam	*Carpinus caroliniana*	X	X
Pignut Hickory	*Carya glabra*	X	X
Mockernut Hickory	*Carya tomentosa*	X	X
American Chestnut	*Castanea dentata*	X	
Chinese Chestnut	*Castanea mollissima*	X	
Chinkapin	*Castanea pumila*	X	X

Eastern Redbud	*Cercis canadensis*	X	
White Fringetree	*Chionanthus virginicus*	X	
Silky Dogwood	*Cornus amomum*	X	X
Flowering Dogwood	*Cornus florida*	X	X
Gray Dogwood	*Cornus racemosa*		X
Common Persimmon	*Diospyros virginiana*	X	
American Beech	*Fagus grandifolia*	X	X
White Ash	*Fraxinus americana*	X	
Green Ash	*Fraxinus pennsylvanica*	X	X
Pumpkin Ash	*Fraxinus profunda*	X	X
American Holly	*Ilex opaca*	X	X
Common Winterberry	*Ilex verticillata*	X	X
Black Walnut	*Juglans nigra*	X	X
Eastern Redcedar	*Juniperus virginiana*	X	
Sweetgum	*Liquidambar styraciflua*	X	X
Tuliptree	*Liriodendron tulipifera*	X	X
Sweetbay	*Magnolia virginiana*	X	
White Mulberry	*Morus alba*	X	
Red Mulberry	*Morus rubra*	X	
Blackgum	*Nyssa sylvatica*	X	X
Princesstree	*Paulownia tomentosa*	X	
Norway Spruce	*Picea abies*	X	
Eastern White Pine	*Pinus strobus*	X	
Loblolly Pine	*Pinus taeda*	X	
Virginia Pine	*Pinus virginiana*	X	
American Sycamore	*Platanus occidentalis*	X	X
Bigtooth Aspen	*Populus grandidentata*	X	
Black Cherry	*Prunus serotina*	X	X
Callery Pear	*Pyrus calleryana*	X	
White Oak	*Quercus alba*	X	X
Swamp White Oak	*Quercus bicolor*	X	
Scarlet Oak	*Quercus coccinea*	X	
Southern Red Oak	*Quercus falcata*	X	X
Blackjack Oak	*Quercus marilandica*	X	
Swamp Chestnut Oak	*Quercus michauxii*	X	
Cherrybark Oak	*Quercus pagoda*	X	
Pin Oak	*Quercus palustris*	X	
Willow Oak	*Quercus phellos*	X	X
Chestnut Oak	*Quercus prinus*	X	
Northern Red Oak	*Quercus rubra*	X	X
Post Oak	*Quercus stellata*	X	
Black Oak	*Quercus velutina*	X	
Black Locust	*Robinia pseudoacacia*	X	
Black Willow	*Salix nigra*	X	
Sassafras	*Sassafras albidum*	X	

American Basswood	*Tilia americana*	X	
American Elm	*Ulmus americana*	X	
Blackhaw	*Viburnum prunifolium*	X	

Table 9. Ant (Order: Hymenoptera) species observed and identified on the Bioblitz. Species marked with an asterisk were observed for the first time in 2009.

Common Name	Scientific Name	JBWS Species Observed 2007 or 2009	PRP Species Observed 2009
Myrmicine Ant	*Aphaenogaster fulva*	X	X
	Aphaenogaster rudis	X	X
	Aphaenogaster lamellidens	X	
	*Aphaenogaster tennesseensis**	X	X
	Aphaenogaster treatea	X	
	*Brachymyrmex depilis**	X	
Carpenter Ant	*Camponotus americanas*	X	X
Chestnut Carpenter Ant	*Camponotus castaneus*	X	X
Red Carpenter Ant	*Camponotus chromaiodes**	X	X
	Camponotus impressus		X
	*Camponotus nearcticus**	X	X
Black Carpenter Ant	*Camponotus pennsylvanicus*	X	X
Carpenter Ant	*Camponotus subbarbatus*	X	X
Myrmicine Acrobatic Ant	*Crematogaster cerasi*	X	X
	Crematogaster sp.	X	
Lined Acrobatic Ant	*Crematogaster lineolata*	X	X
Formicine Dolichoderine Ant	*Dorymyrmex bureni*	X	
	Dorymyrmex grandulus	X	
Formicine Ant	*Formica dolosa*	X	
	Formica integra	X	
	Formica pallidifulva		X
	*Formica pallidifulva pallidifulva**	X	X
	*Formica pallidifulva nitidiventris**	X	
	Formica subsericia	X	X
	Formica vinculans	X	
Ponerine Ant	*Hypoponera opacior*	X	
Cornfield Ant	*Lasius alienus*	X	X
	*Lasius interjectus**	X	
	Lasius murphyi	X	
Little Black Ant	*Monomorium emarginatum*	X	
Little Black Ant	*Monomorium minimum*	X	X
Myrmicine Ant	*Myrmecina americana*	X	X

	Myrmica sp.	X	
	Myrimica latifrons	X	
	Myrmica lobicornis		X
	Myrmica pinetorum	X	X
	Myrmica punctiventris		X
	*Paratrechina faisonensis**	X	X
	Paratrechina parvula	X	
Myrmicine Ant	*Pheidole bicarinata*	X	
	Pheidole davisi	X	
	Pheidole dentata	X	
	Pheidole pilifera	X	
	Phenolepsis impairs	X	
	*Ponera pennsylvanica**	X	X
Formicine Ant	*Prenolepis impairs*	X	X
	*Proceratium pergandei**	X	
	*Stenamma impar**	X	X
Myrmicine Ant	*Solenopsis molesta*	X	
Odorous House Ant	*Tapinoma sessile*	X	X
	*Temnothorax curvispinosus**	X	X
	Temnothorax longispinosus		X
Myrmicine Pavement Ant	*Tetramorium caespitum*	X	X
Northern Fungus Gardening Ant	*Trachymyrmex septentrionalis*	X	
	Vollenhovia emeryi		X

Table 10. Bee and wasp (Order: Hymenoptera) species observed and identified on the Bioblitz. Species marked with an asterisk were observed for the first time in 2009.

Common Name	Scientific Name	JBWS Species Observed 2007 or 2009	PRP Species Observed 2009
	Agapostemon virescens	X	
	Andrena aliciae	X	
Mining Bee	*Andrena brevipalpis/robertsonii*		X
Mining Bee	*Andrena illicis*		X
Mining Bee	*Andrena morissonella*		X
Mining Bee	*Andrena thaspii*		X
Mining Bee	*Andrena tridens*		X
Spider Wasp	*Anoplius* sp. *	X	
Mustached Mud Bee	*Anthophora abrupta*		X
European Honeybee	*Apis mellifera*	X	X
	Augochlora pura		X
	Augochloropsis metallica		X
Common Eastern Bumblebee	*Bombus impatiens*	X	
American Bumblebee	*Bombus pensylvanicus* *	X	
	Calliopsis andreniformis	X	

Smaller Carpenter Bee	*Ceratina calcarata*		X
Smaller Carpenter Bee	*Ceratina dupla*		X
Smaller Carpenter Bee	*Ceratina strenua*		X
Green Cuckoo Wasp	*Chrysis* sp. *	X	
	Coelioxys octodentata	X	
	Coelioxys sayi	X	
	Colletes compactus	X	
	Epeolus autumnalis	X	
	Epeolus pusillus	X	
	Halictus poeyi	X	
	Halictus confusus		X
Sweat Bee	*Halictus ligatus*		X
	Heriades carinatus		X
Sweat Bee	*Hylaeus modestus*		X
Sweat Bee	*Lasioglossum fuscipenne*		X
Sweat Bee	*Lasioglossum imitatum*		X
Sweat Bee	*Lasioglossum nelumbonis*	X	X
	Lasioglossum pectorale		X
Sweat Bee	*Lasioglossum pilosum*	X	
Sweat Bee	*Lasioglossum versatum*	X	
Sweat Bee	*Lasioglossum vierecki*	X	
Cricket Wasp	*Liris* sp.	X	
Potter Wasp	*Monobia quadridens* *	X	
Leaf-cutting Bee	*Megachile campanulae*	X	
Leaf-cutting Bee	*Megachile mendica*	X	
	Melissodes denticulata	X	
	Nomada affabilis		X
	Nomada articulata		X
	Nomada bidentate group		X
	Nomada pygmaea		X
Metallic Solitary Bee	*Perdita bequaerti*	X	
Panurgine bee	*Perdita boltoniae*	X	
	Perdita octomaculata	X	
Paper Wasp	*Polistes sp.* *	X	
	Pseudopanurgus rugosa	X	
Velvet Ant	*Pseudomethocha* sp. *	X	
Scoliid Wasp	*Scolia* sp. *	X	
	Sphecodes sp.		X
European Hornet	*Vespa crabro*	X	
Yellowjacket	*Vespula maculifrons*	X	
Large Carpenter Bee	*Xylocopa virginica*	X	X

Table 11. Beetle (Order: Coleoptera) species observed and identified on the Bioblitz. Species marked with an asterisk were observed for the first time in 2009.

Common Name (or Family)	Scientific Name (or Family)	JBWS Species Observed 2007 or 2009	PRP Species Observed 2009
Predacious Diving Beetle	*Acilius* sp.		X
False Mealworm Beetle	*Alobates pennsylvanica*		X
Chrysomelidae	*Anisotena nigrita*		X
Scarabaeidae	*Anomala* sp.		X
Clay-colored Leaf Beetle	*Anomoea laticlavia*		X
Aphodius Dung Beetle	*Aphodius* sp. *	X	
Bostrichidae	*Bostrichus* sp. *	X	
Two-banded Japanese Weevil	*Callirhopalus bifasciatus*		X
Bean Leaf Beetle	*Cerotoma trifurcata*		X
Chrysomelidae	*Chalepus bicolor*		X
Yellow-bordered Leather Wing Beetle	*Chauliognathus marginatus* *	X	
Goldenrod Soldier Beetle	*Chauliognathus pennsylvanicus*	X	
Buprestidae	*Chrysobothris* sp.		X
Tiger Beetle	*Cicindela punctulata*	X	
Tiger Beetle	*Cicindela scutellaris*	X	
Six-spotted Green Tiger Beetle	*Cicindela sexguttata*		X
Tiger Beetle	*Cicindela tranquebarica*	X	
Spotted Lady Beetle	*Coleomegilla maculata*	X	X
Polished Lady Beetle	*Cycloneda munda*		X
Leaf Beetle	*Diabrotica undecimpunctata*	X	
Gyrinidae (Whirligig)	*Dineutus* sp.		X
Striped Leaf Beetle	*Disonycha* sp.	X	
Water Lily Leaf Beetles	*Donacia* sp. *	X	
Click Beetle	*Elateridae* *	X	
Darkling Beetle	*Eleodes* sp. *	X	
Riffle Beetle	Family Elmidae		X
Clerid Beetle	*Enoclerus rosmarus* *	X	
Blister Beetle	*Epicauta* sp.	X	
Family Chrysomelidae	*Epitrix* sp.		X
Dark Flower Scarab	*Euphoria sepulcralis*	X	
Earth Boring Dung Beetle	*Geotrupes slendidus*	X	
Geotrupidae Dung Beetle	*Geotrupes* sp.		X
Crawling Beetle	Family Haliplidae		X
Multicolored Asian Lady Beetle	*Harmonia axyridis*		X
Carabid Beetle	*Harpalus* sp.	X	
Hydrophilidae	*Hydrochara* sp.		X
Spotted Longhorn Beetle	*Hyperplatys aspersa*		X
Carabidae	*Lebia* sp.		X

Colorado Potato Beetle	*Leptinotarsa decemlineata* *	X	
Black Firefly	*Lucidota atra*		X
Long-horned Beetle	*Megacyllene robiniae*	X	
Goldenrod Leaf Miner	*Microrhopala vittata*		X
Chrysomelidae	*Microrhopala xerene*		X
Tumbling Flower Beetle	*Mordellistena scapularis* *	X	
Chrysomelidae	*Neochlamisus* sp.		X
Dytiscidae	*Neoporus* sp.		X
Locust Leaf Miner	*Odontota dorsalis*		X
Bess Beetle	*Odontotaenius disjunctus*	X	X
Scarabaeidae	*Onthophagus* sp.		X
Chrysomelidae	*Ophraella* sp.		X
Chrysomelidae	*Paria* sp.		X
Ripiphoridae	*Pelecotoma flavipes*		X
Haliplidae	*Peltodytes* sp.		X
Firefly Beetle	*Photuris* sp.	X	
June Beetle	*Phyllophaga* sp. *	X	
Clavate Tortoise Beetle	*Plagiometriona clavata*		X
Chrysomelidae	*Plateumaris* sp.		X
Carabid Beetle	*Platynus* sp.	X	
Bess Beetle	*Popilius disjunctus*	X	
Fourteen-Spotted Lady Beetle	*Propylea quatuordecimpunctata*		X
Marsh Beetles	Family Scirtidae		X
Chrysomelidae	*Stenispa metallica*		X
Scarabaeidae Dung Beetle	*Stephanuca areata*	X	
Chrysomelidae	*Sumitrosis* sp.		X
Milkweed Longhorn Beetle	*Tetraopes tetrophthalmus* *	X	
Erotylidae	*Triplax* sp.		X
Unid. Lady beetle	Family Coccinellidae *	X	

Table 12. Mosquito (Order: Diptera) species identified by Dr. Marm Kilpatrick (UC Santa Cruz) and his research team in the Sanctuary, June 2009.

Common Name	Scientific Name
Asian Tiger Mosquito	*Aedes albopictus*
	Aedes atlanticus
	Aedes aurifer
Woodland Pool Mosquito	*Aedes canadensis*
	Aedes grossbecki
Asian Rockpool Mosquito	*Aedes japonicus*
Tree-hole Mosquito	*Aedes triseriatus*
	Aedes trivittatus
Inland Floodwater Mosquito	*Aedes vexans*
Tree-hole Breeding Mosquito	*Anopheles barberi*
Woodland Malaria Mosquito	*Anopheles punctipennis*
Common Malaria Mosquito	*Anopheles quadrimaculatus*
	Coquillettidia perturbans
	Culex erraticus
House Mosquito	*Culex pipiens*
White-dotted Mosquito	*Culex restuans*
Unbanded Saltmarsh Mosquito	*Culex salinarius*
White-footed Mosquito	*Psorophora ferox*

Table 13. Butterfly and moth (Order: Lepidoptera) species observed and identified on the Bioblitz. Species marked with an asterisk were observed for the first time in 2009.

Common Name	Scientific Name	JBWS Species Observed 2007 or 2009	PRP Species Observed 2009
American Dagger Moth	*Acronicta americana*		X
Celery Looper	*Anagrapha falcifera*	X	
Least Skipper	*Ancyloxypha numitor*	X	X
Schlaeger's Fruitworm Moth	*Antaeotricha schlaegeri*		X
Banded Tussock Moth	*Halisidata tesselaris* *	X	X
Hackberry Emperor	*Asterocampa celtis*	X	
Sachem	*Atalopedes campestris*	X	
Ailanthus Webworm Moth	*Atteva punctella*	X	
Forage Looper	*Caenurgina erechtea*	X	
Summer Azure	*Celastrina ladon*	X	X
Orange Sulphur	*Colias eurytheme*	X	
Lead-colored Lichen Moth	*Cisthene plumbea*		X
Clouded Sulphur	*Colias philodice*	X	
Eastern Grass-veneer moth	*Crambus laqueatellus*		X
Sawtoothed Crocidophora	*Crocidophora serratissimalis*		X

Scape Moth	*Ctenuchidae* sp.	X	
Monarch	*Danaus plexippus*	X	
Tephra Tussock Moth	*Dasychira tephra*		X
Silver-Spotted Skipper	*Epargyreus clarus*	X	X
Tulip-tree Beauty Moth	*Epimecis hortaria* *	X	X
Horace's Duskywing	*Erynnis horatius*	X	
Deep Yellow Euchlaena	*Euchlaena amoenaria*		X
Dun Skipper	*Euphyes vestris*	X	X
Common Eupithecia Moth	*Eupithecia miserulata*		X
Variegated Fritillary	*Euptoieta claudia*	X	
Sleepy Orange	*Eurema nicippe*	X	
Eastern Tailed Blue Butterfly	*Everes comyntas*	X	X
Tulip-tree Beauty Moth	*Geometridae epimecis hortaria*	X	
Arge Tiger Moth	*Grammia arge*	X	
Parthenice Tiger Moth	*Grammia parthenice*		X
Zebra Swallowtail	*Graphium marcellus* *	X	
Fiery Skipper	*Hylephila phyleus*	X	
Green Cloverworm Moth	*Hypena scabra*	X	
Buckeye	*Junonia coenia*	X	
Viceroy	*Limenitis archippus*	X	
White Admiral	*Limenitis arthemis*	X	
Red-Spotted Purple	*Limenitis arthemis astyanax* *	X	
American Copper	*Lycaena phlaeas*	X	
Gypsy Moth	*Lymantria dispar*		X
Decorated Owlet Moth	*Pangrapta decoralis*		X
Long-winged Skipper	*Panoquina ocola*	X	
Tiger Swallowtail	*Papilio glaucus*	X	
Spicebush Swallowtail	*Papilio troilus*	X	
Cloudless Sulphur	*Phoebis sennae*	X	
Common Sootywing	*Pholisora catullus*		X
Turbulent Phosphila	*Phosphila turbulenta*	X	
Pearl Crescent	*Phyciodes tharos*	X	
Magnolia Leafminer	*Phyllocnistis magnoliella*		X
American Leafminer	*Phyllocnistis vitegenella*		X
Cabbage White	*Pieris rapae*	X	
Common Tan Wave Moth	*Pleuroprucha insulsaria*		X
Broad-winged Skipper	*Poanes viator*	X	
Zabulon	*Poanes zabulon*	X	X
Crossline skipper	*Polites origenes*	X	
Peck's Skipper	*Polites peckius* *	X	
Comma	*Polygonia comma*	X	
Question Mark	*Polygonia interrogationis*	X	
Little Glassywing	*Pompeius verna*		X
Checkered White	*Pontia protodice*	X	
Carpenter Moth	*Prionoxystus robinia**	X	

Variable Reddish Pyrausta	*Pyrausta rubricalis*	X	
Common Checkered Skipper	*Pyrgus communis*	X	
Isabella Tiger Moth	*Pyrrharctia isabella*		X
Swarthy Skipper	*Nastra iherminier*	X	
White Flannel Moth	*Norape ovina*	X	
Appalachian Brown	*Satyrodes appalachia*	X	
Arcigera Flower Moth	*Schinia arcigera*	X	
Great Spangled Fritillary	*Speyeria cybele*	X	
Dubious Tiger Moth	*Spilosoma dubia*		X
Virginian Tiger Moth	*Spilosoma virginica*	X	X
Gray Hairstreak	*Stymon melinus*	X	
Banded Hairstreak	*Styrium falacer* *	X	
Red Admiral	*Vanessa atalanta*	X	
American Painted Lady	*Vanessa virginiensis*	X	
Southern Cloudywing	*Thorybes bathyllus* *	X	
Celery Leaftier	*Udea rubigalis*		X
Tussock Moth Caterpillar	*Unidentified species*	X	
Snowy Urola Moth	*Urola nivalis*	X	
Geometer Moth	*Xanthotype sospeta*		X
Ermine Moth	*Yponomeuta* sp. *	X	
Grayish Zanclognatha	*Zanclognatha pedipilalis*		X

Table 14. Damselflies and dragonflies (Order: Odonata) observed and identified on the Bioblitz. Species marked with an asterisk were observed for the first time in 2009.

Common Name	Scientific Name (or family)	JBWS Species Observed 2007 or 2009	PRP Species Observed 2009
Shadow Darner	*Aeshna umbrosa*	X	
Green Darner	*Anax junius*	X	X
Ebony Jewelwing Damselfly	*Calopteryx maculata* *	X	X
Biddies	Family Cordulegasterdae		X
Brown Spiketail	*Cordulegaster bilineata*		X
Familiar Bluet	*Enallagma civile*	X	X
Orange Bluet	*Enallagma signatum*	X	X
Swamp Darner	*Epiaeschna heros*		X
Basket Tail	*Epitheca* sp. *	X	
Common Pond Hawk	*Erythemis simplicicollis*	X	X
Stream Cruiser	*Didymops transversa*		X
Clubtail dragonfly species	Family Gomphidae		X
Ashy Clubtail	*Gomphus lividus*		X
Roger's Clubtail	*Gomphus rogersi*		X
Fragile Forktail	*Ischnura posita posita*	X	X
Rambur's Forktail	*Ischnura ramburii*	X	

Eastern Forktail	*Ischnura verticalis*	X	X
Common Whitetail	*Libellula lydia*	X	X
Slaty Skimmer	*Libellula incesta*	X	
Needham's Skimmer	*Libellula needham*		X
Great Blue Skimmer	*Libellula vibrans*		X
Blue Dasher	*Pachydiplax longipennis*	X	X
Wandering Glider	*Pantala flavescens*	X	
Spot-winged Glider	*Pantala hymenaea*	X	X
Eastern Amberwing	*Perithemis tenera*	X	
Mocha Emerald	*Somatochlora linearis*	X	
Gray Petaltail	*Tachopteryx thoreyi*		X
Carolina Saddlebag	*Tramea carolina*	X	
Black Saddlebag	*Tramea lacerate*	X	

Table 15. Miscellaneous insects, other arthropods and flatworms observed and identified on the Bioblitz. Species marked with an asterisk were observed for the first time in 2009.

Common Name	Scientific Name or Family	JBWS Species Observed 2007	JBWS Species Observed 2007 or 2009
Parasitic Flatworm	*Leucochloridium paradoxum**		X
Wooly Aphid	*Adelges piceae* *		X
Lone Star Tick	*Amblyomma americanum* *		X
Cutworm	*Agrotis* sp.	X	
Wheel Bug	*Arilus cristatus*	X	
Phantom Cranefly	*Bittacomorpha clavipes*	X	X
Box Elder Bug	*Boisea trivittata*	X	
Caterpillar Hunter	*Calosoma scrutator*	X	
Midge	Family Chironomidae *		X
Green Lacewing	*Chrysopa sp.*	X	
Long-legged Fly species	*Chrysosoma* sp. *		X
American Dog Tick	*Dermacentor variabilis* *		X
Carolina Grasshopper	*Dissosteira carolina*	X	
Water Striders	*Gerris* sp. *		X
Field Cricket	*Gryllus pennsylvanicus*	X	
Restless Bush Cricket	*Hapithus agitator*	X	
Lightning Beetle	Family Lampiridae *		X
Robber Fly	*Laphria sacrator*	X	X
Long Horn Caddisfly	Family Leptoceridae *		X
Day Flying Firefly	*Lucidota* sp. *		X
Rose Chafer	*Macrodactylus subspinosus* *		X
Red Plant Bug	Family Miridae *		X
Ant Lion	*Myrmeleon* sp.	X	
Large Milkweed Bug	*Oncopeltus fasciatus*	X	

Red-headed Meadow Katydid	*Orchelimum erythrocephalum*	X	
European Corn Borer	*Ostrinia nubilalis* *		X
Wood Cockroach	*Parcoblatta pennsylvanica* *		X
Handsome Trig Cricket	*Phyllopalpus pulchellus*	X	
Katydid sp.	*Pterophylla* sp.	X	
Assasin Bug	Family Reduviidae*		X
Eastern Subterranean Termite	*Reticulitermes*		X
Marsh Fly	Family Sciomyzidae *		X
Flower Flies	Family Syrphidae*		X
Cranefly	Family Tipulidae	X	

Table 16. Reptile and amphibian species observed and identified on the Bioblitz.

Common Name	Scientific Name	JBWS Species Observed 2007 or 2009	PRP Species Observed 2009
Northern Cricket Frog	*Acris crepitans*	X	X
Spotted Salamander	*Ambystoma maculatum*	X	
Marbled Salamander	*Ambystoma opacum*	X	
American Toad	*Anaxyrus americanus*	X	X
Fowler's Toad	*Anaxyrus fowleri*	X	X
Eastern Six-lined Racerunner	*Aspidoscelis sexlineata sexlineata*	X	
Eastern Wormsnake	*Carphophis amoenus amoenus*	X	X
Snapping Turtle (eggs)	*Chelydra serpentine*	X	X
Eastern Painted Turtle	*Chrysemys picta picta*	X	X
Northern Black Racer	*Coluber constrictor constrictor*	X	X
Northern Dusky Salamander	*Desmognathus fuscus*	X	
Northern Ring-necked Snake	*Diadophis punctatus edwardsii*		X
Northern Two-lined Salamander	*Eurycea bislineata*	X	
Cope’s Gray Treefrog	*Hyla chrysoscelis*	X	X
Green Treefrog	*Hyla cinerea*	X	X
Gray Treefrog	*Hyla versicolor*	X	X
Eastern Mud Turtle	*Kinosternon subrubrum subrubrum*	X	
American Bullfrog	*Lithobates castesbeiana*	X	X
Northern Green Frog	*Lithobates clamitans melanota*	X	X
Pickerel Frog	*Lithobates palustris*	X	X
Southern Leopard Frog	*Lithobates sphenocephalus utricularius*	X	
Wood Frog	*Lithobates sylvaticus*	X	
Northern Watersnake	*Nerodia sipedon sipedon*		X
Northern Rough Greensnake	*Opheodrys aestivuls*		X
Eastern Ratsnake	*Pantherophis alleghaniensis*	X	
Common Five-Lined Skink	*Plestiodon fasciatus*	X	X
Eastern Red-backed Salamander	*Plethodon cinereus*		X
Northern Spring Peeper	*Pseudacris crucifer crucifer*	X	

Red-bellied Turtle	*Pseudemys rubriventris*	X	X
Eastern Mud Salamander	*Pseudotriton montanus montanus*	X	
Eastern Fence Lizard	*Sceloporus undulates*	X	
Eastern Box Turtle	*Terrapene carolina carolina*	X	X
Common Ribbonsnake	*Thamnophis sauritus sauritus*	X	X
Eastern Gartersnake	*Thamnophis sirtalis sirtalis*	X	X
Eastern Smooth Earthsnake	*Virginia valeriae*	X	

Table 17. Mammals trapped or observed on 2009 Bioblitz. Species marked with an asterisk were observed for the first time 2009.

Common Name	Scientific Name	Species Observed on 2007 Bioblitz	Species Observed 2007 & 2009
Mammals captured in Sherman Live Traps and a "Have-a-Heart" trap set overnight			
Virginia Opossum	*Didelphis marsupialis**		
White-footed Mouse	*Peromyscus leucopus**		
Ancillary Sighting of other Mammals			
Beaver	*Castor canadensis*	X	X
Muskrat	*Ondatra zibethica*	X	
White-tailed Deer	*Odocoileus virginiana*	X	X
Gray Squirrel	*Sciuris griseus*	X	X
Eastern Cottontail	*Sylvilagus floridanus*	X	X
Eastern Chipmunk	*Tamias striatus*	X	X
Red Fox	*Vulpes vulpes*	X	
Bat (unknown species)	Chiroptera species		None captured in 2009