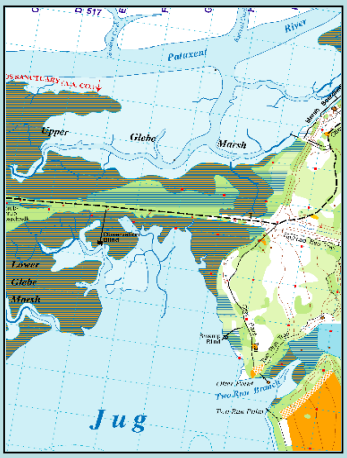
2007 Jug Bay BioBlitz

Technical Report of the
Jug Bay Wetlands Sanctuary



2007 Jug Bay BioBlitz Report

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Jug Bay Wetlands Sanctuary
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Introduction

A BioBlitz is a 24-hour field survey and inventory of organisms in a well-defined area such as a park or other natural area. The objective of this intensive survey is to generate a catalog or list of all species that are identified or collected during the brief survey period. The first BioBlitz in the United States was conducted in 1996 in Washington, DC. Today dozens of BioBlitzes are held annually in the United States (see Wikipedia Encyclopedia; http://en.wikipedia.org/wiki/BioBlitz. A BioBlitz increases local knowledge of biodiversity and involves local naturalists and the public in coordinated fieldwork and observation. The surveys raise the awareness among the general public about the natural world and the importance of biodiversity. The species distribution and occurrence information that is obtained from a BioBlitz also provides resource managers with a deeper understanding of the natural lands under their management, thus enabling improved habitat stewardship.

Biodiversity has been a central focus of ecological research at the Jug Bay Wetlands Sanctuary for many years (see References). For example, the Great Herp Search was designed as a mini-BioBlitz specifically for reptiles and amphibians. By conducting the Great Herp Search in the same way for over 20 years (1986-2006), we have gained an understanding of local herp diversity and of the habitats where these animals are found (Smithberger and Swarth 1993, Molines 1995, Molines and Wright 1998, Swarth 2000). More recently, entomologists have conducted surveys of sand-dwelling beetles and bees at the Glendening Preserve (Droege 2005, Droege et al. 2007, Mawdsley 2007) and invertebrate zoologists have discovered two new species of earthworms in the Sanctuary (Csuzdi and Szlávecz 2002; 2003). Monitoring surveys for birds, turtles, fish, aquatic insects, and wetland plants also take place annually under the direction of Sanctuary naturalists.

This report summarizes the results of the 2007 Jug Bay BioBlitz. The BioBlitz took place at the Sanctuary over a 24-hour period, from 12:00 (noon) on 15 September to 12:00 on 16 September. We organized this event in order to take advantage of the growing interest in biodiversity by the public and to tap in to the community of active, highly skilled naturalists in the Washington DC/Baltimore area. For this first-time effort we concentrated the field surveys on groups of organisms for which local biogeographical information was poor or incomplete (for example, ants, ground bees, spiders and zooplankton), rather than on the groups for which our knowledge on distribution was relatively thorough such as birds and herps. Depending on priorities and the availability of experts, future BioBlitzes will focus on groups of organisms that were not surveyed in 2007.

Many of the expert leaders who helped with our BioBlitz are teachers and ecologists who frequently lead field trips; several leaders serve on the Sanctuary's Scientific Advisory Committee. We received assistance from a total of twenty-five scientists and specialists from various organizations, including the Smithsonian Institution, U.S. Geological Survey, Johns Hopkins University, Washington Area Butterfly Club, Maryland Entomological Society, Maryland Native Plant Society, and several other colleges and organizations (see Table I for the names of the team leaders).

This report is dedicated to the memory of Nancy Kreiter. Nancy died on December 30, 2007, after a scuba diving accident in Florida. We greatly enjoyed Nancy's knowledge about spiders and the natural world which she shared so enthusiastically with us.

Acknowledgements
A total of 97 observers participated in the Jug Bay BioBlitz. In addition to the experts noted in Table 1, the following individuals helped on the field teams: Sera Baghdadi, Kristina Benefyle, Lisa Bierer-Garrett, Zoe Black, Anne Carnes, Kathy Chow, Peter Chow, Steven Chow, Matthew Chow, Pati Delgado, Desiree Demauro, Rachael Dickey, Julie Diewald, Adrien Downey, Shannon Earle, Kim Elliott, Anna Eshelman, Ellen Farr, Kelly Franklin, Kata Frederick, Rosemary Frezza, Elaine Friebele, Lynette Fullerton, Bob Gardiner, Chris Garrett, John Gilman, Kristen Hall, Sue Hamilton, Darcy Herman, Molly Houseman, Beth Johnson, Dominique Jordon, Phil Kean, Svetlana Klimenko, Miriam Lemus, Kyle Maduro, Susan Matthews, Karen McDonald, Mimi McKindley-Ward, Steve McKindley-Ward, Rob Mitchell, Dawn Miller, Candace Morrell, Jennifer Muro, William Needham, Lorrie Oakes, Diana Ogilvie, Jan Owings, Beth Pieper, Nicolay Perrin, Ashleigh Pfarr, Sandy Poland, Sue Ricciardi, Justin Rodriquez, Tim Rule, Patty Satz, Fred Seitz, Chris Seitz, Gabi Shenot, Josh Shenot, Sam Shenot, Lisa Siciliano, Les Silva, Shelby Silvernell, Alex Steininger, Satoshi Tasumi, Yuka Tasumi, Pete Uimonen, Darlene Walker, Brianne Walsh, Bobby Whitkop, Mary Zastrow, and Tim Zastrow.

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

Team Leader/Expert	Organization	Area of Expertise
Nancy Kreiter	College of Notre Dame, Baltimore	Spiders; Insects
Daniel Kjar	Elmira College, Elmira, New York	Ants
Tim Foard	ICR Lab	Ants
Kathy Szlavecz	Johns Hopkins University	Earthworms; Isopods
Kathy Ellett	Jug Bay Wetlands Sanctuary	Plankton
Robert Frezza	Jug Bay Wetlands Sanctuary	Herps
Lindsay Hollister	Jug Bay Wetlands Sanctuary	Nocturnal Mammals
Karyn Molines	Jug Bay Wetlands Sanctuary	Fish; Plants; Herps
Dotty Mumford	Jug Bay Wetlands Sanctuary	Birds
Dave Perry	Jug Bay Wetlands Sanctuary	Plants; Butterflies
Mike Quinlan	Jug Bay Wetlands Sanctuary	Herps; Birds
Jeff Shenot	Jug Bay Wetlands Sanctuary	Birds; Butterflies
Chris Swarth	Jug Bay Wetlands Sanctuary	Herps; Birds
Fred Paraskevoudakis	Maryland Entomological Society	Butterflies & other Insects
Joe Metzger	Maryland Native Plant Society	Plants
Richard Orr	Mid-Atlantic Invertebrate Field Studies	Dragonflies; Damselflies
Jonathan Mawdsley	Natural History Museum, Smithsonian Institution	Insects; Tiger Beetles
Ben Hollister	Prince George's Community College	Insects
Dennis Whigham	Smithsonian Environmental Research Center	Plants
Jeff Campbell	University of Maryland, Baltimore County	Fish
David Farr	USDA, Beltsville Lab	Mushrooms
Sam Droege	USGS, Patuxent Wildlife Research Center	Bees
Pat Durkin	Washington Area Butterfly Club	Butterflies
Dick Smith	Washington Area Butterfly Club	Butterflies; Day-flying moths

We especially thank Jeff Campbell for setting up the Access database program; Kim Elliott for data entry; Lisa Siciliano for creating colorful & informative posters highlighting biodiversity; and Jennifer Muro for the artwork and attractive poster boards that we used each morning to assemble the teams. Thanks to James Trager of the Missouri Botanical Garden for commenting on ant nomenclature and identification.

We are very grateful for the support of the Anne Arundel County Recreation and Parks Department, the Chesapeake Bay National Estuarine Research Reserve – Maryland, and the Friends of Jug Bay.

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, near the middle of the Sanctuary, is located at 38^{o} 47' 05'' W; 76^{o} 42' 06''N.

Jug Bay is a shallow embayment located near the head of tide on the estuary. Tidal amplitude is about 0.75m, and salinity varies from 0 for most of the year to a maximum of about 2 ppt in late summer and early fall. The Sanctuary contains about 600 acres of freshwater tidal wetlands and about 5 miles of shoreline on the east side of the Patuxent River. Habitats within the Sanctuary consist of tidal marsh, scrub wetland and swamp; mixed hardwood forests; managed meadows; old horse pastures; and stream valleys. Much of the uplands were logged and farmed during the past 250 years. The forests are 50 to 75 years old, with trees perhaps surpassing a century in age found along the slopes of stream valleys. The Sanctuary contains about fifteen miles of hiking trails, boardwalks and roads.

Methods

Several parks in the Washington metropolitan region have conducted BioBlitzes. As a result, we talked with local naturalists and park employees to gain knowledge directly from them. The first phase of organizing the event was to identify specialists who had the time and interest to help us. Using our contacts from around the region we recruited experts for three to four months prior to the BioBlitz. At the outset we wanted to put less field effort on the better-studied groups of organisms (for example, birds, plants, mammals, amphibians and reptiles) and more emphasis on organisms (especially invertebrates) that are not as well known in our area. Therefore we made a special effort to recruit among the entomological community and with other invertebrate specialists. Fortunately most experts were enthusiastic about being part of our BioBlitz and they committed early to helping with the project. Having a group of committed experts made it easier for us to attract others to help on the search teams. The team leaders and experts are shown in Table 1.

We created a field survey schedule through e-mails and phone calls with the leaders. We found that some leaders could help on one day but not on the other. Some preferred working during the warmer parts of the day, others at night, and some had no preferences. To organize the team leaders and search participants we produced a matrix of three-hour time slots (for example, noon to 3 pm.; 3 to 6 pm; 6 to 9 pm; etc.). At optimal times during the day, participants had the option of choosing among several search events that were scheduled at the same time. Participation by the public was limited to adults and older teens. We tried to spread participants evenly among groups but this was not always possible. Two groups surveyed different areas of the Sanctuary at night. Some participants spent the night in the Wetlands Center. Greater search effort and more searchers worked on Saturday than on Sunday.

We divided the Sanctuary into 39 search areas (see two Sanctuary maps in Appendix A). Some areas were the same as those used on the Great Herp Search. Area size and shape were determined by habitat type and were bounded by hiking trails and roads. Search areas varied from 2 to 28 ha, but most were 4 to 8 ha in size. There were about 20 areas in the Sanctuary north of Wrighton Rd. (the Parris Glendening Nature Preserve) and twenty areas south of Wrighton Rd. A summary of the leaders, times and the areas they searched is shown in Appendix B.

Leaders and participants arrived at 10:00 am so that we had adequate time to go over survey objectives, maps, data sheets, and other details before the 12:00 start. By 11:45 am the teams were assembled and ready to depart the Wetlands Center at noon.

Leaders were given one data sheet for recording searcher names and contact information, habitats and search times, and another data sheet for listing species, locations, and notes. Data sheets are shown in Appendices C and D. Each team leader was given a map showing the northern and southern search areas. After the BioBlitz was completed the data were transferred from the field sheets to an Access database and Excel spreadsheets.

Teams covered 19 of 39 designated search areas, representing about 30% of the 1,500 acre sanctuary. Search Areas 1 through 12, 20, 33, 34(a, b, and c) 37, and 39 were covered (see maps).Tidal wetlands were not searched extensively, except along the Marsh Boardwalk, Railroad Bed and River Pier.

Approximately 23 teams, each composed of 1 to 10 searchers, conducted the BioBlitz. Average team size was about 5. Almost 500 searcher-hours were devoted to this effort (Table 2). Most teams searched for one or two 3-hour search periods. The Tree Team led by Dave Perry and the Herp Team led by Mike Quinlan searched for three three-hour periods over both days.

Table 2. Search effort by field teams.

Species Groups	Number of Searchers	Searcher-Hours
Meadow Plants	9	36
Trees	12	36
Vines	9	30
Mushrooms	7	21
Plankton	3	9
Earthworms & Isopods	3	9
Spiders	5	15
Ants	3	9
Bees & Wasps	5	12
Tiger Beetles	4	12
Butterflies & Moths	20	54
Dragonflies & Damselflies	10	30
Insects (general)	11	33
Fish	3	9
Reptiles & Amphibians	48	118
Birds (diurnal)	8	23
Birds (nocturnal)	7	21
Mammals	5	15
Total	172	492

Teams mostly searched by walking slowly through the search areas inspecting the leaf litter, shrubs and trees, or looking through the soil. Some used insect sweep nets to capture butterflies, dragonflies and damselflies. Pitfall traps were set overnight in a meadow for ground dwelling insects and bees. Wood and sheet metal cover boards were placed in open meadows to attract snakes or other animals. The Fish team used short seines and nets to collect fish in Galloway Creek, in the vicinity of grid poles 543-G, 542-H, and 542-I. The plankton team used a plankton net at the River Pier. About 10 5-gallon pitfall buckets at the Wet Forest Trap site (near grid poles 515-N) were opened on 14 September and checked in the evening on 15 September. Two teams searched at night for nocturnal mammals and birds. We did not set small mammal traps or use mist nets during the BioBlitz.

The greatest field effort (118 searcher-hours) was expended by three herp teams. Butterflies were also well surveyed by three teams which devoted 54 searcher-hours in the field. The fewest hours were spent observing and collecting plankton, ants, earthworms, isopods, and fish. The plant team effort was spent primarily on trees, vines, and on plants in meadows; little effort was made to identify plants (except vines) in tidal or non-tidal wetlands, or stream floodplains.

Leaders who surveyed plankton, ants, and bees, collected and preserved their specimens in order to determine their specific identity. Their results and species' confirmations were sent to us later.

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

The nomenclature used in this report for flowering plants, birds, and amphibians and reptiles is based primarily on the following references:

- Manual of Vascular Plants of Northeastern United States and Adjacent Canada. Gleason and Cronquist. 1991. 2nd Edition.
- 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 on the BioBlitz

Weather conditions during the 24-hour BioBlitz on 15 and 16 September 2007 were ideal for field work, and air temperature was somewhat cooler than the long-term monthly average. September 2007 was "warm and very sunny" according to the Atlantic Coast Observer's Network www.jhuapl.edu/weather/education/ACONdata.html. The mean long-term maximum air temperature for September in Maryland is about 29° C and the mean long-term low temperature is 15° C. The warmest part of the survey period occurred at 3:00 p.m. on 15 September (24° C; 76° F) and the coolest temperatures were at 7:00 a.m. on 16 September (6° C; 42° F). A record of the air temperature throughout the survey period is shown in Table 3. Both days were breezy, and it was overcast on Saturday. The second of four September rain events occurred on the 14th and the morning of the 15th when a storm dropped about 6 mm (0.25 in.) of rain across the state. We measured 18 mm (0.7 in.) in the Sanctuary rain gauge on 14 September, however no rain fell during the survey period.

Table 3. Hourly record of air temperature on the BioBlitz.

15 Sept.		16 Sept.	
Time	Temp (C)	Time	Temp (C)
13:00	23.6	1:00	8.6
14:00	23.6	2:00	
15:00	23.9	3:00	7.2
16:00	23.3	4:00	
17:00	21.7	5:00	
18:00		6:00	
19:00		7:00	6.1
20:00	13.3	8:00	10.0
21:00		9:00	15.0
22:00	10.6	10:00	
23:00	9.4	11:00	18.1
24:00	8.9	12:00	19.4

BioBlitz Results

A total of 500 species of fungi, plants, and animals were identified on the BioBlitz. Table 4 provides a summary of the number of species observed in each organism group. Observers recorded 156 plant species, the group with the highest number of species. Other groups with high species numbers were birds (100 species), hymenopterans (60), and butterflies (37). Species lists for each group are shown in Tables 6 to 23. Within most tables the species are arranged alphabetically be genus, however, the birds and mammals are arranged alphabetically by common name.

Table 4. Groups and number of species observed.

Group of Organisms	Species Observed
Vascular Flowering Plants (herbs and shrubs)	96
Ferns	1
Trees	59
Mushrooms	16
Plankton	5
Earthworms	5
Isopod Crustaceans	3
Spiders	13
Ants	34
Bees & Wasps	26
Beetles	14
Butterflies	37
Moths	13
Damselflies & Dragonflies	18
Other Insects	16
Fish	11
Amphibians	14
Reptiles	13
Birds	100
Mammals	7
Total Species Observed	500

This report is a summary of the species that we observed on the BioBlitz. For the vast majority of species, observers noted “presence” (no count data) on the data sheets. This was intentional because we did not want to take time to do counts or estimates of individuals. However, for some species we do have additional information on the numbers observed, habitats, natural history and behavior. You may contact the Sanctuary staff if you would like view this additional information.

At least two species of State listed rare plants, 11 species of rare and State listed invertebrates, and six rare bird species were observed (Table 5). The earthworm, *Diplocardia patuxentis*, which was described as a species new to science in 2002 (Csuzdi, C. and K. Szlávecz 2002), was observed again by Kathy Szlavecz on the BioBlitz. This small native earthworm is found in the moist soil of ravines that contain shallow, intermittent streams. The Sand Barren (Area 37) and Pine Barren (Area 33) areas in the Glendening Preserve were singled out for intensive surveys by entomologist leaders because these open sandy areas have been recognized recently as important habitats for certain rare ground nesting bees, tiger beetles, and ants.

Meadow plants were well covered by Joe Metzger and Plant Team members (Table 6). The Vine Team led by Dennis Whigham noted 19 vine species. The Tree Team, led by Dave Perry, succeeded in their goal of finding every tree species known to occur in the Sanctuary (36 species) , including 13 oak species, the rare pumpkin ash, the uncommon fringe-tree, and the big-toothed aspen (Table 7).

Spiders were surveyed for the first time here by Nancy Kreiter. Her team worked mostly along the Otter Point Trail and along the edges of the beaver pond on Two-run Creek where they identified 13 spider species (Table 12).

Of great interest was the high diversity of ants, bees, butterflies, dragonflies and damselflies. Ant Team leaders Dan Kjar, Fred Paras and Timothy Foard discovered and identified 34 ant species, three of which are considered rare and one (*Formica vinculans*) which may be a new state record (see Tables 5 and 13). The Bee Team led by Sam Droege identified 36 species of bees and wasps (Table 14) , including the first Maryland record for the ground bee *Perdita bequaerti* (Table 3). Fred Paraskevoudakis retained ant voucher specimens for a state ant survey, and other leaders collected insects and invertebrates for their private collections.

Table. 5. Rare species observed on the BioBlitz.

Anglepod (*Matelia carolinensis*)	Maryland "Highly State Rare" status
Pumpkin Ash (*Fraxinus profunda*)	Maryland "Highly State Rare" status
Earthworm (*Diplocardia patuxentis*)	Kathy Szlavecz: "a new species to science, first discovered in the Sanctuary in 2001."
Fungus Gardening Ant (*Trachymyrmex septentrionalis*)	Timothy Foard: "Unusual this far north."
Ant (*Formica vinculans*)	Fred Paras: "A possible new state record."
Ant (*Hypoponera opacior*)	Fred Paras: "Rare west of the Chesapeake Bay."
Ground bee (*Epeolus autumnalis*)	Sam Droege: "Very rare."
Ground bee (*Epeolus pusillus*)	Sam Droege: "Very rare."
Ground bee (*Perdita bequaerti*)	Sam Droege: "A new state record."
Ground bee (*Perdita boltoniae*)	Sam Droege: "A sand specialist; rare."
Ground bee (*Pseudopanurgus rugosa*)	Sam Droege: "Rare."
Damselfly (*Somatochlora linearis*)	Maryland "Watch" list status
Tiger Beetle (*Cicindela scutellaris*)	Maryland "Watch" list status
Least Bittern	Maryland "State Rare" status
Sora	Maryland "Highly State Rare" status
Bald Eagle	Maryland "State Threatened" status
Common Nighthawk	Maryland State "Watch" list status
Magnolia Warbler	Maryland State "Watch" list status
Black-throated Blue Warbler	Maryland State "Watch" list status

The Butterfly Teams led by Pat Durkin, Dick Smith, Fred Paras, Sue Ricciardi, and Jeff Shenot observed 37 species (Table 16). This represents 71% of the 52 species that are known to occur in the Sanctuary. The teams worked mostly along the meadows (Area 3) and Pine Barrens (Area 33) at the Glendening Preserve, and near the warm season grass meadows at the River Farm (Area 20). These areas are known to harbor many plants that are important for butterflies.

The Odonate Team under Richard Orr's leadership observed 18 species of dragonflies and damselflies (Table 18). This represents about 42% of the 43 species that are known to occur in this area.

Reptiles and amphibians ("herps) were exceptionally well surveyed and observed by leaders Mike Quinlan and Robert Frezza. Sixty-six percent (27 of the 41 species) of the species that are known to occur in the Sanctuary were encountered on the BioBlitz (Tables 20 and 21). The eastern mud salamander was most uncommon of the herps that the team observed.

Birds are perhaps the easiest animal group to survey because of their conspicuous behavior, calls and songs. Bird experts Dotty Mumford and Jeff Shenot worked together and separately, with contributions from several others, to record 100 bird species (Table 22). Bird diversity is especially high at Jug Bay in mid-September. At this time many neotropical migrant songbirds that breed at Jug Bay have not yet departed for the tropics, whereas good numbers of migratory species that breed to our north and west are already passing through Maryland's Coastal Plain. For example, local breeders observed on the BioBlitz included

chimney swift, eastern kingbird, Acadian flycatcher, red-eyed vireo, scarlet tanager, summer tanager, wood thrush and ovenbird. Non-breeding migrants included sharp-shinned hawk, northern pintail, northern shoveler, green-winged teal, blue-winged teal, northern harrier, herring gull, ring-billed gull, greater yellowlegs, blackpoll warbler, Tennessee warbler, and Wilson's warbler.

In addition to the rare birds listed in Table 5, other notable species identified by the bird teams were glossy ibis (late summer migrant), Cooper's hawk (uncommon local breeder), red-breasted nuthatch (uncommon winter visitant) and rose-breasted grosbeak (uncommon fall migrant).

Three resident, non-native birds were noted: mute swan, rock dove, and European starling. Mute swans are not common at Jug Bay and occur in only small numbers (usually no more than five), but in the lower parts of the Patuxent River estuary they are more abundant. Rock doves frequently roost on utility wires at the Glendening Preserve (Plummer House area).

Great-horned owls and barred owls were heard by the two "nocturnal" search teams, but whip-poor-will, southern flying squirrel and raccoon were not detected and no bats were identified.

Discussion

The consensus of participants in Jug Bay's first BioBlitz was that it was fun, educational and productive. Our leaders were friendly and they enjoyed instructing team members in search techniques. In addition to teaching the public about ecology, field sampling and biodiversity, our other objective was to collect new scientific information about biodiversity within the Sanctuary. We confirmed the presence many common flowering plants, trees and vertebrates, but more importantly we added over thirty new invertebrate species to our list of resident fauna.

The success of the event is due in large part to the leaders who donated their time and talents to spending a day or two in the field at Jug Bay. These professionals and serious amateurs possess the field skills, the knowledge of animal behavior and habitats, and the collecting expertise that ensured a successful biodiversity survey. The leaders indicated to us that their time was well used, and they appreciated the help provided by the search team members.

Leaders and team members remarked that the event was well organized. By creating an organizational matrix early in the planning phase to organize and schedule leaders, participants could easily decide which group or groups they wanted to work with. The schedule of three-hour time blocks made it possible to fill gaps by assigning leaders to specified search times and to help participants decide their involvement based on time and the group of organisms they were interested in. Data recording worked well, but leaders must be encouraged to complete all the required data entry fields on the data sheets and to strive for accuracy when doing so. Good penmanship is also necessary, especially when scientific names are used.

The results of this survey will assist us with identifying key habitats that may be unique or that may harbor rare or sensitive species. We now have a better basis for protecting and managing the various habitats within the Sanctuary. For example, the Sand Barrens and Pine Barrens at the Glendening Preserve support a varied community of rare, sand-loving insects – ants, solitary bees, and tiger beetles. Protecting these areas from inadvertent damage will become an important management objective. Wet ravines that support native earthworms will be similarly protected and the public will be discouraged from walking through these areas. Armed with new knowledge about Sanctuary biodiversity will also help us mount focused investigations that look more closely at life history strategies, habitat use, reproductive biology and other areas of interest. We will also encourage universities to use the Sanctuary for ecological studies by graduate students who could carry out multi-year studies.

We were surprised that some common vertebrates known to be present in the Sanctuary were missed during the survey. For example, no one observed the red-backed salamander, queen snake, northern water snake or eastern garter snake. The probable reasons for these "misses" are because search teams did not spend much time in tidal wetlands or that they did not search thoroughly for soil dwelling salamanders. Examples of birds that were certainly present in the Sanctuary yet were missed, include eastern towhee, blue-gray gnatcatcher, and

marsh wren. It is not unusual for searchers conducting a survey such as this one to fail to find all species that are present. On the other hand, the fact that we did not see or hear bobwhite or whip-poor-will lends further support to the consensus among birders that these species are no longer a part of the Sanctuary's avifauna.

Comments that we received later from several leaders were interesting and provided useful suggestions for future BioBlitzes:

> "It was fun on Sunday. I keep telling people that the great volunteers I had with me really made my day" – Dr. Nancy Kreiter.
>
> "You may want to consider adding a survey of your Orthoptera to your list of things to do in the future. The results would be interesting, productive and I think there is a good chance of identifying a couple of good indicator species for measuring the health of the various plant communities of the uplands and river marsh. " – Richard Orr.
>
> "The mystery plant we were looking at… may turn out to be Pinweed." – Joe Metzger.
>
> "The ant faunal composition is very unusual for central Maryland, containing a number of species more common in drier habitats, such as would be present in the southern part of the Eastern Shore." – Timothy Foard.
>
> "Yep, these are crab spiders. Both (species) feed the same way – disguising themselves in a flower and waiting for unsuspecting nectar drinkers and pollen collectors to make a mistake".
> – Dr. Nancy Kreiter.
>
> "Sorry that it took all winter before I finished doing this, but I have pinned and finished identifying the six small day-flying moths I collected for identification purposes on the September 16, 2007 Jug Bay BioBlitz." – Dick Smith.
>
> "More common in the early morning" – Fred Paraskevoudakis commenting about finding the ant *Prenolepsis impairs* in the afternoon.
>
> "I can't believe I found all three color phases of the Yellow Bear (an arctiid moth) on one plant at the beaver pond and I did not have to pose them (for a photo)." – Richard Orr.

Several leaders suggested that we hold a future BioBlitz earlier in the summer so that overnight temperatures would be higher making it easier to observe more insect activity. We plan to focus our next BioBlitz on aquatic insects, wetland plants, mosses, bats, small mammals and other groups that we did not survey on the 2007 event.

Table 6. Vascular plant species observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Yarrow	Achillea millefolium	Joe Metzger
Field Garlic	Allium vineale	Joe Metzger
Green Amaranthus	Amaranthus retroflexus	Team 01
Pigweed	Amaranthus sp.	Joe Metzger
Common Ragweed	Ambrosia artemisiifolia	Joe Metzger
Canadian Serviceberry	Amelanchier canadensis	Dave Perry
Porcelainberry	Ampelopsis brevipedunculata	Dennis Whigham
Hog Peanut	Amphicarpaea bracteata	Dennis Whigham
Ground-nut	Apios Americana	Dennis Whigham
Dogbane	Apocynum cannabinum	Joe Metzger
Devil's Walking Stick	Aralia spinosa	Dave Perry
Burdock	Arctium sp.	Joe Metzger
Red Chokeberry	Aronia arbutifolia	Dave Perry
Common Milkweed	Asclepias syriaca	Joe Metzger
Aster	Aster sp.	Joe Metzger
False Nettle	Boehmeria cylindria	Joe Metzger
Paper Mulberry	Broussonetia papyrifera	Dave Perry
Bulbostylis Sedge	Bulbostylis capillaris	Joe Metzger
Trumpet-creeper	Campsis radicans	Dennis Whigham
Small-flowered Partridge Pea	Cassia nictitans	Joe Metzger
Common Hackberry	Celtis occidentalis	Dave Perry
Sandbur	Cenchrus longispinus	Joe Metzger
Buttonbush	Cephalanthus occidentalis	Dave Perry
White Turtlehead	Chelone glabra	Lynette Fullerton
Goosefoot	Chenopodium sp.	Joe Metzger
Ox-eye Daisy	Chrysanthamum leucanthemum	Joe Metzger
Chickory	Cichorium intybus	Joe Metzger
Thistle	Cirsium sp.	Joe Metzger
Virgin's Bower	Clematis virginiana	Dennis Whigham
Horse-weed	Conyza canadensis	Joe Metzger
Tooth-leaved Croton	Croton glandulosus	Karyn Molines
Dodder	Cuscuta gronovii	Dennis Whigham
Sedge	Cyperus sp.	Joe Metzger
Queen Anne's Lace	Daucus carota	Joe Metzger
Water-willow	Decodon verticillatus	Dennis Whigham
Small-leaved Tick-trefoil	Desmodium ciliare	Joe Metzger
Narrow Tick-trefoil	Desmodium marilandicum	Joe Metzger
Deptford Pink	Dianthus armeria	Joe Metzger
Deer-tongue Witchgrass	Dichanthelium clandestinum	Joe Metzger
Crabgrass	Digitaria sp.	Joe Metzger
Rough Buttonweed	Diodia teres	Joe Metzger
Wild Yam	Dioscorea villosa	Dennis Whigham
Indian Strawberry	Duchesnea idica	Joe Metzger
Beech-drops	Epifagus virginiana	Nancy Kreiter
Purple Love Grass	Eragrostis spectabilis	Joe Metzger
Fireweed	Erechtites hieraciifolia	Joe Metzger

Daisy-fleabane	Erigeron annuus	Joe Metzger
Late Eupatorium	Eupatorium serotinum	Joe Metzger
Common Flat-topped Goldenrod	Euthamia graminifolia	Joe Metzger
Gill-over-the-ground	Glechoma hederacae	Joe Metzger
Witch-hazel	Hamamelis virginiana	Dave Perry
Ivy-leaved Morning-glory	Ipomoea hederacea	Dennis Whigham
White Morning-glory	Ipomoea lacunose	Dennis Whigham
Path Rush	Juncus tenuis	Joe Metzger
Mountain Laurel	Kalmia latifolia	Dave Perry
Pinweed	Lechea leggettii	Joe Metzger, Karyn Molines
Cuneate Bush-clover	Lespedeza cuneata	Joe Metzger
Japanese Honeysuckle	Lonicera japonica	Dennis Whigham
Virginia Water-horehound	Lycopus virginicus	Joe Metzger
Anglepod	Matelia carolinensis	Chris Swarth
Asian Stiltgrass	Microstegium vimineum	Joe Metzger
Climbing Hempweed	Mikania scandens	Dennis Whigham
Bee-balm	Monarda punctata	Richard Orr
Spatterdock	Nuphar advena	Dennis Whigham
Eastern Prickly Pear	Opuntia humifusa	Joe Metzger
Wood-sorrel	Oxalis stricta	Joe Metzger
Virginia Creeper	Parthenocissus quinquefolia	Dennis Whigham
Perilla Mint	Perilla frutescens	Joe Metzger
Common Timothy	Phleum pretense	Joe Metzger
Ground Cherry	Physalis sp.	Joe Metzger
Pokeweed	Phytolacca americana	Joe Metzger
Ribgrass	Plantago sp.	Joe Metzger
Halberd-leaved Tearthumb	Polygonum arifolium	Dennis Whigham
Smartweed	Polygonum cespitosum	Joe Metzger
Arrow-leaved Tearthumb	Polygonum sagittatum	Dennis Whigham
False Buckwheat	Polygonum scandens	Dennis Whigham
Heal-all	Prunella vulgaris	Joe Metzger
Winged Sumac	Rhus copallina	Dave Perry
Poison Ivy	Rhus radicans	Dennis Whigham
Multiflora Rose	Rosa multiflora	Dennis Whigham
Sheep Sorrel	Rumex acetosela	Joe Metzger
Bitter Dock	Rumex obtusifolius	Joe Metzger
Foxtail-grass	Setaria faberi	Joe Metzger
Glaucous Catbrier	Smilax glauca	Dennis Whigham
Greenbrier	Smilax rotundifolia	Dennis Whigham
Horse-nettle	Solanum carolinense	Joe Metzger
Common Goldenrod	Solidago canadense	Joe Metzger
Goldenrod	Solidago rugosa	Joe Metzger
Poison Sumac	Toxicodendron vernix	Dave Perry
Blue Curls	Trichostema dichotomum	Joe Metzger
Purpletop	Tridens flava	Joe Metzger
Eastern Gramma Grass	Tripsacum dactyloides	Joe Metzger
Common Mullein	Verbascum thapsus	Joe Metzger
White Vervain	Verbena urticifolia	Joe Metzger

Summer Grape	Vitis aestivalis	Dennis Whigham
Frost Grape	Vitis vulpine	Dennis Whigham
Sensitive Fern	Onoclea sensibilis	Joe Metzger

Table 7. Trees observed and identified on BioBlitz.

Common Name	Scientific Name	Observers
Boxelder	Acer negundo	Dave Perry
Norway Maple	Acer platanoides	Dave Perry
Red Maple	Acer rubrum	Dave Perry
Tree-of-Heaven	Ailanthus altissima	Dave Perry
Mimosa	Albizzia julibrissin	Dave Perry
Common Alder	Alnus serrulata	Dave Perry
Paw-paw	Asimina triloba	Dave Perry
River Birch	Betula nigra	Dave Perry
American Hornbeam	Carpinus caroliniana	Dave Perry
Pignut Hickory	Carya glabra	Dave Perry
Mockernut Hickory	Carya tomentosa	Dave Perry
American Chestnut	Castanea dentata	Dave Perry
Chinese Chestnut	Castanea mollissima	Dave Perry
Allegheny Chinquapin	Castanea pumila	Dave Perry
Redbud	Cercis canadensis	Dave Perry
Fringe-tree	Chionanthus virginicus	Dave Perry
Flowering Dogwood	Cornus florida	Dave Perry
Persimmon	Diospyros virginiana	Dave Perry
American Beech	Fagus grandifolia	Dave Perry
White Ash	Fraxinus americana	Dave Perry
Green Ash	Fraxinus pennsylvanica	Dave Perry
Pumpkin Ash	Fraxinus profunda	Dave Perry
American Holly	Ilex opaca	Dave Perry
Black Walnut	Juglans nigra	Dave Perry
Red Cedar	Juniperus virginiana	Dave Perry
Sweetgum	Liquidambar styraciflua	Dave Perry
Tuliptree	Liriodendron tulipifera	Dave Perry
Sweetbay	Magnolia virginiana	Dave Perry
White Mulberry	Morus alba	Dave Perry
Red Mulberry	Morus rubra	Dave Perry
Black Gum	Nyssa sylvatica	Dave Perry
Princess Tree	Paulownia tomentosa	Dave Perry
Norway Spruce	Picea abies	Dave Perry
White Pine	Pinus strobus	Dave Perry
Loblolly Pine	Pinus taeda	Dave Perry
Virginia Pine	Pinus virginiana	Dave Perry
Sycamore	Platanus occidentalis	Dave Perry
Big-toothed Aspen	Populus grandidentata	Dave Perry
Black Cherry	Prunus serotina	Dave Perry
Bradford Pear	Pyrus calleryana	Dave Perry
White Oak	Quercus alba	Dave Perry

Swamp White Oak	Quercus bicolor	Dave Perry
Scarlet Oak	Quercus coccinea	Dave Perry
Southern Red Oak	Quercus falcata	Dave Perry
Black-jack Oak	Quercus marilandica	Dave Perry
Swamp Chestnut Oak	Quercus michauxii	Dave Perry
Cherrybark Oak	Quercus pagoda	Dave Perry
Pin Oak	Quercus palustris	Dave Perry
Willow Oak	Quercus phellos	Dave Perry
Rock Chestnut Oak	Quercus prinus	Dave Perry
Northern Red Oak	Quercus rubra	Dave Perry
Post Oak	Quercus stellata	Dave Perry
Black Oak	Quercus velutina	Dave Perry
Black Locust	Robinia pseudoacacia	Dave Perry
Black Willow	Salix nigra	Dave Perry
Sassafras	Sassafras albidum	Dave Perry
Basswood	Tilia americana	Dave Perry
American Elm	Ulmus americana	Dave Perry
Smooth Blackhaw	Viburnum prunifolium	Dave Perry

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

Common Name	Scientific Name	Observers
Mushroom	Amanita citrina	David Farr
Mushroom	Amanita sp.	David Farr
Earth Star	Astreus sp.	Joe Metzger
	Boletus sp.	David Farr
Mushroom	Clitocybe tabescense	David Farr
	Fistula hepatica	David Farr
	Gymnopilus sp.	David Farr
White Polypore	Irpex lacteus	David Farr
Mushroom	Oudemansiella radicata	David Farr
Mushroom	Pleurotes ostreatus	David Farr
Mushroom	Pluteus sp.	David Farr
Mushroom	Polyporum sp.	David Farr
Mushroom	Russula laura-ceraceus	David Farr
	Schizophyllum commune	David Farr
Mushroom	Stereum sp.	David Farr
Mushroom	Tramates versicolor	David Farr

Table 9. Plankton observed on the Bioblitz.

Scientific Name	Group	Observers
Nitzschia sp.	Diatom	Kathy Ellett
Brachionus sp.	Rotifer	Kathy Ellett
Copepod sp.	Crustacean	Kathy Ellett
Flagellelate sp.	Protozoan	Kathy Ellett
Gymnodium sp.	Dinoflagellate	Kathy Ellett

Table 10. Earthworm species observed and identified on the Bioblitz.

Scientific Name	Observers
Amynthas hilgendorfi	Kathy Szlavecz, Dan Kjar, Chris Swarth
Diplocardia patuxentis	Kathy Szlavecz, Dan Kjar, Chris Swarth
Eisenoides löennbergi	Kathy Szlavecz, Dan Kjar, Chris Swarth
Lumbricus rubellis	Kathy Szlavecz, Dan Kjar, Chris Swarth
Octalasion lacteum	Kathy Szlavecz, Dan Kjar, Chris Swarth

Table 11. Isopod (Crustacea) species observed on the BioBlitz.

Scientific Name	Observers
Armadillidium nasatum	Kathy Szlavecz, Dan Kjar, Chris Swarth
Philoscia muscorum	Kathy Szlavecz, Dan Kjar, Chris Swarth
Trachelipus rathkei	Kathy Szlavecz, Dan Kjar, Chris Swarth

Table 12. Spiders observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Grass Spider	Agelenopsis pennsylvanica	Nancy Kreiter
Marbled Orb Weaver	Araneus marmoreus	Nancy Kreiter
Dewdrop Spider	Argyrodes sp.	Nancy Kreiter
Six-spotted Fishing Spider	Dolomedes triton	Nancy Kreiter
Orchard Spider	Leucauge venusta	Nancy Kreiter
Basilica Orbweaver	Mecynogea lemniscata	Nancy Kreiter
Orb Weaver	Metapiera sp.	Nancy Kreiter
Spiny-backed Spider	Microthena gracillus	Nancy Kreiter
Goldenrod Crab Spider	Misumena vatia	Nancy Kreiter
Yellow Crab Spider	Misumenoides formosipes	Nancy Kreiter; Steve McKindley-Ward
Wolf Spider	Pardosa sp.	Nancy Kreiter
Nursery Web Spider	Pisaurina mira	Nancy Kreiter
Long-jawed Spider	Tetragnatha elongata	Nancy Kreiter

Table 13. Ant species observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Myrmicine Ant	Aphaenogaster fulva	Dan Kjar
Myrmicine Ant	Aphaenogaster lamellidens	Fred Paras
Myrmicine Ant	Aphaenogaster rudis	Dan Kjar
Myrmicine Ant	Aphaenogaster treatae	Timothy Foard, Dan Kjar
Carpenter Ant	Camponotus americanus	Dan Kjar
Black Carpenter Ant	Camponotus pennsylvanicus	Dan Kjar
Carpenter Ant	Camponotus subbarbatus	Dan Kjar
Chestnut Carpenter Ant	Camponotus castaneus	Dan Kjar
Myrmicine Acrobatic Ant	Crematogaster cerasi	Fred Paras
Lined Acrobatic Ant	Crematogaster lineolata	Tim Foard, Dan Kjar
Formicine Dolichoderine Ant	Dorymyrmex bureni	Dan Kjar
Formicine Dolichoderine Ant	Dorymyrmex grandulus	Tim Foard
Formicine Ant	Formica integra	Dan Kjar
Formicine Ant	Formica dolosa	Dan Kjar

Formicine Ant	Formica subsericea	Dan Kjar
Formicine Ant	Formica vinculans (neogagates?)	Fred Paras
Ponerine Ant	Hypoponera opacior	Tim Foard
Cornfield Ant	Lasius alienus	Dan Kjar
Formicine Ant	Lasius murphyi	Tim Foard
Myrmicine Little Black Ant	Monomorium emarginatum	Tim Foard
Little Black Ant	Monomorium minimum	Fred Paras; Dan Kjar
Myrmicine Ant	Myrmica latifrons	Tim Foard
Myrmicine Ant	Myrmica pinetorum	Tim Foard
Myrmicine Ant	Myrmecina americana	Dan Kjar
Formicine Ant	Paratrechina parvula	Tim Foard
Myrmicine Ant	Pheidole bicarinata	Tim Foard
Myrmicine Ant	Pheidole davisi	Dan Kjar
Myrmicine Ant	Pheidole dentata	Tim Foard
Myrmicine Ant	Pheidole pilifera	Tim Foard
Formicine Ant	Prenolepis imparis	Tim Foard; Dan Kjar
Myrmicine Ant	Solenopsis molesta	Tim Foard
Dolichoderine Odorous House Ant	Tapinoma sessile	Tim Foard
Myrmicine Pavement Ant	Tetramorium caespitum	Tim Foard
Northern fungus gardening ant	Trachymyrmex septentrionalis	Tim Foard; Dan Kjar

Table 14. Bee and wasp species observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
	Agapostemon virescens	Sam Droege
Andrenine bee	Andrena aliciae	Sam Droege
European Honeybee	Apis mellifera	Sam Droege
Common Eastern Bumblebee	Bombus impatiens	Sam Droege
	Calliopsis andreniformis	Sam Droege
	Coelioxys octodentata	Sam Droege
	Coelioxys sayi	Sam Droege
	Colletes compactus	Sam Droege
	Epeolus autumnalis	Sam Droege
	Epeolus pusillus	Sam Droege
	Halictus poeyi	Sam Droege
Sweat Bee	Lasioglossum nelumbonis	Sam Droege
Sweat Bee	Lasioglossum pilosum	Sam Droege
Sweat Bee	Lasioglossum rohweri	Sam Droege
Sweat Bee	Lasioglossum vierecki	Sam Droege
Leaf-cutting Bee	Megachile campanulae	Sam Droege
Leaf-cutting Bee	Megachile mendica	Sam Droege
	Melissodes denticula	Sam Droege
Metallic Solitary Bee	Perdita bequaerti	Sam Droege
panurgine bee	Perdita boltoniae	Sam Droege
panurgine bee	Perdita octomaculata	Sam Droege
	Pseudopanurgus rugosa	Sam Droege
Large Carpenter Bee	Xylocopa virginica	Sam Droege
Cricket Wasp	Liris sp.	Richard Orr
European Hornet	Vespa crabro	Ben Hollister
Yellowjacket	Vespula maculifrons	Sam Droege

Table 15. Beetles, flies, orthopterans and other insects observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Cutworm	Agrotis sp.	Ben Hollister
Wheel Bug	Arilus cristatus	Ben Hollister
Boxelder Bug	Boisea trivittata	Fred Paras
Caterpillar Hunter	Calosoma scrutator	Fred Paras
Goldenrod Soldier Beetle	Chauliognathus pennsylvanicus	Fred Paras
Green Lacewing	Chrysopa sp.	Ben Hollister
Tiger Beetle	Cicindela punctulata	Jonathon Mawdsley
Tiger Beetle	Cicindela scutellaris	Jonathon Mawdsley; Fred Paras
Tiger Beetle	Cicindela tranquebarica	Jonathon Mawdsley
Leaf Beetle	Diabrotica undecimpunctata	Fred Paras
Carolina Grasshopper	Dissosteira carolina	Richard Orr, Elaine Friebele
Blister Beetle	Epicauta sp.	
Dark Flower Scarab	Euphoria sepulcralis	Fred Paras
Earth Boring Dung Beetle	Geotropes splendidus	Ben Hollister
Field Cricket	Gryllus sp.	Ben Hollister
Restless Bush Cricket	Hapithus agitator	Richard Orr
Carabid Beetle	Harpalus sp.	Fred Paras
Bee-like Robber Fly	Laphria sp.	Fred Paras
Long-horned Beetle	Megacyllene robiniae	Fred Paras; Joe Metzger
Ant Lion	Myrmeleo sp.	Chris Swarth
Bess Beetle	Odontotaenius disjunctus	Richard Orr, Elaine Friebele
Large Milkweed Bug	Oncopeltus fasciatus	Fred Paras
Red-headed Meadow Katydid	Orchelimum erythrocephalum	Richard Orr
Firefly Beetle	Photuris sp.	Lindsay Hollister
Handsome Trig Cricket	Phyllopalpus pulchellus	Richard Orr, Elaine Friebele
Carabid Beetle	Platynus sp.	Jonathon Mawdsley
Katydid sp.	Pterophylla sp.	Richard Orr, E. Friebele; B. Hollister
Phantom Cranefly	Bittacomorpha clavipes	Nancy Kreiter
Dung Beetle	Stephanuca areata	Fred Paras
Cranefly sp.	Tipularia sp.	Mike Quinlan

Table 16. Butterflies observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Least Skipper	Ancyloxypha numitor	Jeff Shenot; Fred Paras
Hackberry Emperor	Asterocampa celtis	Fred Paras
Sachem	Atalopedes campestris	Jeff Shenot; Pat Durken, Dick Smith, Sue Ricciardi; Fred Paras
Orange Sulphur	Colias eurytheme	Pat Durkin, Dick Smith, Sue Ricciardi; F. Paras
Common Sulphur	Colias philodice	Pat Durken, Dick Smith, Sue Ricciardi
Monarch	Danaus plexippus	Jeff Shenot; Pat Durken, Dick Smith, Sue Ricciardi; Fred Paras
Silver Spotted Skipper	Epargyreus clarus	Pat Durkin
Horace's Duskywing	Erynnis horatius	Mike Quinlan
Dun Skipper	Euphyes vestris	Pat Durken, Dick Smith, Sue Ricciardi; F. Paras
Variegated Fritillary	Euptoieta claudia	Jeff Shenot; Fred Paras
Sleepy Orange	Eurema nicippe	Pat Durken
Eastern Tailed Blue	Everes comyntas	Pat Durken, Dick Smith, Sue Ricciardi; F. Paras
Fiery Skipper	Hylephila phyleus	Jeff Shenot
Buckeye	Junonia coenia	Pat Durken, Dick Smith, Sue Ricciardi
Skipper	Lerodea lherminier	Fred Paras
Viceroy	Limenitis archippus	Mike Quinlan
White Admiral	Limenitis arthemis	Fred Paras
American Copper	Lycaena phlaeas	Pat Durken, Dick Smith, Sue Ricciardi; F. Paras
Swarthy Skipper	Nastra iherminier	Pat Durkin
Long-winged Skipper	Panoquina ocola	Pat Durken
Tiger Swallowtail	Papilio glaucus	Jeff Shenot; Pat Durken, Dick Smith, Sue Ricciardi; Fred Paras
Spicebush Swallowtail	Papilio troilus	Jeff Shenot
Cloudless Sulphur	Phoebis sennae	Jeff Shenot; Fred Paras
Pearl Crescent	Phyciodes tharos	Jeff Shenot; Pat Durken, Dick Smith, Sue Ricciardi; Fred Paras
Cabbage White Butterfly	Pieris rapae	Jeff Shenot; Fred Paras; Past Durkin
Broad-winged Skipper	Poanes viator	Pat Durken, Dick Smith, Sue Ricciardi
Zabulon Skipper	Poanes zabulon	Jeff Shenot
Crossline Skipper	Polites origenes	Pat Durken, Dick Smith, Sue Ricciardi; F. Paras
Comma	Polygonia comma	Pat Durken, Dick Smith, Sue Ricciardi
Question Mark	Polygonia interrogationis	Jeff Shenot; Fred Paras
Checkered White	Pontia protodice	Pat Durkin
Common Checkered Skipper	Pyrgus communis	Pat Durken, Dick Smith, Sue Ricciardi; F. Paras
Appalachian Brown	Satyrodes appalachia	Jeff Shenot
Great Spangled Fritillary	Speyeria Cybele	Jeff Shenot; Pat Durkin
Gray Hairstreak	Strymon melinus	Jeff Shenot; Fred Paras
Red Admiral	Vanessa atalanta	Fred Paras
American Painted Lady	Vanessa virginiensis	Pat Durken, Dick Smith, Sue Ricciardi; F. Paras

Table 17. Moth species observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Celery Looper	Anagrapha falcifera	Dick Smith
Ailanthus Webworm Moth	Atteva punctella	Richard Orr, Elaine Friebele; Ben Hollister
Forage Looper	Caenurgina erechtea	Dick Smith
Arge Tiger Moth	Grammia arge	Dick Smith
Green Cloverworm Moth	Hypena scabra	Dick Smith
White Flannel Moth	Norape ovina	Pat Durken, Dick Smith, Sue Ricciardi
Turbulent Phosphila	Phosphila turbulenta	Steve McKindley-Ward
Variable Reddish Pyrausta	Pyrausta rubricalis	Dick Smith; Bob Patterson
Virginian Tiger Moth	Spilosoma virginica	Pat Durken, Dick Smith, Sue Ricciardi; Rich Orr
Arcigera Flower Moth	Schinia arcigera	Fred Paras
Snowy Urola Moth	Urola nivalis	Dick Smith
Scape Moth	Ctenuchidae sp.	Fred Paras
Tussock Moth Caterpillar	Unidentified species	Joe Metzger

Table 18. Dragonflies and damselflies observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Shadow Darner	Aeshna umbrosa	Richard Orr
Common Green Darner	Anax junius	Richard Orr
Familiar Bluet	Enallagma civile	Richard Orr
Orange Bluet	Enallagma signatum	Richard Orr
Common Pondhawk	Erythemis simplicicollis	Richard Orr
Fragile Forktail	Ischnura posita posita	Richard Orr
Rambur's Forktail	Ischnura ramburii	Richard Orr
Eastern Forktail	Ischnura verticalis	Richard Orr
Slaty Skimmer	Libellula incesta	Richard Orr
Common Whitetail	Libellula lydia	Richard Orr
Blue Dasher	Pachydiplax longipennis	Richard Orr
Wandering Glider	Pantala flavescens	Richard Orr
Spot-winged Glider	Pantala hymenaea	Richard Orr
Eastern Amberwing	Perithemis tenera	Richard Orr
Mocha Emerald	Somatochlora linearis	Richard Orr
Autumn Meadowhawk	Sympetrum vicinum	Richard Orr
Carolina Saddlebag	Tramea carolina	Richard Orr
Black Saddlebag	Tramea lacerata	Richard Orr

Table 19. Fish observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Rosyside Dace	Clinostomus funduloides	Karyn Molines; Jeff Cambell, Yuka Tasumi
Creek Chubsucker	Erimyzon oblongus	Karyn Molines; Jeff Cambell, Yuka Tasumi
Tesselated Darter	Etheostama olmstedi	Karyn Molines; Jeff Cambell, Yuka Tasumi
Mosquitofish	Gambusia affinis	Karyn Molines; Jeff Cambell, Yuka Tasumi
Least Brook Lamprey	Lampetra aepytera	Karyn Molines; Jeff Cambell, Yuka Tasumi
Pumpkinseed	Lepomis gibbosus	Karyn Molines; Jeff Cambell, Yuka Tasumi
Bluegill	Lepomis macrochirus	Karyn Molines; Jeff Cambell, Yuka Tasumi
Golden Shiner	Notemigonus crysoleucas	Karyn Molines; Jeff Cambell, Yuka Tasumi
Swallowtail Shiner	Notropis procne	Karyn Molines; Jeff Cambell, Yuka Tasumi
Blacknose Dace	Rhinichthys atratulus	Karyn Molines; Jeff Cambell, Yuka Tasumi
Eastern Mudminnow	Umbra pygmaea	Karyn Molines; Jeff Cambell, Yuka Tasumi

Table 20. Amphibians observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Northern Cricket Frog	Acris crepitans crepitans	Mike Quinlan
Spotted Salamander	Ambystoma maculatum	Robert Frezza
Marbled Salamander	Ambystoma opacum	Robert Frezza; Mike Quinlan
American Toad	Anaxyrus americanus	Mike Quinlan
Fowler's Toad	Anaxyrus fowleri	Robert Frezza
Northern Dusky Salamander	Desmognathus fuscus	Robert Frezza
Northern Two-lined Salamander	Eurycea bislineata	Robert Frezza
Bullfrog	Lithobates catesbeiana	Lindsay Hollister
Green Frog	Lithobates clamitans	Robert Frezza
Pickerel Frog	Lithobates palustris	Robert Frezza
Florida Leopard Frog	Lithobates sphenocephala	Mike Quinlan
Wood Frog	Lithobates sylvatica	Mike Quinlan
Northern Spring Peeper	Pseudacris crucifer crucifer	Mike Quinlan
Eastern Mud Salamander	Pseudotriton montanus montanus	Mike Quinlan

Table. 21. Reptiles observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Six-lined Racerunner	Aspicoscelis sexlineata sexlineata	Mike Quinlan
Worm Snake	Carphophis amoenus amoenus	Robert Frezza
Snapping Turtle	Chelydra serpentine	Mike Quinlan
Eastern Painted Turtle	Chrysemys picta picta	Chris Swarth
Northern Black Racer	Coluber constrictor constrictor	Mike Quinlan; Chris Swarth
Eastern Mud Turtle	Kinosternon subrubrum subrubrum	Mike Quinlan
Eastern Ratsnake	Pantherophis alleghaniensis	Mike Quinlan; David Farr; Joe Metzger
Five-lined Skink	Plestiodon fasciatus	Chris Swarth
Red-bellied Turtle	Pseudemys rubriventris	Chris Swarth
Eastern Fence Lizard	Sceloporus undulatus	Mike Quinlan
Eastern Box Turtle	Terrapene carolina carolina	Mike Quinlan
Eastern Ribbon Snake	Thamnophis sauritus	Chris Swarth
Smooth Earth Snake	Virginia valeriae valeriae	Chris Swarth

Table 22. Birds observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Acadian Flycatcher	Empidonax virescens	Jeff Shenot
American Crow	Corvus brachyrhynchos	Dotty Mumford & Jeff Shenot
American Goldfinch	Carduelis tristis	Dotty Mumford & Jeff Shenot; Mike Quinlan
American Kestrel	Falco sparvarius	Sue Hamilton
American Redstart	Setophaga ruticilla	Dotty Mumford & Jeff Shenot
American Robin	Turdus migratorius	Dotty Mumford & Jeff Shenot
Bald Eagle	Haliaeetus leucocephalus	Dotty Mumford & Jeff Shenot
Barred Owl	Strix varia	Dotty Mumford & Jeff Shenot; Mike Quinlan
Belted Kingfisher	Ceryle alcyon	Jeff Shenot; Mike Quinlan
Black Vulture	Coragyps atratus	Dotty Mumford & Jeff Shenot
Black-and-white Warbler	Mniotilta varia	Jeff Shenot
Black-crowned Night-Heron	Nycticorax nycticorax	Dotty Mumford & Jeff Shenot
Blackpoll Warbler	Dendroica striata	Jeff Shenot
Black-throated Blue Warbler	Dendroica caerulescens	Jeff Shenot
Black-throated Green Warbler	Dendroica virens	Jeff Shenot
Blue Grosbeak	Guiraca caerulea	Dotty Mumford & Jeff Shenot
Blue Jay	Cyanocitta cristata	Dotty Mumford & Jeff Shenot
Blue-winged Teal	Anas discors	Jeff Shenot
Brown Thrasher	Toxostoma rufum	Jeff Shenot; Mike Quinlan
Brown-headed Cowbird	Molothrus ater	Dotty Mumford & Jeff Shenot
Canada Goose	Branta canadensis	Dotty Mumford & Jeff Shenot
Cape May Warbler	Dendroica tigrina	Jeff Shenot
Carolina Chickadee	Poecile carolinensis	Dotty Mumford & Jeff Shenot
Carolina Wren	Thryothorus ludovicianus	Dotty Mumford & Jeff Shenot
Cedar Waxwing	Bombycilla cedrorum	Dotty Mumford & Jeff Shenot
Chestnut-sided Warbler	Dendroica pensylvanica	Jeff Shenot
Chimney Swift	Chaetura pelagica	Jeff Shenot
Chipping Sparrow	Spizella passerina	Dotty Mumford & Jeff Shenot
Common Grackle	Quiscalus quiscula	Jeff Shenot
Common Nighthawk	Chordeiles minor	Dotty Mumford & Jeff Shenot
Common Yellowthroat	Geothlypis trichas	Dotty Mumford & Jeff Shenot
Cooper's Hawk	Accipiter cooperii	Dotty Mumford & Jeff Shenot
Double-crested Cormorant	Phalacrocorax auritus	Dotty Mumford & Jeff Shenot
Downy Woodpecker	Picoides pubescens	Dotty Mumford & Jeff Shenot
Eastern Bluebird	Sialia sialis	Dotty Mumford & Jeff Shenot
Eastern Kingbird	Tyrannus tyrannus	Dotty Mumford & Jeff Shenot
Eastern Phoebe	Sayornis phoebe	Dotty Mumford & Jeff Shenot
Eastern Wood-Pewee	Contopus virens	Dotty Mumford & Jeff Shenot
European Starling	Sturnus vulgaris	Dotty Mumford & Jeff Shenot
Field Sparrow	Spizella pusilla	Dotty Mumford & Jeff Shenot
Fish Crow	Corvus ossifragus	Dotty Mumford & Jeff Shenot
Forster's Tern	Sterna forsteri	Dotty Mumford & Jeff Shenot
Glossy Ibis	Plegadis falcinellus	Dotty Mumford & Jeff Shenot
Gray Catbird	Dumetella carolinensis	Dotty Mumford & Jeff Shenot
Great Blue Heron	Ardea herodias	Dotty Mumford & Jeff Shenot
Great Egret	Ardea albus	Dotty Mumford & Jeff Shenot

Great Horned Owl	Bubo virginianus	Jeff Shenot; Lindsay Hollister
Greater Yellowlegs	Tringa melanoleuca	Dotty Mumford & Jeff Shenot
Green Heron	Butorides virescens	Dotty Mumford & Jeff Shenot
Green-winged Teal	Anas crecca	Jeff Shenot
Hairy Woodpecker	Picoides villosus	Dotty Mumford & Jeff Shenot
Herring Gull	Larus argentatus	Dotty Mumford & Jeff Shenot
Indigo Bunting	Passerina cyanea	Dotty Mumford & Jeff Shenot
Killdeer	Charadrius vociferus	Jeff Shenot
Laughing Gull	Larus atricilla	Dotty Mumford & Jeff Shenot
Least Bittern	Ixobrychus exilis	Jeff Shenot
Magnolia Warbler	Dendroica magnolia	Jeff Shenot
Mallard	Anas platyrhynchos	Dotty Mumford & Jeff Shenot
Mourning Dove	Zenaida macroura	Dotty Mumford & Jeff Shenot
Mute Swan	Cygnus olor	Dotty Mumford & Jeff Shenot
Northern Cardinal	Cardinalis cardinalis	Dotty Mumford & Jeff Shenot
Northern Flicker	Colaptes auratus	Jeff Shenot
Northern Harrier	Circus cyaneus	Dotty Mumford & Jeff Shenot
Northern Mockingbird	Mimus polyglottos	Dotty Mumford & Jeff Shenot
Northern Parula	Parula americana	Jeff Shenot
Northern Pintail	Anas acuta	Jeff Shenot
Northern Shoveler	Anas clypeata	Dotty Mumford & Jeff Shenot
Northern Waterthrush	Seiurus noveboracensis	Dotty Mumford & Jeff Shenot
Osprey	Pandion haliaetus	Dotty Mumford & Jeff Shenot
Ovenbird	Seiurus aurocapillus	Jeff Shenot
Pileated Woodpecker	Dryocopus pileatus	Dotty Mumford & Jeff Shenot
Pine Warbler	Dendroica pinus	Jeff Shenot
Red-bellied Woodpecker	Melanerpes carolinus	Dotty Mumford & Jeff Shenot
Red-breasted Nuthatch	Sitta canadensis	Dotty Mumford & Jeff Shenot
Red-eyed Vireo	Vireo olivaceus	Dotty Mumford & Jeff Shenot
Red-headed Woodpecker	Melanerpes erythrocephalus	Jeff Shenot; Nancy Kreiter
Red-shouldered Hawk	Buteo lineatus	Dotty Mumford & Jeff Shenot
Red-tailed Hawk	Buteo jamaicensis	Jeff Shenot
Red-winged Blackbird	Agelaius phoeniceus	Dotty Mumford & Jeff Shenot
Ring-billed Gull	Larus delawarensis	Dotty Mumford & Jeff Shenot
Rock Dove	Columba livia	Sue Hamilton
Rose-breasted Grosbeak	Pheucticus ludovicianus	Jeff Shenot
Ruby-throated Hummingbird	Archilochus colubris	Dotty Mumford & Jeff Shenot
Rufous-sided Towhee	Pipilo erythrophthalmus	Jeff Shenot
Scarlet Tanager	Piranga olivacea	Dotty Mumford & Jeff Shenot
Sharp-shinned Hawk	Accipiter striatus	Jeff Shenot
Sora	Porzana carolina	Jeff Shenot
Summer Tanager	Piranga rubra	Jeff Shenot
Tennessee Warbler	Vermivora peregrina	Jeff Shenot
Tree Swallow	Tachycineta bicolor	Jeff Shenot
Tufted Titmouse	Baeolophus bicolor	Dotty Mumford & Jeff Shenot
Turkey Vulture	Cathartes aura	Dotty Mumford & Jeff Shenot
Virginia Rail	Rallus limicola	Jeff Shenot
White-breasted Nuthatch	Sitta carolinensis	Dotty Mumford & Jeff Shenot
White-eyed Vireo	Vireo griseus	Dotty Mumford & Jeff Shenot
Wilson's Warbler	Wilsonia pusilla	Jeff Shenot
Wood Duck	Aix sponsa	Dotty Mumford & Jeff Shenot

Wood Thrush	Hylocichla mustelina	Dotty Mumford & Jeff Shenot
Yellow Warbler	Dendroica petechia	Jeff Shenot

Table 23. Mammals observed and identified on the BioBlitz.

Common Name	Scientific Name	Observers
Beaver	Castor canadensis	visitors
Eastern Chipmunk	Tamias striatus	visitors
Eastern Cottontail	Sylvilagus floridanus	visitors
Gray Squirrel	Sciuris griseus	Mike Quinlan
Muskrat	Ondatra zibethica	visitors
Red Fox	Vulpes vulpes	Karyn Molines
White-tailed Deer	Odocoileus virginiana	Mike Quinlan

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Appendix A.

Maps of the north and south sections of the Jug Bay Wetlands Sanctuary, indicating the Search Areas used in the 2007 BioBlitz.

Appendix B. Summary of leaders and the areas searched.

Team	Date	Leaders	Time Period	Search Areas
Amphibians	15 Sept	Robert Frezza & Karyn Molines	6 – 7 pm	4 (Including Wet Forest pitfall traps)
Ants	15 Sept	Fred Paraskevoudakis	12 – 3 pm	32 & 33
Bees	15 Sept	Sam Droege	12 – 3 pm	3, 34A & 37
Birds	15 Sept	Dotty Mumford	12 – 3 pm	20
Birds	15 Sept	Jeff Shenot	3 – 6 pm	20
Butterflies	15 Sept	Jeff Shenot	12 – 3 pm	37
Butterflies	15 Sept	Pat Durkin	12 – 3 pm	3 & 20
Dragonflies	15 Sept	Richard Orr	12 – 3 pm 3 – 6 pm	3, 8, 9 & 11
Fish	15 Sept	Karyn Molines; Jeff Campbell	3 – 6 pm	36
Herps	15 Sept	Chris Swarth	12 – 3 pm 3 – 6 pm	3, 5 & 8
Herps	15 Sept	Mike Quinlan	12 – 3 pm	1, 2, 3, 4, 6 & 7
Herps	15 Sept	Mike Quinlan	3 – 6 pm	33
Herps	15 Sept	Robert & Rosemary Frezza	12 – 3 pm	39
Insects	15 Sept	Ben Hollister	12 – 3 pm	3
Insects	15 Sept	Fred Paraskevoudakis & Timothy Foard	12 – 3 pm	33
Meadow Plants	15 Sept	Joe Metzger	12 – 3 pm 3 – 6 pm	33 & 34
Mushrooms	15 Sept	David Farr	3 – 6 pm	1, 5, 6 & 11C
Nocturnal animals	15 Sept	Lindsay Hollister	9 pm – midnight	11
Owls	15 Sept	Mike Quinlan	9 pm – midnight	20
Plankton	15 Sept	Kathy Ellett	3 – 6 pm	11C (River Pier)
Trees	15 Sept	Dave Perry	12 – 3 pm	1, 2, 3, 9 & 11
Trees	15 Sept	Dave Perry	3 – 6 pm	34A
Vines	15 Sept	Dennis Whigham	12 – 3 pm	34
Vines	15 Sept	Dennis Whigham	3 – 6 pm	1 & 11
Ants	16 Sept	Dan Kjar	9 am – 12 pm	
Beetles	16 Sept	Jonathan Mawdsley	9 am – 12 pm	33 & 37
Birds	16 Sept	Jeff Shenot	6 am – 12 pm	7 & 11
Birds	16 Sept	Dotty Mumford	6 – 9 am	1, 9, 11 & 10
Butterflies	16 Sept	Pat Durkin	9 am – 12 pm	33, 34A & 34B
Earthworms	16 Sept	Kathy Szlavecz; Dan Kjar	9 am – 12 pm	1 & 2
Herps	16 Sept	Mike Quinlan	9 am – 12 pm	8, 13 and 14
Moths	16 Sept	Dick Smith	9 am – 12 pm	33, 34A & 34B
Spiders	16 Sept	Nancy Kreiter	9 am – 12 pm	1, 6, 9 & 10
Trees	16 Sept	Dave Perry	9 am – 12 pm	1 & 20

Appendix C. Species tally sheet used in 2007 BioBlitz.

Team Leader _____

Date _____

	Site Information: If all the same				**Taxonomic Information: If All the Same**				
					Phylum	Class	Order		
Line#	UTM E ---------- UTM N	GMP	Distance (m)	Bearing (to GMP)	(Order, if different) Family	Genus	Species	Number	Notes
1									
2									
3									
4									
5									
6									
7									
8									

Appendix D. Observer and habitat sheet used in the 2007 BioBlitz

Team Leader_____

Address_____

Phone_____email_____

Other Volunteers:

Name				
Address				
City, State ZIP				
Phone				
Email				
Name				
Address				
City, State ZIP				
Phone				
Email				

GENERAL HABITAT INFORMATION

UTM E_____UTM N_____GMP_____

General Site Information:_____

_____

_____

Nearest Trail / Intersection:_____

Tidal
- ☐ Low Marsh
- ☐ High Marsh
- ☐ Phragmites
- ☐ Scrub Shrub
- ☐ Swamp
- ☐ Intertidal mudflats
- ☐ Intertidal sand/gravel

Rivers and Streams
- ☐ Deep water river (Patuxent)
- ☐ Year-round stream
- ☐ Intermittent stream–lower
- ☐ Intermittent stream–upper

Non-Tidal
- ☐ Shallow emergent
- ☐ Shrub swamp
- ☐ Seepage swamp
- ☐ Seep
- ☐ Bottomland forest
- ☐ Vernal pool
- ☐ Beaver Pond
- ☐ Quarry pond

Terrestrial
- ☐ Mixed hardwood
- ☐ Evergreen (Pine)
- ☐ Stream banks
- ☐ Managed meadow

Disturbed or Open
- ☐ Gardens, planted areas
- ☐ Lawns / cleared lands
- ☐ Railroad bed
- ☐ Abandoned sand mine
- ☐ Old fields