

**WILDLIFE AND PLANT SURVEYS AT BIG OAK PARK
ADOPT-A-WETLAND SITE
THE DELAWARE NATIVE PLANT SOCIETY
2007**



Breeding Bird Surveys in Selected Habitats at Big Oak Park

Eric F. Zuelke and Richard C. McCorkle

Abstract. An avian inventory of Big Oak Park was undertaken to determine the abundances of nesting birds in various habitats of the park. A 50 meter, fixed-radius point count method was used. Three survey sites were established. The most frequently encountered species was the Red-winged Blackbird. Rare breeding species included Great Blue Heron, Hairy Woodpecker, and Grasshopper Sparrow.

Methods and Materials

A 50-m fixed-radius point count method will be used to inventory breeding birds at Big Oak Park. Point count sites were established at Sites 1A, 1B, and 2 (Figures 1 and 2). These sites include stream-side/floodplain forest (Site 1A), a complex of forested, scrub-shrub and herbaceous wetlands with interspersed old field (Site 1B), and a wet meadow where bluebird nest boxes have been erected (Site 2).

At each established point-count location, a tree, or other natural feature of the land will be selected to mark the center of the point count area or, in the absence of such a feature (e.g., wet meadow at Site 2), a wooden stake will be erected. Each point will be clearly marked by wrapping flagging around the center tree or stake.

Methods for point count surveys are modified from Bibby et al. (1992), and Ralph et al. (1995). To maximize the probability that all species around a given point count site have a reasonable chance of being detected, each point will be visited on two separate dates: once during 21-23 May and again during 16-18 June. Two visits are necessary because some species arrive early on their nesting grounds and their daily singing may be markedly diminished as other late-arriving species are just beginning to establish territories. Additionally, certain species may be more easily detected during different periods of their nesting cycle. Ralph et al. (1995) encourages repeated visits to points to maximize the number of species detected at each site.

Point count surveys will commence by 0600 hours and will be completed by 0700 hrs. To minimize the effects of environmental conditions on the ability of the observer to detect bird songs and calls, surveys will not be conducted during inclement weather (e.g., heavy rain, high winds). During each visit, all birds detected within a 50-m radius of the center of the survey site will be registered for a ten-minute period. Birds flying in open airspace and not actively using the site for foraging (e.g., birds of prey and waterfowl) will not be registered. A stopwatch will be used to track the ten-minute period. The 50-m radius of the point count site will be determined using bare eyesight estimations.

Results and Discussion

Seven species of birds tied for the most frequently encountered species (Tables 1 and 2). The species with the highest abundance was the Red-winged Blackbird (Table 1). Red-winged Blackbird and Common Yellowthroat had the highest number of registrations. Total number of species recorded was 22, all of which were non-transient. The survey site with the highest number of registrations was 1B. Opportunistically observed birds recorded outside of point count radii during avian point counts at Big Oak Park are found in Table 3.

The results of these point counts clearly reveal the diversity of habitats in this park, with common species of forest, swamp, successional marsh, open marsh, and old field birds all being present. However, it is the quality of these habitats that is in question. The low numbers of registrations at each site is in part due

to the individual sizes of these habitats, as avian territory sizes dictate the number of individual that can co-occur in a habitat, and the smaller the habitat size, the fewer the individuals that can live there. However, habitat quality can also have a profound impact on the numbers of individuals that can occur in a habitat as well. None of the habitats in this park could be considered high quality. However, as it is situated in the midst of a surrounding matrix of suburban and agricultural landscapes, the park does seem to be acting as a small refuge for the breeding birds of the area as it is the best habitat available. Aside from this, although habitat quality will likely improve as recently created and/or restored habitats mature, much could still be done to improve habitat quality and quantity.

Management activities such as non-native species removal, increasing the size of unmanaged borders along ecotones, and increasing the amount of forest (thus decreasing the edge effect) can all help to improve this park.

Table 1. Relative frequencies and relative abundances of non-transient songbirds recorded during 2007 avian point counts in Big Oak Park

Species	Relative Frequency	Relative Abundance
Red-winged Blackbird	66.67%	0.261
American Goldfinch	66.67%	0.065
Tree Swallow	66.67%	0.065
Common Yellowthroat	66.67%	0.043
Eastern Kingbird	66.67%	0.043
Field Sparrow	66.67%	0.043
Barn Swallow	33.33%	0.043
Indigo Bunting	66.67%	0.022
Common Grackle	33.33%	0.022
Great Blue Heron	33.33%	0.022
Green Heron	33.33%	0.022
American Robin	33.33%	0.000
Blue Jay	33.33%	0.000
Carolina Wren	33.33%	0.000
Eastern Wood-Pewee	33.33%	0.000
Gray Catbird	33.33%	0.000
Hairy Woodpecker	33.33%	0.000
Northern Cardinal	33.33%	0.000
Northern Flicker	33.33%	0.000
Red-eyed Vireo	33.33%	0.000
Tufted Titmouse	33.33%	0.000
Yellow-breasted Chat	33.33%	0.000

Table 2. Breeding bird registrations recorded during 2007 point counts at Big Oak Park

Survey Site	1A	1B	2	Total Registrations
Species	Non-transient	Non-transient	Non-transient	
American Goldfinch			1	2 . 3
American Robin	2			. 2
Barn Swallow				2 . 2
Blue Jay	1			. 1
Carolina Wren	2			. 2
Common Grackle				1 . 1
Common Yellowthroat	2		2	. 4
Eastern Kingbird			1	1 . 2
Eastern Wood-Pewee	1			. 1
Field Sparrow		1		1 . 2
Gray Catbird	1			. 1
Great Blue Heron			1	. 1
Green Heron			1	. 1
Hairy Woodpecker	1			. 1
Indigo Bunting	1		1	. 2
Northern Cardinal	1			. 1
Northern Flicker	1			. 1
Red-eyed Vireo	1			. 1
Red-winged Blackbird			10	2 . 12
Tree Swallow			2	1 . 3
Tufted Titmouse	1			. 1
Yellow-breasted Chat	1			. 1
				.
Total registrations for site	16	20	10	. .
Total species for site	13	9	7	. .

Table 3. Opportunistically observed birds recorded outside of point count radii during 2007 avian point counts in Big Oak Park

American Crow
Eastern Towhee
Grasshopper Sparrow
Great Crested Flycatcher
Killdeer
Song Sparrow
Unconfirmed aural
observation of either an
Orchard Oriole, or Blue
Grosbeak

References

- Bibby, C. J., N. D. Burgess and D. A. Hill. 1992. Bird Census Techniques. Harcourt Brace and Company.
- Ralph, C. J., S. Droege and J. R. Sauer. 1995. Managing and monitoring birds using point counts: Standards and Applications. *In*, C. J. Ralph, J. R. Sauer and S. Droege eds., Monitoring Bird Populations by Point counts. USDA Forest Service General Technical Report PSW-GTR-149.

Figure 1. Big Oak Adopt-A-Wetland Site. Sites 1A and 1B are contained within the green polygon at the top of the image. Site 1A is the forested stream corridor and floodplain running more or less southwest to northeast across the top of the image. Site 1B includes the red polygon, which contains the three created wetland cells. The storm-water retention pond and herbaceous marsh are to the west of this polygon, and the forested swamp is due north of the polygon. Site 2 is contained within the smaller green polygon toward the bottom (southern end) of the image.

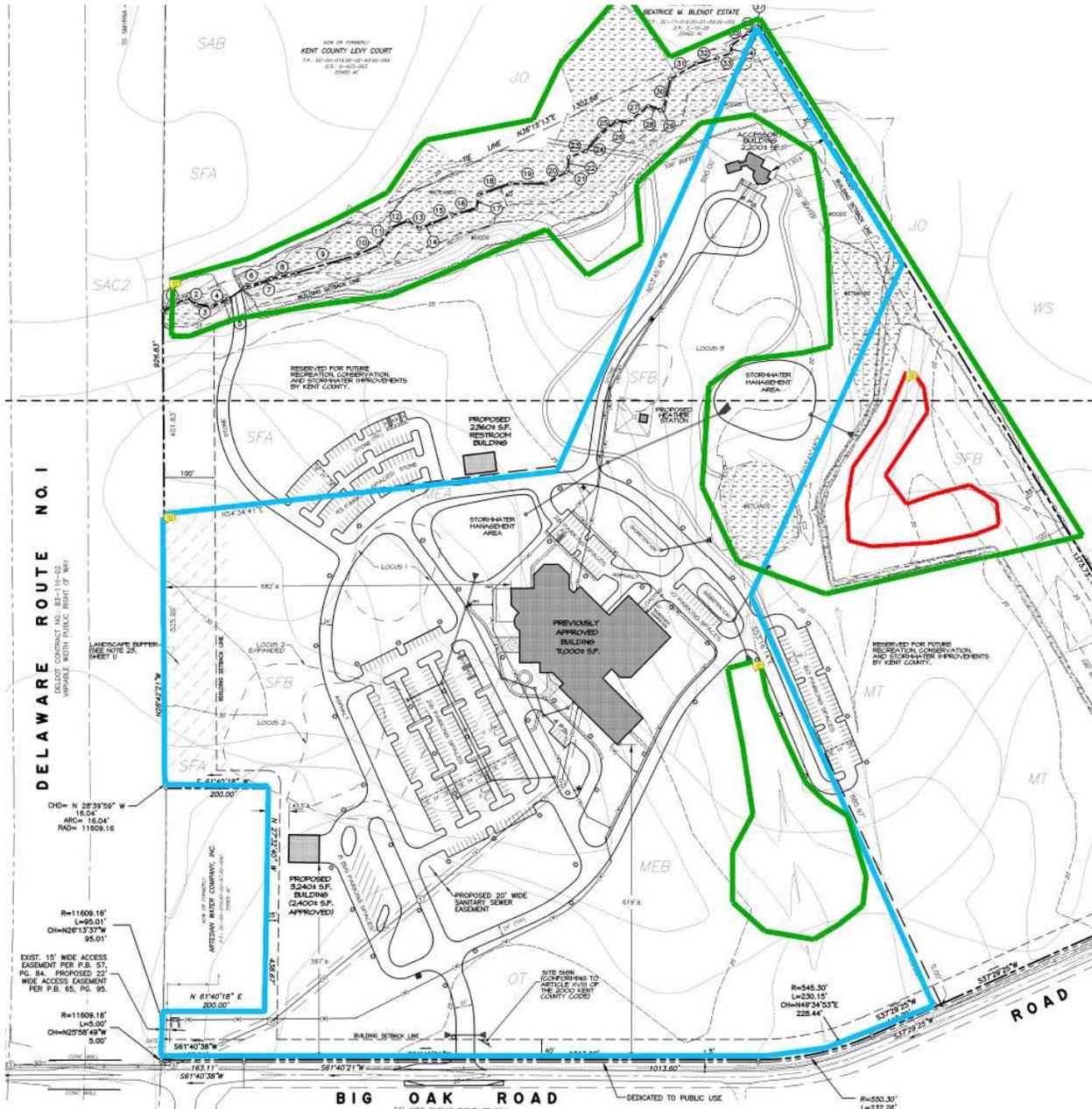


Figure 2. Aerial View of Big Oak Park and associated wetlands. This aerial photo is taken from a vantage point that is off the southwest corner of the Big Oak Park. The forested stream corridor (Site 1A) runs from the left side of the photo to just above and to the left of center of the photo. Contiguous with this corridor is the forested swamp (north end of Site 1B), which is just above and to the right of center in the photo. Immediately below the forested swamp is the storm-water management basin (also part of Site 1B), and to its right is the freshwater marsh and the 3 created wetland cells (also Site 1B). Site 2, the wet meadow, is only partially visible, just below center on the right side of the photo. Note that the water feature nearest the center of this photo, a second storm-water management basin, is not an adopted wetland and is not included in monitoring.



Spring Migratory Bird Survey

Eric F. Zuelke and Richard C. McCorkle

Each year the Delmarva Ornithological Society hosts the State of Delaware spring migration bird census, also known as the “Spring Round Up,” which has been performed in Delaware for decades. The state is divided into regions and volunteers cover each region. The methods for this survey simply involve covering as much area as possible in the region, on foot and by car, and tallying each individual bird observed for each species. Equipment consists of binoculars and spotting scopes. Birds that are observed only and/or heard only are tallied. Observers also record the number of hours spent on foot, in car, and the number of miles driven and/or walked.

The Big Oak spring round up was performed on the same day as the official statewide survey, but was limited to the boundaries of the park only and the data was not used in the statewide survey results. This survey was performed from 0530 to 0930, on 12 May 2007, by Eric Zuelke. Table 4 lists the results of this survey.

Number of hours spent observing on foot: 4.0 hours

Number of hours spent observing while driving: 0

Number of miles driven: 0

Number of miles walked: approximately 2.5

Table 4. Results of the 2007 spring migration bird census in Big Oak Park

Species	Number of individuals observed	Species	Number of individuals observed
American Crow	2	Grasshopper Sparrow	1
American Goldfinch	3	Great Crested Flycatcher	1
American Robin	8	Great Egret	1
Barn Swallow	1	Great Horned Owl	1
Blue Jay	1	Indigo Bunting	4
Blue Grosbeak	1	Mallard	1
Brown-headed Cowbird	1	Northern Cardinal	8
Canada Goose	2	Northern Flicker	2
Carolina Wren	5	Northern Mockingbird	2
Common Grackle	5	Prairie Warbler	2
Common Yellowthroat	6	Red-winged Blackbird	6
Downy Woodpecker	1	Ruby-throated Hummingbird	1
Eastern Phoebe	1	Song Sparrow	3
Eastern Wood-Pewee	1	Tree Swallow	2
Field Sparrow	2	White-eyed Vireo	4
Fish Crow	2	Wood Thrush	2
Gray Catbird	4		

Christmas Bird Count

Eric F. Zuelke and Richard C. McCorkle

Each year the Delmarva Ornithological Society hosts the the State of Delaware Christmas bird count. This annual survey has been performed in Delaware for over 100 years and gives an overview of the bird species that winter in Delaware. The state is divided into regions and volunteers cover each region. The methods for this survey simply involve covering as much area as possible in the region, on foot and by car, and tallying each species observed (for this survey, individuals birds are not tallied, just species). Equipment consists of binoculars and spotting scopes. Birds that are observed only and/or heard only are tallied. Observers also record the number of hours spent on foot, in car, and the number of miles driven and/or walked.

The Big Oak Christmas bird count was not performed on the same day as the official statewide survey, and was limited to the boundaries of the park only and the data was not used in the statewide survey results. This survey was performed from 0945 to 1215, on 30 Dec 2007, by Eric Zuelke, and Rick McCorkle. Table 5 lists the results of this survey.

Number of hours spent observing on foot: 2.5 hours

Number of hours spent observing while driving: 0

Number of miles driven: 0

Number of miles walked: approximately 2.5

Table 5. Results of the 2007 Christmas bird count in Big Oak Park

Species

American Goldfinch

American Kestrel

Carolina Wren

Great Blue Heron

Mallard

Morning Dove

Northern Cardinal

Northern Harrier

Northern Flicker

Northern Mockingbird

Red-bellied Woodpecker

Savannah Sparrow

Song Sparrow

Swamp Sparrow

Tufted Titmouse

White-throated Sparrow

Breeding Frog and Toad Surveys

Eric F. Zuelke and Richard C. McCorkle

Methods and Materials

Frog and toad call survey methods are adapted from the established protocol of the North American Amphibian Monitoring Program (Bishop 1996). A total of 3 survey sites will be established along roads and trails and spaced no less than 100 meters apart. Traditional methods of breeding frog surveys use a purely roadside methodology and sites are spaced no less than 0.75 km, but Big Oak Park is small (only about 50 acres in size) so we adapted the traditional protocols to match the size of the park. The standard protocol for distance between monitoring points was established to prevent observers from double-counting individual calls or choruses, since the standard surveys are conducted from road-side locations that are sometimes considerable distances (e.g., > 50 m) from the wetlands being monitored, and in such situations choruses from a particular wetland might be heard from multiple stops if those stops are spaced too close together. This will not be an issue at Big Oak Park, as surveys will be conducted immediately adjacent to wetland sites.

The 3 survey sites (Figures 1 and 2) include the forested stream corridor at the north end of the park (Site 1A), an area along the eastern boundary of the park which encompasses six separate wetland components (Site 1B): forested swamp, freshwater marsh, storm-water retention basin, and three created wetlands], and a wet meadow at the southern end of the park, near Big Oak Road (Site 2). Sites 1A and 1B were previously identified as a single Adopt-A-Wetland unit by Carl Solberg (i.e., Adopt-A-Wetland Area 1). Site 2 was identified by Mr. Solberg as Adopt-A-Wetland Area 2. Surveys at Site 1A will be conducted from the middle of the boardwalk, where it crosses the stream. Surveys of Site 1B will be conducted from the top of a man-made berm at the approximate center of this cluster of six wetland cells. Some effort will be made to distinguish between the different wetland cells/habitats at this site, in terms of which wetland cells or habitats are supporting which species and their relative abundances. Although this is difficult to do, there will be added value in comparing amphibian use of the created wetlands to that of the storm-water basin and existing swamp and marsh. Surveys of Site 2 will be conducted from the southern-most end of the parking lot access road at the southern end of the park.

Surveys will begin at least 30 minutes after sunset, consistent with North American Amphibian Monitoring Program protocol, and each site will be monitored for 10 minutes, with a minimum of 5 minutes of “settle time” prior to initiation of survey, in case frogs are disturbed by approaching observers. Surveys will be conducted when the weather is favorable for frog and toad activity, preferably following rain events, at or above the minimum allowable temperatures (Table 6), when wind is at a minimum, and not during heavy rain (light rain is acceptable, but heavy rain or high winds affect observers’ ability to hear frog calls). Species will be identified by aural cues only and chorus code levels will be used to estimate abundance (Table 7). Surveys will be conducted on a minimum of 3 dates between February and July (Niederreiter, <http://www.dnrec.state.de.us/nhp/information/volunteer.shtml>), and will be timed as much as possible to correspond with peak calling periods for the various species, some of which begin calling early (e.g., mid-March) and others initiating breeding calls later in the season (e.g., June). The beginning point of the circuit of survey sites will be randomly chosen for each survey so as to give each site the potential to be visited at a different time of night.

Other information to be collected, in addition to species heard and chorus levels, will include time period of survey, temperature, weather conditions including Beaufort Wind Code (Table 8), and Sky Code (Table 9), noise index (Table 10), and any other disturbances that might affect frog-calling or the observers' ability to hear calls. Other wildlife (e.g., owls) heard or seen within wetland sites will also be recorded. The observers may break the listening period to avoid sampling during excessive noise. If such a time out is taken, this will be noted on the datasheet. After the major disturbance ends, the observer will resume listening for the time remaining. Note that Big Oak Park is adjacent to Route 1, which may pose problems for amphibian aural surveys, especially at Site 1A. Site 2 is near (within 100 m) Big Oak Road which is only lightly traveled, but occasional passing cars or trucks may pose problems for this site.

We also used the visual encounter survey method (Crump and Scott 1994), whereby a surveyor systematically searches for reptiles and amphibians for a prescribed time period. At each point, a 15m circle around the point's center was searched. All possible microhabitats, such as downed trees, burrows, and under loose tree bark, were inspected. Small rotting logs were dismantled. Visual encounter surveys were conducted in May and June.

Table 6.

Minimum Allowable Temperatures

Survey 1: 5.6° C (42° F)

Survey 2: 10° C (50° F)

Survey 3: 12.8° C (55° F)

Table 7.

Definitions of code levels

Code 0: No frogs or toads vocalizing

Code 1: Individuals can be counted; there is space between calls; just a few individuals vocalizing, and no two vocalizations happen at the same time or the individuals are easily counted; small population size.

Code 2: Calls of individuals can be distinguished but there is some overlapping of calls; typically fewer than 10 individuals; an exact count is difficult, but a reasonable estimate is possible; moderate population size.

Code 3: Full chorus, calls are constant, continuous and overlapping vocalizations; too many individuals vocalizing to accurately estimate numbers; large population size.

Table 8.

Beaufort Wind Codes

Code 0: Calm (< 1 mph); smoke rises vertically

Code 1: Light Air (1-3 mph); smoke drifts; weather vane inactive

Code 2: Light Breeze (4-7 mph); leaves rustle; can feel wind on face

Code 3: Gentle Breeze (8-12 mph); leaves and twigs move around; small flags extend

Code 4*: Moderate Breeze (13-18 mph); moves thin branches; raises loose papers

Code 5**: Fresh Breeze (19 mph or greater); small trees begin to sway

*Do not conduct survey at Level 4, unless in Great Plains

**Do not conduct survey at Level 5 in ALL REGIONS

Table 9.

Sky Codes (note 3 and 6 are not valid code numbers)

Code 0: Few Clouds

Code 1: Partly cloudy (scattered) or variable sky

Code 2: Cloudy or overcast

Code 4: Fog or smoke

Code 5: Drizzle or light rain (not affecting hearing ability)

Code 7: Snow

Code 8: Showers (affecting hearing ability); do not conduct survey

Table 10.

Noise Index

Code 0: No appreciable effect (e.g., owl calling)

Code 1: Slightly affecting sampling (e.g., distant traffic; dog barking; one car passing)

Code 2: Moderately affecting sampling (e.g., nearby traffic; 2-5 cars passing)

Code 3: Seriously affecting sampling (e.g., continuous traffic nearby; 6-10 cars passing)

Code 4: Profoundly affecting sampling (e.g., continuous traffic passing; construction noise)

Discussion

Overall, the habitat in Big Oak Park is good for frog and toad species. The numerous permanent and seasonal ponds and swampy areas make ideal breeding habitats. The most species were recorded at site 1B, where wetlands were recently created. This complex of open water and emergent wetlands is a critical habitat in this area. Its relative permanence provides an important breeding location for frogs and toads because eggs, larva and juveniles can grow to maturity without the water and prey species disappearing.

Survey site 2 is an open marsh near one of the parking lots. This was an active site overall, and was the only site where Fowler's Toad was recorded.

Survey site 1A is the forested stream corridor where the boardwalk is located. We did not encounter any species of frogs or toads in this habitat. This finding was somewhat disturbing, but at the same time, not entirely surprising. The habitat is relatively low quality forest with no permanent water sources besides the small stream running through the interior. To the east of the forest is habitat that is more swampy and is part of site 1B (swamp). This habitat is of better quality for frogs and toads. One aspect of site 1A that was a constant problem was the road noise from Route 1. We fear that this road noise could have also been a reason for the lack of observations as it could have easily drowned out any vocalizations from just about any species.

A total of eight species were recorded (Table 11). The two most frequently encountered species were the Northern Spring Peeper, and Green Treefrog with an equal number of encounters, and both had the highest calling code levels of all species encountered.

Results of the breeding frog and toad surveys are summarized in Table 12 below.

Table 11. Species found, sites where they were found, and maximum calling level (based on call codes) for each site during the 2007 road/trailside frog and toad surveys in Big Oak Park.

Survey Site			
Species	1A	1B	2
Bullfrog		2	
Fowler's Toad			1
Green Frog		1	1
Green Treefrog		3	2
Northern Spring Peeper		3	1
Pickerel Frog		1	
Southern Leopard Frog		1	1
Wood Frog		2	2

References

Bishop, C. "Protocols and Strategies for Monitoring North American Amphibians: Calling Surveys," [<http://www.mp1-pwrc.usgs.gov/amphib/tools/proto-call.html>], 1996.

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U.S. Department of the Interior, U.S. Geological Survey, Patuxent Wildlife Research Center.
 North American Amphibian Monitoring Program,
<http://www.pwrc.usgs.gov/NAAMP/protocol/index.html>

Plant Surveys at Big Oak Park

William A. McAvoy

On 15 July, 2007, a plant survey was conducted of the Adopt-A-Wetland sites at Big Oak Park. The Adopt-A-Wetland sites included a natural stream corridor and two created wetlands. Overall, 75 species and varieties of native and non-native vascular plants were recorded this day (Table 13). Of the 74 species, 10 are non-native invasive species (highlighted in bold in Table 13). No state rare or federally listed plant species were discovered. Plants that were observed on this date from the boardwalk, which crosses through the natural stream corridor wetland, are noted in Table 13, as well as the species found in both the two created wetlands. In addition, Table 13 also makes note of species observed in an open, beaver influenced wetland that occurs northeast of the previously mentioned boardwalk. For the convenience of the reader, the life form of each species listed in Table 13 is given, e.g., deciduous shrub.

Table 13. Vascular plants observed in the Adopt-A-Wetland Sites at Big Oak Park, 2007

SCIENTIFIC NAME	COMMON NAME	LIFE FORM	BOADWALK PLANTS	CREATED WETLAND 1	CREATED WETLAND 2	BEAVER WETLAND
Acer rubrum	red maple	Deciduous Tree	X			
Ailanthus altissima	tree-of-Heaven	Deciduous Tree	X			
Alisma subcordatum	broadleaf water-plantain	Broad-leaf Herb		X	X	
Apios americana	American groundnut	Herbaceous Vine	X			
Aralia spinosa	Hercules club	Deciduous Tree	X			
Arisaema triphyllum	small Jack-in-the-Pulpit	Broad-leaf Herb	X			
Asclepias incarnata subsp. pulchra	swamp milkweed	Broad-leaf Herb			X	
Athyrium filix-femina	northern lady fern	Fern	X			
Boehmeria cylindrica	false nettle	Broad-leaf Herb	X			
Callitriche heterophylla	large water-starwort	Submerged Aquatic Herb	X			
Carex annectens	yellow-fruited sedge	Sedge		X		
Carex laevivaginata	smooth-sheath sedge	Sedge				
Carex lurida	shallow sedge	Sedge	X	X	X	X
Carex scoparia	pointed broom sedge	Sedge			X	
Carex seorsa	weak stellate sedge	Sedge				
Cicuta maculata	spotted water-hemlock	Broad-leaf Herb	X			X
Cinna arundinacea	stout wood reedgrass	Grass	X			
Clethra alnifolia	sweet pepper bush	Deciduous Shrub	X			

SCIENTIFIC NAME	COMMON NAME	LIFE FORM	BOADWALK PLANTS	CREATED WETLAND 1	CREATED WETLAND 2	BEAVER WETLAND
Cornus amomum	silky dogwood	Deciduous Shrub	X			
Cuscuta gronovii	Gronovius's dodder	Herbaceous Vine	X			
Dichanthelium clandestinum (Panicum clandestinum)	deer-tongue witchgrass	Grass	X			
Dioscorea villosa	yellow yam	Herbaceous Vine	X			X
Eleocharis obtusa	blunt spikerush	Sedge		X	X	
Eupatorium perfoliatum	common boneset	Broad-leaf Herb	X			
Glyceria striata	fowl mannagrass	Grass	X			
Hypericum mutilum	slender St. John's-wort	Broad-leaf Herb	X	X		
Ilex verticillata	winterberry holly	Deciduous Shrub	X			
Impatiens capensis	spotted jewel-weed	Broad-leaf Herb	X			X
Juncus acuminatus	sharp-fruit rush	Broad-leaf Herb		X	X	
Juncus effusus	soft rush	Rush	X	X	X	
Juncus tenuis	slender rush	Rush				
Leersia oryzoides	rice cutgrass	Grass	X		X	X
Leersia virginica	Virginia cutgrass	Grass	X			
Lilium superbum	Turk's cap lily	Broad-leaf Herb	X			
Lindera benzoin	spicebush	Deciduous Shrub				
Lindernia dubia	yellowseed false pimpernel	Broad-leaf Herb		X		
Liquidambar styraciflua	sweetgum	Deciduous Tree	X			

SCIENTIFIC NAME	COMMON NAME	LIFE FORM	BOADWALK PLANTS	CREATED WETLAND 1	CREATED WETLAND 2	BEAVER WETLAND
Liriodendron tulipifera	tuliptree	Deciduous Tree	X			
Lonicera japonica	Japanese honeysuckle	Woody Vine				
Ludwigia alternifolia	bushy seedbox	Broad-leaf Herb				
Ludwigia palustris	marsh seedbox	Broad-leaf Herb		X	X	
Ludwigia peploides	floating seedbox	Broad-leaf Herb			X	
Lycopus virginicus	Virginia bugleweed	Broad-leaf Herb				
Magnolia virginiana	sweetbay magnolia	Deciduous Tree	X			
Mimulus ringens	square-stem monkeyflower	Broad-leaf Herb			X	
Morus alba	white mulberry	Deciduous Tree	X			
Nyssa sylvatica	blackgum	Deciduous Tree	X			
Osmunda cinnamomea	cinnamon fern	Fern	X			
Parthenocissus quinquefolia	Virginia creeper	Woody Vine				
Peltandra virginica	arrow-arum	Emergent Aquatic Herb	X			
Persicaria hydropiperoides (Polygonum hydropiperoides)	mild water-pepper	Broad-leaf Herb			X	
Persicaria sagittata (Polygonum sagittatum)	arrow-leaved tearthumb	Broad-leaf Herb				X
Phalaris arundinacea	reed canary grass	Grass				X
Phragmites australis	common reed	Grass				X
Podophyllum peltatum	Mayapple	Broad-leaf Herb	X			

SCIENTIFIC NAME	COMMON NAME	LIFE FORM	BOADWALK PLANTS	CREATED WETLAND 1	CREATED WETLAND 2	BEAVER WETLAND
Quercus phellos	willow oak	Deciduous Tree				
Rosa multiflora	multiflora rose	Deciduous Shrub	X			
Rubus phoenicolasius	wineberry	Deciduous Shrub				
Sambucus canadensis	common elderberry	Deciduous Shrub	X			
Schoenoplectus mucronatus (Scirpus mucronatus)	alien bulrush	Sedge		X		
Schoenoplectus pungens (Scirpus pungens)	three-square bulrush	Sedge				
Schoenoplectus tabernaemontani (Scirpus validus)	softstem bulrush	Sedge			X	
Scirpus cyperinus	woolgrass bulrush	Sedge	X			
Smilax rotundifolia	common greenbrier	Woody Vine	X			
Solidago rugosa	rough-leaf goldenrod	Broad-leaf Herb	X			
Symplocarpus foetidus	skunk cabbage	Broad-leaf Herb	X			
Thelypteris palustris	marsh fern	Fern				
Typha angustifolia	narrowleaf cattail	Broad-leaf Herb		X	X	
Typha latifolia	broadleaf cattail	Broad-leaf Herb				X
Veratrum viride	American false hellebore	Broad-leaf Herb	X			
Vernonia noveboracensis	New York ironweed	Broad-leaf Herb			X	
Viburnum dentatum	southern arrow-wood	Deciduous Shrub	X			

SCIENTIFIC NAME	COMMON NAME	LIFE FORM	BOADWALK PLANTS	CREATED WETLAND 1	CREATED WETLAND 2	BEAVER WETLAND
Viburnum nudum	possum-haw viburnum	Deciduous Shrub				
Viola cucullata	marsh blue violet	Broad-leaf Herb	X			
Vitis sp.	summer grape	Woody Vine	X			
Woodwardia areolata	netted chainfern	Fern	X			

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