



Habitat Characterization and Evaluation of Community Types Utilized by Copperbelly Water Snake (*Nerodia erythrogaster neglecta*) in Michigan and Northern Ohio



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ABSTRACT

To characterize and evaluate the community types in which copperbelly water snake (*Nerodia erythrogaster neglecta*) occurs in southern Michigan and northern Ohio, 48 communities at 9 different sites were sampled. Species composition and abundance, soil substrate, physiography, community rank, landscape context, abundance of invasive species, habitat alteration, hydrologic alteration, and soil erosion were all considered. The communities were comprised of 10 different types, including 6 wetland and 4 upland types. Wetland types included pond, emergent marsh, southern wet meadow, inundated shrub swamp, southern floodplain forest, and southern swamp. Upland types included mesic southern forest, dry-mesic southern forest, old field, and pasture. A common attribute shared by all communities was the presence of heavy-textured soil, which impedes drainage. Copperbelly water snake was found to utilize a variety of community types, many of which exhibited significant anthropogenic disturbances. Vegetation composition was often strongly influenced by past land use changes such as agriculture, selective logging, stream channelization, and pond creation. However, the presence of invasive, exotic species represents a more recent threat and may negatively impact copperbelly water snake by altering trophic relationships. Conservation planning for the copperbelly water snake should strive to 1) protect all wetland types, including small, isolated, seasonally inundated depressions; 2) protect riparian corridors and habitat corridors among wetlands; 3) protect existing upland forests; and 4) reduce forest fragmentation.

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INTRODUCTION

Copperbelly water snake (*Nerodia erythrogaster neglecta*) is a federally-listed threatened species (NatureServe 2005). In Michigan and Ohio, however, it is critically imperiled and has an endangered status. Two disjunct populations occur in the United States. The southern population spans southeastern Illinois, southwestern Indiana, and northwestern Kentucky. The northern population spans southern Michigan, northeastern Indiana, and northwestern Ohio. Warmer climate 4,000-6,000 years ago likely allowed distribution of copperbelly water snake to extend northward to its current extent. This species is highly mobile (Roe et al. 2003, 2004), and it utilizes various wetland and upland ecosystems for feeding, basking, mating, and hibernating. Compared to the closely related northern water snake (*Nerodia sipedon sipedon*), the copperbelly water snake can move twice as far, exploit areas four times as large, utilize a greater number of wetland and upland ecosystems at a greater frequency, and is more specific in prey preference (Roe et al. 2003, 2004). Undoubtedly, this dependence on large connected areas has threatened copperbelly water snake populations because of the increased fragmentation of landscapes, hydrologic manipulations, and habitat disturbances and destruction caused by anthropogenic pressures.

Common descriptions for habitats used by copperbelly water snakes include swampy woodlands, river bottoms, oxbow lakes, brushy ditches, wooded lakes, and shallow, slow-moving streams (NatureServe 2005). Favorable hibernation sites include felled tree root networks in bottomlands, dense brush piles, fieldstone piles, beaver and muskrat lodges, and inactive crayfish burrows (U.S. Fish and

Wildlife Service 1993). Although a general sense of these habitats is conveyed, detailed characterizations of vegetation, soil, and physiographic context are lacking. Furthermore, the tolerance and resilience of this species to the effects of habitat alteration, invasive species, hydrologic manipulation, and increased edge to interior ratio of natural systems is largely unknown.

The current study aims to provide a more in-depth characterization of the community types of Michigan and northern Ohio in which there are known copperbelly water snake occurrences. The information provided will hopefully guide management and restoration practices to account for the relevant ecosystem attributes affecting copperbelly water snake viability at multiple landscape scales. The specific objectives are to:

- 1) Identify community types in which copperbelly water snakes have been observed.
- 2) Characterize these community types on the basis of vegetation composition, dominant soil substrate, and physiography.
- 3) Evaluate within-site habitat quality and landscape context quality. Also, evaluate the impact of invasive species, hydrologic alterations, habitat alterations, and soil erosion on the future persistence of copperbelly water snake.
- 4) Suggest management strategies that would bolster current copperbelly water snake populations and reduce the likelihood of placing this species in further peril.

METHODS

Habitat for the copperbelly water snake at the community level was characterized through field site evaluations conducted in October 2001, June-October 2002, June 2004, and September 2005. Community-level habitat evaluations were

conducted at nine sites, including three extant and six historical copperbelly water snake sites. Sites occurred in the far lower central and southwestern portions of the Lower Peninsula of Michigan (Figure 1) and in northwestern Ohio.

The following habitat information was recorded: 1) estimates of the relative abundance of plant species in the overstory, understory, and ground layer (species lists were compiled using the Floristic Quality Assessment Program (Herman et al. 2001)); 2) soil type, soil pH, and litter depth; 3) water depth; 4) short description of the general habitat; 5) description of the landscape context and surrounding land use(s); and 6) rankings of the natural area quality of the vegetative community. A habitat evaluation form was developed and used to record data in the field (Appendix 1).

A detailed field assessment of potential threats was also conducted as part of the habitat characterization. The field assessment of threats included: 1) recording exotic plant species and estimating their relative abundance; 2) characterizing any hydrologic alterations; 3) recording evidence of habitat destruction or disturbance; 4) documenting habitat manipulation, such as mowing or grazing; and

5) noting evidence of soil erosion. A data form for recording habitat threats in the field was developed (Appendix 2).

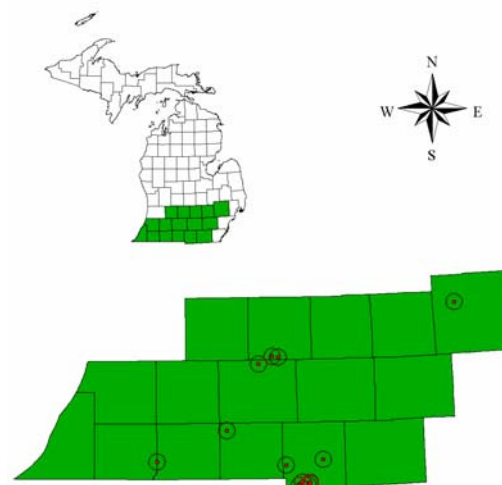


Figure 1. Site locations in Michigan.

RESULTS

During the course of this five-year study, 48 communities were evaluated at 9 different sites (Table 1). The number of communities evaluated at each site ranged from 1 to 12 and were selected based upon known or suspected use by copperbelly water snakes for foraging, basking, or hibernating. The communities were comprised of 10 different types, including 6 wetland and 4 upland types. Wetland types included pond, emergent marsh, southern wet meadow, inundated shrub swamp, southern floodplain forest, and southern swamp. Upland

types included mesic southern forest, dry-mesic southern forest, old field, and pasture. For general descriptions of the natural community types, which include all types listed above except pond, old field, and pasture, please see the excerpt from the MNFI community classification in Appendix 3 and the natural community abstracts for southern wet meadow (Kost 2001), southern floodplain forest (Tepley et al. 2004), and mesic southern forest (Cohen 2004).

Vegetation Composition

Most of the sites contained a variety of community types. As stated above, we focused our efforts on characterizing the vegetation composition of communities that were presently or historically utilized by copperbelly water snakes (Table 1). Of the sampling sites, only Hillsdale County Element Occurrence #8 (EO .008), Williams County-Ohio, and Hillsdale County EO .010 are known to have extant populations of the copperbelly water snake.

Species lists are provided for each community we evaluated in Appendices 4-12, and species found to be dominant or abundant within the overstory, understory, and ground layer are listed in Appendix 13. Comparisons among similar communities are provided below.

Table 1. Community types evaluated at each site.

Site	pond	emergent marsh	southern wet meadow	inundated shrub swamp	southern floodplain forest	southern swamp	mesic southern forest	dry- mesic southern forest	old field	pasture	Number of communities evaluated
Cass-St. Joseph County EO .002	1			4			1				6
Hillsdale County EO .007					1						1
Calhoun County EO .013			1		1			1			3
Hillsdale County EO .004			1		1		1				3
Hillsdale County EO .008	1		4	1	1		3				10
Hillsdale County EO .005		2					2	1			5
Branch County EO .012				2	1						3
Williams County-Ohio				1	1	1	2				5
Hillsdale County EO .010	2			5	2		1		1	1	12
Total	4	2	6	13	8	1	10	2	1	1	48

Pond

The vegetation along the margins of four ponds was evaluated at three sites: Cass-St. Joseph County EO .002, Hillsdale County EO .008, and Hillsdale County EO .010 (Table 1). Evidence of dead tamarack trees at Hillsdale County EO .008 suggests that the pond was formerly a relict conifer swamp. Dredging has caused a dramatic rise in standing water and the subsequent mortality of most overstory vegetation. Overstory cover ranged from 0 to 10 percent with pin oak (*Quercus palustris*) serving as a dominant species at Cass-St. Joseph County EO .002 and black willow (*Salix nigra*) at Hillsdale County EO .008 and Hillsdale County EO .010 pond (A) (Appendix 13). Overstory cover was lacking at Hillsdale County EO .010 pond (B). Understory cover ranged from 1 to 60 percent and was dominated by buttonbush (*Cephalanthus occidentalis*) at all sites, except at Hillsdale County EO .010 pond (B), where black willow was dominant. Ground layer vegetation ranged from 5 to 35 percent cover, with duckweed (*Lemna minor*), broad-leaved cattail (*Typha latifolia*), sedge (*Carex stricta*), purple loosestrife (*Lythrum salicaria*), Kentucky bluegrass (*Poa pratensis*), and spotted touch-me-not (*Impatiens capensis*) as dominant species.

Emergent Marsh

The two emergent marshes we evaluated occurred as small narrow bands along the margins of man-made ponds at Hillsdale County EO .005 (Table 1). Neither supported an overstory, and understory vegetation was similarly sparse (e.g., one and two percent cover) (Appendix 13). Understory species that occurred in the emergent marshes were silky dogwood (*Cornus amomum*), red-osier dogwood (*Cornus stolonifera*), and gray dogwood (*Cornus foemina*). The cover of ground layer vegetation in the two marshes was 80 and 90 percent, with broad-leaved cattail, purple loosestrife, and narrow-leaved cattail (*Typha angustifolia*) as dominant species.

Southern Wet Meadow

Six southern wet meadows were evaluated at three sites, with four occurring at Hillsdale County EO .008 and one each at Calhoun County EO .013 and Hillsdale County EO .004 (Table 1). The flora and vegetation structure varied considerably among southern wet meadows, likely due to differences in landscape context and anthropogenic disturbances. The cover of overstory vegetation ranged from 0 to 30 percent, with silver maple (*Acer saccharinum*), cottonwood (*Populus deltoides*), box elder (*Acer negundo*), swamp white oak (*Quercus bicolor*), and black willow as dominant species (Appendix 13). Similarly, the cover of understory vegetation ranged from 1 to 50 percent. Dominant species in the understory included gray dogwood, ninebark (*Physocarpus opulifolius*), and slender willow (*Salix petiolaris*). Ground layer vegetation showed little variation in overall cover, ranging from 80 to 90 percent. Dominant ground layer plants included sedges (*Carex stricta*, *C. lacustris*, and *C. sartwellii*), swamp milkweed (*Asclepias incarnata*), reed canary grass (*Phalaris arundinacea*), Joe-Pye weed (*Eupatorium maculatum*), sensitive fern (*Onoclea sensibilis*), and marsh fern (*Thelypteris palustris*).

Inundated Shrub Swamp

The 13 inundated shrub swamps we evaluated occurred at 5 different sites, with 4 at Cass-St. Joseph County EO .002, 1 each at Hillsdale County EO .008 and Williams County-Ohio, 2 at Branch County EO .012, and 5 at Hillsdale County EO .010 (Table 1). The inundated shrub swamp and pond communities we evaluated appeared very similar in their flora, vegetation structure, and soil. Like the ponds, the inundated shrub swamps had relatively sparse overstory cover, which averaged 23 percent and ranged from 5 to 60 percent (Appendix 13). The overstory trees were typically limited to the margins of the shrub swamp or occurred on raised islands within the swamp. Typical overstory trees included red maple (*Acer rubrum*), swamp white oak, silver maple, pin oak, black willow, American elm (*Ulmus americana*), and red ash (*Fraxinus*

pennsylvanica). Each of the inundated shrub swamps had dense understory cover that was dominated by buttonbush. The cover of understory vegetation averaged 71 percent and ranged from 38 to 95 percent. The degree of buttonbush cover in the understory is directly related to canopy closure and the amount of radiant sunlight penetrating lower vegetation strata. Buttonbush is a shade-intolerant shrub requiring open conditions, and, in instances where there was moderate overstory cover (e.g. Williams County-Ohio, 60%), there was subsequently low coverage of buttonbush in the understory (Williams County-Ohio, 40%). In addition to buttonbush, other common understory species included swamp rose (*Rosa palustris*) and winterberry (*Ilex verticillata*). Ground layer vegetation varied greatly among inundated shrub swamps with cover averaging 39 percent and ranging from 1 to 90 percent. Common ground layer species included duckweed, reed canary grass, clearweed (*Pilea pumila*), and sedges (*Carex stricta*, *C. rostrata*, and *C. lacustris*, and *C. crinita*).

Southern Floodplain Forest

The eight southern floodplain forests that we evaluated occurred in seven different sites: Hillsdale County EO .007, Calhoun County EO .013, Hillsdale County EO .004, Hillsdale County EO .008, Branch County EO .012, Williams County-Ohio, and Hillsdale County EO .010 (Table 1). Each site contained a single occurrence of southern floodplain forest, with the exception of Hillsdale County EO .010, where there were two separate stands. The sites differed considerably with respect to landscape setting. Hillsdale County EO .007, Hillsdale County EO .008, Branch County EO .012, and Hillsdale County EO .010 occurred along the upper reaches of major river systems. Calhoun County EO .013 and Hillsdale County EO .004 straddled narrow streams, and Williams County-Ohio was adjacent to an intermittent stream flowing through a ravine within a mesic southern forest. Although the communities at Calhoun County EO .013, Hillsdale County EO .004, and Williams County-Ohio do not adhere to the strict definition that southern floodplain forests occur along streams that are at least third

order in magnitude (Appendix 3), the overstory and understory composition was similar to that of the other sites (Appendix 13). These communities could have been typed as either southern swamps or, because of their small size, included within the broader matrix communities of mesic southern forests or dry-mesic forests. The overstory cover ranged from 60 to 90 percent, and understory cover ranged from 20 to 75 percent. Dominant overstory species included black walnut (*Juglans nigra*), silver maple, basswood (*Tilia americana*), red ash, American elm, black maple (*Acer nigrum*), black ash (*Fraxinus nigra*), white ash (*Fraxinus americana*), and cottonwood. Many of these species also occurred as dominants within the understory. Additional dominant understory species included pawpaw (*Asimina triloba*), musclewood (*Carpinus caroliniana*), nannyberry (*Viburnum lentago*), shagbark hickory (*Carya ovata*), box elder, and buttonbush. Ground layer vegetation showed considerable variation among sites with cover ranging from 35 to 95 percent. Species that occurred as dominants in the ground layer included black snakeroot (*Sanicula gregaria*), white grass (*Leersia virginica*), richweed (*Collinsonia canadensis*), wood nettle (*Laportea canadensis*), clearweed, and lizard's tail (*Saururus cernuus*).

Southern Swamp

Only one southern swamp was evaluated, and it occurred in Williams County-Ohio (Table 1). The southern swamp was situated at the bottom of a narrow, steep-sided ravine. The narrowly-shaped ravine and rapid change in elevation allowed varied soil moisture conditions to exist in a relatively small area. As a result, mesic and wet-mesic species occurred in proximity. Overstory cover was 60 percent and was dominated by black maple and white oak (*Quercus alba*) (Appendix 13). The latter species was more prevalent on lower slopes where there was better drainage. Also present in the overstory were silver maple, bur oak (*Quercus macrocarpa*), basswood, and red ash. Understory cover was 80 percent and was dominated by sugar maple (*Acer saccharum*) and basswood. Also present in the understory

were American elm, alternate-leaved dogwood (*Cornus alternifolia*), musclewood, red ash, and northern haw (*Viburnum cassinoides*). Ground layer cover was 60 percent and was dominated by wild-ginger (*Asarum canadense*), Virginia creeper (*Parthenocissus quinquefolia*), black snakeroot, and honeysuckle (*Cryptotaenia canadensis*). Additional mesic ground flora species included running strawberry bush (*Euonymus obovata*), great waterleaf (*Hydrophyllum appendiculatum*), and sedge (*Carex plantaginea*). More wet-mesic ground flora species included false nettle (*Boehmeria cylindrica*), clearweed, and elderberry (*Sambucus canadensis*).

Mesic Southern Forest

The 10 mesic southern forests we evaluated occurred at 6 sites, with 1 each at Cass-St. Joseph County EO .002, Hillsdale County EO .004, and Hillsdale County EO .010, 2 each at Hillsdale County EO .005 and Williams County-Ohio, and 3 at Hillsdale County EO .008 (Table 1). With the exception of Hillsdale County EO .004, which was in an early stage of succession, all the communities had well-developed vegetation structures and were similar in species composition (Appendix 13). Overstory cover ranged from 70 to 90 percent with American beech (*Fagus grandifolia*), sugar maple, white ash, red oak (*Quercus rubra*) occurring as dominant species. Understory cover ranged from 25 to 70 percent with many of the overstory species reoccurring as understory dominants. Additional species abundant in the understory included musclemwood, ironwood (*Ostrya virginiana*), prickly-ash (*Zanthoxylum americanum*), maple-leaved arrow-wood (*Viburnum acerifolium*), and black cherry (*Prunus serotina*). Ground layer cover ranged from 30 to 75 percent and was dominated by a variety of species including wood nettle, bottlebrush grass (*Hystrix patula*), black snakeroot, sedge (*Carex pensylvanica*), jumpseed (*Polygonum virginianum*), wild-ginger, and blue-stemmed goldenrod (*Solidago caesia*).

Dry-Mesic Southern Forest

The two dry-mesic southern forests we evaluated at Calhoun County EO .013 and Hillsdale County EO .005 (Table 1) were found to be relatively similar in their flora and vegetation structure. The cover of the overstory vegetation was estimated at 80 and 70 percent, respectively, with black oak (*Quercus velutina*), white oak, red maple, shagbark hickory, and pignut hickory (*Carya glabra*) occurring as dominant species (Appendix 13). Understory cover was estimated at 60 and 50 percent, respectively, and was dominated by red maple and shagbark hickory at Calhoun County EO .013 and shrubby St. John's-wort (*Hypericum prolificum*), raspberry (*Rubus* sp.), and hawthorn (*Crataegus* sp.) at Hillsdale County EO .005. Ground layer cover was estimated at 80 and 40 percent, respectively, with sedge (*Carex pensylvanica*) occurring as a dominant species at both sites.

Old Field

Only one old field was evaluated, and it occurred in Hillsdale County EO .010 (Table 1). Severe habitat manipulation and disturbance had caused invasion by many exotic plant species. Overstory and understory cover was sparse at two percent for both strata (Appendix 13). The most common overstory species was sugar maple, and the most common understory species were autumn-olive (*Elaeagnus umbellata*), sugar maple, and red maple. Exotic or weedy species covered 90 percent of the ground layer with tall goldenrod (*Solidago altissima*), alsike clover (*Trifolium hybridum*), red clover (*Trifolium pratense*), Queen-Anne's-lace (*Daucus carota*), reed canary grass, and timothy (*Phleum pratense*) being most dominant.

Pasture

The one pasture we evaluated occurred at Hillsdale County EO .010 and was dominated by invasive species (Table 1). The pasture lacked an overstory but supported a sparse understory with 30 percent cover (Appendix 13). Autumn-olive and hawthorn occurred as dominant species. Ground layer cover was 90 percent and

was dominated by a variety of species, including yarrow (*Achillea millefolium*), Queen-Anne's-

lace, and old-field cinquefoil (*Potentilla simplex*).

Invasive Species

Invasive species were observed at all sites (Table 2 and Appendix 14). Collectively, 37 invasive species were found among the 9 sites (Table 3). Garlic mustard (*Alliaria petiolata*) occurred in the most number of sites (6), followed by autumn-olive (*Elaeagnus umbellata*) (4), purple loosestrife (*Lythrum salicaria*) (4), reed canary grass (*Phalaris arundinacea*) (4), multiflora rose (*Rosa multiflora*) (4), Morrow honeysuckle (*Lonicera morrowii*) (3), moneywort (*Lysimachia nummularia*) (3), and bittersweet nightshade (*Solanum dulcamara*) (3) (Table 3). Species that occurred in the greatest number of community types were autumn-olive (8), followed by multiflora rose (7), garlic mustard (5), purple loosestrife (5), Queen-Anne's lace (*Daucus carota*) (3), Morrow honeysuckle (3), moneywort (3), reed canary grass (3), and Kentucky bluegrass (*Poa pratensis*) (3) (Table 3).

In general, invasive species did not exhibit exclusivity to any particular community type. Autumn-olive, multiflora rose, garlic mustard, and Morrow honeysuckle occurred in a wide variety of both upland and wetland systems (Table 3). However, certain invasive species are known to have greater affinity to wetlands. Purple loosestrife, for example, occurred in five community types, four of which are clearly wetland systems: pond, emergent marsh, southern wet meadow, and southern floodplain forest. The occurrence of purple loosestrife in the old field at Hillsdale County EO .010 was likely restricted to numerous wet depressions throughout the area. Reed canary grass was observed in two distinct wetland types, southern wet meadow and inundated shrub swamp, but,

similar to purple loosestrife, it was also present in the old field at Hillsdale County EO .010. Moneywort was only observed in southern wet meadow, inundated shrub swamp, and southern floodplain forest. Bittersweet nightshade occurred in five separate occasions within the inundated shrub swamp community type (Table 3).

The sites with the greatest number of invasive species were Hillsdale County EO .010 (26), Hillsdale County EO .008 (12), Cass-St. Joseph County EO .002 (6), and Hillsdale County EO .005 (5) (Table 2). The high frequency of invasive species at Hillsdale County EO .010 can be attributed to the inclusion of an old field in the sample. Due to its anthropogenic disturbance history and the relative lack of overstory cover, many weedy, shade-intolerant exotics are able to colonize this old field. At Hillsdale County EO .008, many invasive species occurred exclusively in southern wet meadow (A), which had been formerly used as a sheep pasture. In fact, 7 of 9 invasive species observed in southern wet meadow (A) were absent from the other 10 communities evaluated at this site, since many of these are commonly planted as agricultural forage species (Appendix 14). Sites in which few invasive species were observed, such as Hillsdale County EO .007, Branch County EO .012, and Williams County-Ohio, likely harbored invasive species within the surrounding communities. For example, the communities we evaluated at Williams County-Ohio were surrounded by old fields that were dominated by invasive species. Branch County EO .012 and Hillsdale County EO .007, similarly, both bordered pastures that were also dominated by invasive species.

Soil

Soil at all sites showed significant capacity for water retention with silt- or clay-dominated soil horizons observed in at least some portion of all communities evaluated (Appendix 15). Because

of the low permeability and porosity of silt and clay, drainage is significantly reduced when compared to sand- and loam-textured soil.

Table 2. Numbers of invasive species observed per community and site.

Site	Invasives per Community	Invasives per Site
Community Type		
Cass-St. Joseph County EO .002		6
inundated shrub swamp (A)	1	
inundated shrub swamp (B)	2	
inundated shrub swamp (C)	1	
inundated shrub swamp (D)	3	
pond	2	
mesic southern forest	2	
Hillsdale County EO .007		2
southern floodplain forest	2	
Calhoun County EO .013		4
southern floodplain forest	3	
southern wet meadow	3	
dry-mesic southern forest	2	
Hillsdale County EO .004		4
southern floodplain forest	1	
southern wet meadow	1	
mesic southern forest	3	
Hillsdale County EO .008		12
pond	1	
southern wet meadow (A)	9	
southern wet meadow (B)	2	
southern wet meadow (C)	0	
southern wet meadow (D)	2	
inundated shrub swamp	1	
mesic southern forest (A)	1	
mesic southern forest (B)	0	
mesic southern forest (C)	1	
southern floodplain forest	1	
Hillsdale County EO .005		5
emergent marsh (A)	1	
emergent marsh (B)	2	
mesic southern forest (A)	0	
mesic southern forest (B)	0	
dry-mesic southern forest	3	
Branch County EO .012		2
southern floodplain forest	0	
inundated shrub swamp (A)	2	
inundated shrub swamp (B)	1	

Table 2. (cont.).

Site		Invasives per Community	Invasives per Site
Community Type			
Williams County-Ohio			2
inundated shrub swamp		0	
southern floodplain forest		0	
mesic southern forest (A)		0	
mesic southern forest (B)		2	
southern swamp		1	
Hillsdale County EO .010			26
pond (A)		3	
pond (B)		9	
southern floodplain forest (A)		1	
southern floodplain forest (B)		0	
inundated shrub swamp (A)		1	
inundated shrub swamp (B)		3	
inundated shrub swamp (C)		0	
inundated shrub swamp (D)		5	
inundated shrub swamp (E)		0	
mesic southern forest		1	
pasture		4	
old field		16	

Table 3. Frequency of invasive species occurrence by community type.

Species	pond	emergent marsh	southern wet meadow	inundated shrub swamp	southern floodplain forest	southern swamp	mesic southern forest	dry- mesic southern forest	old field	pasture	Number of community types with species	Number of sites with species
Alliara petiolata				1	3	1	5	1			5	6
Arctium minus								1			1	1
Berberis thunbergii					1						1	1
Carduus nutans			1								1	1
Chrysanthemum leucanthemum									1		1	1
Cirsium arvense				1							1	1
Cirsium vulgare										1	1	1
Clover	1										1	1
Daucus carota			1						1	1	3	2
Dianthus armeria									1		1	1
Dipsacus laciniatus									1		1	1
Elaeagnus umbellata	2		1	2	1		1	1	1	1	8	4
Exotic Pine	1										1	1
Festuca sp.	1										1	1
Glechoma hederacea							1				1	1
Hieracium caespitosum									1		1	1
Lolium perenne			1								1	1
Lonicera morrowii	1						1	1			3	3
Lotus corniculata			1								1	1
Lysimachia nummularia			1	1	1						3	3
Lythrum salicaria	2	2	3		1				1		5	4
Melilotus alba									1		1	1
Melilotus officinalis	1								1		2	1
Phalaris arundinacea			4	4					1		3	4
Phleum pratense									1		1	1
Poa pratensis	1		1						1		3	2
Potamogeton crispus	1										1	1
Potentilla recta									1		1	1

Table 3. (cont.).

Species	pond	emergent marsh	southern wet meadow	inundated shrub swamp	southern floodplain forest	southern swamp	mesic southern forest	dry- mesic southern forest	old field	pasture	Number of community types with species	Number of sites with species
Prunella vulgaris										1	1	1
Rosa multiflora	3		1	4	1		2	1	1		7	4
Rumex crispus				1							1	1
Solanum carolinense				1							1	1
Solanum dulcamara				5							1	3
Trifolium hybridum	1								1		2	1
Trifolium pratense									1		1	1
Trifolium sp.			1								1	1
Typha angustifolia		1	1								2	2
Total number of invasive species per community type	11	2	12	9	6	1	5	5	16	4		

The presence of high water tables and extended periods of standing water was also evident at all sites (Appendix 15). For example, all sites contained communities with gleyed soil, which forms when mineral soil (e.g., sand, silt, and clay) is saturated for much of the year. Iron mottling, which is indicative of high water tables and fluctuating water levels, was evident in communities at seven sites: Cass-St. Joseph County EO .002, Hillsdale County EO .007,

Calhoun County EO .013, Hillsdale County EO .004, Hillsdale County EO .008, Williams County-Ohio, and Hillsdale County EO .010. Organic soil, which forms when microbial decomposition of litter is retarded due to constantly saturated conditions, was present in wetlands at five sites: Cass-St. Joseph County EO .002, Hillsdale County EO .004, Hillsdale County EO .008, Branch County EO .012, and Hillsdale County EO .010.

Landscape Context

All of the sites occurred within a landscape dominated by agriculture and rural housing. Row-crop agriculture, hay fields, animal pastures, and old fields were adjacent, or in close proximity, to all sites. Embedded within this agricultural matrix were scattered homesteads that directly abutted the natural communities in some locations.

A review of landscape context ranks reveals that 17 communities ranked low, 29 ranked medium, and 2 ranked high (Appendix 16). Although several communities occurred on public lands or within private preserves, most of these were either adjacent to roads, homes, old fields, or agricultural fields. Only southern floodplain forest (B) and inundated shrub swamp (C) in Hillsdale County EO .010 were deemed to have high quality landscape context. The former community was five acres in size and was surrounded by a river, mesic southern forests, and inundated shrub swamps (i.e., buttonbush depressions). The latter community was surrounded by a southern floodplain forest and mesic southern forest (Appendix 16). Communities assigned ranks of medium were only partially bordered by natural communities of significant size. Communities assigned ranks of low were almost completely surrounded by agriculture or mowed lawns.

Collectively, communities of most sites were assigned similar ranks for landscape context. For example, all communities were assigned ranks of medium at the following three sites: Cass-St. Joseph County EO .002, Hillsdale County EO .004, and Branch County EO .012. The single community evaluated at Hillsdale County EO .007 was assigned a low rank. Four sites contained communities with both low and medium ranks: Calhoun County EO .013, Hillsdale County EO .008, Hillsdale County EO .005, and Williams County-Ohio. Hillsdale County EO .010 was the only site that contained communities of low, medium, and high quality landscape context.

Emergent marsh was the only community type with multiple occurrences to receive a consistent rank for landscape context (Appendix 16). The landscape context rank was low for two emergent marshes at Hillsdale County EO .005. Southern floodplain forest and inundated shrub swamp were the only community types to receive all three ranks for landscape context. All other community types with multiple occurrences were assigned both low and medium ranks for landscape context.

Natural Community Rank

The number of communities assigned low and medium ranks was 23 and 22, respectively (Appendix 16). Despite its relatively large, five-acre size, inundated shrub swamp (B) at Hillsdale County EO .010 was assigned a rank

of low-medium because of hydrologic runoff and overflow from a nearby pond and horse pasture. Two communities, mesic southern forest (A) in Williams County-Ohio and inundated shrub swamp (C) in Hillsdale County

EO .010, were assigned a high natural community rank. The two communities ranked as high were large in size, had high levels of diversity (relative to community type) in the overstory, understory, and ground layer, and lacked recent anthropogenic disturbance and invasive plants. Communities with medium ranks were typically moderate to large in size, had moderate to high levels of diversity, experienced low levels of recent anthropogenic disturbance, and lacked, or had been minimally impacted by, invasive plants. Communities with low ranks were typically small in size, had low plant diversity, experienced recent anthropogenic disturbance, and harbored invasive plants.

Most sites contained communities with an assortment of natural community ranks. The 5 communities evaluated at Williams County-Ohio and the 12 communities evaluated at Hillsdale County EO .010, for instance, received three different ranks (i.e., low, medium, and high). Four sites contained communities with both low and medium ranks: Cass-St. Joseph County EO .002, Calhoun County EO .013, Hillsdale County EO .008, and Hillsdale County

EO .005. Three sites contained communities that all received the same within-site rank: Hillsdale County EO .007, Hillsdale County EO .004, and Branch County EO .012. For example, the three evaluated communities at Hillsdale County EO .004 and Branch County EO .012 all received low and medium ranks, respectively.

The majority of community types with multiple occurrences received a variety of natural community ranks. The 10 mesic southern forest communities, for example, received ranks of low, medium, and high. These communities occurred at six different sites: Cass-St. Joseph County EO .002 (one ranked medium), Hillsdale County EO .004 (one ranked low), Hillsdale County EO .008 (two ranked low, one ranked medium), Hillsdale County EO .005 (two ranked medium), Williams County-Ohio (one ranked medium, one ranked high), and Hillsdale County EO .010 (one ranked medium). Three of the community types with multiple occurrences had consistent ranks at all sites. All emergent marshes, southern wet meadows, and dry-mesic southern forests consistently received low natural community ranks at all sites.

Hydrologic Alterations

Evidence of hydrologic alterations from either water level manipulation or increased surface water flow was observed at all sites and most communities (Appendix 17). Three communities in which hydrologic alterations were not noted were the two mesic southern forests at Cass-St. Joseph County EO .002 and Hillsdale County EO .010 and the pasture at Hillsdale County EO .010. Due to the effects of grazing and mowing, however, the pasture at Hillsdale County EO .010 likely receives surface runoff in a different manner today than during the pre-settlement era. Water level changes due to damming of creeks, blocked culverts at road crossings, dredging for the creation of ponds, ditching, and drain tiling were common occurrences. Water levels controlled by dams influenced the hydrology of some communities at three sites: Calhoun County EO .013, Hillsdale County EO .005, and Hillsdale County EO .010. Restricted water flow due to culverts at road crossings impacted

communities at five sites: Hillsdale County EO .007, Hillsdale County EO .004, Hillsdale County EO .008, Williams County-Ohio, and Hillsdale County EO .010. Man-made ponds influenced water levels and hydrology at seven sites: Cass-St. Joseph County EO .002, Calhoun County EO .013, Hillsdale County EO .004, Hillsdale County EO .008, Hillsdale County EO .005, Williams County-Ohio, and Hillsdale County EO .010. A drainage ditch along a gravel road may have been inadvertently lowering the water table and facilitating shrub encroachment of the southern wet meadow at Hillsdale County EO .004. Drain tile runoff from an agricultural field directly influenced water levels of three communities at Hillsdale County EO .008: southern wet meadow (C), inundated shrub swamp, and mesic southern forest (B). Similarly, drain tiling affected two communities at Hillsdale County EO .010: inundated shrub swamp (E) and the old field.

Increased surface water flow as a result of impervious surfaces or non-native ecosystems, such as agricultural fields, pastures, old fields, and lawns, was almost universally observed (Appendix 17). Runoff from gravel roads led to increased surface water flow into wetlands at

seven sites: Cass-St. Joseph County EO .002, Hillsdale County EO .004, Hillsdale County EO .008, Hillsdale County EO .005, Branch County EO .012, Williams County-Ohio, and Hillsdale County EO .010.

Habitat Alterations

All of the sites had communities that had undergone significant changes since pre-settlement. Some of these changes were very recent, and the impacts were easily observed. Other impacts, such as those caused by early logging and road building activities, were no longer obvious. For example, while all of the forests we evaluated were likely harvested by the early 1900s, indication of logging was only readily apparent at five sites: Cass-St. Joseph County EO .002, Hillsdale County EO .004, Hillsdale County EO .008, Hillsdale County EO .005, and Branch County EO .012 (Appendix 18). Activities associated with road building in the distant past may have altered the shape and depth of several wetlands that were directly adjacent to roads at Cass-St. Joseph County EO .002, Hillsdale County EO .004, Hillsdale County EO .008, and Hillsdale County EO .010. It is even possible that these wetlands were inadvertently created by mining gravel to build the adjacent roads. However, evidence for these plausible past events was no longer readily apparent. Therefore, because of the difficulty in recognizing and interpreting signs of past anthropogenic disturbances, this study aims to document more recent habitat alterations.

Habitat destruction was observed at six sites: Cass-St. Joseph County EO .002, Calhoun County EO .013, Hillsdale County EO .004, Hillsdale County EO .008, Hillsdale County EO .005, and Hillsdale County EO .010 (Appendix 18). A house was built on a portion of the floodplain forest at Hillsdale County EO .004. Dredging and/or damming to create ponds had flooded swamp forests and other wetland types at five sites: Cass-St. Joseph County EO .002, Calhoun County EO .013, Hillsdale County EO .008, Hillsdale County EO .005, and Hillsdale County EO .010. Buildings, campsites, fire pits, and observation platforms occupied portions of

both dry-mesic southern forests at Calhoun County EO .013 and Hillsdale County EO .005 and mesic southern forest (A) at Hillsdale County EO .005.

Habitat disturbances were observed at all sites (Appendix 18). The types of observed disturbances included ORV and logging trails, grazing, excessive nutrient input, excessive deer herbivory, trash piles, fire suppression, shrub encroachment, domesticated pet use, and frequent recreational use (e.g., swimming, fishing, boating, hiking, camping, etc.). Trails used for logging and/or ORVs were observed within communities of eight sites: Cass-St. Joseph County EO .002, Hillsdale County EO .007, Calhoun County EO .013, Hillsdale County EO .004, Hillsdale County EO .008, Hillsdale County EO .005, Branch County EO .012, and Williams County-Ohio. At Hillsdale County EO .008, southern wet meadow (A) was formerly used as a sheep pasture and was presently receiving nutrient input from a cattle holding area and walkway. Similarly, at Hillsdale County EO .010, cattle were observed grazing a pasture adjacent to an inundated shrub swamp. Excessive deer herbivory was observed in all communities of Calhoun County EO .013. Old abandoned trash piles were observed at the base of a steep slope in the southern floodplain forest at Hillsdale County EO .007 and along a ravine in the southern swamp at Williams County-Ohio. Fire suppression had likely contributed to shrub encroachment in the southern wet meadow at Hillsdale County EO .004. A domesticated dog was reported to harass copperbelly water snakes in pond (B) at Hillsdale County EO .010. Lastly, frequent recreational use of the communities we evaluated was observed at five sites: Cass-St. Joseph County EO .002, Calhoun County EO

.013, Hillsdale County EO .004, Hillsdale County EO .008, and Hillsdale County EO .005.

Habitat manipulations including logging, mowing, herbicidal treatment, flooding, and planting of agricultural forage species were observed in the communities evaluated at all sites (Appendix 18). Logging was evident at five sites: Cass-St. Joseph County EO .002, Hillsdale County EO .004, Hillsdale County EO .008, Hillsdale County EO .005, and Branch County EO .012. Mowing was observed at four sites: Calhoun County EO .013, Hillsdale County EO .004, Hillsdale County EO .005, and Hillsdale County EO .010. The use of herbicides was observed only once in pond (B) at Hillsdale County EO .010. Flooding had altered communities at five sites: Calhoun County EO .013, Hillsdale County EO .008, Hillsdale County EO .005, Williams County-Ohio, and Hillsdale County EO .010. Invasive species, such as reed canary grass, were likely planted in three sites: in southern wet meadow (A) at

Hillsdale County EO .008, on the edge of inundated shrub swamp (D) at Cass-St. Joseph County EO .002, and on the edges of both inundated shrub swamps at Branch County EO .012.

Soil erosion was evident in communities at all sites (Appendix 18). Poorly vegetated slopes occurred above the eight southern floodplain forests at seven sites: Hillsdale County EO .007, Calhoun County EO .013, Hillsdale County EO .004, Hillsdale County EO .008, Branch County EO .012, Williams County-Ohio, and Hillsdale County EO .010. Soil erosion on steep slopes within mesic southern forests was observed at five sites: Cass-St. Joseph County EO .002, Hillsdale County EO .004, Hillsdale County EO .008, Hillsdale County EO .005, and Williams County-Ohio. Soil erosion was also evident along a steep-sided channelized stream in the dry-mesic southern forest at Hillsdale County EO .005.

DISCUSSION

Vegetation Composition

Comparisons among similar community types reveals that most of the differences in vegetation composition were likely the result of anthropogenic disturbances, such as selective logging, flooding, planting of agricultural forage species, mowing, or nutrient input. While we did not evaluate all communities at each site, ponds (including artificially created ponds), emergent marshes, southern wet meadows, inundated shrub swamps, southern floodplain forests, and southern swamps all appear to be important wetland communities for the copperbelly water snake. These community types correspond with Herbert's (2003) palustrine open canopy, lacustrine open canopy, palustrine forest, and palustrine shrub-scrub habitats utilized by copperbelly water snakes in south central Michigan and northwestern Ohio. Using a variety of wetland community types likely helps ensure a varied and reliable base of prey throughout the active season. Furthermore, opportunities for thermoregulation are enhanced when both forested and non-forested community

types are available. Seasonal life history activities in wetland communities such as basking, foraging, and mating were visually apparent during Herbert's (2003) study. All sites we evaluated contained permanent sources of water, such as ponds, streams, or rivers. These features are especially critical to the copperbelly water snake during late summer when many seasonally inundated wetlands lack standing water.

Unlike its more common sympatric congener, the northern water snake, the copperbelly water snake exploits more upland habitats at a greater frequency (Herbert 2003). Upland forested communities, such as mesic southern forests and dry-mesic southern forests, are important community types for the copperbelly water snake. They provide cover for concealing movement between wetland foraging sites. Concealment from predators is especially important for the copperbelly water snake because of its habit of frequently moving

through uplands to reach isolated wetlands (Roe et al. 2003, 2004). Aside from their function as travel corridors, upland communities are frequently visited by copperbelly water snakes during prey searches. Anuran prey densities fluctuate intra- and inter-annually, and foraging activities of copperbelly water snakes must

sometimes extend beyond wetland boundaries. Other, more stationary behaviors reported to occur in upland communities are ecdysis (shedding), feeding and digestion, injury recovery, refuge seeking, hibernation, and birthing (Herbert 2003).

Invasive Species

While 37 species of invasive plants were observed in the communities we evaluated, 7 pose very serious threats to biodiversity because of their ability to rapidly colonize new habitats and form nearly monotypic structural layers. Purple loosestrife and reed canary grass threaten to erode biodiversity of non-forested wetlands, such as emergent marshes, southern wet meadows, and along margins of inundated shrub swamps. Multiflora rose, autumn-olive, Morrow honeysuckle, and Japanese barberry threaten diversity in all types of uplands (e.g., forested and non-forested) and can invade wetlands that lack standing water, such as the margins of inundated shrub swamps. Garlic mustard rapidly colonizes mesic and wet forests (Meekins and McCarthy 2001), such as dry-mesic southern forests, mesic southern forests, and southern floodplain forests. In addition, it can invade the margins of inundated shrub swamps that occur within forests.

Invasive plant species can cause a significant reduction in overall biodiversity, thus impacting the copperbelly water snake. As numerous

native plants are outcompeted and replaced by a single or few invasive species, longstanding, complex ecological relationships may be lost. The resulting changes in species composition and structure upset delicately balanced ecological processes, such as trophic relationships, interspecific competition, nutrient cycling, soil erosion, hydrologic balance, and solar insulation (Bratton 1982). When invasive species, such as the seven egregious ones mentioned above, cause reductions in plant diversity, trophic web structure is disrupted due to reduced food and nectar sources, elimination of host plants, and alteration of overall community structure. For example, when insect diversity and abundance are reduced as a result of simplification in the plant community, populations of insect predators, like frogs, are also negatively impacted. The decline of prey for frogs, in turn, leads to smaller frog populations. This ultimately affects the viability of copperbelly water snakes, for they are almost solely reliant on frogs for nutrition (Roe et al. 2003, 2004).

Soil

Signs of high water tables and saturated conditions were clearly evident in the soil of all sites. Iron mottling, gleyed soil horizons, silt and clay layers, and organic soil were all repeatedly observed during this study. The soil types associated with copperbelly water snake habitat allow water to remain at or near the surface for extended periods. The ability of the soil to retain water and resist rapid drainage is critical for survival of the copperbelly water snake for several reasons.

Copperbelly water snakes feed almost exclusively on anurans (i.e., frogs and toads) (Roe et al. 2003, 2004). All anurans require standing water for breeding, and several species, such as green frog (*Rana clamitans*), bull frog (*Rana catesbeiana*), and northern leopard frog (*Rana pipiens*), require standing water throughout the year. Because prey of the copperbelly water snake are dependent on standing water (e.g., ephemeral pools or permanent ponds), soil types that retain water are critical habitat components.

Equally critical to its survival are the availability of suitable hibernacula. For hibernacula, copperbelly water snakes rely on the extensive networks of underground tunnels built by crayfish (Roe et al. 2003, 2004). Because crayfish require the presence of water at or near the surface, soil with a predominance of silt and clay are important habitat components for many

species of crayfish. In addition, the structural integrity of the crayfish burrows that are built in silt and clay soil is ensured because of the strong chemical bonds formed among these soil particles. Thus, crayfish burrows are a critical habitat component for copperbelly water snakes, and the presence of soil types that prevent drainage allow for the presence of crayfish.

Landscape Context

The landscape context at all publicly and privately owned sites was dominated by agriculture and rural residential. Even the sites that occurred on public land were adjacent to homes, roads, agricultural fields, and old fields, and thus were similar in landscape context to privately owned sites. Differences in landscape context between extant and historical sites were not apparent. The increasing fragmentation of

natural areas is of great concern, since the copperbelly water snake is reported to avoid residential and agricultural developments. A minimum patch size in which this species can sustain a viable population should be further investigated. Based on Herbert's (2003) study, wetland complexes situated in an undeveloped upland matrix with a range of successional stages should have conservation priority.

Natural Community Rank and Habitat Alterations

Only two of the communities we evaluated, mesic southern forest (A) at Williams County-Ohio and inundated shrub swamp (C) at Hillsdale County EO .010 were in good ecological condition. Therefore, it appears that the ecological condition of natural communities is not an important factor in determining copperbelly water snake utilization of a particular site or community. Comparisons among the three sites with extant populations of copperbelly water snakes show that this species utilized communities with predominately low and medium ranks (e.g., Hillsdale County EO .008 and Hillsdale County EO .010), as well as communities with high and medium ranks, like

Williams County-Ohio. While we do not yet understand how disturbances, such as selective logging, flooding, grazing, and nutrient input, are impacting the copperbelly water snake, it has thus far survived these assaults to its habitat at Hillsdale County EO .008 and Hillsdale County EO .010. Therefore, other factors, such as a consistently available base of prey, multiple wetlands in close proximity (e.g., within 125 m of each other) (Roe et al. 2003, 2004), and adequate hibernacula, are likely to have a much greater influence on copperbelly water snake viability than the absence of anthropogenic disturbances.

Hydrologic Alterations

Many of the sites have experienced significant human-induced changes in hydrology. Flooding to create ponds through dredging or damming was frequently observed. Nonetheless, extant populations of copperbelly water snakes were using man-made ponds at Hillsdale County EO .008, Williams County-Ohio, and Hillsdale County EO .010. Copperbelly water snakes were also using wetlands that received drainage from agricultural fields lined with drain tiles at

Hillsdale County EO .008 (southern wet meadow (C) and the inundated shrub swamp) and Hillsdale County EO .010 (inundated shrub swamp (E)). While these types of hydrologic alterations are typically thought of as a form of degradation, they are likely benefiting the copperbelly water snake by supporting a consistently reliable base of prey. As noted, copperbelly water snakes feed almost exclusively on frogs and toads (Roe et al. 2003,

2004). Thus, the creation of additional habitats with standing water throughout the year, which provides habitat for species, like green frogs,

bull frogs, and northern leopard frogs, may significantly improve the copperbelly water snake's ability to survive extended droughts.

Management Considerations

Invasive plants have the potential to significantly impact the copperbelly water snake by reducing the abundance of its prey. Control measures should be taken to reduce and eliminate invasive species from its habitat and the surrounding landscape. Presently, the following species pose the greatest threat to the copperbelly water snake: purple loosestrife, reed canary grass, garlic mustard, Morrow honeysuckle, autumn-olive, multiflora rose, and Japanese barberry. Other equally pernicious invasive species that were not observed but are present within the surrounding landscape include glossy buckthorn (*Rhamnus frangula*), common buckthorn (*Rhamnus cathartica*), and oriental bittersweet (*Celastrus orbiculata*). Information on detailed methods for controlling invasive species and abstracts concerning invasive species can be obtained at <http://tncweeds.ucdavis.edu/>.

Copperbelly water snakes utilize a variety of forested and non-forested wetlands, which helps ensure the availability of prey and a broad range of conditions for thermoregulation. Thus, management of copperbelly water snake sites should strive to maintain a heterogeneous mix of wetland types. Ideal areas for conservation have been suggested to be moderately-sized, open-canopied wetlands integrated with smaller ephemeral shrub and forested wetlands in a contiguous but clustered complex (Herbert 2003). Maintaining open conditions in non-forested, seasonally inundated wetland types, such as southern wet meadows, will require the most active forms of management. In the past, wildfires and beaver flooding were responsible for reducing shrub and tree encroachment in southern wet meadows. In the absence of these natural forms of disturbance, active management, such as prescribed burning, purposeful flooding, or cutting of woody vegetation accompanied by herbicide application to cut stumps, will be necessary. In addition to

maintaining open conditions that contribute to a diversity of prey and increased opportunities for thermoregulation, shrub and tree removal helps maintain higher water levels because of reduced rates of transpiration and water table drawdown.

In the surrounding upland communities, stratified structural layers such as coarse woody debris, graminoid patches, tall herbaceous plants, and thick woody shrubs should be maintained for copperbelly water snakes to allow for thermoregulation, concealment, and hibernation (Herbert 2003). Multi-structured communities can be achieved through natural maturation of the ecosystem, whereby various seral stages develop over time to form vegetation strata of varying age and size classes. Furthermore, conservation activities should be accomplished at the landscape level to facilitate greater inclusiveness of multiple natural communities at differing seral stages. Following a landscape-level management protocol will increase the potential seasonal home range of copperbelly water snakes (Herbert 2003). See the natural community abstracts for more information on management of southern wet meadows (Kost 2001), southern floodplain forests (Tepley et al. 2004), and mesic southern forests (Cohen 2004).

Protecting the hydrology of copperbelly water snake sites is also critically important. Lowering of water tables from excessive irrigation or urban sprawl can cause seasonally inundated wetlands and hibernacula sites to become permanently dry. The loss of either of these habitat components can result in the extinction of copperbelly water snake populations. Protecting riparian corridors and hydrologic processes, such as seasonal flooding and stream meandering is also critically important, as these processes create habitat for the copperbelly water snake and its prey.

CONCLUSIONS

The copperbelly water snake requires sites with heavy soil (e.g., silt or clay) that support forested uplands and a diversity of wetland community types in close proximity, including those with year-round standing water. The species appears to be tolerant of alterations to portions of its habitat, such as selective logging, flooding or dredging to create ponds, and mowing. It readily uses man-made ponds, which, in the absence of other sources of standing water, become critical habitat components. It occurs within an agrarian-based landscape and occupies sites that have been heavily impacted by surrounding land use practices. While past and present land use practices have altered its habitat, the rampant spread of invasive species poses a new threat with the potential to significantly impact its prey.

Conservation planning for the copperbelly water snake should strive to 1) protect all wetland types, including small, isolated, seasonally inundated depressions; 2) protect riparian corridors and habitat corridors among wetlands;

3) protect existing upland forests; and 4) reduce forest fragmentation. Because the copperbelly water snake moves frequently between wetlands and utilizes both large and small (e.g., <1 acre) wetlands (Roe et al. 2003, 2004), all wetlands within one mile of a copperbelly water snake site should be strongly protected. The active nature of the copperbelly water snake also necessitates the protection of riparian corridors and land situated among isolated wetlands that are in close proximity. Protection of riparian corridors will also allow rivers to overflow and meander, thus continually creating new, stranded wetlands for the copperbelly water snake and its prey. The use of forests for hibernacula and cover necessitates that all existing blocks of upland forest be protected, and, where feasible, enlarged by allowing adjacent old fields to convert to forest. Lastly, creating forested corridors among existing forest blocks and among isolated wetlands will help reduce mortality by providing additional cover and potential sites for hibernacula.

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APPENDICES

Appendix 2. Example field form for copperbelly habitat threats.

COPPERBELLY WATER SNAKE THREATS

Date: _____ Site: _____

Community: _____

Exotic Plants:

D, Dominant or Co-dominant; A, Abundant; C, Common; O, Occasional; U, uncommon;
L, Locally; as in LD, Locally Dominant; LA, Locally Abundant; or LC, Locally Common

Abundance **Location**

Phalaris arundinacea _____

Phragmites australis _____

Typha angustifolia _____

Lythrum salicaria _____

Rhamnus frangula _____

Rhamnus cathartica _____

Lonicera morrowii _____

Other:

Hydrologic Alteration:

Type **Comments**

- Drainage ditch draining wetland: _____
- Drain tiled: _____
- Surface water flow into wetland from farm field or development (roads, culverts etc.): _____
- Surface run-off into wetland from non-native upland system (erosion): _____
- Excessive draw-down of aquifer: _____
- Water control structures present (dams, pumps etc.): _____

Habitat Destruction/Disturbance

Habitat Manipulation:

Mowing: _____

Water level manipulation: _____

Grazing: _____

Soil Erosion: _____

Appendix 3. Descriptions of natural community types that provide habitat for copperbelly water snake. (from: Michigan Natural Features Inventory. 1990. Draft description of Michigan natural community types. Michigan Natural Features Inventory, Lansing, MI. 34 pp.).

PALUSTRINE

MARSH

EMERGENT MARSH

Overview: A shallow water marsh characterized by emergent narrow- and broad-leaved herbs and grass-like plants as well as floating-leaved herbs at the shores of lakes and streams.

Dominant plants: *Alisma plantago-aquatica*, *Carex*, *Eleocharis*, *Glyceria borealis*, *Leersia*, *Lemna*, *Nuphar*, *Nymphaea*, *Polygonum*, *Pontederia cordata*, *Sagittaria*, *Scirpus*, *Sparganium*, *Spirodela*, *Typha*, *Wolffia*, *Zizania aquatica*.

Similar communities: emergent marsh, southern wet meadow, northern wet meadow

Disturbance effects: Dredging for marl has destroyed many marshes along lake margins in eastern Upper Michigan and portions of Lower Michigan.

SOUTHERN WET MEADOW

Overview: A sedge and grass dominated wetland located mostly south of the transition zone.

Physiography and geology: In stream valleys, along lake margins, and in depressions and channels in glacial outwash.

Soils: Typical muck soil is neutral to medium acid.

Dominant plants: *Calamagrostis canadensis*, *Carex* (*C. stricta*, *C. aquatilis*, *C. lanuginosa*, *C. bebbii*, *C. lacustris*), *Phalaris arundinacea*. Other plants which are abundant include *Eleocharis*, *Juncus*, *Typha*, *Eupatorium maculatum*, and *E. perfoliatum*.

Variation: Species of northern wet meadow are present, but southern species distinguish the type.

Similar communities: northern wet meadow, emergent marsh, southern shrub-carr

Natural processes: Fire and flooding help maintain open conditions.

Literature: Kost, M.A. 2001. Natural community abstract for southern wet meadow. Natural Features Inventory, Lansing, MI. 6 pp.

Disturbance effects: *Leersia*, *Phalaris arundinacea*, and *Phragmites australis* in abundance usually indicate past disturbance, often grazing.

FOREST

SOUTHERN SWAMP

Overview: A wetland deciduous forest type located south of the transition zone.

Physiography and geology: Situated primarily in depressions and channels of ground moraines, on glacial lake plains, and also in depressions of glacial outwash, especially near moraines.

Soils: Loam and silt loam soil (sometimes sandy loam) often possesses a clay layer; pH is neutral to slightly acid (in sandier soils).

Dominant plants: Dominant species often are *Acer saccharinum*, *Acer rubrum*, *Fraxinus pensylvanica*, *F. nigra* and, before the elm blight arrived, *Ulmus americana*.

Associated species: Several other species which codominate in the canopy include *Acer rubrum*, *Quercus bicolor*, *Q. palustris*, *Nyssa sylvatica*, the last two principally on sandy glacial lake plains.

Similar communities: southern floodplain forest, mesic southern forest

Natural processes: Sites are often inundated in the spring, a condition which can last into the summer, hence the groundlayer, except on elevated areas, is often sparse.

Appendix 3. (cont.).

SOUTHERN FLOODPLAIN FOREST

Overview: A bottomland deciduous forest type located south of the transition zone and occurring on mineral soil (less frequently on shallow muck).

Physiography and geology: Located along streams which are third order or greater.

Soils: Loam or silt loam (sometimes sandy loam and occasionally thin muck); neutral pH.

Dominant plants: Dominant plants nearly always include *Acer saccharinum*, often *Fraxinus pennsylvanica*, and sometimes *A. rubrum*. *Ulmus americana* was once important but was eliminated from the canopy by elm blight. Several other species can be important, especially in the southernmost watersheds, resulting in complex patterns of dominance. These additional species include *Juglans cinerea*, *Acer nigra*, *Aesculus glabra*, *Acer negundo*, *Fraxinus nigra*, *Salix nigra*, and *Populus deltoides*, the last two in former channels and on low riverbanks. *Ulmus rubra* is occasionally important.

Associated species: When sufficient elevation in the floodplain exists, species of surrounding higher ground will invade (e.g., *Acer saccharum*, *Fagus grandifolia*, *Tilia americana*, *Fraxinus americana*, *Carya cordiformis*). Other typical canopy species include *Quercus bicolor*, *Platanus occidentalis* (which may dominate less frequently flooded "flats"), *Celtis occidentalis* and *Juglans nigra*. *Crataegus* spp., *Lindera benzoin*, *Cornus alternifolia*, *Carpinus caroliniana*, and *Cercis canadensis* often occur in the understory. A number of species reach their northern limit in this forest type, including *Aesculus glabra*, *Asimina triloba*, *Camassia scilloides*, *Cercis canadensis*, *Diarrhena americana*, *Fraxinus quadrangulata*, *Gleditsia tricanthos*, *Gymnocladus dioica*, *Mertensia virginica*, *Morus rubra*, *Trillium nivale*, *T. recurvatum*, *T. sessile*.

Variation: The flora of many of the river floodplains north of the tension zone, such as the Menominee and Sturgeon Rivers in the southern Upper Peninsula, contain species with a more southern affinity. A more complete survey of these streams is needed to determine whether the range of the community should be extended north or whether additional floodplain types should be added.

Similar communities: southern swamp, mesic southern forest

Natural processes: Flooding and windthrow.

Disturbance effects: Flooding and windthrow introduced frequent disturbance to floodplain forest. Weedy exotics and natives like *Ambrosia trifida*, *Alliaria officinalis*, *Lysimachia nummularia*, and *Urtica dioica* are common. Grass and herb dominated openings of *Phalaris*, *Elymus virginicus*, *E. riparia*, and *Solidago altissima* are often present.

RELICT CONIFER SWAMP

Overview: A minerotrophic forested peatland located primarily south of the transition zone.

Physiography and geology: Situated on glacial outwash drainageways, at stream headwaters in end moraines, in kettle depressions in kettle-kame or coarse end moraine topography, and rarely on sandy glacial lake plain.

Soils: Saturated muck soil is neutral due to groundwater infusion, but surface soil layers may be acid.

Dominant plants: Dominance is nearly always by northern conifers: *Larix laricina* most commonly, *Thuja occidentalis* occasionally, and *Pinus strobus* and others only rarely.

Associated species: Other occasional canopy trees include *Acer rubrum*, *Fraxinus nigra*, *Betula allegheniensis*. *Lindera benzoin*, *Vaccinium corymbosum*, *Toxicodendron vernix*, *Ilex verticillata*, *Viburnum lentago*, etc. typically are present, the first often abundantly. Species of northern conifer swamps are present, as are several southern species not found in the north and also certain rare insects, e.g. *Neonympha mitchellii mitchellii* (Mitchell's satyr), *Oecanthus laricis* tamarack tree cricket).

Similar communities: rich conifer swamp, hardwood-conifer swamp

Natural processes: Larch sawfly outbreaks may have periodically opened the canopy, increasing plant diversity.

Literature: Kost, M.A. 2001. Natural community abstract for relict conifer swamp. Michigan Natural Features Inventory, Lansing, MI. 6 pp.

Appendix 3. (cont.).

SHRUB

INUNDATED SHRUB SWAMP

Overview: A moderate to long persistent, shrub-dominated successional community. Successionally intermediate between emergent marsh and forested swamp or bog. Characterized by fluctuating water levels and very poor drainage.

Physiography and geology: Occupies kettleholes in kettle/kame ice-disintegration topography, in moats around bogs and less frequently associated with wetland depressions on outwash and sandy lake plains.

Soils: Inundated to deeply inundated (1-2 feet deep) muck, or (less frequently) mineral soil.

Dominant plants: *Alisma plantago-aquatica*, *Cephalanthus occidentalis*, *Lemna minor*, *Polygonum punctatum*, *Salix* spp., and *Typha latifolia*.

Associated plants: *Acer saccharinum*, *Alopecurus aquatilis*, *Agrostis gigantea*, *Asclepias incarnata*, *Carex scoparia* var. *condensa*, *C. vulpinoidea*, *Convolvulus arvensis*, *Cornus stolonifera*, *C. amomum*, *Glyceria septentrionalis*, *Juncus acuminatus*, *J. effusus* var. *solutus*, *J. tenuis*, *Lycopus americanus*, *Lysimachia quadrifolia*, *Penthorum sedoides*, *Phalaris arundinacea*, *Quercus bicolor*, *Ranunculus flabellaris*, *Rosa carolina*, *Sagittaria latifolia*, *Scirpus atrovirens*, *Sium suave*, *Sparganium chlorocarpum*, and *Veronica scutellata*.

Characteristic plants: This type is recognized by the overwhelming dominance of *Cephalanthus occidentalis*, frequently in combination with either *Salix bebbiana* and/or *S. discolor*.

Variation: This type is floristically depauperate, however, northern and southern variations are likely.

Similar communities: emergent marsh, northern shrub thicket, southern shrub-carr

Natural processes: Strong seasonal hydrologic cycling.

Bingham, M.T. 1945. The flora of Oakland Co., Michigan. Cranbrook Institute of Science, Bulletin 22. 155 pp.

TERRESTRIAL

FOREST

MESIC SOUTHERN FOREST [SOUTHERN HARDWOOD FOREST]

Overview: A southern hardwood forest type on moist ground with little oak, lying mostly south of the transition zone.

Physiography and geology: Occurring principally on medium- or fine-textured ground moraine, on fine-textured end moraine, and on silty/clayey glacial lake plains. Within 10-20 miles of the shores of the Great Lakes, due to improved evapotranspiration conditions, can also occur on sandy lake plains and sand dunes.

Soils: Variable, with a predominance of clay to loam texture.

Dominant plants: *Acer saccharum*, *Fagus grandifolia*; occasionally, *Quercus rubra* or *Liriodendron tulipifera* codominates.

Associated species: Other important canopy species are *Fraxinus americana*, *Tilia americana*, *Prunus serotina*, *Carya cordiformis*, and sometimes *Acer rubrum*, *Quercus alba*, and *Q. macrocarpa*.

Characteristic plants: The spring flora of this mesophytic woods shows striking diversity, typified by large colonies of such herbs as *Allium tricoccum*, *Asarum canadense*, *Dentaria laciniata*, *Dicentra cucullaria*, *Erythronium americanum*, *Hydrophyllum virginianum*, *Isopyrum bitermum*, *Phlox divaricata*, *Trillium grandiflorum*.

Variation: Three subtypes can be recognized: one on the eastern lake plains, one in the western sand dunes, and one on the glacial materials between these areas.

Similar communities: mesic northern forest, dry-mesic southern forest, southern swamp, southern floodplain forest

Natural processes: Windthrow is the most common natural disturbance.

Appendix 3. (cont.).

Disturbance effects: A natural preponderance of *Fagus* could possibly signify a longer time in mature forest conditions, but it could also be the result of heavy selective cutting of sugar maple or of moderately poor drainage conditions for which beech has better tolerance.

DRY-MESIC SOUTHERN FOREST [OAK-HARDWOOD FOREST]

Overview: An oak or oak-hardwood forest type on generally dry-mesic sites lying mostly south of the transition zone.

Physiography and geology: Occurring principally on glacial outwash, coarse-textured end moraines, and sandy glacial lake plains; also on kettle-kame topography, coarse-textured ground moraines, and sand dunes.

Soils: Sandy loam and loam soils are slightly acid to neutral.

Dominant plants: *Quercus alba*, *Q. velutina* (always dominant or important in the canopy, the former more than the latter).

Associated species: Other trees sometimes codominant or important are *Acer rubrum*, *Carya ovalis*, *Fraxinus americana*, *Quercus coccinea*. Constant canopy trees are *Prunus serotina* and *Sassafras albidum*. *Quercus rubra* localized on moister lower slope position.

Characteristic plants: Typical species include *Actaea alba*, *Brachyelytrum erectum*, *Bromus pubescens*, *Carex albursina*, *C. convoluta*, *Carya ovata*, *Corallorhiza maculata*, *Galium triflorum*, *Hamamelis virginiana*, *Ostrya virginiana*, *Sanicula marilandica*, *Smilax tamnoides*, *Viola pubescens*.

Variation: *Pinus strobus* enters toward the transition zone.

Similar communities: dry southern forest, mesic southern forest

Natural processes: Present dry-mesic southern forests were probably oak openings prior to fire suppression, based on comparison of General Land Office survey reports and present vegetation in Oakland County.

SCS Soil pH Ranges

< 4.5	extremely acid
4.5-5.0	very strongly acid
5.1-5.5	strongly acid
5.6-6.0	medium acid
6.1-6.5	slightly acid
6.6-7.3	neutral
7.4-7.8	mildly alkaline
7.9-8.4	moderately alkaline
8.5-9.0	strongly alkaline
> 9.0	very strongly alkaline

Appendix 4. Plant species observed at Cass-St. Joseph County EO .002. "x" indicates the species occurred within the site and "-" indicates the species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "W" is the Coefficient of Wetness and varies from 5 to -5, with positive values indicating that the species most commonly occurs in uplands and negative values indicating an affinity for wetlands (Herman et al 2001, Reed 1988, Wilhelm 1989). A Wetness Index was calculated for each community as the mean of the species wetness coefficients.

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Cass-St. Joseph County EO .002									
Scientific Name	Common Name	Life Form	W	inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	pond	mesic southern forest
Acer rubrum	RED MAPLE	Nt Tree	0	x	x	x	x	x	x
Acer saccharinum	SILVER MAPLE	Nt Tree	-3	x	x	-	-	-	-
Acer saccharum	SUGAR MAPLE	Nt Tree	3	x	x	-	x	-	x
Actaea sp.	BANEBERRY	Nt P-Forb	-	-	-	-	-	-	x
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	-	-	-	x	-	x
Allium tricoccum	WILD LEEK	Nt P-Forb	2	-	-	-	-	-	x
Alopecurus aequalis	SHORT-AWNED FOXTAIL	Nt P-Grass	-5	-	-	x	x	-	-
Amelanchier sp.	SERVICEBERRY	-	-	-	-	x	x	x	-
Amphicarpaea bracteata	HOG PEANUT	Nt A-Forb	0	-	x	-	-	-	x
Aronia prunifolia	BLACK CHOKEBERRY	Nt Shrub	-3	x	-	-	-	-	-
Asarum canadense	WILD GINGER	Nt P-Forb	5	-	-	-	-	-	x
Asimina triloba	PAWPAW	Nt Tree	0	-	-	-	x	-	x
Aster lanceolatus	EASTERN LINED ASTER	Nt P-Forb	-3	-	-	-	-	-	x
Aster sagittifolius	ARROW LEAVED ASTER	Nt P-Forb	5	-	-	-	-	-	x
Athyrium filix-femina	LADY FERN	Nt Fern	0	-	-	-	-	-	x
Athyrium pycnocarpon	NARROW LEAVED SPLEENWORT	Nt Fern	1	-	-	-	-	-	x
Betula alleghaniensis	YELLOW BIRCH	Nt Tree	0	x	-	-	-	-	-
Bidens comosus	SWAMP TICKSEED	Nt A-Forb	-3	-	-	-	x	x	-
Botrychium virginianum	RATTLESNAKE FERN	Nt Fern	3	-	-	-	-	-	x
Carex albursina	SEDGE	Nt P-Sedge	5	-	-	-	-	-	x
Carex crinita	SEDGE	Nt P-Sedge	-4	x	-	x	x	x	-
Carex gracillima	SEDGE	Nt P-Sedge	3	-	x	-	-	-	-
Carex hirtifolia	SEDGE	Nt P-Sedge	5	-	x	-	x	-	-
Carex intumescens	SEDGE	Nt P-Sedge	-4	x	-	-	-	-	-

Appendix 4. (cont.).

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Scientific Name	Common Name	Life Form	W	Cass-St. Joseph County EO .002					
				inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	pond	mesic southern forest
Carex pedunculata	SEDGE	Nt P-Sedge	5	-	-	-	-	-	x
Carex pensylvanica	SEDGE	Nt P-Sedge	5	-	-	-	-	-	x
Carex plantaginea	SEDGE	Nt P-Sedge	5	-	-	-	x	-	x
Carex radiata	STRAIGHT STYLED WOOD SEDGE	Nt P-Sedge	1	x	x	-	-	-	-
Carex rostrata	SEDGE	Nt P-Sedge	-5	-	-	-	x	-	-
Carex sp.	SEDGE	Sedge	-	-	-	-	-	-	x
Carex stipata	SEDGE	Nt P-Sedge	-5	-	x	-	-	-	-
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	x	-	-	x	-	x
Carya cordiformis	BITTERNUT HICKORY	Nt Tree	0	-	-	-	-	-	x
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	x	-	-	-	-	-
Caulophyllum thalictroides	BLUE COHOSH	Nt P-Forb	5	-	-	-	-	-	x
Celtis occidentalis	HACKBERRY	Nt Tree	1	-	-	x	-	-	x
Cephalanthus occidentalis	BUTTONBUSH	Nt Shrub	-5	x	x	x	x	x	-
Ceratophyllum demersum	COONTAIL	Nt P-Forb	-5	-	-	-	-	x	-
Cicuta bulbifera	WATER HEMLOCK	Nt P-Forb	-5	x	-	-	-	-	-
Cinna arundinacea	WOOD REEDGRASS	Nt P-Grass	-3	-	-	-	-	-	x
Coptis trifolia	GOLDTHREAD	Nt P-Forb	-3	x	-	-	-	-	-
Cornus florida	FLOWERING DOGWOOD	Nt Tree	4	-	-	-	-	x	-
Corylus americana	HAZELNUT	Nt Shrub	4	-	x	-	-	-	-
Cryptotaenia canadensis	HONEWORT	Nt P-Forb	0	-	-	-	-	-	x
Dryopteris carthusiana	SPINULOSE WOODFERN	Nt Fern	-2	x	x	x	-	x	x
Dryopteris intermedia	EVERGREEN WOODFERN	Nt Fern	0	-	-	-	-	-	x
Dryopteris marginalis	MARGINAL WOODFERN	Nt Fern	3	-	-	-	x	-	-
ELAEAGNUS UMBELLATA	AUTUMN OLIVE	Ad Shrub	3	-	x	-	-	-	-
Elymus virginicus	VIRGINIA WILD-RYE	Nt P-Grass	-2	-	x	-	-	-	-
Epifagus virginiana	BEECH DROPS	Nt P-Forb	5	-	-	-	-	-	x
Fagus grandifolia	AMERICAN BEECH	Nt Tree	3	x	x	x	x	x	x
Fraxinus americana	WHITE ASH	Nt Tree	3	-	-	-	-	-	x
Fraxinus nigra	BLACK ASH	Nt Tree	-4	x	x	-	-	-	-

Appendix 4. (cont.).

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				Cass-St. Joseph County EO .002					
Scientific Name	Common Name	Life Form	W	inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	pond	mesic southern forest
Fraxinus pennsylvanica	RED ASH	Nt Tree	-3	-	x	-	-	-	-
Galium aparine	ANNUAL BEDSTRAW	Nt A-Forb	3	-	x	-	-	-	-
Galium circaeans	WHITE WILD LICORICE	Nt P-Forb	4	-	-	-	-	-	x
Gaultheria procumbens	WINTERGREEN	Nt Shrub	3	-	-	x	-	-	-
Geum canadense	WHITE AVENS	Nt P-Forb	0	-	-	-	-	-	x
Glyceria canadensis	RATTLESNAKE GRASS	Nt P-Grass	-5	-	x	-	-	-	-
Glyceria striata	FOWL MANNA GRASS	Nt P-Grass	-5	-	-	-	x	-	x
Hepatica acutiloba	SHARP LOBED HEPATICA	Nt P-Forb	5	-	-	-	-	-	x
Hydrophyllum appendiculatum	GREAT WATERLEAF	Nt P-Forb	5	-	-	-	-	-	x
Hystrix patula	BOTTLEBRUSH GRASS	Nt P-Grass	5	-	-	-	-	-	x
Ilex verticillata	MICHIGAN HOLLY	Nt Shrub	-4	x	-	x	x	x	-
Impatiens capensis	SPOTTED TOUCH ME NOT	Nt A-Forb	-3	x	-	-	-	-	-
Iris virginica	SOUTHERN BLUE FLAG	Nt P-Forb	-5	x	-	-	-	x	-
Juglans nigra	BLACK WALNUT	Nt Tree	3	x	-	x	-	x	x
Juncus effusus	SOFT STEMMED RUSH	Nt P-Forb	-5	-	-	x	-	-	-
Laportea canadensis	WOOD NETTLE	Nt P-Forb	-3	-	-	-	-	-	x
Lemna minor	SMALL DUCKWEED	Nt A-Forb	-5	x	-	x	x	x	-
Lindera benzoin	SPICEBUSH	Nt Shrub	-2	-	x	-	-	-	-
Liriodendron tulipifera	TULIP TREE	Nt Tree	2	-	-	-	x	-	x
LONICERA MORROWII	MORROW HONEYSUCKLE	Ad Shrub	5	-	-	-	-	x	-
Lycopus americanus	COMMON WATER HOREHOUND	Nt P-Forb	-5	x	-	-	-	-	-
Lycopus rubellus	STALKED WATER HOREHOUND	Nt P-Forb	-5	-	-	-	x	-	-
Lycopus uniflorus	NORTHERN BUGLE WEED	Nt P-Forb	-5	x	-	-	-	-	-
Lysimachia thyrsiflora	TUFTED LOOSESTRIFE	Nt P-Forb	-5	x	-	x	x	-	-
Maianthemum canadense	CANADA MAYFLOWER	Nt P-Forb	0	x	-	x	x	-	-
Muhlenbergia glomerata	MARSH WILD TIMOTHY	Nt P-Grass	-4	-	-	x	-	-	-
Nyssa sylvatica	BLACK GUM	Nt Tree	-4	-	-	x	x	-	x

Appendix 4. (cont.).

				Cass-St. Joseph County EO .002					
Scientific Name	Common Name	Life Form	W	inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	pond	mesic southern forest
Onoclea sensibilis	SENSITIVE FERN	Nt Fern	-3	x	-	x	-	-	x
Osmorhiza claytonii	HAIRY SWEET CICELY	Nt P-Forb	4	-	-	x	-	-	x
Osmunda cinnamomea	CINNAMON FERN	Nt Fern	-3	x	-	-	-	-	-
Ostrya virginiana	IRONWOOD; HOP HORNBEAM	Nt Tree	4	-	-	-	-	-	x
Parthenocissus quinquefolia	VIRGINIA CREEPER	Nt W-Vine	1	x	-	-	-	-	x
Phalaris arundinacea	REED CANARY GRASS	Nt P-Grass	-4	-	-	x	x	-	-
Phlox divaricata	WOODLAND PHLOX	Nt P-Forb	3	-	x	-	-	-	x
Phryma leptostachya	LOPSEED	Nt P-Forb	5	-	-	-	-	-	x
Phytolacca americana	POKEWEED	Nt P-Forb	1	-	-	-	-	-	x
Podophyllum peltatum	MAY APPLE	Nt P-Forb	3	-	x	-	-	-	-
Polygonum amphibium	WATER SMARTWEED	Nt P-Forb	-5	-	-	x	-	-	-
Polygonum virginianum	JUMPSEED	Nt P-Forb	0	-	-	-	-	-	x
Polystichum acrostichoides	CHRISTMAS FERN	Nt Fern	5	-	-	-	-	-	x
Prenanthes alba	WHITE LETTUCE	Nt P-Forb	3	-	x	-	-	-	-
Prunus serotina	WILD BLACK CHERRY	Nt Tree	3	-	x	-	x	x	x
Prunus virginiana	CHOKE CHERRY	Nt Shrub	1	-	-	-	-	-	x
Pteridium aquilinum	BRACKEN FERN	Nt Fern	3	-	-	x	-	-	-
Puccinellia pallida	PUCCINELLIA	Nt P-Grass	-5	-	-	x	x	-	-
Quercus alba	WHITE OAK	Nt Tree	3	x	-	x	x	-	-
Quercus bicolor	SWAMP WHITE OAK	Nt Tree	-4	x	-	x	-	-	-
Quercus palustris	PIN OAK	Nt Tree	-3	-	-	x	-	-	-
Quercus rubra	RED OAK	Nt Tree	3	x	-	-	x	x	-
Ricciocarpos natans	LIVERWORT	Bryophyte	-	-	-	x	x	-	-
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	3	-	x	-	x	x	x
Rosa palustris	SWAMP ROSE	Nt Shrub	-5	x	-	x	x	-	-
Rubus hispidus	SWAMP DEWBERRY	Nt Shrub	-3	x	-	x	-	-	-
Rubus sp.	BERRY	-	-	-	-	x	x	-	-
Salix nigra	BLACK WILLOW	Nt Tree	-5	x	-	x	x	x	-
Sanguinaria canadensis	BLOODROOT	Nt P-Forb	4	-	x	-	-	-	-

Appendix 4. (cont.).

				Cass-St. Joseph County EO .002					
				inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	pond	mesic southern forest
Scientific Name	Common Name	Life Form	W						
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1	-	x	-	-	-	x
Sassafras albidum	SASSAFRAS	Nt Tree	3	-	-	-	x	x	-
Sium suave	WATER PARSNIP	Nt P-Forb	-5	x	x	-	x	-	-
Smilacina racemosa	FALSE SPIKENARD	Nt P-Forb	3	-	x	-	-	-	x
SOLANUM DULCAMARA	BITTERSWEET NIGHTSHADE	Ad P-Forb	0	x	-	x	-	-	-
Solidago caesia	BLUE STEMMED GOLDENROD	Nt P-Forb	3	-	-	-	-	-	x
Solidago patula	SWAMP GOLDENROD	Nt P-Forb	-5	-	x	-	-	-	-
Solidago rugosa	ROUGH GOLDENROD	Nt P-Forb	-1	-	x	x	-	-	-
Sparganium sp.	BUR-REED	Nt P-Forb	-5	x	-	-	-	-	-
Sphagnum sp.	SPHAGNUM	Moss	-	-	-	x	x	-	-
Stylophorum diphyllum	WOOD POPPY	Nt P-Forb	5	-	-	-	-	-	x
Symplocarpus foetidus	SKUNK CABBAGE	Nt P-Forb	-5	-	x	-	-	-	-
Thelypteris noveboracensis	NEW YORK FERN	Nt Fern	-1	-	-	-	-	-	x
Tilia americana	BASSWOOD	Nt Tree	3	-	x	-	-	-	x
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	-	x	-	-	-	x
Toxicodendron vernix	POISON SUMAC	Nt Shrub	-5	x	-	-	-	-	-
Trientalis borealis	STARFLOWER	Nt P-Forb	-1	x	-	-	-	-	-
Trillium grandiflorum	COMMON TRILLIUM	Nt P-Forb	5	-	x	-	-	-	-
Ulmus americana	AMERICAN ELM	Nt Tree	-2	x	x	-	x	x	x
Ulmus rubra	SLIPPERY ELM	Nt Tree	0	-	-	-	x	x	-
Uvularia grandiflora	BELLWORT	Nt P-Forb	5	-	x	-	-	-	x
Vaccinium corymbosum	SMOOTH Highbush BLUEBERRY	Nt Shrub	-3	x	x	x	-	x	-
Viburnum acerifolium	MAPLE LEAVED ARROW WOOD	Nt Shrub	5	-	-	-	-	-	x
Viola sp.	VIOLET	Forb	-	-	x	-	-	-	x
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	-	-	-	-	-	x
Woodwardia virginica	VIRGINIA CHAIN FERN	Nt Fern	-5	x	-	-	-	-	-

Appendix 4. (cont.).

				Cass-St. Joseph County EO .002					
Scientific Name	Common Name	Life Form	W	inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	pond	mesic southern forest
Total number of species observed				42	38	35	38	22	63
Wetness Index				-2.2	0.2	-2.1	-1.2	-0.8	1.7

Appendix 5. Plant species observed at Hillsdale County EO .007. "x" indicates the species occurred within the site and "-" indicates the species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "W" is the Coefficient of Wetness and varies from 5 to -5, with positive values indicating that the species most commonly occurs in uplands and negative values indicating an affinity for wetlands (Herman et al 2001, Reed 1988, Wilhelm 1989). A Wetness Index was calculated for each community as the mean of the species wetness coefficients.

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .007
				southern floodplain forest
Acer saccharinum	SILVER MAPLE	Nt Tree	-3	x
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	x
Arisaema triphyllum	JACK IN THE PULPIT	Nt P-Forb	-2	x
Asarum canadense	WILD GINGER	Nt P-Forb	5	x
Asimina triloba	PAWPAW	Nt Tree	0	x
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	x
Carex intumescens	SEDGE	Nt P-Sedge	-4	x
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	x
Clematis virginiana	VIRGIN'S BOWER	Nt W-Vine	0	x
Cornus alternifolia	ALTERNATE LEAVED DOGWOOD	Nt Tree	5	x
Crataegus sp.	HAWTHORN	Tree	-	x
Cryptotaenia canadensis	HONEWORT	Nt P-Forb	0	x
Fraxinus pennsylvanica	RED ASH	Nt Tree	-3	x
Galium asprellum	ROUGH BEDSTRAW	Nt P-Forb	-5	x
Geranium maculatum	WILD GERANIUM	Nt P-Forb	3	x
Helenium autumnale	SNEEZEWEED	Nt P-Forb	-4	x
Heracleum maximum	COW PARSNIP	Nt P-Forb	-3	x
Iris virginica	SOUTHERN BLUE FLAG	Nt P-Forb	-5	x
Juglans nigra	BLACK WALNUT	Nt Tree	3	x
Laportea canadensis	WOOD NETTLE	Nt P-Forb	-3	x
Lilium philadelphicum	WOOD LILY	Nt P-Forb	1	x
LYSIMACHIA NUMMULARIA	MONEYWORT	Ad P-Forb	-4	x
Osmorhiza longistylis	SMOOTH SWEET CICELY	Nt P-Forb	4	x
Parthenocissus quinquefolia	VIRGINIA CREEPER	Nt W-Vine	1	x
Platanus occidentalis	SYCAMORE	Nt Tree	-3	x
Polygonatum biflorum	SOLOMON SEAL	Nt P-Forb	3	x

Appendix 5. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .007
				southern floodplain forest
Polygonum virginianum	JUMPSEED	Nt P-Forb	0	x
Populus deltoides	COTTONWOOD	Nt Tree	-1	x
Prunus virginiana	CHOKE CHERRY	Nt Shrub	1	x
Rubus sp.	BERRY	Nt Shrub	5	x
Rudbeckia laciniata	CUT LEAVED CONEFLOWER	Nt P-Forb	-4	x
Sanguinaria canadensis	BLOODROOT	Nt P-Forb	4	x
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1	x
Scutellaria lateriflora	MAD DOG SKULLCAP	Nt P-Forb	-5	x
Smilax sp.	CARRION-FLOWER/GREEN-BRIER	-	-	x
Solidago gigantea	LATE GOLDENROD	Nt P-Forb	-3	x
Thalictrum dasycarpum	PURPLE MEADOW RUE	Nt P-Forb	-2	x
Tilia americana	BASSWOOD	Nt Tree	3	x
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	x
Ulmus americana	AMERICAN ELM	Nt Tree	-2	x
Viburnum lentago	NANNYBERRY	Nt Shrub	-1	x
Viola sp.	VIOLET	Forb	-	x
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	x
Zanthoxylum americanum	PRICKLY ASH	Nt Shrub	5	x
Zizia aurea	GOLDEN ALEXANDERS	Nt P-Forb	-1	x
Total number of species observed				45
Wetness Index				-0.5

Appendix 6. Plant species observed at Calhoun County EO .013. "x" indicates the species occurred within the site and "-" indicates the species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "W" is the Coefficient of Wetness and varies from 5 to -5, with positive values indicating that the species most commonly occurs in uplands and negative values indicating an affinity for wetlands (Herman et al 2001, Reed 1988, Wilhelm 1989). A Wetness Index was calculated for each community as the mean of the species wetness coefficients.

Scientific Name	Common Name	Life Form	W	Calhoun County EO .013		
				southern floodplain forest	southern wet meadow	dry-mesic southern forest
Acer rubrum	RED MAPLE	Nt Tree	0	-	-	x
Acer saccharinum	SILVER MAPLE	Nt Tree	-3	x	x	-
Agrimonia pubescens	SOFT AGRIMONY	Nt P-Forb	5	x	-	-
Asclepias incarnata	SWAMP MILKWEED	Nt P-Forb	-5	-	x	-
Asplenium platyneuron	EBONY SPLEENWORT	Nt Fern	3	-	-	x
Aster firmus	SMOOTH SWAMP ASTER	Nt P-Forb	-5	-	x	-
Aster lanceolatus	EASTERN LINED ASTER	Nt P-Forb	-3	x	-	-
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	-	x	-
Aster sagittifolius	ARROW LEAVED ASTER	Nt P-Forb	5	-	-	x
BERBERIS THUNBERGII	JAPANESE BARBERRY	Ad Shrub	4	x	-	-
Boehmeria cylindrica	FALSE NETTLE	Nt P-Forb	-5	-	x	-
Botrychium virginianum	RATTLESNAKE FERN	Nt Fern	3	x	-	x
Carex pensylvanica	SEDGE	Nt P-Sedge	5	x	-	x
Carex sp.	SEDGE	Sedge	-	x	-	-
Carex stricta	SEDGE	Nt P-Sedge	-5	-	x	-
Carex vulpinoidea	SEDGE	Nt P-Sedge	-5	-	x	-
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	x	-	x
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	x	-	x
Cephalanthus occidentalis	BUTTONBUSH	Nt Shrub	-5	-	x	-
Ceratophyllum demersum	COONTAIL	Nt P-Forb	-5	-	x	-
Cinna arundinacea	WOOD REEDGRASS	Nt P-Grass	-3	x	-	-
Cornus foemina	GRAY DOGWOOD	Nt Shrub	-2	-	-	x
Cyperus sp.	SEDGE	Nt Sedge	-	-	x	-
Decodon verticillatus	WHORLED LOOSESTRIFE	Nt Shrub	-5	-	x	-
Desmodium glutinosum	CLUSTERED LEAVED TICK TREFOIL	Nt P-Forb	5	-	-	x
Dioscorea villosa	WILD YAM	Nt P-Forb	1	x	-	-

Appendix 6. (cont.).

Scientific Name	Common Name	Life Form	W	Calhoun County EO .013		
				southern floodplain forest	southern wet meadow	dry-mesic southern forest
Dryopteris carthusiana	SPINULOSE WOODFERN	Nt Fern	-2	x	-	x
ELAEAGNUS UMBELLATA	AUTUMN OLIVE	Ad Shrub	3	x	x	x
Elodea sp.	WATERWEED	Nt P-Forb	-5	-	x	-
Eupatorium perfoliatum	COMMON BONESET	Nt P-Forb	-4	-	x	-
Galium asprellum	ROUGH BEDSTRAW	Nt P-Forb	-5	x	-	-
Geum canadense	WHITE AVENS	Nt P-Forb	0	-	-	x
Impatiens capensis	SPOTTED TOUCH ME NOT	Nt A-Forb	-3	-	x	-
Leersia virginica	WHITE GRASS	Nt P-Grass	-3	x	-	-
Lobelia cardinalis	CARDINAL FLOWER	Nt P-Forb	-5	-	x	-
Lycopus americanus	COMMON WATER HOREHOUND	Nt P-Forb	-5	-	x	-
Mentha arvensis	WILD MINT	Nt P-Forb	-3	-	x	-
Nymphaea odorata	SWEET SCENTED WATERLILY	Nt P-Forb	-5	-	x	-
Onoclea sensibilis	SENSITIVE FERN	Nt Fern	-3	x	-	-
Parthenocissus quinquefolia	VIRGINIA CREEPER	Nt W-Vine	1	-	-	x
Phalaris arundinacea	REED CANARY GRASS	Nt P-Grass	-4	-	x	-
Pilea pumila	CLEARWEED	Nt A-Forb	-3	-	x	-
Polygonum hydropiper	WATER PEPPER	Nt A-Forb	-5	-	x	-
Polygonum virginianum	JUMPSEED	Nt P-Forb	0	x	-	x
Populus deltoides	COTTONWOOD	Nt Tree	-1	-	x	-
Potentilla simplex	OLD FIELD CINQUEFOIL	Nt P-Forb	4	x	-	-
Prunus serotina	WILD BLACK CHERRY	Nt Tree	3	x	-	x
Quercus alba	WHITE OAK	Nt Tree	3	x	-	x
Quercus bicolor	SWAMP WHITE OAK	Nt Tree	-4	x	-	-
Quercus velutina	BLACK OAK	Nt Tree	5	x	-	x
Ribes cynosbati	PRICKLY or WILD GOOSEBERRY	Nt Shrub	5	x	-	-
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	3	x	x	x
Rubus sp.	BERRY	-	-	x	-	x
Rumex orbiculatus	GREAT WATER DOCK	Nt P-Forb	-5	-	x	-
Sagittaria latifolia	COMMON ARROWHEAD	Nt P-Forb	-5	-	x	-
Salix nigra	BLACK WILLOW	Nt Tree	-5	-	x	-

Appendix 6. (cont.).

Scientific Name	Common Name	Life Form	W	Calhoun County EO .013		
				southern floodplain forest	southern wet meadow	dry-mesic southern forest
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1	x	-	x
Sassafras albidum	SASSAFRAS	Nt Tree	3	x	-	-
Scirpus cyperinus	WOOL GRASS	Nt P-Sedge	-5	-	x	-
Smilacina racemosa	FALSE SPIKENARD	Nt P-Forb	3	-	-	x
Sparganium sp.	BUR-REED	Nt P-Forb	-5	-	x	-
Thalictrum dioicum	EARLY MEADOW RUE	Nt P-Forb	2	x	-	-
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	x	-	x
Ulmus americana	AMERICAN ELM	Nt Tree	-2	x	-	-
Verbena hastata	BLUE VERVAIN	Nt P-Forb	-4	-	x	-
VIBURNUM LANTANA	WAYFARING TREE	Ad Shrub	5	x	-	-
Viola sp.	VIOLET	Forb	-	x	-	x
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	x	-	-
Total number of species observed				33	30	23
Wetness Index				0.8	-3.8	1.9

Appendix 7. Plant species observed at Hillsdale County EO .004. "x" indicates the species occurred within the site and "-" indicates the species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "W" is the Coefficient of Wetness and varies from 5 to -5, with positive values indicating that the species most commonly occurs in uplands and negative values indicating an affinity for wetlands (Herman et al 2001, Reed 1988, Wilhelm 1989). A Wetness Index was calculated for each community as the mean of the species wetness coefficients.

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .004		
				southern floodplain forest	southern wet meadow	mesic southern forest
Acer rubrum	RED MAPLE	Nt Tree	0	-	-	x
Acer saccharum	SUGAR MAPLE	Nt Tree	3	x	-	-
Agrimonia striata	AGRIMONY	Nt P-Forb	1	-	-	x
Angelica atropurpurea	ANGELICA	Nt P-Forb	-5	-	x	-
Aster firmus	SMOOTH SWAMP ASTER	Nt P-Forb	-5	x	x	-
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	x	-	-
Aster sagittifolius	ARROW LEAVED ASTER	Nt P-Forb	5	x	-	x
Calamagrostis canadensis	BLUE JOINT GRASS	Nt P-Grass	-5	x	x	-
Campanula aparinoides	MARSH BELLFLOWER	Nt P-Forb	-5	-	x	-
Carex pensylvanica	SEDGE	Nt P-Sedge	5	x	-	x
Carex sp.	SEDGE	Sedge	-	-	-	x
Carex stricta	SEDGE	Nt P-Sedge	-5	x	x	-
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	x	-	x
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	x	-	x
Chelone glabra	TURTLEHEAD	Nt P-Forb	-5	-	x	-
Collinsonia canadensis	RICHWEED	Nt P-Forb	0	x	-	-
Cornus foemina	GRAY DOGWOOD	Nt Shrub	-2	-	x	x
Desmodium glutinosum	CLUSTERED LEAVED TICK TREFOIL	Nt P-Forb	5	x	-	x
Desmodium sp.	TICK-TREFOIL	Forb	-	x	-	-
ELAEAGNUS UMBELLATA	AUTUMN OLIVE	Ad Shrub	3	-	x	x
Elymus canadensis	CANADA WILD RYE	Nt P-Grass	1	-	x	-
Elymus virginicus	VIRGINIA WILD RYE	Nt P-Grass	-2	x	-	-
Epilobium leptophyllum	FEN WILLOW HERB	Nt P-Forb	-5	-	x	-
Euphorbia maculata	NODDING SPURGE	Nt A-Forb	4	-	x	-
Fraxinus pennsylvanica	RED ASH	Nt Tree	-3	x	x	-
Galium sp.	BEDSTRAW	Forb	-	x	-	-

Appendix 7. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .004		
				southern floodplain forest	southern wet meadow	mesic southern forest
Gentiana andrewsii	BOTTLE GENTIAN	Nt P-Forb	-3	-	x	-
Geum canadense	WHITE AVENS	Nt P-Forb	0	x	-	x
Hamamelis virginiana	WITCH HAZEL	Nt Shrub	3	-	-	x
Helianthus sp.	SUNFLOWER	Forb	-	x	-	-
Hystrix patula	BOTTLEBRUSH GRASS	Nt P-Grass	5	-	-	x
Impatiens capensis	SPOTTED TOUCH ME NOT	Nt A-Forb	-3	x	-	-
Iris virginica	SOUTHERN BLUE FLAG	Nt P-Forb	-5	x	-	-
Juglans nigra	BLACK WALNUT	Nt Tree	3	x	-	-
Juniperus virginiana	RED CEDAR	Nt Tree	3	x	-	x
Leersia oryzoides	CUT GRASS	Nt P-Grass	-5	x	-	-
Liriodendron tulipifera	TULIP TREE	Nt Tree	2	x	-	-
Lobelia cardinalis	CARDINAL FLOWER	Nt P-Forb	-5	x	-	-
LONICERA MORROWII	MORROW HONEYSUCKLE	Ad Shrub	5	-	x	x
Lycopodium clavatum	RUNNING GROUND PINE	Nt Fern Ally	0	-	-	x
Lycopus uniflorus	NORTHERN BUGLE WEED	Nt P-Forb	-5	-	x	-
LYTHRUM SALICARIA	PURPLE LOOSESTRIFE	Ad P-Forb	-5	x	x	-
Onoclea sensibilis	SENSITIVE FERN	Nt Fern	-3	-	x	-
Osmorhiza claytonii	HAIRY SWEET CICELY	Nt P-Forb	4	-	-	x
Pedicularis lanceolata	SWAMP BETONY	Nt P-Forb	-4	-	x	-
Physocarpus opulifolius	NINEBARK	Nt Shrub	-2	-	x	-
Pilea pumila	CLEARWEED	Nt A-Forb	-3	x	-	-
Polygonum amphibium	WATER SMARTWEED	Nt P-Forb	-5	-	x	-
Populus deltoides	COTTONWOOD	Nt Tree	-1	-	x	-
Populus grandidentata	BIG TOOTHED ASPEN	Nt Tree	3	-	-	x
Potentilla simplex	OLD FIELD CINQUEFOIL	Nt P-Forb	4	-	-	x
Prunus serotina	WILD BLACK CHERRY	Nt Tree	3	x	-	x
Pycnanthemum virginianum	COMMON MOUNTAIN MINT	Nt P-Forb	-4	-	x	-
Quercus alba	WHITE OAK	Nt Tree	3	-	-	x
Quercus rubra	RED OAK	Nt Tree	3	x	-	-
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	3	-	x	x

Appendix 7. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .004		
				southern floodplain forest	southern wet meadow	mesic southern forest
Rosa palustris	SWAMP ROSE	Nt Shrub	-5	-	x	-
Rubus sp.	BERRY	-	-	-	-	x
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1	x	-	-
Sanicula marilandica	BLACK SNAKEROOT	Nt P-Forb	3	-	-	x
Sassafras albidum	SASSAFRAS	Nt Tree	3	x	-	-
Smilax tamnoides	BRISTLY GREEN BRIER	Nt W-Vine	0	x	-	-
Solidago caesia	BLUE STEMMED GOLDENROD	Nt P-Forb	3	x	-	x
Solidago canadensis	CANADA GOLDENROD	Nt P-Forb	3	-	x	x
Solidago gigantea	LATE GOLDENROD	Nt P-Forb	-3	-	x	-
Thalictrum dioicum	EARLY MEADOW RUE	Nt P-Forb	2	x	-	-
Tilia americana	BASSWOOD	Nt Tree	3	x	-	x
Ulmus americana	AMERICAN ELM	Nt Tree	-2	x	x	-
Vernonia missurica	MISSOURI IRONWEED	Nt P-Forb	-1	-	x	-
Viola sp.	VIOLET	Forb	-	x	-	-
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	x	x	-
Zanthoxylum americanum	PRICKLY ASH	Nt Shrub	5	x	-	x
Zizia aurea	GOLDEN ALEXANDERS	Nt P-Forb	-1	x	x	-
Total number of species observed				39	30	28
Wetness Index				-0.1	-2.2	2.8

Appendix 8. Plant species observed at Hillsdale County EO .008. "x" indicates the species occurred within the site and "-" indicates the species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "W" is the Coefficient of Wetness and varies from 5 to -5, with positive values indicating that the species most commonly occurs in uplands and negative values indicating an affinity for wetlands (Herman et al 2001, Reed 1988, Wilhelm 1989). A Wetness Index was calculated for each community as the mean of the species wetness coefficients.

					Hillsdale County EO .008			
Scientific Name	Common Name	Life Form	W	pond	southern wet meadow (A)	southern wet meadow (B)	southern wet meadow (C)	southern wet meadow (D)
Acer negundo	BOX ELDER	Nt Tree	-2	-	x	-	-	-
Acer nigrum	BLACK MAPLE	Nt Tree	3	-	-	-	-	-
Acer rubrum	RED MAPLE	Nt Tree	0	-	-	-	x	x
Acer saccharinum	SILVER MAPLE	Nt Tree	-3	-	-	-	x	-
Acer saccharum	SUGAR MAPLE	Nt Tree	3	-	-	-	-	-
Actaea pachypoda	DOLL'S EYES	Nt P-Forb	5	-	-	-	-	-
Agrimonia gryposepala	TALL AGRIMONY	Nt P-Forb	2	-	-	-	-	-
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	-	-	-	-	-
Allium sp.	-	Forb	-	-	-	-	-	-
Allium tricoccum	WILD LEEK	Nt P-Forb	2	-	-	-	-	-
Angelica atropurpurea	ANGELICA	Nt P-Forb	-5	-	-	-	-	x
Arisaema triphyllum	JACK IN THE PULPIT	Nt P-Forb	-2	-	-	-	-	-
Asclepias incarnata	SWAMP MILKWEED	Nt P-Forb	-5	-	-	-	-	x
Asimina triloba	PAWPAW	Nt Tree	0	-	-	-	-	-
Asplenium platyneuron	EBONY SPLEENWORT	Nt Fern	3	-	-	-	-	-
Aster lanceolatus	EASTERN LINED ASTER	Nt P-Forb	-3	-	-	-	-	x
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	-	-	x	x	-
Aster sp.	ASTER	Forb	-	-	x	-	-	-
Bidens cernuus	NODDING BUR MARIGOLD	Nt A-Forb	-5	x	x	x	x	-
Boehmeria cylindrica	FALSE NETTLE	Nt P-Forb	-5	-	-	-	-	x
Botrychium virginianum	RATTLESNAKE FERN	Nt Fern	3	-	-	-	-	-
Calamagrostis canadensis	BLUE JOINT GRASS	Nt P-Grass	-5	x	-	x	-	-
Calystegia sepium	HEDGE BINDWEED	Nt P-Forb	0	-	-	-	-	x
Campanula aparinoides	MARSH BELLFLOWER	Nt P-Forb	-5	x	-	x	-	-
CARDUUS NUTANS	MUSK THISTLE	Ad B-Forb	5	-	x	-	-	-

Appendix 8. (cont.).

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					Hillsdale County EO .008			
Scientific Name	Common Name	Life Form	W	pond	southern wet meadow (A)	southern wet meadow (B)	southern wet meadow (C)	southern wet meadow (D)
Carex albursina	SEDGE	Nt P-Sedge	5	-	-	-	-	-
Carex amphibola	SEDGE	Nt P-Sedge	-2	-	-	-	-	-
Carex comosa	SEDGE	Nt P-Sedge	-5	x	-	x	-	-
Carex hirsutella	SEDGE	Nt P-Sedge	5	-	-	-	-	-
Carex hirtifolia	SEDGE	Nt P-Sedge	5	-	-	-	-	-
Carex hystericina	SEDGE	Nt P-Sedge	-5	-	x	-	-	-
Carex intumescens	SEDGE	Nt P-Sedge	-4	-	-	-	x	-
Carex lacustris	SEDGE	Nt P-Sedge	-5	-	x	x	x	-
Carex pedunculata	SEDGE	Nt P-Sedge	5	-	-	-	-	-
Carex pensylvanica	SEDGE	Nt P-Sedge	5	-	-	-	-	-
Carex plantaginea	SEDGE	Nt P-Sedge	5	-	-	-	-	-
Carex radiata	STRAIGHT STYLED WOOD SEDGE	Nt P-Sedge	1	-	-	-	x	-
Carex sartwellii	SEDGE	Nt P-Sedge	-4	-	-	-	x	x
Carex sp.	SEDGE	Sedge	-	-	x	-	-	-
Carex stricta	SEDGE	Nt P-Sedge	-5	x	x	x	x	-
Carex vulpinoidea	SEDGE	Nt P-Sedge	-5	-	-	-	x	-
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	-	-	-	-	-
Carya cordiformis	BITTERNUT HICKORY	Nt Tree	0	-	-	-	-	-
Carya glabra	PIGNUT HICKORY	Nt Tree	3	-	-	-	-	-
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	-	-	-	-	-
Celtis occidentalis	HACKBERRY	Nt Tree	1	-	-	-	-	-
Cephalanthus occidentalis	BUTTONBUSH	Nt Shrub	-5	x	-	-	x	-
Ceratophyllum demersum	COONTAIL	Nt P-Forb	-5	x	-	-	-	-
Cicuta bulbifera	WATER HEMLOCK	Nt P-Forb	-5	-	-	x	-	-
Cicuta maculata	WATER HEMLOCK	Nt B-Forb	-5	-	-	-	x	-
Cinna arundinacea	WOOD REEDGRASS	Nt P-Grass	-3	-	-	-	x	-
Circaea lutetiana	ENCHANTER'S NIGHTSHADE	Nt P-Forb	3	-	-	-	-	-
Cirsium muticum	SWAMP THISTLE	Nt B-Forb	-5	-	-	x	-	-
Cornus amomum	SILKY DOGWOOD	Nt Shrub	-4	-	-	-	-	x
Cornus foemina	GRAY DOGWOOD	Nt Shrub	-2	x	-	x	-	x

Appendix 8. (cont.).

					Hillsdale County EO .008			
					southern wet meadow (A)	southern wet meadow (B)	southern wet meadow (C)	southern wet meadow (D)
Scientific Name	Common Name	Life Form	W	pond				
Cornus stolonifera	RED OSIER DOGWOOD	Nt Shrub	-3	-	-	-	-	-
Cryptotaenia canadensis	HONEWORT	Nt P-Forb	0	-	-	-	-	-
Cyperus sp.	SEDGE	Sedge	-	-	x	-	-	-
DAUCUS CAROTA	QUEEN ANNE'S LACE	Ad B-Forb	5	-	x	-	-	-
ECHINOCHLOA CRUSGALLI	BARNYARD GRASS	Ad A-Grass	-3	-	x	-	-	-
Elymus canadensis	CANADA WILD RYE	Nt P-Grass	1	-	-	x	-	-
Epifagus virginiana	BEECH DROPS	Nt P-Forb	5	-	-	-	-	-
Epilobium sp.	WILLOW-HERB	Forb	-	-	-	x	x	-
Euonymus obovata	RUNNING STRAWBERRY BUSH	Nt Shrub	5	-	-	-	-	-
Eupatorium maculatum	JOE-PYE WEED	Nt P-Forb	-5	-	-	x	-	x
Eupatorium perfoliatum	COMMON BONESET	Nt P-Forb	-4	-	-	x	x	x
Fagus grandifolia	AMERICAN BEECH	Nt Tree	3	-	-	-	x	-
Fragaria virginiana	WILD STRAWBERRY	Nt P-Forb	1	-	-	-	x	-
Fraxinus americana	WHITE ASH	Nt Tree	3	-	-	-	-	-
Fraxinus nigra	BLACK ASH	Nt Tree	-4	-	-	-	x	x
Galium asprellum	ROUGH BEDSTRAW	Nt P-Forb	-5	-	-	x	-	-
Galium circaezans	WHITE WILD LICORICE	Nt P-Forb	4	-	-	-	-	-
Galium lanceolatum	YELLOW WILD LICORICE	Nt P-Forb	5	-	-	-	-	-
Galium sp.	BEDSTRAW	Forb	-	x	-	-	x	-
Galium triflorum	FRAGRANT BEDSTRAW	Nt P-Forb	2	-	-	-	-	-
Gentiana andrewsii	BOTTLE GENTIAN	Nt P-Forb	-3	-	-	x	-	-
Geranium maculatum	WILD GERANIUM	Nt P-Forb	3	-	-	-	-	-
Geum canadense	WHITE AVENS	Nt P-Forb	0	-	-	-	x	-
Glyceria striata	FOWL MANNA GRASS	Nt P-Grass	-5	-	-	-	x	-
Hamamelis virginiana	WITCH HAZEL	Nt Shrub	3	-	-	-	-	-
Hepatica acutiloba	SHARP LOBED HEPATICA	Nt P-Forb	5	-	-	-	-	-
Hydrophyllum virginianum	VIRGINIA WATERLEAF	Nt P-Forb	-2	-	-	-	-	-
Hystrix patula	BOTTLEBRUSH GRASS	Nt P-Grass	5	-	-	-	-	-
Impatiens capensis	SPOTTED TOUCH ME NOT	Nt A-Forb	-3	-	-	x	-	x
Iris virginica	SOUTHERN BLUE FLAG	Nt P-Forb	-5	x	-	-	x	-

Appendix 8. (cont.).

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					Hillsdale County EO .008			
Scientific Name	Common Name	Life Form	W	pond	southern wet meadow (A)	southern wet meadow (B)	southern wet meadow (C)	southern wet meadow (D)
Juglans cinerea	BUTTERNUT	Nt Tree	2	-	-	-	-	-
Juncus effusus	SOFT STEMMED RUSH	Nt P-Forb	-5	-	x	-	-	-
Lactuca sp.	LETTUCE	Forb	-	-	-	-	-	-
Laportea canadensis	WOOD NETTLE	Nt P-Forb	-3	-	-	-	-	-
Leersia oryzoides	CUT GRASS	Nt P-Grass	-5	-	x	-	-	x
Lemna minor	SMALL DUCKWEED	Nt A-Forb	-5	x	x	-	-	-
Lindera benzoin	SPICEBUSH	Nt Shrub	-2	-	-	-	-	-
Liriodendron tulipifera	TULIP TREE	Nt Tree	2	-	-	-	-	-
Lobelia siphilitica	GREAT BLUE LOBELIA	Nt P-Forb	-4	-	x	x	-	-
LOLIUM PERENNE	PERENNIAL RYE GRASS	Ad P-Grass	3	-	x	-	-	-
LONICERA MORROWII	MORROW HONEYSUCKLE	Ad Shrub	5	-	-	-	-	-
LOTUS CORNICULATA	BIRDFOOT TREFOIL	Ad P-Forb	1	-	x	-	-	-
Lycopus uniflorus	NORTHERN BUGLE WEED	Nt P-Forb	-5	x	-	x	x	x
LYSIMACHIA	MONEYWORT	Ad P-Forb	-4	-	-	-	-	x
NUMMULARIA								
Lysimachia thyrsiflora	TUFTED LOOSESTRIFE	Nt P-Forb	-5	x	-	x	-	-
LYTHRUM SALICARIA	PURPLE LOOSESTRIFE	Ad P-Forb	-5	x	x	x	-	-
Mentha sp.	MINT	Forb	-	-	x	-	-	-
Mitella diphylla	BISHOP'S CAP	Nt P-Forb	2	-	-	-	-	-
Onoclea sensibilis	SENSITIVE FERN	Nt Fern	-3	-	-	x	x	-
Osmorhiza longistylis	SMOOTH SWEET CICELY	Nt P-Forb	4	-	-	-	-	-
Osmunda regalis	ROYAL FERN	Nt Fern	-5	-	-	-	x	-
Panicum capillare	WITCH GRASS	Nt A-Grass	0	-	x	-	-	-
Parthenocissus quinquefolia	VIRGINIA CREEPER	Nt W-Vine	1	-	-	-	-	-
Phalaris arundinacea	REED CANARY GRASS	Nt P-Grass	-4	-	x	x	-	x
Phytolacca americana	POKEWEED	Nt P-Forb	1	-	-	-	-	-
Pilea pumila	CLEARWEED	Nt A-Forb	-3	-	-	-	-	-
POA PRATENSIS	KENTUCKY BLUEGRASS	Ad P-Grass	1	-	x	-	-	-
Podophyllum peltatum	MAY APPLE	Nt P-Forb	3	-	-	-	-	-
Polygonatum pubescens	DOWNY SOLOMON SEAL	Nt P-Forb	5	-	-	-	-	-

Appendix 8. (cont.).

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					Hillsdale County EO .008			
Scientific Name	Common Name	Life Form	W	pond	southern wet meadow (A)	southern wet meadow (B)	southern wet meadow (C)	southern wet meadow (D)
Polygonum hydropiper	WATER PEPPER	Nt A-Forb	-5	-	x	-	-	-
POLYGONUM PERSICARIA	LADY'S THUMB	Ad A-Forb	-3	-	x	-	-	-
Polygonum virginianum	JUMPSEED	Nt P-Forb	0	-	-	-	-	-
Polystichum acrostichoides	CHRISTMAS FERN	Nt Fern	5	-	-	-	-	-
Populus deltoides	COTTONWOOD	Nt Tree	-1	-	x	-	-	-
Prenanthes alba	WHITE LETTUCE	Nt P-Forb	3	-	-	-	-	-
Prunus nigra	CANADA PLUM	Nt Tree	4	-	-	-	-	-
Prunus serotina	WILD BLACK CHERRY	Nt Tree	3	-	-	-	x	-
Prunus virginiana	CHOKE CHERRY	Nt Shrub	1	-	-	-	-	-
Quercus alba	WHITE OAK	Nt Tree	3	-	-	-	-	-
Quercus bicolor	SWAMP WHITE OAK	Nt Tree	-4	-	-	-	x	-
Quercus muehlenbergii	CHINQUAPIN OAK	Nt Tree	5	-	-	-	-	-
Quercus rubra	RED OAK	Nt Tree	3	-	-	-	-	-
Ribes americanum	WILD BLACK CURRANT	Nt Shrub	-3	-	-	-	x	-
Ribes cynosbati	PRICKLY or WILD GOOSEBERRY	Nt Shrub	5	-	-	-	-	-
Ribes sp.	CURRANT/GOOSEBERRY	Nt Shrub	-	-	-	-	-	-
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	3	-	-	-	-	-
Rosa palustris	SWAMP ROSE	Nt Shrub	-5	-	-	x	x	-
Rubus sp.	BERRY	(blank)	-	-	-	-	x	-
Rudbeckia laciniata	CUT LEAVED CONEFLOWER	Nt P-Forb	-4	-	-	-	-	-
Rumex orbiculatus	GREAT WATER DOCK	Nt P-Forb	-5	-	-	-	-	x
Salix discolor	PUSSY WILLOW	Nt Shrub	-3	x	-	x	-	-
Salix nigra	BLACK WILLOW	Nt Tree	-5	x	-	-	-	x
Salix petiolaris	SLENDER WILLOW	Nt Shrub	-4	-	x	-	-	x
Sambucus canadensis	ELDERBERRY	Nt Shrub	-2	-	-	-	x	-
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1	-	-	-	-	-
Sanicula marilandica	BLACK SNAKEROOT	Nt P-Forb	3	-	-	-	-	-
Scirpus atrovirens	BULRUSH	Nt P-Sedge	-5	-	x	x	x	-
Scirpus cyperinus	WOOL GRASS	Nt P-Sedge	-5	-	x	x	-	-
Senecio aureus	GOLDEN RAGWORT	Nt P-Forb	-3	-	-	-	-	-

Appendix 8. (cont.).

					Hillsdale County EO .008			
Scientific Name	Common Name	Life Form	W	pond	southern wet meadow (A)	southern wet meadow (B)	southern wet meadow (C)	southern wet meadow (D)
Setaria sp.	FOXTAIL	Ad A-Grass	-	-	x	-	-	-
Sium suave	WATER PARSNIP	Nt P-Forb	-5	-	-	-	-	-
Smilacina racemosa	FALSE SPIKENARD	Nt P-Forb	3	-	-	-	-	-
SOLANUM CAROLINENSE	HORSE NETTLE	Ad P-Forb	4	-	-	-	-	-
SOLANUM DULCAMARA	BITTERSWEET NIGHTSHADE	Ad P-Forb	0	-	-	-	-	x
Solanum ptycanthum	BLACK NIGHTSHADE	Nt A-Forb	5	-	-	-	-	-
Solidago caesia	BLUE STEMMED GOLDENROD	Nt P-Forb	3	-	-	-	-	-
Solidago gigantea	LATE GOLDENROD	Nt P-Forb	-3	-	-	-	x	-
Solidago rugosa	ROUGH GOLDENROD	Nt P-Forb	-1	-	-	-	x	-
Spiraea alba	MEADOWSWEET	Nt Shrub	-4	-	-	-	x	-
Thalictrum dioicum	EARLY MEADOW RUE	Nt P-Forb	2	-	-	-	-	-
Thelypteris noveboracensis	NEW YORK FERN	Nt Fern	-1	-	-	-	-	-
Thelypteris palustris	MARSH FERN	Nt Fern	-4	-	-	x	x	-
Tilia americana	BASSWOOD	Nt Tree	3	-	-	-	-	-
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	-	-	-	x	-
Trifolium sp.	CLOVER	Ad A-Forb	-	-	x	-	-	-
Trillium grandiflorum	COMMON TRILLIUM	Nt P-Forb	5	-	-	-	-	-
TYPHA ANGUSTIFOLIA	NARROW LEAVED CATTAIL	Ad P-Forb	-5	-	x	x	-	-
Typha latifolia	BROAD LEAVED CATTAIL	Nt P-Forb	-5	x	-	-	-	-
Ulmus americana	AMERICAN ELM	Nt Tree	-2	-	-	-	x	x
Ulmus rubra	SLIPPERY ELM	Nt Tree	0	-	-	-	-	-
Urtica dioica	NETTLE	Nt P-Forb	-1	-	x	-	-	-
Verbena hastata	BLUE VERVAIN	Nt P-Forb	-4	-	-	-	x	x
Viburnum acerifolium	MAPLE LEAVED ARROW WOOD	Nt Shrub	5	-	-	-	-	-
Viburnum cassinoides	NORTHERN HAW	Nt Shrub	-3	-	-	-	-	-
Viola pubescens	YELLOW VIOLET	Nt P-Forb	4	-	-	-	-	-
Viola sp.	VIOLET	Forb	-	-	-	-	-	-
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	-	-	-	x	-
Zanthoxylum americanum	PRICKLY ASH	Nt Shrub	5	-	-	-	-	-

Appendix 8. (cont.).

				Hillsdale County EO .008				
					southern wet meadow (A)	southern wet meadow (B)	southern wet meadow (C)	southern wet meadow (D)
Scientific Name	Common Name	Life Form	W	pond				
Total number of species observed				17	32	29	40	23
Wetness Index				-4.7	-2.6	-4.1	-2.9	-3.6

Appendix 8. (cont.).

					Hillsdale County EO .008				
					inundated	mesic	mesic	mesic	
					shrub	southern	southern	southern	
					swamp	forest	forest	forest	southern
						(A)	(B)	(C)	floodplain
Scientific Name	Common Name	Life Form	W						forest
Acer negundo	BOX ELDER	Nt Tree	-2	-	-	-	-	-	-
Acer nigrum	BLACK MAPLE	Nt Tree	3	-	-	-	-	x	x
Acer rubrum	RED MAPLE	Nt Tree	0	x	-	-	x	-	-
Acer saccharinum	SILVER MAPLE	Nt Tree	-3	-	-	-	-	-	-
Acer saccharum	SUGAR MAPLE	Nt Tree	3	-	-	x	x	x	x
Actaea pachypoda	DOLL'S EYES	Nt P-Forb	5	-	-	-	-	x	-
Agrimonia gryposepala	TALL AGRIMONY	Nt P-Forb	2	-	-	x	-	-	-
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	-	-	x	-	x	x
Allium sp.	-	Forb	-	-	-	-	x	-	-
Allium tricoccum	WILD LEEK	Nt P-Forb	2	-	-	-	-	-	x
Angelica atropurpurea	ANGELICA	Nt P-Forb	-5	-	-	-	-	-	-
Arisaema triphyllum	JACK IN THE PULPIT	Nt P-Forb	-2	-	-	-	x	-	-
Asclepias incarnata	SWAMP MILKWEED	Nt P-Forb	-5	-	-	-	-	-	-
Asimina triloba	PAWPAW	Nt Tree	0	-	-	-	-	-	x
Asplenium platyneuron	EBONY SPLEENWORT	Nt Fern	3	-	-	x	-	-	-
Aster lanceolatus	EASTERN LINED ASTER	Nt P-Forb	-3	-	-	-	-	-	-
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	-	-	x	x	-	x
Aster sp.	ASTER	Forb	-	-	-	-	-	-	-
Bidens cernuus	NODDING BUR MARIGOLD	Nt A-Forb	-5	x	-	-	-	-	-
Boehmeria cylindrica	FALSE NETTLE	Nt P-Forb	-5	-	-	-	-	-	-
Botrychium virginianum	RATTLESNAKE FERN	Nt Fern	3	-	-	x	x	-	x
Calamagrostis canadensis	BLUE JOINT GRASS	Nt P-Grass	-5	-	-	-	-	-	-
Calystegia sepium	HEDGE BINDWEED	Nt P-Forb	0	-	-	-	-	-	-
Campanula aparinoides	MARSH BELLFLOWER	Nt P-Forb	-5	-	-	-	-	-	-
CARDUUS NUTANS	MUSK THISTLE	Ad B-Forb	5	-	-	-	-	-	-
Carex albursina	SEDGE	Nt P-Sedge	5	-	-	-	-	x	-
Carex amphibola	SEDGE	Nt P-Sedge	-2	-	-	-	-	-	x
Carex comosa	SEDGE	Nt P-Sedge	-5	-	-	-	-	-	-
Carex hirsutella	SEDGE	Nt P-Sedge	5	-	-	-	-	-	x

Appendix 8. (cont.).

					Hillsdale County EO .008				
					inundated shrub swamp	mesic southern forest (A)	mesic southern forest (B)	mesic southern forest (C)	southern floodplain forest
Scientific Name	Common Name	Life Form	W						
Carex hirtifolia	SEDGE	Nt P-Sedge	5	-	-	-	-	x	-
Carex hystericina	SEDGE	Nt P-Sedge	-5	-	-	-	-	-	-
Carex intumescens	SEDGE	Nt P-Sedge	-4	-	-	-	-	-	-
Carex lacustris	SEDGE	Nt P-Sedge	-5	-	-	-	-	-	-
Carex pedunculata	SEDGE	Nt P-Sedge	5	-	-	-	-	x	x
Carex pensylvanica	SEDGE	Nt P-Sedge	5	-	-	x	x	-	-
Carex plantaginea	SEDGE	Nt P-Sedge	5	-	-	x	-	x	-
Carex radiata	STRAIGHT STYLED WOOD SEDGE	Nt P-Sedge	1	-	-	-	-	x	-
Carex sartwellii	SEDGE	Nt P-Sedge	-4	-	-	-	-	-	-
Carex sp.	SEDGE	Sedge	-	-	-	-	-	-	-
Carex stricta	SEDGE	Nt P-Sedge	-5	-	-	-	-	-	-
Carex vulpinoidea	SEDGE	Nt P-Sedge	-5	-	-	-	-	-	-
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	-	-	-	-	-	x
Carya cordiformis	BITTERNUT HICKORY	Nt Tree	0	-	-	-	-	x	x
Carya glabra	PIGNUT HICKORY	Nt Tree	3	-	-	-	x	-	-
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	-	-	x	x	x	-
Celtis occidentalis	HACKBERRY	Nt Tree	1	-	-	x	-	-	-
Cephalanthus occidentalis	BUTTONBUSH	Nt Shrub	-5	x	-	-	-	-	-
Ceratophyllum demersum	COONTAIL	Nt P-Forb	-5	-	-	-	-	-	-
Cicuta bulbifera	WATER HEMLOCK	Nt P-Forb	-5	-	-	-	-	-	-
Cicuta maculata	WATER HEMLOCK	Nt B-Forb	-5	x	-	-	-	-	-
Cinna arundinacea	WOOD REEDGRASS	Nt P-Grass	-3	-	-	-	-	-	-
Circaea lutetiana	ENCHANTER'S NIGHTSHADE	Nt P-Forb	3	-	-	-	-	x	x
Cirsium muticum	SWAMP THISTLE	Nt B-Forb	-5	-	-	-	-	-	-
Cornus amomum	SILKY DOGWOOD	Nt Shrub	-4	-	-	-	-	-	-
Cornus foemina	GRAY DOGWOOD	Nt Shrub	-2	-	-	x	-	-	-
Cornus stolonifera	RED OSIER DOGWOOD	Nt Shrub	-3	x	-	-	-	-	-
Cryptotaenia canadensis	HONEWORT	Nt P-Forb	0	-	-	-	-	-	x
Cyperus sp.	SEDGE	Sedge	-	-	-	-	-	-	-
DAUCUS CAROTA	QUEEN ANNE'S LACE	Ad B-Forb	5	-	-	-	-	-	-

Appendix 8. (cont.).

				Hillsdale County EO .008				
				inundated	mesic	mesic	mesic	
				shrub	southern	southern	southern	southern
Scientific Name	Common Name	Life Form	W	swamp	(A)	(B)	(C)	floodplain forest
ECHINOCHLOA CRUSGALLI	BARNYARD GRASS	Ad A-Grass	-3	-	-	-	-	-
Elymus canadensis	CANADA WILD RYE	Nt P-Grass	1	-	-	-	-	-
Epifagus virginiana	BEECH DROPS	Nt P-Forb	5	-	-	-	x	-
Epilobium sp.	WILLOW-HERB	Forb	-	-	-	-	-	-
Euonymus obovata	RUNNING STRAWBERRY BUSH	Nt Shrub	5	-	x	x	-	x
Eupatorium maculatum	JOE-PYE WEED	Nt P-Forb	-5	-	-	-	-	-
Eupatorium perfoliatum	COMMON BONESET	Nt P-Forb	-4	-	-	-	-	-
Fagus grandifolia	AMERICAN BEECH	Nt Tree	3	-	-	x	x	x
Fragaria virginiana	WILD STRAWBERRY	Nt P-Forb	1	-	-	-	-	-
Fraxinus americana	WHITE ASH	Nt Tree	3	-	x	x	x	-
Fraxinus nigra	BLACK ASH	Nt Tree	-4	-	-	-	-	x
Galium asprellum	ROUGH BEDSTRAW	Nt P-Forb	-5	-	-	-	-	-
Galium circaezans	WHITE WILD LICORICE	Nt P-Forb	4	-	x	x	x	-
Galium lanceolatum	YELLOW WILD LICORICE	Nt P-Forb	5	-	x	-	-	-
Galium sp.	BEDSTRAW	Forb	-	-	-	-	-	-
Galium triflorum	FRAGRANT BEDSTRAW	Nt P-Forb	2	-	x	-	-	-
Gentiana andrewsii	BOTTLE GENTIAN	Nt P-Forb	-3	-	-	-	-	-
Geranium maculatum	WILD GERANIUM	Nt P-Forb	3	-	-	-	x	x
Geum canadense	WHITE AVENS	Nt P-Forb	0	-	x	x	-	-
Glyceria striata	FOWL MANNA GRASS	Nt P-Grass	-5	-	x	x	-	-
Hamamelis virginiana	WITCH HAZEL	Nt Shrub	3	-	-	x	-	-
Hepatica acutiloba	SHARP LOBED HEPATICA	Nt P-Forb	5	-	-	x	x	-
Hydrophyllum virginianum	VIRGINIA WATERLEAF	Nt P-Forb	-2	-	-	-	-	x
Hystrix patula	BOTTLEBRUSH GRASS	Nt P-Grass	5	-	-	x	x	x
Impatiens capensis	SPOTTED TOUCH ME NOT	Nt A-Forb	-3	-	-	-	-	-
Iris virginica	SOUTHERN BLUE FLAG	Nt P-Forb	-5	-	-	-	-	-
Juglans cinerea	BUTTERNUT	Nt Tree	2	-	-	-	-	x
Juncus effusus	SOFT STEMMED RUSH	Nt P-Forb	-5	-	-	-	-	-
Lactuca sp.	LETTUCE	Forb	-	x	-	-	-	-
Laportea canadensis	WOOD NETTLE	Nt P-Forb	-3	-	-	-	-	x

Appendix 8. (cont.).

				Hillsdale County EO .008				
				inundated shrub swamp	mesic southern forest (A)	mesic southern forest (B)	mesic southern forest (C)	southern floodplain forest
Scientific Name	Common Name	Life Form	W					
Leersia oryzoides	CUT GRASS	Nt P-Grass	-5	-	-	-	-	-
Lemna minor	SMALL DUCKWEED	Nt A-Forb	-5	x	-	-	-	-
Lindera benzoin	SPICEBUSH	Nt Shrub	-2	x	-	-	-	-
Liriodendron tulipifera	TULIP TREE	Nt Tree	2	-	-	-	-	x
Lobelia siphilitica	GREAT BLUE LOBELIA	Nt P-Forb	-4	-	-	-	-	-
LOLIUM PERENNE	PERENNIAL RYE GRASS	Ad P-Grass	3	-	-	-	-	-
LONICERA MORROWII	MORROW HONEYSUCKLE	Ad Shrub	5	-	x	-	-	-
LOTUS CORNICULATA	BIRDFOOT TREFOIL	Ad P-Forb	1	-	-	-	-	-
Lycopus uniflorus	NORTHERN BUGLE WEED	Nt P-Forb	-5	x	-	-	-	-
LYSIMACHIA	MONEYWORT	Ad P-Forb	-4	-	-	-	-	-
NUMMULARIA								
Lysimachia thyrsiflora	TUFTED LOOSESTRIFE	Nt P-Forb	-5	-	-	-	-	-
LYTHRUM SALICARIA	PURPLE LOOSESTRIFE	Ad P-Forb	-5	-	-	-	-	-
Mentha sp.	MINT	Forb	-	-	-	-	-	-
Mitella diphylla	BISHOP'S CAP	Nt P-Forb	2	-	-	-	-	x
Onoclea sensibilis	SENSITIVE FERN	Nt Fern	-3	-	-	-	-	-
Osmorhiza longistylis	SMOOTH SWEET CICELY	Nt P-Forb	4	-	x	x	-	x
Osmunda regalis	ROYAL FERN	Nt Fern	-5	-	-	-	-	-
Panicum capillare	WITCH GRASS	Nt A-Grass	0	-	-	-	-	-
Parthenocissus quinquefolia	VIRGINIA CREEPER	Nt W-Vine	1	-	x	-	-	-
Phalaris arundinacea	REED CANARY GRASS	Nt P-Grass	-4	-	-	-	-	-
Phytolacca americana	POKEWEED	Nt P-Forb	1	-	x	-	-	-
Pilea pumila	CLEARWEED	Nt A-Forb	-3	x	-	-	-	-
POA PRATENSIS	KENTUCKY BLUEGRASS	Ad P-Grass	1	-	-	-	-	-
Podophyllum peltatum	MAY APPLE	Nt P-Forb	3	-	-	-	x	-
Polygonatum pubescens	DOWNY SOLOMON SEAL	Nt P-Forb	5	-	-	-	-	x
Polygonum hydropiper	WATER PEPPER	Nt A-Forb	-5	-	-	-	-	-
POLYGONUM PERSICARIA	LADY'S THUMB	Ad A-Forb	-3	x	-	-	-	-
Polygonum virginianum	JUMPSEED	Nt P-Forb	0	-	x	-	x	x
Polystichum acrostichoides	CHRISTMAS FERN	Nt Fern	5	-	-	x	x	x

Appendix 8. (cont.).

				Hillsdale County EO .008				
Scientific Name	Common Name	Life Form	W	inundated shrub swamp	mesic southern forest (A)	mesic southern forest (B)	mesic southern forest (C)	southern floodplain forest
Populus deltoides	COTTONWOOD	Nt Tree	-1	-	-	-	-	-
Prenanthes alba	WHITE LETTUCE	Nt P-Forb	3	-	-	-	x	-
Prunus nigra	CANADA PLUM	Nt Tree	4	-	-	x	-	-
Prunus serotina	WILD BLACK CHERRY	Nt Tree	3	-	x	-	x	x
Prunus virginiana	CHOKE CHERRY	Nt Shrub	1	-	-	x	-	-
Quercus alba	WHITE OAK	Nt Tree	3	-	x	-	-	-
Quercus bicolor	SWAMP WHITE OAK	Nt Tree	-4	-	x	x	-	-
Quercus muehlenbergii	CHINQUAPIN OAK	Nt Tree	5	-	x	-	x	-
Quercus rubra	RED OAK	Nt Tree	3	-	-	x	x	x
Ribes americanum	WILD BLACK CURRANT	Nt Shrub	-3	-	-	-	-	-
Ribes cynosbati	PRICKLY or WILD GOOSEBERRY	Nt Shrub	5	-	-	-	x	x
Ribes sp.	CURRANT/GOOSEBERRY	Nt Shrub	-	-	x	-	-	-
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	3	-	-	x	-	-
Rosa palustris	SWAMP ROSE	Nt Shrub	-5	-	-	-	-	-
Rubus sp.	BERRY	(blank)	-	-	-	x	-	-
Rudbeckia laciniata	CUT LEAVED CONEFLOWER	Nt P-Forb	-4	-	-	-	-	x
Rumex orbiculatus	GREAT WATER DOCK	Nt P-Forb	-5	-	-	-	-	-
Salix discolor	PUSSY WILLOW	Nt Shrub	-3	-	-	-	-	-
Salix nigra	BLACK WILLOW	Nt Tree	-5	x	-	-	-	-
Salix petiolaris	SLENDER WILLOW	Nt Shrub	-4	-	-	-	-	-
Sambucus canadensis	ELDERBERRY	Nt Shrub	-2	-	-	-	-	-
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1	-	x	-	-	x
Sanicula marilandica	BLACK SNAKEROOT	Nt P-Forb	3	-	-	x	-	-
Scirpus atrovirens	BULRUSH	Nt P-Sedge	-5	-	-	-	-	-
Scirpus cyperinus	WOOL GRASS	Nt P-Sedge	-5	-	-	-	-	-
Senecio aureus	GOLDEN RAGWORT	Nt P-Forb	-3	-	-	-	-	x
Setaria sp.	FOXTAIL	Ad A-Grass	-	-	-	-	-	-
Sium suave	WATER PARSNIP	Nt P-Forb	-5	x	-	-	-	-
Smilacina racemosa	FALSE SPIKENARD	Nt P-Forb	3	-	-	-	x	x
SOLANUM CAROLINENSE	HORSE NETTLE	Ad P-Forb	4	x	-	-	-	-

Appendix 8. (cont.).

				Hillsdale County EO .008				
Scientific Name	Common Name	Life Form	W	inundated shrub swamp	mesic southern forest (A)	mesic southern forest (B)	mesic southern forest (C)	southern floodplain forest
SOLANUM DULCAMARA	BITTERSWEET NIGHTSHADE	Ad P-Forb	0	-	-	-	-	-
Solanum ptycanthum	BLACK NIGHTSHADE	Nt A-Forb	5	x	-	-	-	-
Solidago caesia	BLUE STEMMED GOLDENROD	Nt P-Forb	3	-	-	x	x	-
Solidago gigantea	LATE GOLDENROD	Nt P-Forb	-3	-	-	-	-	-
Solidago rugosa	ROUGH GOLDENROD	Nt P-Forb	-1	-	-	-	-	-
Spiraea alba	MEADOWSWEET	Nt Shrub	-4	-	-	-	-	-
Thalictrum dioicum	EARLY MEADOW RUE	Nt P-Forb	2	-	x	-	-	-
Thelypteris noveboracensis	NEW YORK FERN	Nt Fern	-1	-	-	x	-	-
Thelypteris palustris	MARSH FERN	Nt Fern	-4	-	-	-	-	-
Tilia americana	BASSWOOD	Nt Tree	3	-	-	-	x	x
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	-	-	-	-	x
Trifolium sp.	CLOVER	Ad A-Forb	-	-	-	-	-	-
Trillium grandiflorum	COMMON TRILLIUM	Nt P-Forb	5	-	-	-	-	x
TYPHA ANGUSTIFOLIA	NARROW LEAVED CATTAIL	Ad P-Forb	-5	-	-	-	-	-
Typha latifolia	BROAD LEAVED CATTAIL	Nt P-Forb	-5	-	-	-	-	-
Ulmus americana	AMERICAN ELM	Nt Tree	-2	x	x	x	-	-
Ulmus rubra	SLIPPERY ELM	Nt Tree	0	-	-	-	-	x
Urtica dioica	NETTLE	Nt P-Forb	-1	-	-	-	-	-
Verbena hastata	BLUE VERVAIN	Nt P-Forb	-4	-	-	-	-	-
Viburnum acerifolium	MAPLE LEAVED ARROW WOOD	Nt Shrub	5	-	-	-	x	-
Viburnum cassinoides	NORTHERN HAW	Nt Shrub	-3	-	-	-	-	x
Viola pubescens	YELLOW VIOLET	Nt P-Forb	4	-	-	-	x	x
Viola sp.	VIOLET	Forb	-	-	x	x	-	x
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	x	-	-	-	-
Zanthoxylum americanum	PRICKLY ASH	Nt Shrub	5	-	-	x	x	x
Total number of species observed				17	32	32	33	43
Wetness Index				-2.6	1.7	2.1	3.5	1.6

Appendix 9. Plant species observed at Hillsdale County EO .005. "x" indicates the species occurred within the site and "-" indicates the species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "W" is the Coefficient of Wetness and varies from 5 to -5, with positive values indicating that the species most commonly occurs in uplands and negative values indicating an affinity for wetlands (Herman et al 2001, Reed 1988, Wilhelm 1989). A Wetness Index was calculated for each community as the mean of the species wetness coefficients.

				Hillsdale County EO .005				
Scientific Name	Common Name	Life Form	W	emergent marsh (A)	emergent marsh (B)	mesic southern forest (A)	mesic southern forest (B)	dry-mesic southern forest
Acer saccharum	SUGAR MAPLE	Nt Tree	3	-	-	x	x	x
Actaea pachypoda	DOLL'S EYES	Nt P-Forb	5	-	-	x	x	-
Agrimonia gryposepala	TALL AGRIMONY	Nt P-Forb	2	-	-	-	-	x
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	-	-	-	-	x
Angelica atropurpurea	ANGELICA	Nt P-Forb	-5	-	-	-	-	-
ARCTIUM MINUS	COMMON BURDOCK	Ad B-Forb	5	-	-	-	-	x
Asarum canadense	WILD GINGER	Nt P-Forb	5	-	-	x	-	-
Asclepias incarnata	SWAMP MILKWEED	Nt P-Forb	-5	x	-	-	-	-
Aster firmus	SMOOTH SWAMP ASTER	Nt P-Forb	-5	-	-	-	-	-
Aster lanceolatus	EASTERN LINED ASTER	Nt P-Forb	-3	-	-	x	-	-
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	-	-	-	x	-
Aster oolentangiensis	PRAIRIE HEART LEAVED ASTER	Nt P-Forb	5	-	-	-	x	-
Aster sagittifolius	ARROW LEAVED ASTER	Nt P-Forb	5	-	-	x	x	x
Boehmeria cylindrica	FALSE NETTLE	Nt P-Forb	-5	x	-	-	x	-
Calamagrostis canadensis	BLUE JOINT GRASS	Nt P-Grass	-5	-	-	-	-	-
Campanula aparinoides	MARSH BELLFLOWER	Nt P-Forb	-5	-	-	-	-	-
Carex hystericina	SEDGE	Nt P-Sedge	-5	x	x	-	x	-
Carex pensylvanica	SEDGE	Nt P-Sedge	5	-	-	x	x	x
Carex sp.	SEDGE	Nt P-Sedge	-	-	-	x	x	-
Carex stricta	SEDGE	Nt P-Sedge	-5	-	x	-	-	-
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	-	-	x	-	-
Carya glabra	PIGNUT HICKORY	Nt Tree	3	-	-	x	x	x
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	-	-	x	x	x
Ceratophyllum demersum	COONTAIL	Nt P-Forb	-5	x	-	-	-	-
Chelone glabra	TURTLEHEAD	Nt P-Forb	-5	-	-	-	-	-

Appendix 9. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .005				
				emergent marsh (A)	emergent marsh (B)	mesic southern forest (A)	mesic southern forest (B)	dry-mesic southern forest
Collinsonia canadensis	RICHWEED	Nt P-Forb	0	-	-	x	-	-
Cornus foemina	GRAY DOGWOOD	Nt Shrub	-2	-	x	-	x	-
Cornus stolonifera	RED OSIER DOGWOOD	Nt Shrub	-3	-	x	-	-	-
Crataegus sp.	HAWTHORNE	Nt Shrub	-	-	-	-	-	x
Cyperus sp.	SEDGE	Nt P-Forb	-	-	x	-	-	-
ECHINOCHLOA	BARNYARD GRASS	Ad A- Grass	-3	-	x	-	-	-
CRUSGALLI								
ELAEAGNUS	AUTUMN OLIVE	Ad Shrub	3	-	-	-	-	x
UMBELLATA								
Eleocharis erythropoda	SPIKE RUSH	Nt P-Sedge	-5	x	-	-	-	-
Elymus canadensis	CANADA WILD RYE	Nt P-Grass	1	-	-	-	-	-
Epilobium leptophyllum	FEN WILLOW HERB	Nt P-Forb	-5	-	-	-	-	-
Euonymus obovata	RUNNING STRAWBERRY BUSH	Nt Shrub	5	-	-	x	x	-
Eupatorium maculatum	JOE PYE WEED	Nt P-Forb	-5	-	x	-	-	-
Eupatorium perfoliatum	COMMON BONESET	Nt P-Forb	-4	x	-	-	-	-
Euthamia graminifolia	GRASS LEAVED GOLDENROD	Nt P-Forb	-2	-	x	-	-	-
Fagus grandifolia	AMERICAN BEECH	Nt Tree	3	-	-	x	x	-
Fragaria virginiana	WILD STRAWBERRY	Nt P-Forb	1	-	-	-	-	x
Fraxinus americana	WHITE ASH	Nt Tree	3	-	-	x	x	x
Fraxinus pennsylvanica	RED ASH	Nt Tree	-3	-	-	x	-	-
Galium circaeazans	WHITE WILD LICORICE	Nt P-Forb	4	-	-	-	x	-
Galium sp.	BEDSTRAW	Nt P-Forb	-	-	-	-	x	-
Gentiana andrewsii	BOTTLE GENTIAN	Nt P-Forb	-3	-	-	-	-	-
Geum canadense	WHITE AVENS	Nt P-Forb	0	-	-	x	-	-
Hamamelis virginiana	WITCH HAZEL	Nt Shrub	3	-	-	x	-	-
Hepatica acutiloba	SHARP LOBED HEPATICA	Nt P-Forb	5	-	-	-	x	-
Hypericum prolificum	SHRUBBY ST. JOHN'S WORT	Nt P-Forb	3	-	-	-	-	x
Hystrix patula	BOTTLEBRUSH GRASS	Nt P-Grass	5	-	-	x	x	-
Impatiens capensis	SPOTTED TOUCH ME NOT	Nt A-Forb	-3	-	-	-	x	-

Appendix 9. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .005				
				emergent marsh (A)	emergent marsh (B)	mesic southern forest (A)	mesic southern forest (B)	dry-mesic southern forest
Juncus effusus	SOFT STEMMED RUSH	Nt P-Forb	-5	x	-	-	-	-
Lemna minor	SMALL DUCKWEED	Nt A-Forb	-5	x	-	-	-	-
Lobelia siphilitica	GREAT BLUE LOBELIA	Nt P-Forb	-4	-	-	-	x	-
Lonicera canadensis	AMERICAN FLY HONEYSUCKLE	Nt Shrub	3	-	-	-	x	-
LONICERA MORROWII	MORROW HONEYSUCKLE	Ad Shrub	5	-	-	-	-	x
Lycopus uniflorus	NORTHERN BUGLE WEED	Nt P-Forb	-5	x	x	-	x	-
LYTHRUM SALICARIA	PURPLE LOOSESTRIFE	Ad P-Forb	-5	x	x	-	x	-
Myriophyllum sp.	WATER MILFOIL	Nt P-Forb	-5	x	x	-	-	-
Onoclea sensibilis	SENSITIVE FERN	Nt Fern	-3	-	x	-	x	-
Osmorhiza claytonii	HAIRY SWEET CICELY	Nt P-Forb	4	-	-	-	x	x
Ostrya virginiana	IRONWOOD; HOP HORNBEAM	Nt Tree	4	-	-	x	x	-
Pedicularis lanceolata	SWAMP BETONY	Nt P-Forb	-4	-	-	-	-	-
Physocarpus opulifolius	NINEBARK	Nt Shrub	-2	-	-	-	-	-
Pinus strobus	WHITE PINE	Nt Tree	3	-	-	-	-	x
Platanus occidentalis	SYCAMORE	Nt Tree	-3	-	-	x	-	-
Polygonum amphibium	WATER SMARTWEED	Nt P-Forb	-5	-	-	-	-	-
Polystichum acrostichoides	CHRISTMAS FERN	Nt Fern	5	-	-	x	x	-
Populus deltoides	COTTONWOOD	Nt Tree	-1	-	-	-	-	-
Prunus serotina	WILD BLACK CHERRY	Nt Tree	3	-	-	-	x	x
Pycnanthemum virginianum	COMMON MOUNTAIN MINT	Nt P-Forb	-4	-	-	-	-	-
Quercus alba	WHITE OAK	Nt Tree	3	-	-	-	x	x
Quercus muehlenbergii	CHINQUAPIN OAK	Nt Tree	5	-	-	x	x	x
Quercus rubra	RED OAK	Nt Tree	3	-	-	x	x	x
Ribes sp.	CURRENT/GOOSEBERRY	Nt Shrub	-	-	-	x	x	-
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	3	-	-	-	-	-
Rosa palustris	SWAMP ROSE	Nt Shrub	-5	-	-	-	-	-
Rubus sp.	BERRY	Nt Shrub	-	-	x	x	-	x
Salix sp.	WILLOW	Nt Shrub	-	x	x	-	-	-
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1	-	-	x	x	x

Appendix 9. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .005				
				emergent marsh (A)	emergent marsh (B)	mesic southern forest (A)	mesic southern forest (B)	dry-mesic southern forest
Schizachne purpurascens	FALSE MELIC	Nt P-Grass	2	-	-	-	x	-
Scirpus atrovirens	BULRUSH	Nt P-Sedge	-5	-	x	-	-	-
Scirpus cyperinus	WOOL GRASS	Nt P-Sedge	-5	-	x	-	x	-
Solidago altissima	TALL GOLDENROD	Nt P-Forb	3	x	x	-	-	-
Solidago caesia	BLUE STEMMED GOLDENROD	Nt P-Forb	3	-	-	x	x	-
Solidago canadensis	CANADA GOLDENROD	Nt P-Forb	3	-	-	-	-	-
Solidago flexicaulis	BROAD LEAVED GOLDENROD	Nt P-Forb	3	-	-	-	x	-
Solidago gigantea	LATE GOLDENROD	Nt P-Forb	-3	-	-	-	-	-
Tilia americana	BASSWOOD	Nt Tree	3	-	-	x	x	-
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	-	-	x	-	-
TYPHA ANGUSTIFOLIA	NARROW LEAVED CATTAIL	Ad P-Forb	-5	x	x	-	-	-
Ulmus americana	AMERICAN ELM	Nt Tree	-2	-	-	-	x	x
Urtica dioica	NETTLE	Nt P-Forb	-1	-	-	-	x	-
Vernonia missurica	MISSOURI IRONWEED	Nt P-Forb	-1	-	-	-	-	-
Viburnum acerifolium	MAPLE LEAVED ARROW WOOD	Nt Shrub	5	-	-	x	x	-
Viola sp.	VIOLET	Nt P-Forb	-	-	-	-	x	x
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	-	-	-	-	-
Zanthoxylum americanum	PRICKLY ASH	Nt Shrub	5	-	-	x	-	x
Zizia aurea	GOLDEN ALEXANDERS	Nt P-Forb	-1	-	-	-	-	-
Total number of species observed				14	18	31	43	25
Wetness Index				-4.3	-3.7	2.6	1.6	3.1

Appendix 10. Plant species observed at Branch County EO .012. "x" indicates the species occurred within the site and "-" indicates the species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "W" is the Coefficient of Wetness and varies from 5 to -5, with positive values indicating that the species most commonly occurs in uplands and negative values indicating an affinity for wetlands (Herman et al 2001, Reed 1988, Wilhelm 1989). A Wetness Index was calculated for each community as the mean of the species wetness coefficients.

Scientific Name	Common Name	Life Form	W	Branch County EO .012		
				southern floodplain forest	inundated shrub swamp (A)	inundated shrub swamp (B)
Acer saccharinum	SILVER MAPLE	Nt Tree	-3	x	x	x
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	x	-	-
Boehmeria cylindrica	FALSE NETTLE	Nt P-Forb	-5	-	x	-
Calamagrostis canadensis	BLUE JOINT GRASS	Nt P-Grass	-5	-	x	-
Carex lacustris	SEDGE	Nt P-Sedge	-5	-	x	-
Carex sp.	SEDGE	Sedge	-	x	x	-
Carex stricta	SEDGE	Nt P-Sedge	-5	-	x	-
Carya laciniosa	SHELLBARK HICKORY	Nt Tree	-3	x	-	-
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	x	-	-
Cephalanthus occidentalis	BUTTONBUSH	Nt Shrub	-5	x	x	x
Cornus amomum	SILKY DOGWOOD	Nt Shrub	-4	-	x	-
Cornus stolonifera	RED OSIER DOGWOOD	Nt Shrub	-3	-	x	-
Eupatorium maculatum	JOE PYE WEED	Nt P-Forb	-5	-	x	-
Fraxinus nigra	BLACK ASH	Nt Tree	-4	x	x	-
Fraxinus pennsylvanica	RED ASH	Nt Tree	-3	x	x	x
Glyceria striata	FOWL MANNA GRASS	Nt P-Grass	-5	x	-	-
Leersia oryzoides	CUT GRASS	Nt P-Grass	-5	x	-	-
Lindera benzoin	SPICEBUSH	Nt Shrub	-2	x	-	-
Lobelia cardinalis	CARDINAL FLOWER	Nt P-Forb	-5	x	-	-
Lycopus americanus	COMMON WATER HOREHOUND	Nt P-Forb	-5	x	-	-
Lycopus uniflorus	NORTHERN BUGLE WEED	Nt P-Forb	-5	-	x	-
LYSIMACHIA NUMMULARIA	MONEYWORT	Ad P-Forb	-4	-	x	-
Onoclea sensibilis	SENSITIVE FERN	Nt Fern	-3	x	x	-
Osmunda regalis	ROYAL FERN	Nt Fern	-5	-	x	-
Phalaris arundinacea	REED CANARY GRASS	Nt P-Grass	-4	-	x	-
Phytolacca americana	POKEWEED	Nt P-Forb	1	x	-	-

Appendix 10. (cont.).

Scientific Name	Common Name	Life Form	W	Branch County EO .012		
				southern floodplain forest	inundated shrub swamp (A)	inundated shrub swamp (B)
Pilea pumila	CLEARWEED	Nt A-Forb	-3	x	x	x
Polygonum sp.	-	Forb	-	-	x	-
Populus deltoides	COTTONWOOD	Nt Tree	-1	x	-	-
Populus tremuloides	QUAKING ASPEN	Nt Tree	0	x	-	-
Quercus bicolor	SWAMP WHITE OAK	Nt Tree	-4	x	x	x
Rosa palustris	SWAMP ROSE	Nt Shrub	-5	-	x	-
Rumex orbiculatus	GREAT WATER DOCK	Nt P-Forb	-5	x	x	x
Sagittaria latifolia	COMMON ARROWHEAD	Nt P-Forb	-5	x	x	-
Salix nigra	BLACK WILLOW	Nt Tree	-5	-	x	x
Saururus cernuus	LIZARD'S-TAIL	Nt P-Forb	-5	x	-	-
Scutellaria lateriflora	MAD DOG SKULLCAP	Nt P-Forb	-5	x	x	-
Smilax tamnoides	BRISTLY GREEN BRIER	Nt W-Vine	0	x	-	-
SOLANUM DULCAMARA	BITTERSWEET NIGHTSHADE	Ad P-Forb	0	-	x	x
Thelypteris palustris	MARSH FERN	Nt Fern	-4	-	x	-
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	x	-	-
Ulmus americana	AMERICAN ELM	Nt Tree	-2	x	x	-
Viola sp.	VIOLET	Forb	-	x	-	-
Total number of species observed				27	28	8
Wetness Index				-2.9	-4.1	-3.5

Appendix 11. Plant species observed at Williams County-Ohio. "x" indicates the species occurred within the site and "-" indicates the species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "W" is the Coefficient of Wetness and varies from 5 to -5, with positive values indicating that the species most commonly occurs in uplands and negative values indicating an affinity for wetlands (Herman et al 2001, Reed 1988, Wilhelm 1989). A Wetness Index was calculated for each community as the mean of the species wetness coefficients.

Williams County-Ohio								
Scientific Name	Common Name	Life Form	W	inundated shrub swamp	southern floodplain forest	mesic southern forest (A)	mesic southern forest (B)	southern swamp
Acer negundo	BOX ELDER	Nt Tree	-2	-	-	-	-	x
Acer nigrum	BLACK MAPLE	Nt Tree	3	-	-	-	-	x
Acer saccharinum	SILVER MAPLE	Nt Tree	-3	-	x	-	-	x
Acer saccharum	SUGAR MAPLE	Nt Tree	3	-	x	x	-	x
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	-	-	-	x	x
Allium sp.	-	Forb	-	-	-	-	x	-
Asarum canadense	WILD GINGER	Nt P-Forb	5	-	-	-	x	x
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	x	x	x	-	-
Aster sagittifolius	ARROW-LEAVED ASTER	Nt P-Forb	5	-	x	-	-	-
Aster sp.	ASTER	Forb	-	-	-	x	-	-
Bidens frondosus	COMMON BEGGAR TICKS	Nt A-Forb	-3	x	-	-	-	-
Boehmeria cylindrica	FALSE NETTLE	Nt P-Forb	-5	x	-	-	-	x
Carex hirtifolia	SEDGE	Nt P-Sedge	5	-	-	-	x	-
Carex pensylvanica	SEDGE	Nt P-Sedge	5	-	-	x	x	x
Carex plantaginea	SEDGE	Nt P-Sedge	5	-	-	-	x	x
Carex radiata	STRAIGHT-STYLED WOOD SEDGE	Nt P-Sedge	1	x	-	-	-	-
Carex sp.	SEDGE	Sedge	-	x	x	x	-	-
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	-	x	-	x	x
Carya cordiformis	BITTERNUT HICKORY	Nt Tree	0	-	-	-	x	-
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	-	x	x	-	-
Celtis occidentalis	HACKBERRY	Nt Tree	1	-	-	-	x	-
Cephalanthus occidentalis	BUTTONBUSH	Nt Shrub	-5	x	-	-	-	-
Cinna arundinacea	WOOD REEDGRASS	Nt P-Grass	-3	x	x	-	-	-
Cornus alternifolia	ALTERNATE LEAVED DOGWOOD	Nt Tree	5	-	-	-	-	x
Cryptotaenia canadensis	HONEWORT	Nt P-Forb	0	-	-	-	x	x

Appendix 11. (cont.).

Scientific Name	Common Name	Life Form	W	Williams County-Ohio				
				inundated shrub swamp	southern floodplain forest	mesic southern forest (A)	mesic southern forest (B)	southern swamp
Cypripedium candidum	WHITE LADY'S SLIPPER	Nt P-Forb	-5	-	-	-	x	-
Euonymus obovata	RUNNING STRAWBERRY BUSH	Nt Shrub	5	-	-	-	x	x
Eupatorium rugosum	WHITE SNAKEROOT	Nt P-Forb	3	-	x	-	-	-
Fagus grandifolia	AMERICAN BEECH	Nt Tree	3	-	-	x	-	-
Fraxinus americana	WHITE ASH	Nt Tree	3	-	x	x	x	-
Fraxinus nigra	BLACK ASH	Nt Tree	-4	-	x	-	-	-
Fraxinus pennsylvanica	RED ASH	Nt Tree	-3	x	-	-	-	x
Galium aparine	ANNUAL BEDSTRAW	Nt A-Forb	3	-	-	x	-	-
Galium circaezans	WHITE WILD LICORICE	Nt P-Forb	4	-	-	-	-	x
Geranium maculatum	WILD GERANIUM	Nt P-Forb	3	-	-	-	-	x
Geum canadense	WHITE AVENS	Nt P-Forb	0	x	-	x	-	-
GLECHOMA HEDERACEA	GROUND IVY	Ad P-Forb	3	-	-	-	x	-
Hepatica acutiloba	SHARP LOBED HEPATICA	Nt P-Forb	5	-	-	x	x	-
Hydrophyllum appendiculatum	GREAT WATERLEAF	Nt P-Forb	5	-	-	-	x	x
Hydrophyllum virginianum	VIRGINIA WATERLEAF	Nt P-Forb	-2	-	x	-	-	-
Hystrix patula	BOTTLEBRUSH GRASS	Nt P-Grass	5	-	-	-	x	x
Impatiens capensis	SPOTTED TOUCH ME NOT	Nt A-Forb	-3	x	-	-	-	-
Iris virginica	SOUTHERN BLUE FLAG	Nt P-Forb	-5	x	-	-	-	-
Juglans nigra	BLACK WALNUT	Nt Tree	3	-	x	x	-	-
Laportea canadensis	WOOD NETTLE	Nt P-Forb	-3	-	x	-	x	-
Leersia virginica	WHITE GRASS	Nt P-Grass	-3	-	x	-	-	x
Lindera benzoin	SPICEBUSH	Nt Shrub	-2	-	-	x	-	-
Lobelia siphilitica	GREAT BLUE LOBELIA	Nt P-Forb	-4	x	x	-	-	-
Osmorhiza claytonii	HAIRY SWEET CICELY	Nt P-Forb	4	-	-	-	x	-
Ostrya virginiana	IRONWOOD; HOP HORNBEAM	Nt Tree	4	-	-	x	x	-
Parthenocissus quinquefolia	VIRGINIA CREEPER	Nt W-Vine	1	-	-	-	-	x
Phlox pilosa	PRAIRIE PHLOX	Nt P-Forb	1	-	-	-	x	-
Pilea pumila	CLEARWEED	Nt A-Forb	-3	x	x	-	x	x
Polygonatum pubescens	DOWNY SOLOMON SEAL	Nt P-Forb	5	-	-	x	-	-

Appendix 11. (cont.).

Scientific Name	Common Name	Life Form	W	Williams County-Ohio				
				inundated shrub swamp	southern floodplain forest	mesic southern forest (A)	mesic southern forest (B)	southern swamp
Polygonum amphibium	WATER SMARTWEED	Nt P-Forb	-5	-	x	-	-	-
Polygonum sp.	-	Forb	-	x	-	-	-	-
Polygonum virginianum	JUMPSEED	Nt P-Forb	0	-	-	-	x	x
Polystichum acrostichoides	CHRISTMAS FERN	Nt Fern	5	-	-	x	-	-
Prunus serotina	WILD BLACK CHERRY	Nt Tree	3	-	-	x	x	-
Prunus virginiana	CHOKE CHERRY	Nt Shrub	1	-	-	-	-	x
Quercus alba	WHITE OAK	Nt Tree	3	-	-	x	-	x
Quercus bicolor	SWAMP WHITE OAK	Nt Tree	-4	x	-	-	-	-
Quercus macrocarpa	BUR OAK	Nt Tree	1	-	x	-	-	x
Quercus rubra	RED OAK	Nt Tree	3	-	-	x	x	-
Ribes cynosbati	PRICKLY or WILD GOOSEBERRY	Nt Shrub	5	-	-	x	x	x
Rosa palustris	SWAMP ROSE	Nt Shrub	-5	x	-	-	-	-
Rubus allegheniensis	COMMON BLACKBERRY	Nt Shrub	2	-	-	-	x	-
Rubus sp.	BERRY	-	-	-	-	x	-	-
Sambucus canadensis	ELDERBERRY	Nt Shrub	-2	x	-	-	-	x
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1	-	-	-	x	x
Sanicula marilandica	BLACK SNAKEROOT	Nt P-Forb	3	-	x	x	-	-
Scutellaria lateriflora	MAD DOG SKULLCAP	Nt P-Forb	-5	x	-	-	-	-
Smilax sp.	GREENBRIER	-	-	-	-	-	x	-
Smilax tamnoides	BRISTLY GREEN BRIER	Nt W-Vine	0	-	-	x	-	-
Solidago caesia	BLUE STEMMED GOLDENROD	Nt P-Forb	3	-	-	x	-	-
Solidago flexicaulis	BROAD LEAVED GOLDENROD	Nt P-Forb	3	-	-	-	x	-
Teucrium canadense	WOOD SAGE	Nt P-Forb	-2	x	-	-	-	-
Tilia americana	BASSWOOD	Nt Tree	3	-	-	x	x	x
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	x	x	-	x	x
Ulmus americana	AMERICAN ELM	Nt Tree	-2	x	x	-	x	x
Viburnum acerifolium	MAPLE LEAVED ARROW WOOD	Nt Shrub	5	-	-	x	-	-
Viburnum cassinoides	NORTHERN HAW	Nt Shrub	-3	-	-	-	-	x
Viola sp.	VIOLET	Forb	-	-	-	x	x	-
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	-	-	-	x	x

Appendix 11. (cont.).

				Williams County-Ohio				
				inundated	southern	mesic	mesic	
				shrub	floodplain	southern	southern	
				swamp	forest	forest	forest	southern
Scientific Name	Common Name	Life Form	W			(A)	(B)	swamp
Zanthoxylum americanum	PRICKLY ASH	Nt Shrub	5	-	x	x	-	-
Total number of species observed				21	23	28	35	33
Wetness Index				-2.9	-0.3	3.0	1.8	1.0

Appendix 12. Plant species observed at Hillsdale County EO .010. "x" indicates the species occurred within the site and "-" indicates the species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "W" is the Coefficient of Wetness and varies from 5 to -5, with positive values indicating that the species most commonly occurs in uplands and negative values indicating an affinity for wetlands (Herman et al 2001, Reed 1988, Wilhelm 1989). A Wetness Index was calculated for each community as the mean of the species wetness coefficients.

				Hillsdale County EO .010			
Scientific Name	Common Name	Life Form	W	pond (A)	pond (B)	southern floodplain forest (A)	southern floodplain forest (B)
Acer negundo	BOX ELDER	Nt Tree	-2	-	-	x	-
Acer nigrum	BLACK MAPLE	Nt Tree	3	-	-	-	-
Acer rubrum	RED MAPLE	Nt Tree	0	-	x	-	-
Acer saccharinum	SILVER MAPLE	Nt Tree	-3	-	-	x	x
Acer saccharum	SUGAR MAPLE	Nt Tree	3	-	-	-	-
Achillea millefolium	YARROW	Nt P-Forb	3	-	-	-	-
Aesculus glabra	OHIO BUCKEYE	Nt Tree	-1	-	-	-	x
Agrimonia gryposepala	TALL AGRIMONY	Nt P-Forb	2	-	-	-	x
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	-	-	x	-
Anemone canadensis	CANADA ANEMONE	Nt P-Forb	-3	x	-	-	x
Anemone virginiana	THIMBLEWEED	Nt P-Forb	5	-	-	-	-
Apocynum sibiricum	CLASPING DOGBANE	Nt P-Forb	-1	-	-	-	-
Aquilegia canadensis	WILD COLUMBINE	Nt P-Forb	1	-	-	-	-
Asarum canadense	WILD GINGER	Nt P-Forb	5	-	-	-	-
Asclepias incarnata	SWAMP MILKWEED	Nt P-Forb	-5	-	x	-	-
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	-	-	x	x
Aster pilosus	HAIRY ASTER	Nt P-Forb	2	-	-	-	-
Aster sagittifolius	ARROW LEAVED ASTER	Nt P-Forb	5	-	-	-	-
Bidens frondosus	COMMON BEGGAR TICKS	Nt A-Forb	-3	x	-	-	-
Boehmeria cylindrica	FALSE NETTLE	Nt P-Forb	-5	-	-	x	x
Botrychium sp.	GRAPE FERN/MOONWORT	Nt Fern	-	-	-	-	-
Calamagrostis canadensis	BLUE JOINT GRASS	Nt P-Grass	-5	x	-	-	-
Carex comosa	SEDGE	Nt P-Sedge	-5	-	-	-	-
Carex grayi	SEDGE	Nt P-Sedge	-4	-	-	-	x
Carex hystericina	SEDGE	Nt P-Sedge	-5	x	x	-	-
Carex lacustris	SEDGE	Nt P-Sedge	-5	x	x	-	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010			
				pond (A)	pond (B)	southern floodplain forest (A)	southern floodplain forest (B)
Carex pensylvanica	SEDGE	Nt P-Sedge	5	-	-	-	-
Carex radiata	STRAIGHT STYLED WOOD SEDGE	Nt P-Sedge	1	-	-	-	-
Carex rosea	CURLY STYLED WOOD SEDGE	Nt P-Sedge	5	-	-	-	-
Carex sp.	SEDGE	Sedge	-	-	x	x	-
Carex stipata	SEDGE	Nt P-Sedge	-5	-	x	-	-
Carex stricta	SEDGE	Nt P-Sedge	-5	x	-	-	-
Carex vulpinoidea	SEDGE	Nt P-Sedge	-5	-	-	-	-
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	-	-	-	x
Carya cordiformis	BITTERNUT HICKORY	Nt Tree	0	-	-	-	x
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	-	-	-	-
Celtis occidentalis	HACKBERRY	Nt Tree	1	-	-	-	x
Cephalanthus occidentalis	BUTTONBUSH	Nt Shrub	-5	x	-	-	x
Chelone glabra	TURTLEHEAD	Nt P-Forb	-5	-	x	-	-
CHRYSANTHEMUM	OX EYE DAISY	Ad P-Forb	5	-	-	-	-
LEUCANTHEMUM							
Cicuta bulbifera	WATER HEMLOCK	Nt P-Forb	-5	-	x	-	-
Cicuta maculata	WATER HEMLOCK	Nt B-Forb	-5	-	-	-	x
Cinna arundinacea	WOOD REEDGRASS	Nt P-Grass	-3	-	-	x	-
Circaea lutetiana	ENCHANTER'S NIGHTSHADE	Nt P-Forb	3	-	-	-	-
CIRSIUM ARVENSE	CANADIAN THISTLE	Ad P-Forb	3	-	-	-	-
CIRSIUM VULGARE	BULL THISTLE	Ad B-Forb	4	-	-	-	-
Clover	CLOVER	Forb	-	-	x	-	-
Cornus amomum	SILKY DOGWOOD	Nt Shrub	-4	-	x	-	-
Cornus foemina	GRAY DOGWOOD	Nt Shrub	-2	x	x	x	-
Crataegus sp.	HAWTHORNE	Tree	-	-	-	-	-
Cryptotaenia canadensis	HONEWORT	Nt P-Forb	0	-	-	-	x
DAUCUS CAROTA	QUEEN ANNE'S LACE	Ad B-Forb	5	-	-	-	-
DIANTHUS ARMERIA	DEPTFORD PINK	Ad A-Forb	5	-	-	-	-
Dioscorea villosa	WILD YAM	Nt P-Forb	1	-	-	-	-
DIPSACUS LACINIATUS	CUT LEAVED TEASEL	Ad B-Forb	5	-	-	-	-
Dryopteris carthusiana	SPINULOSE WOODFERN	Nt Fern	-2	-	-	-	x

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010			
				pond (A)	pond (B)	southern floodplain forest (A)	southern floodplain forest (B)
ELAEAGNUS ANGUSTIFOLIA	RUSSIAN OLIVE	Ad Tree	4	x	-	-	-
ELAEAGNUS UMBELLATA	AUTUMN OLIVE	Ad Shrub	3	-	x	-	-
Elymus virginicus	VIRGINIA WILD RYE	Nt P-Grass	-2	-	-	x	-
Equisetum arvense	COMMON HORSETAIL	Nt Fern Ally	0	-	-	-	x
Erigeron strigosus	DAISY FLEABANE	Nt P-Forb	1	-	-	-	-
Euonymus obovata	RUNNING STRAWBERRY BUSH	Nt Shrub	5	-	-	-	-
Eupatorium maculatum	JOE PYE WEED	Nt P-Forb	-5	x	-	x	-
Euthamia graminifolia	GRASS LEAVED GOLDENROD	Nt P-Forb	-2	-	-	-	-
Exotic Pine	PINE	Ad Tree	-	-	x	-	-
Fagus grandifolia	AMERICAN BEECH	Nt Tree	3	-	-	-	-
Festuca sp.	FESCUE	Grass	-	-	x	-	-
Fragaria virginiana	WILD STRAWBERRY	Nt P-Forb	1	-	-	-	-
Fraxinus americana	WHITE ASH	Nt Tree	3	-	-	-	-
Fraxinus nigra	BLACK ASH	Nt Tree	-4	-	-	-	-
Fraxinus pennsylvanica	RED ASH	Nt Tree	-3	-	-	x	x
Galium asprellum	ROUGH BEDSTRAW	Nt P-Forb	-5	x	-	-	-
Galium circaezans	WHITE WILD LICORICE	Nt P-Forb	4	-	-	-	-
Galium concinnum	SHINING BEDSTRAW	Nt P-Forb	3	-	-	-	-
Galium obtusum	WILD MADDER	Nt P-Forb	-5	-	-	-	-
Geranium maculatum	WILD GERANIUM	Nt P-Forb	3	-	-	x	-
Geum canadense	WHITE AVENS	Nt P-Forb	0	-	-	-	-
Glyceria striata	FOWL MANNA GRASS	Nt P-Grass	-5	-	-	x	x
HIERACIUM CAESPITOSUM	KING DEVIL	Ad P-Forb	5	-	-	-	-
Impatiens capensis	SPOTTED TOUCH ME NOT	Nt A-Forb	-3	-	x	-	-
Iris virginica	SOUTHERN BLUE FLAG	Nt P-Forb	-5	-	-	x	x
Juglans cinerea	BUTTERNUT	Nt Tree	2	-	-	-	-
Juglans nigra	BLACK WALNUT	Nt Tree	3	-	-	-	-
Juncus effusus	SOFT STEMMED RUSH	Nt P-Forb	-5	-	x	-	-
Juniperus virginiana	RED CEDAR	Nt Tree	3	-	-	-	-
Laportea canadensis	WOOD NETTLE	Nt P-Forb	-3	-	-	x	x

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010			
				pond (A)	pond (B)	southern floodplain forest (A)	southern floodplain forest (B)
Leersia oryzoides	CUT GRASS	Nt P-Grass	-5	-	-	-	-
Lemna minor	SMALL DUCKWEED	Nt A-Forb	-5	x	-	-	-
Lobelia siphilitica	GREAT BLUE LOBELIA	Nt P-Forb	-4	-	-	x	-
Lycopus americanus	COMMON WATER HOREHOUND	Nt P-Forb	-5	-	x	-	-
Lycopus uniflorus	NORTHERN BUGLE WEED	Nt P-Forb	-5	x	-	-	-
Lysimachia thyrsiflora	TUFTED LOOSESTRIFE	Nt P-Forb	-5	x	-	-	-
LYTHRUM SALICARIA	PURPLE LOOSESTRIFE	Ad P-Forb	-5	x	-	-	-
MELILOTUS ALBA	WHITE SWEET CLOVER	Ad B-Forb	3	-	-	-	-
MELILOTUS OFFICINALIS	YELLOW SWEET CLOVER	Ad B-Forb	3	-	x	-	-
Monarda fistulosa	WILD BERGAMOT	Nt P-Forb	3	-	-	-	-
MORUS ALBA	WHITE MULBERRY	Ad Tree	0	-	-	x	-
Onoclea sensibilis	SENSITIVE FERN	Nt Fern	-3	-	-	-	x
Oryzopsis asperifolia	ROUGH LEAVED RICE GRASS	Nt P-Grass	5	-	-	-	-
Osmorhiza claytonii	HAIRY SWEET CICELY	Nt P-Forb	4	-	-	-	-
Osmorhiza longistylis	SMOOTH SWEET CICELY	Nt P-Forb	4	-	-	-	-
Ostrya virginiana	IRONWOOD; HOP HORNBEAM	Nt Tree	4	-	-	-	-
Parthenocissus quinquefolia	VIRGINIA CREEPER	Nt W-Vine	1	-	-	-	x
Phalaris arundinacea	REED CANARY GRASS	Nt P-Grass	-4	-	-	-	-
PHLEUM PRATENSE	TIMOTHY	Ad P-Grass	3	-	-	-	-
Pilea pumila	CLEARWEED	Nt A-Forb	-3	-	-	x	x
POA PRATENSIS	KENTUCKY BLUEGRASS	Ad P-Grass	1	-	x	-	-
Podophyllum peltatum	MAY APPLE	Nt P-Forb	3	-	-	-	-
Polygonatum pubescens	DOWNY SOLOMON SEAL	Nt P-Forb	5	-	-	-	-
Polygonum hydropiper	WATER PEPPER	Nt A-Forb	-5	-	-	-	-
Polygonum virginianum	JUMPSEED	Nt P-Forb	0	-	-	-	-
Populus deltoides	COTTONWOOD	Nt Tree	-1	-	-	x	-
POTAMOGETON CRISPUS	PONDWEED	Ad P-Forb	-5	-	x	-	-
Potamogeton natans	PONDWEED	Nt P-Forb	-5	-	x	-	-
POTENTILLA RECTA	ROUGH FRUITED CINQUEFOIL	Ad P-Forb	5	-	-	-	-
Potentilla simplex	OLD FIELD CINQUEFOIL	Nt P-Forb	4	-	-	-	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010			
				pond (A)	pond (B)	southern floodplain forest (A)	southern floodplain forest (B)
Prenanthes alba	WHITE LETTUCE	Nt P-Forb	3	-	-	-	-
Prunus americana	AMERICAN WILD PLUM	Nt Tree	5	-	-	-	-
Prunus serotina	WILD BLACK CHERRY	Nt Tree	3	-	-	-	-
Prunus virginiana	CHOKE CHERRY	Nt Shrub	1	-	-	-	-
Quercus alba	WHITE OAK	Nt Tree	3	-	-	-	-
Quercus muehlenbergii	CHINQUAPIN OAK	Nt Tree	5	-	-	-	-
Quercus rubra	RED OAK	Nt Tree	3	-	-	-	x
Ranunculus flabellaris	YELLOW WATER CROWFOOT	Nt P-Forb	-5	-	-	-	-
Ranunculus hispidus	SWAMP BUTTERCUP	Nt P-Forb	0	-	-	-	x
Rhus typhina	STAGHORN SUMAC	Nt Tree	5	-	x	-	-
Ribes americanum	WILD BLACK CURRANT	Nt Shrub	-3	-	-	x	x
Ribes cynosbati	PRICKLY or WILD GOOSEBERRY	Nt Shrub	5	-	-	-	-
Rosa carolina	PASTURE ROSE	Nt Shrub	4	-	-	-	-
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	3	x	x	-	-
Rosa palustris	SWAMP ROSE	Nt Shrub	-5	x	-	-	-
Rubus allegheniensis	COMMON BLACKBERRY	Nt Shrub	2	-	-	-	-
Rubus strigosus	WILD RED RASPBERRY	Nt Shrub	-2	-	-	-	-
RUMEX CRISPUS	CURLY DOCK	Ad P-Forb	-1	-	-	-	-
Rumex orbiculatus	GREAT WATER DOCK	Nt P-Forb	-5	-	x	-	-
Rumex verticillatus	WATER DOCK	Nt P-Forb	-5	-	-	-	x
Salix discolor	PUSSY WILLOW	Nt Shrub	-3	x	x	-	-
Salix nigra	BLACK WILLOW	Nt Tree	-5	x	x	-	-
Sambucus canadensis	ELDERBERRY	Nt Shrub	-2	-	-	-	-
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1	-	-	x	x
Sassafras albidum	SASSAFRAS	Nt Tree	3	-	-	-	-
Scutellaria lateriflora	MAD DOG SKULLCAP	Nt P-Forb	-5	-	-	x	-
Sisyrinchium angustifolium	STOUT BLUE EYED GRASS	Nt P-Forb	-2	-	-	-	-
Smilacina racemosa	FALSE SPIKENARD	Nt P-Forb	3	-	-	-	-
SOLANUM DULCAMARA	BITTERSWEET NIGHTSHADE	Ad P-Forb	0	-	-	-	-
Solidago altissima	TALL GOLDENROD	Nt P-Forb	3	-	x	-	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010			
				pond (A)	pond (B)	southern floodplain forest (A)	southern floodplain forest (B)
Solidago caesia	BLUE STEMMED GOLDENROD	Nt P-Forb	3	-	-	-	-
Solidago canadensis	CANADA GOLDENROD	Nt P-Forb	3	x	-	-	-
Solidago flexicaulis	BROAD LEAVED GOLDENROD	Nt P-Forb	3	-	-	-	-
Solidago gigantea	LATE GOLDENROD	Nt P-Forb	-3	x	-	x	-
Solidago juncea	EARLY GOLDENROD	Nt P-Forb	5	-	-	-	-
Spiraea alba	MEADOWSWEET	Nt Shrub	-4	x	-	-	-
Symplocarpus foetidus	SKUNK CABBAGE	Nt P-Forb	-5	-	-	-	-
Teucrium canadense	WOOD SAGE	Nt P-Forb	-2	-	-	x	-
Thalictrum dasycarpum	PURPLE MEADOW RUE	Nt P-Forb	-2	x	-	x	-
Thelypteris palustris	MARSH FERN	Nt Fern	-4	-	-	-	-
Tilia americana	BASSWOOD	Nt Tree	3	-	-	-	-
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	-	-	x	x
TRIFOLIUM HYBRIDUM	ALSIKE CLOVER	Ad P-Forb	1	-	x	-	-
TRIFOLIUM PRATENSE	RED CLOVER	Ad P-Forb	2	-	-	-	-
Triosteum perfoliatum	HORSE GENTIAN	Nt P-Forb	5	-	-	-	-
Ulmus americana	AMERICAN ELM	Nt Tree	-2	-	-	x	x
Utricularia sp.	BLADDERWORT	Nt Forb	-5	-	-	-	-
Viburnum cassinoides	NORTHERN HAW	Nt Shrub	-3	-	-	-	-
VIBURNUM LANTANA	WAYFARING TREE	Ad Shrub	5	-	-	x	-
Viburnum lentago	NANNYBERRY	Nt Shrub	-1	-	-	-	-
Viola sp.	VIOLET	Forb	-	x	-	-	-
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	-	-	x	x
Zanthoxylum americanum	PRICKLY ASH	Nt Shrub	5	-	-	-	x
Total number of species observed				24	28	29	31
Wetness Index				-3.3	-2.2	-2.2	-1.7

Appendix 12. (cont.).

				Hillsdale County EO .010				
Scientific Name	Common Name	Life Form	W	inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	inundated shrub swamp (E)
Acer negundo	BOX ELDER	Nt Tree	-2	-	-	-	-	-
Acer nigrum	BLACK MAPLE	Nt Tree	3	-	-	-	x	-
Acer rubrum	RED MAPLE	Nt Tree	0	-	-	-	-	-
Acer saccharinum	SILVER MAPLE	Nt Tree	-3	x	-	x	-	-
Acer saccharum	SUGAR MAPLE	Nt Tree	3	x	-	-	-	-
Achillea millefolium	YARROW	Nt P-Forb	3	-	-	-	-	-
Aesculus glabra	OHIO BUCKEYE	Nt Tree	-1	-	x	-	-	-
Agrimonia gryposepala	TALL AGRIMONY	Nt P-Forb	2	-	-	-	-	-
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	-	-	-	-	-
Anemone canadensis	CANADA ANEMONE	Nt P-Forb	-3	-	-	-	-	-
Anemone virginiana	THIMBLEWEED	Nt P-Forb	5	-	-	-	-	-
Apocynum sibiricum	CLASPING DOGBANE	Nt P-Forb	-1	-	-	-	-	-
Aquilegia canadensis	WILD COLUMBINE	Nt P-Forb	1	-	-	-	-	-
Asarum canadense	WILD GINGER	Nt P-Forb	5	x	-	-	-	-
Asclepias incarnata	SWAMP MILKWEED	Nt P-Forb	-5	-	-	-	-	-
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	-	-	-	-	-
Aster pilosus	HAIRY ASTER	Nt P-Forb	2	-	-	-	-	-
Aster sagittifolius	ARROW LEAVED ASTER	Nt P-Forb	5	-	-	-	-	-
Bidens frondosus	COMMON BEGGAR TICKS	Nt A-Forb	-3	-	-	-	-	-
Boehmeria cylindrica	FALSE NETTLE	Nt P-Forb	-5	x	x	x	x	x
Botrychium sp.	GRAPE FERN/MOONWORT	Nt Fern	-	-	-	-	-	-
Calamagrostis canadensis	BLUE JOINT GRASS	Nt P-Grass	-5	-	-	-	-	-
Carex comosa	SEDGE	Nt P-Sedge	-5	-	x	-	x	-
Carex grayi	SEDGE	Nt P-Sedge	-4	-	-	-	-	-
Carex hystericina	SEDGE	Nt P-Sedge	-5	-	-	-	-	-
Carex lacustris	SEDGE	Nt P-Sedge	-5	-	x	-	x	-
Carex pensylvanica	SEDGE	Nt P-Sedge	5	-	-	-	-	-
Carex radiata	STRAIGHT STYLED WOOD SEDGE	Nt P-Sedge	1	-	-	-	-	x

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010				
				inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	inundated shrub swamp (E)
Carex rosea	CURLY STYLED WOOD SEDGE	Nt P-Sedge	5	-	-	-	-	-
Carex sp.	SEDGE	Sedge	-	x	-	x	-	-
Carex stipata	SEDGE	Nt P-Sedge	-5	-	-	-	-	-
Carex stricta	SEDGE	Nt P-Sedge	-5	-	-	-	-	-
Carex vulpinoidea	SEDGE	Nt P-Sedge	-5	-	x	-	x	-
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	-	-	-	-	-
Carya cordiformis	BITTERNUT HICKORY	Nt Tree	0	x	-	-	-	-
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	-	x	-	-	-
Celtis occidentalis	HACKBERRY	Nt Tree	1	-	-	-	-	-
Cephalanthus occidentalis	BUTTONBUSH	Nt Shrub	-5	x	x	x	x	x
Chelone glabra	TURTLEHEAD	Nt P-Forb	-5	-	-	-	-	-
CHRYSANthemum	OX EYE DAISY	Ad P-Forb	5	-	-	-	-	-
LEUCANTHEMUM								
Cicuta bulbifera	WATER HEMLOCK	Nt P-Forb	-5	-	x	-	-	-
Cicuta maculata	WATER HEMLOCK	Nt B-Forb	-5	-	-	-	-	-
Cinna arundinacea	WOOD REEDGRASS	Nt P-Grass	-3	x	-	-	-	-
Circaea lutetiana	ENCHANTER'S NIGHTSHADE	Nt P-Forb	3	-	-	-	-	-
CIRSium arvense	CANADIAN THISTLE	Ad P-Forb	3	-	-	-	x	-
CIRSium vulgare	BULL THISTLE	Ad B-Forb	4	-	-	-	-	-
Clover	CLOVER	Forb	-	-	-	-	-	-
Cornus amomum	SILKY DOGWOOD	Nt Shrub	-4	-	-	-	-	x
Cornus foemina	GRAY DOGWOOD	Nt Shrub	-2	-	-	-	x	-
Crataegus sp.	HAWTHORNE	Tree	-	-	-	-	x	-
Cryptotaenia canadensis	HONEWORT	Nt P-Forb	0	-	-	-	-	-
DAUCUS CAROTA	QUEEN ANNE'S LACE	Ad B-Forb	5	-	-	-	-	-
DIANTHUS ARMERIA	DEPTFORD PINK	Ad A-Forb	5	-	-	-	-	-
Dioscorea villosa	WILD YAM	Nt P-Forb	1	-	-	-	-	x
DIPSACUS LACINIATUS	CUT LEAVED TEASEL	Ad B-Forb	5	-	-	-	-	-
Dryopteris carthusiana	SPINULOSE WOODFERN	Nt Fern	-2	-	-	-	-	-
ELAEAGNUS ANGUSTIFOLIA	RUSSIAN OLIVE	Ad Tree	4	-	-	-	-	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010				
				inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	inundated shrub swamp (E)
ELAEAGNUS UMBELLATA	AUTUMN OLIVE	Ad Shrub	3	-	-	-	x	-
Elymus virginicus	VIRGINIA WILD RYE	Nt P-Grass	-2	-	-	-	-	-
Equisetum arvense	COMMON HORSETAIL	Nt Fern	0	-	-	-	-	-
Erigeron strigosus	DAISY FLEABANE	Nt P-Forb	1	-	-	-	-	-
Euonymus obovata	RUNNING STRAWBERRY BUSH	Nt Shrub	5	-	-	-	-	-
Eupatorium maculatum	JOE PYE WEED	Nt P-Forb	-5	-	-	-	-	-
Euthamia graminifolia	GRASS LEAVED GOLDENROD	Nt P-Forb	-2	-	-	-	-	-
Exotic Pine	PINE	Ad Tree	-	-	-	-	-	-
Fagus grandifolia	AMERICAN BEECH	Nt Tree	3	-	-	-	-	-
Festuca sp.	FESCUE	Grass	-	-	-	-	-	-
Fragaria virginiana	WILD STRAWBERRY	Nt P-Forb	1	x	-	-	-	-
Fraxinus americana	WHITE ASH	Nt Tree	3	-	-	-	-	-
Fraxinus nigra	BLACK ASH	Nt Tree	-4	-	-	-	x	-
Fraxinus pennsylvanica	RED ASH	Nt Tree	-3	x	x	x	x	-
Galium asprellum	ROUGH BEDSTRAW	Nt P-Forb	-5	-	-	-	-	-
Galium circaezans	WHITE WILD LICORICE	Nt P-Forb	4	-	-	-	-	-
Galium concinnum	SHINING BEDSTRAW	Nt P-Forb	3	-	-	-	x	-
Galium obtusum	WILD MADDER	Nt P-Forb	-5	-	-	x	x	-
Geranium maculatum	WILD GERANIUM	Nt P-Forb	3	-	-	-	-	-
Geum canadense	WHITE AVENS	Nt P-Forb	0	x	-	-	-	-
Glyceria striata	FOWL MANNA GRASS	Nt P-Grass	-5	x	x	-	-	x
HIERACIUM CAESPITOSUM	KING DEVIL	Ad P-Forb	5	-	-	-	-	-
Impatiens capensis	SPOTTED TOUCH ME NOT	Nt A-Forb	-3	-	x	-	x	x
Iris virginica	SOUTHERN BLUE FLAG	Nt P-Forb	-5	-	-	-	-	-
Juglans cinerea	BUTTERNUT	Nt Tree	2	-	x	-	-	-
Juglans nigra	BLACK WALNUT	Nt Tree	3	-	-	-	x	-
Juncus effusus	SOFT STEMMED RUSH	Nt P-Forb	-5	-	x	-	-	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010				
				inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	inundated shrub swamp (E)
Juniperus virginiana	RED CEDAR	Nt Tree	3	-	-	-	-	-
Laportea canadensis	WOOD NETTLE	Nt P-Forb	-3	x	-	-	-	-
Leersia oryzoides	CUT GRASS	Nt P-Grass	-5	-	x	-	x	-
Lemna minor	SMALL DUCKWEED	Nt A-Forb	-5	-	x	x	x	-
Lobelia siphilitica	GREAT BLUE LOBELIA	Nt P-Forb	-4	-	-	-	-	-
Lycopus americanus	COMMON WATER HOREHOUND	Nt P-Forb	-5	-	x	-	x	-
Lycopus uniflorus	NORTHERN BUGLE WEED	Nt P-Forb	-5	x	-	x	-	x
Lysimachia thyrsiflora	TUFTED LOOSESTRIFE	Nt P-Forb	-5	-	-	-	-	-
LYTHRUM SALICARIA	PURPLE LOOSESTRIFE	Ad P-Forb	-5	-	-	-	-	-
MELILOTUS ALBA	WHITE SWEET CLOVER	Ad B-Forb	3	-	-	-	-	-
MELILOTUS OFFICINALIS	YELLOW SWEET CLOVER	Ad B-Forb	3	-	-	-	-	-
Monarda fistulosa	WILD BERGAMOT	Nt P-Forb	3	-	-	-	-	-
MORUS ALBA	WHITE MULBERRY	Ad Tree	0	-	-	-	-	-
Onoclea sensibilis	SENSITIVE FERN	Nt Fern	-3	-	-	-	-	x
Oryzopsis asperifolia	ROUGH LEAVED RICE GRASS	Nt P-Grass	5	-	-	-	-	-
Osmorhiza claytonii	HAIRY SWEET CICELY	Nt P-Forb	4	-	-	-	-	-
Osmorhiza longistylis	SMOOTH SWEET CICELY	Nt P-Forb	4	-	-	-	-	-
Ostrya virginiana	IRONWOOD; HOP HORNBEAM	Nt Tree	4	-	-	-	-	-
Parthenocissus quinquefolia	VIRGINIA CREEPER	Nt W-Vine	1	-	-	-	-	-
Phalaris arundinacea	REED CANARY GRASS	Nt P-Grass	-4	-	x	-	x	-
PHLEUM PRATENSE	TIMOTHY	Ad P-Grass	3	-	-	-	-	-
Pilea pumila	CLEARWEED	Nt A-Forb	-3	x	-	x	-	x
POA PRATENSIS	KENTUCKY BLUEGRASS	Ad P-Grass	1	-	-	-	-	-
Podophyllum peltatum	MAY APPLE	Nt P-Forb	3	-	-	-	-	-
Polygonatum pubescens	DOWNY SOLOMON SEAL	Nt P-Forb	5	-	-	-	-	-
Polygonum hydropiper	WATER PEPPER	Nt A-Forb	-5	-	-	x	-	-
Polygonum virginianum	JUMPSEED	Nt P-Forb	0	-	-	x	-	-
Populus deltoides	COTTONWOOD	Nt Tree	-1	-	-	-	x	-
POTAMOGETON CRISPUS	PONDWEED	Ad P-Forb	-5	-	-	-	-	-

Appendix 12. (cont.).

					Hillsdale County EO .010				
					inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	inundated shrub swamp (E)
Scientific Name	Common Name	Life Form	W						
Potamogeton natans	PONDWEED	Nt P-Forb	-5		-	-	-	-	-
POTENTILLA RECTA	ROUGH FRUITED CINQUEFOIL	Ad P-Forb	5		-	-	-	-	-
Potentilla simplex	OLD FIELD CINQUEFOIL	Nt P-Forb	4		-	-	-	-	-
Prenanthes alba	WHITE LETTUCE	Nt P-Forb	3		-	-	-	-	-
Prunus americana	AMERICAN WILD PLUM	Nt Tree	5		-	-	-	x	x
Prunus serotina	WILD BLACK CHERRY	Nt Tree	3		-	-	-	-	-
Prunus virginiana	CHOKE CHERRY	Nt Shrub	1		-	-	-	-	-
Quercus alba	WHITE OAK	Nt Tree	3		-	x	-	-	-
Quercus muehlenbergii	CHINQUAPIN OAK	Nt Tree	5		-	-	-	-	-
Quercus rubra	RED OAK	Nt Tree	3		-	-	-	x	-
Ranunculus flabellaris	YELLOW WATER CROWFOOT	Nt P-Forb	-5		-	-	-	-	x
Ranunculus hispidus	SWAMP BUTTERCUP	Nt P-Forb	0		x	-	x	-	-
Rhus typhina	STAGHORN SUMAC	Nt Tree	5		-	-	-	-	-
Ribes americanum	WILD BLACK CURRANT	Nt Shrub	-3		x	-	-	-	x
Ribes cynosbati	PRICKLY or WILD GOOSEBERRY	Nt Shrub	5		-	-	-	-	-
Rosa carolina	PASTURE ROSE	Nt Shrub	4		-	-	-	-	-
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	3		-	x	-	x	-
Rosa palustris	SWAMP ROSE	Nt Shrub	-5		-	-	-	-	-
Rubus allegheniensis	COMMON BLACKBERRY	Nt Shrub	2		-	-	-	x	-
Rubus strigosus	WILD RED RASPBERRY	Nt Shrub	-2		-	-	-	-	-
RUMEX CRISPUS	CURLY DOCK	Ad P-Forb	-1		-	x	-	-	-
Rumex orbiculatus	GREAT WATER DOCK	Nt P-Forb	-5		x	-	-	-	-
Rumex verticillatus	WATER DOCK	Nt P-Forb	-5		-	x	-	x	x
Salix discolor	PUSSY WILLOW	Nt Shrub	-3		-	x	-	-	-
Salix nigra	BLACK WILLOW	Nt Tree	-5		x	x	x	x	x
Sambucus canadensis	ELDERBERRY	Nt Shrub	-2		-	-	-	x	x
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1		x	-	-	-	-
Sassafras albidum	SASSAFRAS	Nt Tree	3		-	-	-	-	-
Scutellaria lateriflora	MAD DOG SKULLCAP	Nt P-Forb	-5		x	-	-	-	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010				
				inundated shrub swamp (A)	inundated shrub swamp (B)	inundated shrub swamp (C)	inundated shrub swamp (D)	inundated shrub swamp (E)
Sisyrinchium angustifolium	STOUT BLUE EYED GRASS	Nt P-Forb	-2	-	-	-	-	-
Smilacina racemosa	FALSE SPIKENARD	Nt P-Forb	3	-	-	-	-	-
SOLANUM DULCAMARA	BITTERSWEET NIGHTSHADE	Ad P-Forb	0	x	-	-	x	-
Solidago altissima	TALL GOLDENROD	Nt P-Forb	3	-	-	-	-	-
Solidago caesia	BLUE STEMMED GOLDENROD	Nt P-Forb	3	-	-	-	-	-
Solidago canadensis	CANADA GOLDENROD	Nt P-Forb	3	-	-	-	-	-
Solidago flexicaulis	BROAD LEAVED GOLDENROD	Nt P-Forb	3	-	-	-	-	-
Solidago gigantea	LATE GOLDENROD	Nt P-Forb	-3	x	-	-	-	-
Solidago juncea	EARLY GOLDENROD	Nt P-Forb	5	-	-	-	-	-
Spiraea alba	MEADOWSWEET	Nt Shrub	-4	-	-	-	-	x
Symplocarpus foetidus	SKUNK CABBAGE	Nt P-Forb	-5	-	-	-	-	x
Teucrium canadense	WOOD SAGE	Nt P-Forb	-2	x	-	-	-	x
Thalictrum dasycarpum	PURPLE MEADOW RUE	Nt P-Forb	-2	-	-	-	-	-
Thelypteris palustris	MARSH FERN	Nt Fern	-4	-	x	-	-	-
Tilia americana	BASSWOOD	Nt Tree	3	-	-	-	-	-
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	x	-	-	-	-
TRIFOLIUM HYBRIDUM	ALSIKE CLOVER	Ad P-Forb	1	-	-	-	-	-
TRIFOLIUM PRATENSE	RED CLOVER	Ad P-Forb	2	-	-	-	-	-
Triosteum perfoliatum	HORSE GENTIAN	Nt P-Forb	5	-	-	-	-	-
Ulmus americana	AMERICAN ELM	Nt Tree	-2	x	x	-	x	x
Utricularia sp.	BLADDERWORT	Nt Forb	-5	-	-	-	x	-
Viburnum cassinoides	NORTHERN HAW	Nt Shrub	-3	-	x	-	-	-
VIBURNUM LANTANA	WAYFARING TREE	Ad Shrub	5	-	-	-	-	-
Viburnum lentago	NANNYBERRY	Nt Shrub	-1	-	x	-	-	x
Viola sp.	VIOLET	Forb	-	-	-	-	-	-
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	-	-	-	x	x
Zanthoxylum americanum	PRICKLY ASH	Nt Shrub	5	-	-	-	x	-
Total number of species observed				26	27	13	33	22
Wetness Index				-2.1	-2.9	-3.7	-1.6	-2.8

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010		
				mesic southern forest	pasture	old field
Acer negundo	BOX ELDER	Nt Tree	-2	-	-	-
Acer nigrum	BLACK MAPLE	Nt Tree	3	-	-	-
Acer rubrum	RED MAPLE	Nt Tree	0	-	-	x
Acer saccharinum	SILVER MAPLE	Nt Tree	-3	x	x	-
Acer saccharum	SUGAR MAPLE	Nt Tree	3	x	x	x
Achillea millefolium	YARROW	Nt P-Forb	3	-	x	-
Aesculus glabra	OHIO BUCKEYE	Nt Tree	-1	x	-	-
Agrimonia gryposepala	TALL AGRIMONY	Nt P-Forb	2	-	-	-
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	x	-	-
Anemone canadensis	CANADA ANEMONE	Nt P-Forb	-3	-	-	-
Anemone virginiana	THIMBLEWEED	Nt P-Forb	5	-	x	-
Apocynum sibiricum	CLASPING DOGBANE	Nt P-Forb	-1	-	-	x
Aquilegia canadensis	WILD COLUMBINE	Nt P-Forb	1	-	x	-
Asarum canadense	WILD GINGER	Nt P-Forb	5	-	-	-
Asclepias incarnata	SWAMP MILKWEED	Nt P-Forb	-5	-	-	-
Aster lateriflorus	SIDE FLOWERING ASTER	Nt P-Forb	-2	-	-	-
Aster pilosus	HAIRY ASTER	Nt P-Forb	2	-	x	-
Aster sagittifolius	ARROW LEAVED ASTER	Nt P-Forb	5	-	x	-
Bidens frondosus	COMMON BEGGAR TICKS	Nt A-Forb	-3	-	-	-
Boehmeria cylindrica	FALSE NETTLE	Nt P-Forb	-5	-	-	-
Botrychium sp.	GRAPE FERN/MOONWORT	Nt Fern	-	-	x	-
Calamagrostis canadensis	BLUE JOINT GRASS	Nt P-Grass	-5	-	-	-
Carex comosa	SEDGE	Nt P-Sedge	-5	-	-	-
Carex grayi	SEDGE	Nt P-Sedge	-4	-	-	-
Carex hystericina	SEDGE	Nt P-Sedge	-5	-	-	-
Carex lacustris	SEDGE	Nt P-Sedge	-5	-	-	-
Carex pensylvanica	SEDGE	Nt P-Sedge	5	x	-	-
Carex radiata	STRAIGHT STYLED WOOD SEDGE	Nt P-Sedge	1	-	-	-
Carex rosea	CURLY STYLED WOOD SEDGE	Nt P-Sedge	5	x	-	-
Carex sp.	SEDGE	Sedge	-	x	x	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010		
				mesic southern forest	pasture	old field
Carex stipata	SEDGE	Nt P-Sedge	-5	-	-	-
Carex stricta	SEDGE	Nt P-Sedge	-5	-	-	-
Carex vulpinoidea	SEDGE	Nt P-Sedge	-5	-	-	x
Carpinus caroliniana	BLUE BEECH	Nt Tree	0	x	-	-
Carya cordiformis	BITTERNUT HICKORY	Nt Tree	0	x	-	-
Carya ovata	SHAGBARK HICKORY	Nt Tree	3	x	-	-
Celtis occidentalis	HACKBERRY	Nt Tree	1	-	-	-
Cephalanthus occidentalis	BUTTONBUSH	Nt Shrub	-5	-	-	-
Chelone glabra	TURTLEHEAD	Nt P-Forb	-5	-	-	-
CHRYSANTHEMUM LEUCANTHEMUM	OX EYE DAISY	Ad P-Forb	5	-	-	x
Cicuta bulbifera	WATER HEMLOCK	Nt P-Forb	-5	-	-	-
Cicuta maculata	WATER HEMLOCK	Nt B-Forb	-5	-	-	-
Cinna arundinacea	WOOD REEDGRASS	Nt P-Grass	-3	-	-	-
Circaea lutetiana	ENCHANTER'S NIGHTSHADE	Nt P-Forb	3	x	-	-
CIRSIUM ARVENSE	CANADIAN THISTLE	Ad P-Forb	3	-	-	-
CIRSIUM VULGARE	BULL THISTLE	Ad B-Forb	4	-	x	-
Clover	CLOVER	Forb	-	-	-	-
Cornus amomum	SILKY DOGWOOD	Nt Shrub	-4	-	-	-
Cornus foemina	GRAY DOGWOOD	Nt Shrub	-2	-	x	x
Crataegus sp.	HAWTHORNE	Tree	-	-	x	x
Cryptotaenia canadensis	HONEWORT	Nt P-Forb	0	-	-	-
DAUCUS CAROTA	QUEEN ANNE'S LACE	Ad B-Forb	5	-	x	x
DIANTHUS ARMERIA	DEPTFORD PINK	Ad A-Forb	5	-	-	x
Dioscorea villosa	WILD YAM	Nt P-Forb	1	-	-	-
DIPSACUS LACINIATUS	CUT LEAVED TEASEL	Ad B-Forb	5	-	-	x
Dryopteris carthusiana	SPINULOSE WOODFERN	Nt Fern	-2	-	-	-
ELAEAGNUS ANGUSTIFOLIA	RUSSIAN OLIVE	Ad Tree	4	-	-	-
ELAEAGNUS UMBELLATA	AUTUMN OLIVE	Ad Shrub	3	-	x	x
Elymus virginicus	VIRGINIA WILD RYE	Nt P-Grass	-2	-	-	-
Equisetum arvense	COMMON HORSETAIL	Nt Fern Ally	0	-	x	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010		
				mesic southern forest	pasture	old field
Erigeron strigosus	DAISY FLEABANE	Nt P-Forb	1	-	-	x
Euonymus obovata	RUNNING STRAWBERRY BUSH	Nt Shrub	5	x	-	-
Eupatorium maculatum	JOE PYE WEED	Nt P-Forb	-5	-	-	-
Euthamia graminifolia	GRASS LEAVED GOLDENROD	Nt P-Forb	-2	-	x	x
Exotic Pine	PINE	Ad Tree	-	-	-	-
Fagus grandifolia	AMERICAN BEECH	Nt Tree	3	x	-	-
Festuca sp.	FESCUE	Grass	-	-	-	-
Fragaria virginiana	WILD STRAWBERRY	Nt P-Forb	1	-	x	x
Fraxinus americana	WHITE ASH	Nt Tree	3	x	-	x
Fraxinus nigra	BLACK ASH	Nt Tree	-4	-	-	-
Fraxinus pennsylvanica	RED ASH	Nt Tree	-3	-	-	x
Galium asprellum	ROUGH BEDSTRAW	Nt P-Forb	-5	-	-	-
Galium circaezans	WHITE WILD LICORICE	Nt P-Forb	4	x	-	-
Galium concinnum	SHINING BEDSTRAW	Nt P-Forb	3	x	-	-
Galium obtusum	WILD MADDER	Nt P-Forb	-5	-	-	-
Geranium maculatum	WILD GERANIUM	Nt P-Forb	3	-	-	-
Geum canadense	WHITE AVENS	Nt P-Forb	0	-	-	-
Glyceria striata	FOWL MANNA GRASS	Nt P-Grass	-5	-	-	-
HIERACIUM CAESPITOSUM	KING DEVIL	Ad P-Forb	5	-	-	x
Impatiens capensis	SPOTTED TOUCH ME NOT	Nt A-Forb	-3	-	-	-
Iris virginica	SOUTHERN BLUE FLAG	Nt P-Forb	-5	-	-	-
Juglans cinerea	BUTTERNUT	Nt Tree	2	-	-	-
Juglans nigra	BLACK WALNUT	Nt Tree	3	-	-	x
Juncus effusus	SOFT STEMMED RUSH	Nt P-Forb	-5	-	-	-
Juniperus virginiana	RED CEDAR	Nt Tree	3	-	x	x
Laportea canadensis	WOOD NETTLE	Nt P-Forb	-3	-	-	-
Leersia oryzoides	CUT GRASS	Nt P-Grass	-5	-	-	-
Lemna minor	SMALL DUCKWEED	Nt A-Forb	-5	-	-	-
Lobelia siphilitica	GREAT BLUE LOBELIA	Nt P-Forb	-4	-	-	-
Lycopus americanus	COMMON WATER HOREHOUND	Nt P-Forb	-5	-	-	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010		
				mesic southern forest	pasture	old field
Lycopus uniflorus	NORTHERN BUGLE WEED	Nt P-Forb	-5	-	-	-
Lysimachia thyrsiflora	TUFTED LOOSESTRIFE	Nt P-Forb	-5	-	-	-
LYTHRUM SALICARIA	PURPLE LOOSESTRIFE	Ad P-Forb	-5	-	-	x
MELILOTUS ALBA	WHITE SWEET CLOVER	Ad B-Forb	3	-	-	x
MELILOTUS OFFICINALIS	YELLOW SWEET CLOVER	Ad B-Forb	3	-	-	x
Monarda fistulosa	WILD BERGAMOT	Nt P-Forb	3	-	x	-
MORUS ALBA	WHITE MULBERRY	Ad Tree	0	-	-	-
Onoclea sensibilis	SENSITIVE FERN	Nt Fern	-3	-	-	-
Oryzopsis asperifolia	ROUGH LEAVED RICE GRASS	Nt P-Grass	5	-	x	-
Osmorhiza claytonii	HAIRY SWEET CICELY	Nt P-Forb	4	x	-	-
Osmorhiza longistylis	SMOOTH SWEET CICELY	Nt P-Forb	4	x	-	-
Ostrya virginiana	IRONWOOD; HOP HORNBEAM	Nt Tree	4	x	-	-
Parthenocissus quinquefolia	VIRGINIA CREEPER	Nt W-Vine	1	x	-	-
Phalaris arundinacea	REED CANARY GRASS	Nt P-Grass	-4	-	-	x
PHLEUM PRATENSE	TIMOTHY	Ad P-Grass	3	-	-	x
Pilea pumila	CLEARWEED	Nt A-Forb	-3	-	-	-
POA PRATENSIS	KENTUCKY BLUEGRASS	Ad P-Grass	1	-	-	x
Podophyllum peltatum	MAY APPLE	Nt P-Forb	3	x	-	-
Polygonatum pubescens	DOWNY SOLOMON SEAL	Nt P-Forb	5	x	-	-
Polygonum hydropiper	WATER PEPPER	Nt A-Forb	-5	-	-	-
Polygonum virginianum	JUMPSEED	Nt P-Forb	0	-	-	-
Populus deltoides	COTTONWOOD	Nt Tree	-1	-	-	-
POTAMOGETON CRISPUS	PONDWEED	Ad P-Forb	-5	-	-	-
Potamogeton natans	PONDWEED	Nt P-Forb	-5	-	-	-
POTENTILLA RECTA	ROUGH FRUITED CINQUEFOIL	Ad P-Forb	5	-	-	x
Potentilla simplex	OLD FIELD CINQUEFOIL	Nt P-Forb	4	-	x	x
Prenanthes alba	WHITE LETTUCE	Nt P-Forb	3	x	-	-
Prunus americana	AMERICAN WILD PLUM	Nt Tree	5	-	-	-
Prunus serotina	WILD BLACK CHERRY	Nt Tree	3	x	x	x
Prunus virginiana	CHOKE CHERRY	Nt Shrub	1	-	x	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010		
				mesic southern forest	pasture	old field
Quercus alba	WHITE OAK	Nt Tree	3	x	-	-
Quercus muehlenbergii	CHINQUAPIN OAK	Nt Tree	5	x	-	-
Quercus rubra	RED OAK	Nt Tree	3	x	-	-
Ranunculus flabellaris	YELLOW WATER CROWFOOT	Nt P-Forb	-5	-	-	-
Ranunculus hispidus	SWAMP BUTTERCUP	Nt P-Forb	0	-	-	-
Rhus typhina	STAGHORN SUMAC	Nt Tree	5	-	-	-
Ribes americanum	WILD BLACK CURRANT	Nt Shrub	-3	-	-	-
Ribes cynosbati	PRICKLY or WILD GOOSEBERRY	Nt Shrub	5	x	-	-
Rosa carolina	PASTURE ROSE	Nt Shrub	4	-	x	x
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	3	-	-	x
Rosa palustris	SWAMP ROSE	Nt Shrub	-5	-	-	-
Rubus allegheniensis	COMMON BLACKBERRY	Nt Shrub	2	-	-	-
Rubus strigosus	WILD RED RASPBERRY	Nt Shrub	-2	-	x	-
RUMEX CRISPUS	CURLY DOCK	Ad P-Forb	-1	-	-	-
Rumex orbiculatus	GREAT WATER DOCK	Nt P-Forb	-5	-	-	-
Rumex verticillatus	WATER DOCK	Nt P-Forb	-5	-	-	-
Salix discolor	PUSSY WILLOW	Nt Shrub	-3	-	-	-
Salix nigra	BLACK WILLOW	Nt Tree	-5	-	-	-
Sambucus canadensis	ELDERBERRY	Nt Shrub	-2	-	-	-
Sanicula gregaria	BLACK SNAKEROOT	Nt P-Forb	-1	x	-	-
Sassafras albidum	SASSAFRAS	Nt Tree	3	x	-	-
Scutellaria lateriflora	MAD DOG SKULLCAP	Nt P-Forb	-5	-	-	-
Sisyrinchium angustifolium	STOUT BLUE EYED GRASS	Nt P-Forb	-2	-	-	x
Smilacina racemosa	FALSE SPIKENARD	Nt P-Forb	3	x	-	-
SOLANUM DULCAMARA	BITTERSWEET NIGHTSHADE	Ad P-Forb	0	-	-	-
Solidago altissima	TALL GOLDENROD	Nt P-Forb	3	-	x	x
Solidago caesia	BLUE STEMMED GOLDENROD	Nt P-Forb	3	x	-	-
Solidago canadensis	CANADA GOLDENROD	Nt P-Forb	3	-	-	-
Solidago flexicaulis	BROAD LEAVED GOLDENROD	Nt P-Forb	3	x	-	-
Solidago gigantea	LATE GOLDENROD	Nt P-Forb	-3	-	-	-

Appendix 12. (cont.).

Scientific Name	Common Name	Life Form	W	Hillsdale County EO .010		
				mesic southern forest	pasture	old field
Solidago juncea	EARLY GOLDENROD	Nt P-Forb	5	-	-	x
Spiraea alba	MEADOWSWEET	Nt Shrub	-4	-	-	-
Symplocarpus foetidus	SKUNK CABBAGE	Nt P-Forb	-5	-	-	-
Teucrium canadense	WOOD SAGE	Nt P-Forb	-2	-	-	-
Thalictrum dasycarpum	PURPLE MEADOW RUE	Nt P-Forb	-2	-	-	-
Thelypteris palustris	MARSH FERN	Nt Fern	-4	-	-	-
Tilia americana	BASSWOOD	Nt Tree	3	x	-	-
Toxicodendron radicans	POISON IVY	Nt W-Vine	-1	-	-	-
TRIFOLIUM HYBRIDUM	ALSIKE CLOVER	Ad P-Forb	1	-	-	x
TRIFOLIUM PRATENSE	RED CLOVER	Ad P-Forb	2	-	-	x
Triosteum perfoliatum	HORSE GENTIAN	Nt P-Forb	5	x	-	-
Ulmus americana	AMERICAN ELM	Nt Tree	-2	-	x	-
Utricularia sp.	BLADDERWORT	Nt Forb	-5	-	-	-
Viburnum cassinoides	NORTHERN HAW	Nt Shrub	-3	x	-	-
VIBURNUM LANTANA	WAYFARING TREE	Ad Shrub	5	-	-	-
Viburnum lentago	NANNYBERRY	Nt Shrub	-1	-	-	-
Viola sp.	VIOLET	Forb	-	-	-	-
Vitis riparia	RIVERBANK GRAPE	Nt W-Vine	-2	-	-	-
Zanthoxylum americanum	PRICKLY ASH	Nt Shrub	5	x	-	-
Total number of species observed				37	27	35
Wetness Index				2.7	2.0	1.7

Appendix 13. Vegetation structure and dominant species.

Site	Community Type	Structural Layer	Dominant Species	% Cover
Cass-St. Joseph County EO .002	inundated shrub swamp (A)	Overstory		20
			Acer rubrum	
			Quercus bicolor	
		Understory		85
			Cephalanthus occidentalis	
			Rosa palustris	
		Ground Layer		80
			Lemna minor	
			Carex crinita	
Cass-St. Joseph County EO .002	inundated shrub swamp (B)	Overstory		50
			Acer saccharinum	
		Understory		65
			Cephalanthus occidentalis	
		Ground Layer		30
			Sium suave	
			Glyceria canadensis	
			Symplocarpus foetidus	
			Solidago patula	
Cass-St. Joseph County EO .002	inundated shrub swamp (C)	Overstory		20
			Quercus palustris	
			Salix nigra	
			Juglans nigra	
		Understory		80
			Cephalanthus occidentalis	
			Rosa palustris	
			Ilex verticillata	
		Ground Layer		20
			Puccinellia pallida	
			Lemna minor	
			Phalaris arundinacea	
Cass-St. Joseph County EO .002	inundated shrub swamp (D)	Overstory		5
			Salix nigra	
			Ulmus americana	
		Understory		80
			Cephalanthus occidentalis	
			Ilex verticillata	
			Rosa palustris	
		Ground Layer		80
			Carex rostrata	
			Puccinellia pallida	
			Lemna minor	
			Bidens sp.	

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
Cass-St. Joseph County EO .002	pond	Overstory	Quercus palustris	10
		Understory	Cephalanthus occidentalis	15
			Ilex verticillata	
		Ground Layer	Lemna minor	30
Cass-St. Joseph County EO .002	mesic southern forest	Overstory	Fagus grandifolia	n/a
			Acer saccharum	
			Liriodendron tulipifera	
		Understory	Carpinus caroliniana	n/a
			Acer saccharum	
			Ostrya virginiana	
Hillsdale County EO .007	southern floodplain forest	Ground Layer	Fagus grandifolia	n/a
			Laportea canadensis	
			Thelypteris noveboracensis	
		Overstory	Juglans nigra	80
			Acer saccharinum	
		Understory	Asimina triloba	50
Calhoun County EO .013	southern floodplain forest	Ground Layer	Ulmus americana	95
			Cryptotaenia canadensis	
		Overstory	Parthenocissus quinquefolia	80
			Thalictrum dasycarpum	
			Viola sp.	
Calhoun County EO .013	southern floodplain forest	Understory	Elaeagnus umbellata	60
			Carpinus caroliniana	
		Ground Layer	Ulmus americana	80
			Viburnum lentago	
		Overstory	Sanicula gregaria	80
			Leersia virginica	
		Ground Layer	Carex pensylvanica	

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
Calhoun County EO .013	southern wet meadow	Overstory		10
		Understory	Acer saccharinum	10
			Elaeagnus umbellata	
		Ground Layer	Asclepias incarnata	80
			Carex stricta	
			Mentha arvensis	
			Phalaris arundinacea Sparganium sp.	
Calhoun County EO .013	dry-mesic southern forest	Overstory		80
		Understory	Quercus velutina	60
			Acer rubrum	
			Carya ovata	
		Ground Layer	Acer rubrum	80
			Carya ovata	
			Carex pensylvanica	
Hillsdale County EO .004	southern floodplain forest	Overstory		60
		Understory	Tilia americana	75
			Fraxinus pennsylvanica	
			Tilia americana	
		Ground Layer	Fraxinus pennsylvanica	80
			Ulmus americana	
			Sanicula gregaria	
			Elymus virginica	
Hillsdale County EO .004	southern wet meadow	Overstory		0
		Understory		40
			Cornus foemina	
			Physocarpus opulifolius	
			Ulmus americana	
			Vitis riparia	
		Ground Layer	Carex stricta	90
			Lythrum salicaria	
			Eupatorium maculatum	

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
Hillsdale County EO .004	mesic southern forest	Overstory		70
		Understory	Populus grandidentata	70
			Zanthoxylum americanum	
			Carpinus caroliniana	
			Carya ovata	
			Hamamelis virginiana	
			Tilia americana	
			Acer rubrum	
		Ground Layer		70
			Sanicula gregaria	
Hillsdale County EO .008	pond	Overstory		5
		Understory	Salix nigra	30
			Cephalanthus occidentalis	
		Ground Layer		35
			Typha latifolia	
			Carex stricta	
Hillsdale County EO .008	southern wet meadow (A)	Overstory		<1
			Populus deltoides	
			Acer negundo	
		Understory		1
		Ground Layer	Salix petiolaris	90
			Typha angustifolia	
			Lolium perenne	
			Poa pratensis	
			Carex lacustris	
			Phalaris arundinacea	
Hillsdale County EO .008	southern wet meadow (B)	Overstory		0
		Understory		50
		Ground Layer	Cornus foemina	90
			Salix discolor	
			Carex stricta	
			Onoclea sensibilis	
			Bidens cernuus	

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
Hillsdale County EO .008	southern wet meadow (C)	Overstory		30
		Understory	Quercus bicolor	30
			Cornus foemina	
		Ground Layer		90
			Carex lacustris	
			Thelypteris palustris	
			Glyceria striata	
			Solidago gigantea	
			Cinna arundinacea	
			Onoclea sensibilis	
			Iris virginica	
			Verbena hastata	
			Rubus sp.	
			Vitis riparia	
Hillsdale County EO .008	southern wet meadow (D)	Overstory		20
		Understory	Salix nigra	30
			Salix petiolaris	
			Cornus foemina	
		Ground Layer		90
			Carex sartwellii	
			Phalaris arundinacea	
			Aster lanceolatus	
			Bidens cernua	
			Lysimachia nummularia	
Hillsdale County EO .008	inundated shrub swamp	Overstory		20
		Understory	Salix nigra	70
			Ulmus americana	
			Cephalanthus occidentalis	
		Ground Layer		20
			Lemna minor	
			Polygonum persicaria	
			Bidens cernua	
Hillsdale County EO .008	mesic southern forest (A)	Overstory		90
		Understory	Acer saccharum	30
			Fraxinus americana	
			Prunus serotina	
			Acer saccharum	
		Ground Layer	Amelanchier sp.	40
			Carex pensylvanica	

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
			<i>Polygonum virginiana</i>	
Hillsdale County EO .008	mesic southern forest (B)	Overstory	<i>Fraxinus americana</i> <i>Acer saccharum</i> <i>Carya glabra</i>	80
		Understory	<i>Ulmus americana</i> <i>Acer saccharum</i> <i>Zanthoxylum americanum</i>	30
		Ground Layer	<i>Sanicula gregaria</i> <i>Hystrix patula</i> <i>Aster sagittifolius</i> <i>Aster lateriflora</i> <i>Glyceria striata</i> <i>Geum canadensis</i>	70
Hillsdale County EO .008	mesic southern forest (C)	Overstory	<i>Fagus grandifolia</i> <i>Acer saccharum</i>	85
		Understory	<i>Acer saccharum</i>	50
		Ground Layer	<i>Carex albursina</i> <i>Viola pubescens</i> <i>Geranium maculatum</i>	65
Hillsdale County EO .008	southern floodplain forest	Overstory	<i>Acer nigrum</i>	90
		Understory	<i>Carpinus caroliniana</i>	38
		Ground Layer	<i>Sanicula gregaria</i> <i>Laportea canadensis</i> <i>Alliaria petiolata</i>	90
Hillsdale County EO .005	emergent marsh (A)	Overstory		0
		Understory	<i>Cornus amomum</i>	2
		Ground Layer	<i>Typha latifolia</i> <i>Lythrum salicaria</i> <i>Carex hystericina</i> <i>Eleocharis erythropoda</i>	90

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
Hillsdale County EO .005	emergent marsh (B)	Overstory		0
		Understory		<1
		Ground Layer	Cornus stolonifera Cornus foemina	80
			Lythrum salicaria Typha angustifolia	
Hillsdale County EO .005	mesic southern forest (A)	Overstory		85
			Acer saccharum Carya ovata	
		Understory		25
		Ground Layer	Carpinus caroliniana	55
			Carex pensylvanica Sanicula gregaria Asarum canadensis Collinsonia canadensis	
Hillsdale County EO .005	mesic southern forest (B)	Overstory		90
			Acer saccharum Quercus rubra Fagus grandifolia Tilia americana Fraxinus americana	
		Understory		30
			Quercus rubra Fagus grandifolia Acer saccharum Ostrya virginiana Prunus serotina Viburnum acerifolium	
Hillsdale County EO .005	dry-mesic southern forest	Overstory		70
			Carya ovata Carya glabra Quercus alba	
		Understory		50
			Hypericum prolificum Rubus sp. Crataegus sp.	

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
Branch County EO .012	southern floodplain forest	Ground Layer		40
			Carex pensylvanica	
			Sanicula gregaria	
			Agrimonia sp.	
			Hypericum prolificum	
		Overstory		75
			Acer saccharinum	
			Fraxinus nigra	
			Fraxinus pennsylvanica	
		Understory		20
Branch County EO .012	inundated shrub swamp (A)		Acer saccharinum	
			Ulmus americana	
		Ground Layer		60
			Pilea pumila	
			Saururus cernuus	
		Overstory		30
			Acer saccharinum	
			Quercus bicolor	
		Understory		70
			Acer saccharinum	
Branch County EO .012	inundated shrub swamp (B)		Cephalanthus occidentalis	
		Ground Layer		30
			Phalaris arundinacea	
			Osmunda regalis	
			Carex stricta	
			Carex lacustris	
			Calamagrostis canadensis	
			Pilea pumila	
		Overstory		20
			Salix nigra	
Williams County- Ohio	inundated shrub swamp	Understory		95
			Cephalanthus occidentalis	
		Ground Layer		1
			Cephalanthus occidentalis	
		Overstory		60
			Fraxinus pennsylvanica	
			Quercus bicolor	
		Understory		40
			Cephalanthus occidentalis	
		Ground Layer		60
			Iris virginica	
			Carex radiata	
			Cinna arundinacea	

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
Williams County- Ohio	southern floodplain forest	Overstory	Fraxinus americana	75
			Fraxinus nigra	
			Acer saccharinum	
		Understory	Acer saccharum	60
			Carya ovata	
			Carpinus caroliniana	
		Ground Layer	Hydrophyllum virginianum	65
			Laportea canadensis	
			Leersia virginica	
			Pilea pumila	
Williams County- Ohio	mesic southern forest (A)	Overstory	Acer saccharum	75
			Quercus alba	
		Understory	Fagus grandifolia	65
			Acer saccharum	
			Ostrya virginiana	
		Ground Layer	Carex pensylvanica	65
			Acer saccharum	
			Sanicula gregaria	
Williams County- Ohio	mesic southern forest (B)	Overstory	Fraxinus americana	75
			Acer saccharum	
		Understory	Acer saccharum	68
		Ground Layer	Sanicula gregaria	30
			Asarum canadense	
			Laportea canadensis	
Williams County- Ohio	southern swamp	Overstory	Acer nigrum	60
			Quercus alba	
		Understory	Acer saccharum	80
			Tilia americana	
		Ground Layer	Asarum canadense	60
			Parthenocissus	
			quinquefolia	
			Sanicula gregaria	

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
			Cryptotaenia canadensis	
Hillsdale County EO .010	pond (A)	Overstory		1
		Understory	Salix nigra	60
		Ground Layer	Cephalanthus occidentalis	10
			Lythrum salicaria	
			Carex stricta	
Hillsdale County EO .010	pond (B)	Overstory		0
		Understory		1
		Ground Layer	Salix nigra	5
			Poa pratensis	
			Impatiens capensis	
Hillsdale County EO .010	southern floodplain forest (A)	Overstory		80
		Understory	Populus deltoides	40
		Ground Layer	Acer negundo	
			Viburnum lentago	
			Toxicodendron radicans	35
			Cinna arundinacea	
			Solidago gigantea	
			Sanicula gregaria	
			Pilea pumila	
			Laportea canadensis	
Hillsdale County EO .010	southern floodplain forest (B)	Overstory		85
			Acer saccharinum	
			Fraxinus pennsylvanica	
		Understory		30
		Ground Layer	Cephalanthus occidentalis	50
			Laportea canadensis	
Hillsdale County EO .010	inundated shrub swamp (A)	Overstory		30
			Fraxinus pennsylvanica	
			Salix nigra	
			Acer saccharinum	
		Understory		90
		Ground Layer	Cephalanthus occidentalis	5
			Ranunculus septentrionalis	

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
			Rumex orbiculatus Solanum dulcamara	
Hillsdale County EO .010	inundated shrub swamp (B)	Overstory	Fraxinus pennsylvanica Salix nigra	5
		Understory	Cephalanthus occidentalis	45
		Ground Layer	Lemna minor	90
Hillsdale County EO .010	inundated shrub swamp (C)	Overstory	Salix nigra	10
		Understory	Cephalanthus occidentalis	70
		Ground Layer	Lemna minor	25
Hillsdale County EO .010	inundated shrub swamp (D)	Overstory	Acer nigrum	n/a
		Understory	Cephalanthus occidentalis Rosa multiflora Zanthoxylum americanum	38
		Ground Layer	Phalaris arundinacea Lemna minor Cirsium arvense Carex vulpinoidea	60
Hillsdale County EO .010	inundated shrub swamp (E)	Overstory	Salix nigra	5
		Understory	Cephalanthus occidentalis	90
		Ground Layer	Carex radiata	5
Hillsdale County EO .010	mesic southern forest	Overstory	Acer saccharinum	85
		Understory	Viburnum cassinoides Ostrya virginiana Prunus serotina Zanthoxylum americanum Acer saccharum Carpinus caroliniana	50

Appendix 13. (cont.).

Site	Community Type	Structural Layer	Dominant Species	% Cover
Hillsdale County EO .010	pasture	Ground Layer		70
			Sanicula gregaria	
			Podophyllum peltatum	
			Carex pensylvanica	
			Acer saccharum	
			Circaea lutetiana	
			Prenanthes alba	
		Overstory		0
		Understory		30
			Elaeagnus umbellata	
Hillsdale County EO .010	old field		Crataegus sp.	
		Ground Layer		90
			Achillea millefolium	
			Daucus carota	
			Potentilla simplex	
		Overstory		2
		Understory		2
			Acer saccharum	
			Elaeagnus umbellata	
			Acer saccharum	
Hillsdale County EO .010	old field		Acer rubrum	
		Ground Layer		90
			Solidago altissima	
			Trifolium hybridum	
			Trifolium pratense	
			Daucus carota	
			Phalaris arundinacea	
			Fragaria virginiana	
			Melilotus officinalis	
			Dipsacus laciniatus	
			Phleum pratense	

Appendix 14. Invasive species present in the observed communities at each site.

Site	Community	Scientific Name	Common Name	Estimated Abundance
Cass-St. Joseph County EO .002	inundated shrub swamp (A)	Solanum dulcamara	bittersweet nightshade	Common
	inundated shrub swamp (B)	Elaeagnus umbellata	autumn olive	Uncommon
		Rosa multiflora	multiflora rose	Uncommon
	inundated shrub swamp (C)	Phalaris arundinacea	reed canary grass	Locally Abundant on southwest and east sides of depression, growing with buttonbush
	inundated shrub swamp (D)	Phalaris arundinacea	reed canary grass	Locally Abundant on south side of wetland where it borders an ag. field
		Alliaria petiolata	garlic mustard	Locally abundant in uplands bordering shrub swamp's south side
		Rosa multiflora	multiflora rose	Occasional in uplands bordering shrub swamp's south side
	pond	Rosa multiflora	multiflora rose	Locally Dominant on north edges of pond and in old field
		Lonicera morrowii	Morrow honeysuckle	Uncommon on north side of pond and in old field
	mesic southern forest	Alliaria petiolata	garlic mustard	Uncommon on east sides of north and south slope
		Rosa multiflora	multiflora rose	Uncommon on west side of north slope
Hillsdale County EO .007	southern floodplain forest	Alliaria petiolata	garlic mustard	Uncommon along ATV trail
		Lysimachia nummularia	moneywort	Uncommon along ATV trail
Calhoun County EO .013	southern floodplain forest	Elaeagnus umbellata	autumn olive	Common
		Rosa multiflora	multiflora rose	Occasional
		Berberis thunbergii	Japanese barberry	Uncommon
	southern wet meadow	Phalaris arundinacea	reed canary grass	Locally Dominant
		Elaeagnus umbellata	autumn olive	Locally Dominant
		Rosa multiflora	multiflora rose	Occasional
	dry-mesic southern forest	Elaeagnus umbellata	autumn olive	Abundant throughout forest
		Rosa multiflora	multiflora rose	Occasional throughout forest

Appendix 14. (cont.).

Site	Community	Scientific Name	Common Name	Estimated Abundance
Hillsdale County EO .004	southern floodplain forest	Lythrum salicaria	purple loosestrife	Locally Common along stream
	southern wet meadow	Lythrum salicaria	purple loosestrife	Abundant throughout wetland
	mesic southern forest	Lonicera morrowii	Morrow honeysuckle	Occasional
		Elaeagnus umbellata	autumn olive	Occasional
		Rosa multiflora	multiflora rose	Occasional
Hillsdale County EO .008	pond	Lythrum salicaria	purple loosestrife	Occasional along edge of pond
	southern wet meadow (A)	Lythrum salicaria	purple loosestrife	Occasional along creek near road
		Typha angustifolia	thin-leaved cattail	Locally Dominant
		Phalaris arundinacea	reed canary grass	Locally Dominant along creek near road
		Lolium perenne	ryegrass	Dominant
		Poa pratensis	Kentucky bluegrass	Dominant
		Lotus corniculata	birdfoot trefoil	Common
		Trifolium sp.	White clover	Common
		Daucus carota	Queen Ann's Lace	Locally Common along upland edges
	southern wet meadow (B)	Carduus nutans	Nodding thistle	Uncommon along upland edges
		Phalaris arundinacea	reed canary grass	Locally Abundant on northeast side of pond
		Lythrum salicaria	purple loosestrife	Occasional near pond
	southern wet meadow (C)	none observed		
	southern wet meadow (D)	Phalaris arundinacea	reed canary grass	Locally Dominant
		Lysimachia nummularia	moneywort	Locally Abundant
	inundated shrub swamp	Solanum carolinense	horse nettle	Common
	mesic southern forest (A)	Alliaria petiolata	garlic mustard	Locally Abundant
	mesic southern forest (B)	none observed		
	mesic southern forest (C)	Alliaria petiolata	garlic mustard	Locally Dominant along road on the south side of the creek
	southern floodplain forest	Alliaria petiolata	garlic mustard	Locally Dominant along road from ag. field to forest and on upland slopes.

Appendix 14. (cont.).

Site	Community	Scientific Name	Common Name	Estimated Abundance
Hillsdale County EO .005	emergent marsh (A)	Lythrum salicaria	purple loosestrife	Abundant
	emergent marsh (B)	Lythrum salicaria	purple loosestrife	Dominant
		Typha angustifolia	narrow-leaved cattail	Locally Dominant
	mesic southern forest (A)	none observed		
	mesic southern forest (B)	none observed		
	dry-mesic southern forest	Lonicera morrowii	Morrow honeysuckle	Uncommon along edge of camping area
		Alliaria petiolata	garlic mustard	Uncommon along edge of camping area
		Arctium minus	common burdock	Uncommon along edge of camping area
Branch County EO .012	southern floodplain forest	none observed		
	inundated shrub swamp (A)	Solanum dulcamara	bittersweet nightshade	Occasional
		Lysimachia nummularia	moneywort	Occasional
	inundated shrub swamp (B)	Solanum dulcamara	bittersweet nightshade	Occasional
Williams County- Ohio	inundated shrub swamp	none observed		
	southern floodplain forest	none observed		
	mesic southern forest (A)	none observed		
	mesic southern forest (B)	Alliaria petiolata	garlic mustard	Common on upland slope
		Glechoma hederacea	ground ivy	Uncommon near slope leading to stream
	southern swamp	Alliaria petiolata	garlic mustard	Occasional in ravine bottom
Hillsdale County EO .010	pond (A)	Lythrum salicaria	purple loosestrife	Abundant on edge of pond
		Rosa multiflora	multiflora rose	Abundant along pond edge and road
		Elaeagnus umbellata	autumn olive	Common along road
	pond (B)	Festuca sp.	Fescue	Locally Dominant
		Exotic Pine	Exotic Pine	n/a
		Clover	Clover	n/a
		Melilotus officinalis	yellow sweet-clover	n/a

Appendix 14. (cont.).

Site	Community	Scientific Name	Common Name	Estimated Abundance
		Rosa multiflora	multiflora rose	n/a
		Elaeagnus umbellata	autumn olive	n/a
		Poa pratensis	Kentucky bluegrass	n/a
		Potamogeton crispus	pondweed	n/a
		Trifolium hybridum	alsike clover	n/a
	southern floodplain forest (A)	Alliaria petiolata	garlic mustard	Locally Abundant along road near bridge
	southern floodplain forest (B)	none observed		
	inundated shrub swamp (A)	Solanum dulcamara	bittersweet nightshade	Common
	inundated shrub swamp (B)	Phalaris arundinacea	reed canary grass	Local along water's edge
		Rosa multiflora	multiflora rose	Locally Common/Dominant along water's edge
		Rumex crispus	curly dock	n/a
	inundated shrub swamp (C)	none observed		
	inundated shrub swamp (D)	Phalaris arundinacea	reed canary grass	Locally Dominant and Common along water's edge
		Rosa multiflora	multiflora rose	Locally Dominant along old field edge
		Elaeagnus umbellata	autumn olive	Occasional along old field edge
		Cirsium arvense	Canadian thistle	n/a
		Solanum dulcamara	bittersweet nightshade	n/a
	inundated shrub swamp (E)	none observed		
	mesic southern forest	Alliaria petiolata	garlic mustard	Uncommon along drain that connects inundated shrub swamp and clear fork
	pasture	Elaeagnus umbellata	autumn olive	Abundant
		Daucus carota	Queen Anne's lace	Abundant
		Prunella vulgaris	lawn prunella	Common
		Cirsium vulgare	bull thistle	Occasional
	old field	Phalaris arundinacea	reed canary grass	Locally Dominant near creek/ditch on north side
		Lythrum salicaria	purple loosestrife	Uncommon on edge of field near road

Appendix 14. (cont.).

Site	Community	Scientific Name	Common Name	Estimated Abundance
		Elaeagnus umbellata	autumn olive	Occasional scattered mostly <2 m tall
		Dipsacus laciniatus	cut-leaved teasel	Locally Abundant scattered in northern portion
		Melilotus officinalis	yellow sweet-clover	Locally Dominant throughout
		Melilotus alba	white sweet-clover	Occasional throughout
		Rosa multiflora	multiflora rose	Uncommon scattered
		Chrysanthemum leucanthemum	ox-eye daisy	n/a
		Daucus carota	Queen Ann's Lace	n/a
		Dianthus armeria	deptford pink	n/a
		Hieracium caespitosum	king-devil	n/a
		Phleum pratense	timothy	n/a
		Poa pratensis	Kentucky bluegrass	n/a
		Potentilla recta	rough-fruited cinquefoil	n/a
		Trifolium hybridum	alsike clover	n/a
		Trifolium pratense	red clover	n/a

Appendix 15. Soil descriptions of the observed communities at each site.

Site	Community Type	Soil Type(s)	Soil Description	Soil pH	Litter Depth
Cass-St. Joseph County EO .002	inundated shrub swamp (A)	Organic	black muck to 4 inches; brown highly decomposed peat (hemic peat) with sedge pieces to 3.5 ft with woody debris at 3 ft	5.5	soil surface covered with water
		Mineral	on edges of wetland: thin layer of muck over gleyed clay and coarse-textured, sandy, gleyed clay	6.5 (muck); 7.0 (gleyed clay)	soil surface covered with water
	inundated shrub swamp (B)	Mineral	shrub swamp: thin layer of coarse-textured sand and organic matter, over gray, brown, and black mottled clay to 10 inches. Deeper soil horizons consist of coarse-texture gleyed sandy clay to 18 inches, black, iron-mottled clay to 22 inches; and gleyed, sandy, silty clay to 28 inches	7.0	soil surface covered with water
	inundated shrub swamp (C)	Organic over Mineral	1ft of muck over 4 inches of tan colored silt; over fine- to medium-textured gleyed sandy clay	5.5-6.0	soil surface covered with water
	inundated shrub swamp (D)	Organic	muck soils to 2 ft over medium- to fine-textured sand mixed with organic matter, small pebbles, and chert. Silt and fine sand at occur 3.5 ft	5.5-7.0	soil surface covered with water
		Mineral	< 1 inch of muck over gleyed silt to 6 inches, then gleyed clay	5.5-7.0	soil surface covered with water
	pond	n/a	n/a	5.5	soil surface covered with water

Appendix 15. (cont.).

Site	Community Type	Soil Type(s)	Soil Description	Soil pH	Litter Depth
	mesic southern forest	Mineral	sandy loam A horizon to 6 inches; over a dry clay layer with iron-colored mottling	7.0	0-1 inch
Hillsdale County EO .007	southern floodplain forest	Mineral	sandy clay loam to 1.5 ft; over iron mottled sandy clay loam to 3 ft; over medium textured, gleyed sandy clay loam with iron mottling	6.5	0-1 inch
Calhoun County EO .013	southern floodplain forest	Mineral	6 inches of sandy loam; over iron mottled sandy loam to 18 inches; over iron mottled sandy clay loam to 26 inches; over gleyed sandy clay loam with iron mottling to 30 inches; over gleyed silt to 3 ft; over very wet gleyed sandy, silty, clay to 3.5 ft	7.0	0-1 inch
	southern wet meadow	Mineral	iron mottled sandy clay to 1 ft; over gleyed sandy clay mixed with small pebbles	8.0	soil surface covered with water
	dry-mesic southern forest	Mineral	in vernal pool (dry): 6 inches black sandy loam; over 6 inches slightly gleyed sandy clay loam with iron mottling; over gleyed sandy clay with iron mottling. Near edge of vernal pond: 6 inches brown sandy loam; over 6 inches light brown sandy loam (E horizon); over 6 inches sandy clay loam with iron mottling; over sandy clay. Further up slope from vernal pool: brown-colored sandy loam to 18 inches; over finer textured tan-colored sand (E horizon)	6.0	0-1 inch

Appendix 15. (cont.).

Site	Community Type	Soil Type(s)	Soil Description	Soil pH	Litter Depth
Hillsdale County EO .004	southern floodplain forest	Mineral	sandy loam to 6 inches; iron mottled sandy loam with gleyed concretions to 12 inches; iron mottled sandy clay to 20 inches; gleyed sandy clay to 2 ft; gleyed coarse-textured sandy clay loam to 3 ft; gleyed silty coarse-textured sand with many pebbles to 3.5 ft	7.0-7.5	0-1 inch
	southern wet meadow	Mineral	4 inches of muck; over iron mottled, slightly gleyed clay to 1 ft; over gleyed clay mixed with roots and organic matter to 1.5 ft; over coarse- to medium-textured sandy clay to 2.5 ft; over gravely, gleyed coarse-textured sandy clay to 3.5 ft	8.0	soil surface covered with water
	mesic southern forest	Mineral	sandy clay loam with large peds to 6 inches; over sandy clay loam to 12 inches; clay content and iron mottling increase with depth	7.0	0-1 inch
Hillsdale County EO .008	pond	Mineral	clay	8.0	soil surface covered with water
	southern wet meadow (A)	Mineral	clay	8.0	2 inches
	southern wet meadow (B)	Mineral	loam over sandy gleyed clay	8.0	4 inches
	southern wet meadow (C)	Mineral	sandy clay loam over gleyed sandy clay	8.0	1-2 inches
	southern wet meadow (D)	Mineral	1.5 inches of muck over gleyed clay	8.0	soil surface covered with water

Appendix 15. (cont.).

Site	Community Type	Soil Type(s)	Soil Description	Soil pH	Litter Depth
Hillsdale County EO .005	inundated shrub swamp	Organic over Mineral	6 to 10 inches of muck over gleyed clay	6.5 -7.0	soil surface covered with water
	mesic southern forest (A)	Mineral	near edge of pond: loamy sand with strong iron mottling to 2 ft; over slightly gleyed wet, sandy clay to 3.5 ft. Further inland from pond: sandy loam to 2 ft; over iron mottled sandy loam to 2.5 ft; over gleyed sandy clay loam to 3.5 ft	5.0-5.5	0-1 inch
	mesic southern forest (B)	Mineral	loamy sand over gleyed clay	7.0	0-1 inch
	mesic southern forest (C)	Mineral	six inches of sandy clay loam/sandy clay over sandy clay with iron mottling and gleyed pockets	7.0	n/a
	southern floodplain forest	Mineral	sandy clay with varying amounts of sand and iron mottling. Sand increases and decreases with depth	7.0	n/a
	emergent marsh (A)	Mineral	gleyed clay	8.0	soil surface covered with water
	emergent marsh (B)	Mineral	clay	8.0	soil surface covered with water
	mesic southern forest (A)	Mineral	clay loam	5.5	0-1 inch
	mesic southern forest (B)	Mineral	clay loam	8.0	0-1 inch
	dry-mesic southern forest	Mineral	clay loam	6.0	0-1 inch

Appendix 15. (cont.).

Site	Community Type	Soil Type(s)	Soil Description	Soil pH	Litter Depth
Branch County EO .012	southern floodplain forest	Organic over Mineral	8 inches of muck mixed with sand over gleyed, coarse-textured silty sand to 3.5 ft	7.0	0-1 inch
	inundated shrub swamp (A)	Organic	4 inch root mat; over organic deposits (muck) mixed with clay to 2 ft; over mucky peat (hemic peat) with sedge pieces to 2.5 ft; over mucky peat with sedge pieces, and woody debris to 33 inches; coarse textured-sand to 3.5 ft	6.0	0-1 inch
	inundated shrub swamp (B)	Organic	10 inches of highly decomposed muck (sapric peat) containing easily crushed, gleyed silt nodules; over mucky peat (hemic peat) to 1.5 ft; mucky peat continuing throughout profile mixed with woody debris and roots to 2 ft; mucky peat with sedge pieces, woody debris, and silt deposits to 3.5 ft	6.0	0-1 inch
Williams County-Ohio	inundated shrub swamp	Mineral	1 ft of iron mottled clay over gleyed clay with iron concretions	6.0	0-1 inch
	southern floodplain forest	Mineral	6 inches of iron mottled loam over clay loam to 2 ft	7.0	0-1 inch
	mesic southern forest (A)	Mineral	6 inches of clay loam over rock (probably large glacial erratic in area of soil probe)	6.0	0-1 inch
	mesic southern forest (B)	Mineral	black loam to 4 inches; over blackish sandy clay to 12 inches; over B horizon (pH 7.5) with iron mottling and concretion to 24 inches	7.0	0-1 inch

Appendix 15. (cont.).

Site	Community Type	Soil Type(s)	Soil Description	Soil pH	Litter Depth
	southern swamp	Mineral	loam (pH 7.2-7.5) to 2 inches; over dark iron-colored clay to 8-12 inches; over gleyed/gray clay matrix with iron mottling to 18-20 inches; over gray sandy clay with iron mottling	7.8	0-1 inch
Hillsdale County EO .010	pond (A)	Organic	6 inches of muck; over gleyed clayey silt mixed with fine gravel and coarse textured sand (probably runoff from road) to 12 inches; over gleyed clayey silt to 1.5 ft; over gleyed clayey silt mixed with muck to 3 ft; over mucky peat with woody debris, a thin layer of gleyed clayey silt, and then more muck to 3.5 ft	7.0	soil surface covered with water
	pond (B)	Mineral	gleyed clay with very little iron mottling at 2 feet into pond	7.0	n/a
	southern floodplain forest (A)	Mineral	6 inches of sandy clay loam with little mottling; over iron-mottled sandy clay loam (clay content increasing with depth) to 1 ft; over slightly gleyed, iron-mottled clay to 1.5 ft; over gleyed iron-mottled clay to 2 ft; over gleyed sandy loam with iron mottling to 2.5 ft; over gleyed sandy clay loam and then gleyed clay to 3 ft	7.0	0-1 inch
	southern floodplain forest (B)	Mineral	0-1 inch of organic matter, leaves, and debris; over 6-12 inches of gray clay with iron mottling and easily crushed iron nodules	n/a	0-1 inch
	inundated shrub swamp (A)	Mineral	4 inch root mat; over 4 inches of iron-mottled gleyed clay to 2 ft; over gleyed silt to 2.5 ft; over gleyed coarse-textured, clayey silt to 3 ft; over gleyed clayey silt with small woody debris to 3.5 ft	7.0	0-1 inch

Appendix 15. (cont.).

Site	Community Type	Soil Type(s)	Soil Description	Soil pH	Litter Depth
	inundated shrub swamp (B)	Mineral	gleyed clay with roots	7.0	1 inch fibric root mat with a lot of CWD
	inundated shrub swamp (C)	Organic over Mineral	2 inches of black sapric muck; over a hemic root mat with sapric muck and clay mixed in to 3 inches; over dark gray clay with iron mottling	7.0	n/a
	inundated shrub swamp (D)	Mineral	6 inches of sandy clay; over purplish clay mixed with woody debris	7.0+	0-1 inch of leaves
	inundated shrub swamp (E)	Mineral	thin organic matter layer over dark clay within two inches; clay becomes lighter in color with depth (gray) with iron mottling and organic streaks	7.0	0-1 inch of leaves
	mesic southern forest	Mineral	8 inches of clay loam; over sandy clay with mottling	7.0	0-1 inch
	pasture	Mineral	6 inches of sandy clay loam; over clay loam to 12 inches; over iron-mottled clay	7.0	0-1 inch
	old field	Mineral	10 inches of sandy clay loam; over reddish brown clay with iron mottling	7.0	0-1 inch

Appendix 16. Landscape context and natural community ranks.

Site	Community Type	Landscape Context Rank	Natural Community Rank
Cass-St. Joseph County EO .002	inundated shrub swamp (A)	Medium adjacent to gravel road, ag field, wetland, and mesic forest; surrounding landscape is ag and rural residential	Medium moderate size, good diversity
	inundated shrub swamp (B)	Medium adjacent to gravel road, driveway, wetland, and mesic forest; surrounding landscape is ag and rural residential	Low small size, low diversity
	inundated shrub swamp (C)	Medium adjacent to gravel road, old field, and small swamp forest; surrounding landscape is ag and rural residential	Medium moderate size, good diversity
	inundated shrub swamp (D)	Medium bordered by ag, wetland, and mesic forest, surrounding landscape is ag and rural residential	Medium large size, high diversity, invasive plants dominate portion of community near ag field
	pond	Medium adjacent to old field and swamp forest; surrounding landscape is ag and rural residential	Medium large size, pond edges contains a narrow perimeter of shrub swamp with low diversity, presence of invasive species
	mesic southern forest	Medium adjacent to Wood Lake to the north, a buttonbush inundated shrub swamp to the south, and an old field to the east; surrounding landscape is ag	Medium large CWD and snags; well-developed pit and mound topography; good plant diversity; presence of groundwater seepage at base of forested slopes; high grading in the past; gravel two-track cuts through forest; trash present

Appendix 16. (cont.).

Site	Community Type	Landscape Context Rank	Natural Community Rank
Hillsdale County EO .007	southern floodplain forest	Low dissected by river; surrounding landscape is ag and rural residential	Medium high species diversity but very narrow floodplain, impacted by ORV trail, presence of invasive species and old trash pile
Calhoun County EO .013	southern floodplain forest	Medium adjacent to dam and gravel drive, dissected by small creek, surrounding landscape is ag and rural residential	Medium narrow floodplain, presences of invasive plants
	southern wet meadow	Low adjacent to dam, lawn, and gravel drive, surrounding landscape is ag and rural residential	Low very small and narrow band of wet meadow at edge impoundment, invasive plants abundant
	dry-mesic southern forest	Medium bordered by floodplain forest, impoundment, and old field; surrounding landscape is ag and rural residential	Low small size, low diversity, highly disturbed, dissected by gravel roads and trails, presence of invasive plants
Hillsdale County EO .004	southern floodplain forest	Medium adjacent to gravel road, house, and early successional mesic forest; surrounding landscape is ag and rural residential	Low small, narrow, early successional floodplain forest, low diversity, poor structure, presence of invasive plants
	southern wet meadow	Medium adjacent to gravel road and floodplain forest, surrounding landscape is ag and rural residential	Low moderate size, shrub encroachment is causing conversion to shrub-carr, presence of invasive plants

Appendix 16. (cont.).

Site	Community Type	Landscape Context Rank	Natural Community Rank
	mesic southern forest	Medium adjacent to gravel road, house, and floodplain forest; surrounding landscape is ag and rural residential	Low low diversity, early successional forest, presence of invasive plants
Hillsdale County EO .008	pond	Low adjacent to house, cattle walkway, feed lot, and barn; surrounding landscape is ag and rural residential	Low man-made, stocked with large-mouth bass, invasive plants along pond margin
	southern wet meadow (A)	Low adjacent to house, gravel road, cattle milkhouse, walkway, and holding area; surrounding landscape is ag and rural residential	Low very small (1 acre), low diversity, grazed, highly disturbed, many invasive plants
	southern wet meadow (B)	Low adjacent to man-made pond, Christmas tree plantation, degraded wet meadow, and small block of mesic southern forest; surrounding landscape is ag and rural residential	Low very small, fair diversity, shrub encroachment, invasive species locally abundant
	southern wet meadow (C)	Medium occurs within mesic forest, near edge, which borders a pasture	Low very small, cut stumps occur within wet meadow
	southern wet meadow (D)	Low adjacent to mowed lawn, gravel driveway and road	Low small, several invasive plants

Appendix 16. (cont.).

Site	Community Type	Landscape Context Rank	Natural Community Rank
	inundated shrub swamp	Medium bordered by thin band of forested wet meadow and mesic forest, which is surrounded by ag	Medium small shrub swamp but in good condition
	mesic southern forest (A)	Low bordered by agricultural fields and man-made pond, house, and pasture	Low very small and invasive plants are present
	mesic southern forest (B)	Low surrounded by pasture and ag fields	Low fair ground layer diversity but has been logged in recent past
	mesic southern forest (C)	Medium borders ag field and a floodplain forest	Medium good species diversity and various size classes are present; large diameter trees have been removed and large CWD is lacking; soil erosion associated with abandoned animal burrows and steep slopes; forest is highly dissected by steep-sided tributary channels
	southern floodplain forest	Medium adjacent to forested upland that serves as a buffer between floodplain forest and an ag field; old railroad grade cuts through first terrace	Medium good species diversity, zonation, and heterogeneity; diverse tree size classes; hydrologic processes intact with natural stream meandering and groundwater seepage; evidence of past logging
Hillsdale County EO .005	emergent marsh (A)	Low bordered by mowed lawn, trail, and man-made lake	Low consists of thin (1 to 3 m wide) band of purple loosestrife and cattail along margin of man-made lake.

Appendix 16. (cont.).

Site	Community Type	Landscape Context Rank	Natural Community Rank
Branch County EO .012	emergent marsh (B)	Low surrounded by mowed two-track and adjacent to man-made lake	Low small, narrow (10 m wide) band of marsh, highly infested by invasive plants
	mesic southern forest (A)	Low surrounded by rural residential, pasture, and old field	Medium paths, two-track roads, and out buildings occur throughout forest
	mesic southern forest (B)	Medium borders river and pond, residential boy scout cabins, and old field	Medium young forest, selectively logged, good plant diversity
	dry-mesic southern forest	Low bordered by man-made lake, lawn, and old fields	Low small size, several invasives, selectively logged, and frequently disturbed
	southern floodplain forest	Medium dissected by creek, surrounded by ag and rural residential	Medium large size, good habitat heterogeneity, recently selectively cut, logging roads and staging areas
	inundated shrub swamp (A)	Medium occurs within floodplain, adjacent to shrub swamp and reed canary grass meadow, surrounded by rural residential and ag fields	Medium very small, fair diversity, invasive species locally dominant
	inundated shrub swamp (B)	Medium occurs within floodplain, adjacent to floodplain forest and reed canary grass meadow, surrounded by rural residential and ag fields	Medium good size but low plant diversity

Appendix 16. (cont.).

Site	Community Type	Landscape Context Rank	Natural Community Rank
Williams County-Ohio	inundated shrub swamp	Medium occurs near edge of upland forest that borders old fields and a pond	Low very small, no invasives observed
	southern floodplain forest	Medium occurs near edge of upland forest that borders old fields	Medium small, narrow ravine with intermittent stream, dominant trees are reproducing, no invasive plants observed
	mesic southern forest (A)	Medium surrounded by old fields, ponds, and rural residential	High good species diversity in overstory and understory, no invasive plants observed
	mesic southern forest (B)	Low narrow ecosystem extending 40 m from both sides of the creek; surrounded by ag	Medium young stand with service road running through; invasives like garlic mustard are present
	southern swamp	Low bordered by an old field to the south and east and by a road to the north; overall landscape is ag	Low retains large, moss-covered CWD and natural headwater stream channel; narrow, trash, and garlic mustard
Hillsdale County EO .010	pond (A)	Medium bordered by gravel two-track and early successional floodplain forest, surrounding landscape is ag and rural residential	Medium invasive plants along pond margins, good size, road construction may have altered shape and depth of wetland and created a dam, thus contributing to year-round flooding
	pond (B)	Low pond with 0.5 m band of wet meadow and scattered shrubs; mowed lawn surrounds the pond	Low this is a man-made pond with an earthen dam and drainage pipe; pond treated with herbicide

Appendix 16. (cont.).

Site	Community Type	Landscape Context Rank	Natural Community Rank
	southern floodplain forest (A)	Medium bordered by pasture, old field, gravel road, pine plantation, and shrub swamp/pond, dissected by stream, surrounding landscape is ag and rural residential	Low early successional, low overstory diversity
	southern floodplain forest (B)	High 5+ acres that borders Clear Fork, mesic forests, and buttonbush depression	Medium small diameter trees and relatively small size; lacks recent anthropogenic disturbances
	inundated shrub swamp (A)	Medium borders thin band of early successional hardwood swamp, pasture, and upland forest, surrounding landscape is ag and rural residential	Medium small, west edge of swamp was pastured in past
	inundated shrub swamp (B)	Low bordered by mowed lawn on one side; thin band of forest borders most of swamp; mowed trail runs through forest and around swamp; horse pasture is nearby	Low-Medium 5 acres and receives water overflow from adjacent forest
	inundated shrub swamp (C)	High surrounded by floodplain forest and mesic southern forest	High 3 acres; good landscape context and zonation
	inundated shrub swamp (D)	Medium borders old field to the southeast and west and mesic southern forest to the north	Low formerly an inundated, forested depression currently dominated by buttonbush and <i>Lemna</i> sp. in the open water

Appendix 16. (cont.).

Site	Community Type	Landscape Context Rank	Natural Community Rank
	inundated shrub swamp (E)	Medium surrounded by early successional forest where drain tile ditch feeds into wetland; borders steep slope to the east with heavy soil erosion and formerly logged hardwoods now dominated by aspen	Medium slightly altered hydrology due to the drainage ditch
	mesic southern forest	Low borders old field on two sides and also narrowly borders a floodplain forest and buttonbush depression	Medium large diameter trees; low ground flora diversity; newly fallen CWD that are large and few; no old, highly decomposed CWD
	pasture	Medium bordered by gravel road, early successional floodplain forest, and shrub swamp; surrounding landscape is ag and rural residential	Low low diversity, many invasive plants
	old field	Medium mostly surrounded by natural areas like forested wetlands; borders Buckeye Road and a homestead with mowed lawn, horse pasture, and created pond	Low this is an old abandoned ag field about 30 acres in size; erosion on steep, south-facing slope in a narrow gully channel that meanders toward Buckeye Road

Appendix 17. Water depth and hydrologic alterations.

Site	Community Type	Water Depth (ft)	Water Level Manipulation (dams, pumps, culverts, drainage ditches, drain tile, etc.)	Surface Water Flow into Community from Non-Native Upland System (e.g., agricultural field, lawn, development, road, etc.)
Cass-St. Joseph County EO .002	inundated shrub swamp (A)	2	-	runoff from gravel road likely during heavy rain and snowmelt
	inundated shrub swamp (B)	2.5	-	runoff from gravel road and adjacent driveway likely during heavy rain and snowmelt
	inundated shrub swamp (C)	1	-	runoff from gravel road likely during heavy rain and snowmelt
	inundated shrub swamp (D)	1.5	-	receives runoff from adjacent ag field to the south; shrub swamp borders old field to east and may have received runoff in past when field was used for agriculture
	pond	unknown but up to 2 ft along shore	-	pond borders old field to west and may have received runoff in past when field was used for agriculture
	mesic southern forest	0	-	-
Hillsdale County EO .007	southern floodplain forest	0	adjacent road crossing may act as a dam during high water events	runoff from ag fields upslope
Calhoun County EO .013	southern floodplain forest	0	earthen dam and control structure regulates water flow into creek	-
	southern wet meadow	0-0.5	earthen dam has flooded adjacent wetland to create Big Marsh Lake	surface water flow from mowed lawn atop earthen dam drains directly into wet meadow

Appendix 17. (cont.).

Site	Community Type	Water Depth (ft)	Water Level Manipulation (dams, pumps, culverts, drainage ditches, drain tile, etc.)	Surface Water Flow into Community from Non-Native Upland System (e.g., agricultural field, lawn, development, road, etc.)
	dry-mesic southern forest	0	earthen dam has flooded most of wet meadow to create Big Marsh Lake; water levels controlled by dam	-
Hillsdale County EO .004	southern floodplain forest	0	blocked culvert is restricting water flow in creek	blocked culvert at adjacent gravel-road crossing is causing stream to flow over road as it enters narrow floodplain.
	southern wet meadow	0.33	ditch along road may be draining wetland	runoff from gravel road
	mesic southern forest	0	culvert at road crossing creates a dam at base of forested slope	-
Hillsdale County EO .008	pond	14	pond was created in 1989 by digging out wetland	runoff from sheep pasture, cattle feedlot, barnyard, and cattle walkway
	southern wet meadow (A)	0-0.83	wet meadow borders man-made pond; creek enters wetland through culvert under road	wet meadow receives wastewater from milkhouse and runoff from cattle holding pen, cattle walkway, and adjacent gravel road
	southern wet meadow (B)	0-1	wet meadow borders man-made pond	runoff from Christmas tree plantation on sandy slope
	southern wet meadow (C)	0	drain tile from surrounding ag fields flows into intermittent streams within forest and then enters adjacent shrub swamp	runoff from ag field

Appendix 17. (cont.).

Site	Community Type	Water Depth (ft)	Water Level Manipulation (dams, pumps, culverts, drainage ditches, drain tile, etc.)	Surface Water Flow into Community from Non-Native Upland System (e.g., agricultural field, lawn, development, road, etc.)
	southern wet meadow (D)	0.25-0.33	culvert at driveway crossing may create a dam during high water events	runoff from lawn and driveway
	inundated shrub swamp	0-1	drain tile from surrounding ag fields flows into intermittent streams within forest and then enters shrub swamp	runoff from ag field
	mesic southern forest (A)	0	borders man-made pond	-
	mesic southern forest (B)	0	drain tile from surrounding ag fields causes flow into intermittent streams within forest	runoff from ag field
	mesic southern forest (C)	0	old railroad grade causes pooling of intermittent streams before water drains into floodplain	-
	southern floodplain forest	variable; mostly none but standing water in depressions and in abandoned stream channels	-	runoff from ag field

Appendix 17. (cont.).

Site	Community Type	Water Depth (ft)	Water Level Manipulation (dams, pumps, culverts, drainage ditches, drain tile, etc.)	Surface Water Flow into Community from Non-Native Upland System (e.g., agricultural field, lawn, development, road, etc.)
Hillsdale County EO .005	emergent marsh (A)	0-0.80	water levels controlled by dam	runoff from grass-covered, steep-sloped earthen dam
	emergent marsh (B)	0.33-1.30	marsh borders man-made lake	runoff from adjacent lawn
	mesic southern forest (A)	0	marsh borders earthen dam and man-made lake; forest borders man-made lake	-
	mesic southern forest (B)	0	-	runoff from gravel road and lawn
	dry-mesic southern forest	0	forest borders man-made lake	-
Branch County EO .012	southern floodplain forest	0	footings from former bridge along creek	runoff from pasture and ag fields; runoff from abandoned two-track that leads from former bridge up steep, forested slope to cattle pasture
	inundated shrub swamp (A)	0	-	runoff from adjacent reed canary grass meadow
	inundated shrub swamp (B)	0	-	runoff from adjacent reed canary grass meadow
Williams County-Ohio	inundated shrub swamp	0	-	runoff from adjacent old field

Appendix 17. (cont.).

Site	Community Type	Water Depth (ft)	Water Level Manipulation (dams, pumps, culverts, drainage ditches, drain tile, etc.)	Surface Water Flow into Community from Non-Native Upland System (e.g., agricultural field, lawn, development, road, etc.)
Hillsdale County EO .010	southern floodplain forest	0	-	runoff from adjacent old field
	mesic southern forest (A)	0	-	runoff from adjacent old field
	mesic southern forest (B)	0	channelization of stream; service road runs along stream and crosses stream 10 m to the north	runoff from old field 100 m to the south
	southern swamp	0	culvert under road; road acts like a dike	surface runoff from roads
	pond (A)	unknown but up to 2 ft along shore	road may act as a dam and contribute to year-round flooding	runoff from gravel road
	pond (B)	unknown with gradually sloping shoreline	earthen dam with drain that feeds into the lower wetland	runoff from mowed lawn surrounding pond
	southern floodplain forest (A)	0	bridge (now closed) may act as dam during high water events	runoff from gravel road and drainage ditches alongside road
	southern floodplain forest (B)	0.5-1.0	-	possible runoff from ag fields that has been filtered through other nearby wetlands
	inundated shrub swamp (A)	0	-	runoff from pasture

Appendix 17. (cont.).

Site	Community Type	Water Depth (ft)	Water Level Manipulation (dams, pumps, culverts, drainage ditches, drain tile, etc.)	Surface Water Flow into Community from Non-Native Upland System (e.g., agricultural field, lawn, development, road, etc.)
	inundated shrub swamp (B)	2.5 at 15 ft from shore	drainage ditch with overflow into adjacent shrub swamp; earthen dam above wetland; Brown's Pond feeds into wetland	possible runoff from nearby horse pasture
	inundated shrub swamp (C)	3	-	some drainage occurs from adjacent wetlands that receive runoff from ag fields; connects to inundated shrub swamp (E) and receives input from three other inundated shrub swamps
	inundated shrub swamp (D)	2.5 at 10 ft from shore	connecting channel from another buttonbush depression and a swale in an old field appears to feed this shrub swamp	erosion and runoff from old field
	inundated shrub swamp (E)	2	drainage ditch feeding wetland; drain tiled ag field feeds into wetland	surface flow from culverts
	mesic southern forest	0	-	-
	pasture	0	-	-
	old field	0	drain tiled with subsequent flow into a ditch located in the center of the field that eventually feeds a buttonbush depression	-

Appendix 18. Habitat alterations.

Site	Community Type	Habitat Destruction	Habitat Disturbance	Habitat Manipulation	Soil Erosion
Cass-St. Joseph County EO .002	inundated shrub swamp (A)	road construction in past may have altered shape and depth of wetland	-	selective logging of adjacent uplands	runoff from gravel road and possibly following selective logging of uplands
	inundated shrub swamp (B)	road construction in past may have altered shape and depth of wetland	-	-	-
	inundated shrub swamp (C)	road construction in past may have altered shape and depth of wetland; old fields border shrub swamp	shrubs swamp is adjacent to gravel road	-	-
	inundated shrub swamp (D)	-	-	reed canary grass likely planted in portion of swamp adjacent to ag field	soil erosion on slope in mesic southern forest above shrub swamp
	pond	old fields border pond	pond is surrounded by trails and used by anglers	-	-
	mesic southern forest	-	gravel two-track cuts through forest	removal of large trees in the past and present	on slopes grading into wetland to the south and into Wood Lake to the north
Hillsdale County EO .007	southern floodplain forest	-	trash pile at base of slope; ATV trails along river; evidence of seasonal flooding	selective logging	soil erosion on steep slope above floodplain

Appendix 18. (cont.).

Site	Community Type	Habitat Destruction	Habitat Disturbance	Habitat Manipulation	Soil Erosion
Calhoun County EO .013	southern floodplain forest	earthen dam built over small portion of floodplain forest	excessive deer herbivory	dam regulates stream flow and prevents seasonal flooding and sediment deposition	soil erosion likely on adjacent steep slopes
	southern wet meadow	earthen dam has resulted in flooding of southern wet meadow	excessive deer herbivory	mowing small portion of wet meadow; water levels of pond are controlled by dam	runoff from lawn on earthen dam
	dry-mesic southern forest	gravel roads, buildings and parking areas occupy former areas of upland forest	car and foot traffic along paths and gravel roads that dissect forest and around wooden viewing platforms within forest; excessive deer herbivory	large mowed parking lot and mowed areas around buildings; selective logging	-
Hillsdale County EO .004	southern floodplain forest	house occupies part of floodplain forest; gravel roads and residential gravel driveways border floodplain forest	-	selective logging of adjacent uplands; mowed yard adjacent to wetland	soil erosion likely on adjacent steep slopes and following logging of adjacent uplands
	southern wet meadow	construction of road may have altered shape of wetland and drainage pattern	shrub encroachment, possibly a result of fire suppression in surrounding uplands	drainage ditch along road may be draining wetland	runoff from gravel road
	mesic southern forest	-	two-track runs through community; used for recreation	logged in past	soil erosion on slope leading to floodplain forest and creek

Appendix 18. (cont.).

Site	Community Type	Habitat Destruction	Habitat Disturbance	Habitat Manipulation	Soil Erosion
Hillsdale County EO .008	pond	construction of pond flooded wetland and killed many tamarack, willow, American elm, and buttonbush	pond used for swimming	pond dug in wetland in 1989, stocked with largemouth bass	runoff on forested slope above pond
	southern wet meadow (A)	road construction in past may have altered shape and depth of wetland	nutrient input from adjacent cattle lane, holding pen, and wastewater input from milkhouse; grazing - used as sheep pasture in past	planted with pasture mix (non-native spp.).	runoff from gravel road and driveway
	southern wet meadow (B)	-	grazing - used as sheep pasture in past	adjacent wetland was flooded to create pond	-
	southern wet meadow (C)	-	-	large cut stumps occur within meadow	runoff from pasture into wet meadow
	southern wet meadow (D)	-	-	-	runoff from lawn and gravel driveway
	inundated shrub swamp	-	-	selective logging in adjacent upland	-
	mesic southern forest (A)	-	occasionally grazed by horses and cattle	selectively logged in past	soil erosion on slopes
	mesic southern forest (B)	-	wide trail through forest	selectively logged in recent past	runoff from pasture into forest

Appendix 18. (cont.).

Site	Community Type	Habitat Destruction	Habitat Disturbance	Habitat Manipulation	Soil Erosion
Hillsdale County EO .005	mesic southern forest (C)	-	old railroad grade passes through forest and forms an artificial dam that causes an intermittent stream to pool before draining into floodplain	evidence of past logging	erosion associated with animal burrows and steep slopes of upland terraces; erosion deposits in floodplain
	southern floodplain forest	-	old railroad grade cuts into first terrace	evidence of past logging, reported to occur in 1978	natural erosion from steep slopes associated with terrace risers
	emergent marsh (A)	man-made lake may have flooded former marsh	pond is actively used by boy scouts for recreation	mowed lawn adjacent to marsh; water levels of pond are controlled by dam	runoff from grass-covered, steep-sloped earthen dam
	emergent marsh (B)	man-made lake may have flooded former marsh	pond is actively used by boy scouts for recreation	-	runoff from adjacent mowed lawn and two-track
	mesic southern forest (A)	clearings used for camping and fire pits	paths, two-tracks and out-buildings scattered throughout forest; recreational use by boy scouts	selective logging in recent past	-
	mesic southern forest (B)	-	trails	selective logging	forest is dissected by steep ravine carrying a narrow, shallow creek; forested, short, steep slope leads to lake

Appendix 18. (cont.).

Site	Community Type	Habitat Destruction	Habitat Disturbance	Habitat Manipulation	Soil Erosion
	dry-mesic southern forest	clearings used for camping and fire pits	paths, two-tracks and out-buildings scattered throughout forest; recreational use by boy scouts	selective logging in recent past	soil erosion along small channelized stream
Branch County EO .012	southern floodplain forest	-	heavily rutted logging roads and staging areas; windthrow	selective logging in recent past	from logging roads and staging areas; along forested slopes above floodplain
	inundated shrub swamp (A)	-	-	selective logging in adjacent floodplain forest; reed canary grass likely planted in adjacent wet meadow	-
	inundated shrub swamp (B)	-	-	selective logging in adjacent floodplain forest; reed canary grass likely planted in adjacent wet meadow	-
Williams County- Ohio	inundated shrub swamp	-	-	-	runoff from adjacent old field
	southern floodplain forest	-	-	-	soil erosion likely on slopes
	mesic southern forest (A)	-	-	-	-

Appendix 18. (cont.).

Site	Community Type	Habitat Destruction	Habitat Disturbance	Habitat Manipulation	Soil Erosion
Hillsdale County EO .010	mesic southern forest (B)	-	service road runs along stream and crosses stream 10 m to the north	channelized stream with water flowing to the south	runoff from adjacent old field 100 m to the south
	southern swamp	-	trash along slopes and bottom of ravine	grazing likely in the past; culvert under road with road acting like a dike	along steep slopes and from the nearby road
	pond (A)	road construction in past may have altered shape and depth of wetland	-	-	runoff from gravel road
	pond (B)	created pond/lake with earthen dam and drainage pipe	domesticated dog reported to harass copperbelly snakes	vegetation treated with herbicide; 10-20 ft wide mowed strip adjacent to pond; drain feeds into lower wetland	not observed but likely to occur
	southern floodplain forest (A)	-	-	early successional forest, appears to have been open in past	runoff from gravel road
	southern floodplain forest (B)	-	some drainage into this forest may contain runoff from ag fields that have been filtered through other nearby wetlands	-	soil erosion likely on slopes
	inundated shrub swamp (A)	-	-	-	runoff from slopes of adjacent pasture

Appendix 18. (cont.).

Site	Community Type	Habitat Destruction	Habitat Disturbance	Habitat Manipulation	Soil Erosion
	inundated shrub swamp (B)	likely existed as a former swamp forest that has been purposely inundated to create more open conditions	earthen dam above wetland; overflow from Brown's Pond feeds into wetland	mowed trail occurs in adjacent forest	some erosion detected
	inundated shrub swamp (C)	-	-	-	some drainage occurs from adjacent wetlands that receive runoff from ag fields
	inundated shrub swamp (D)	formerly a forested wetland; hydrologic manipulation likely altered the water table	-	old field and area to the south has been mowed	erosion and runoff likely occurs because of formation of old field
	inundated shrub swamp (E)	degree of altered hydrology unknown; original ecosystem may have been irrevocably damaged	altered hydrology due to drainage ditch and tiles; both hydrologically feed this wetland	logged hardwoods in adjacent forest now aspen-dominated	heavy soil erosion on adjacent steep slope to the east
	mesic southern forest	formerly a contiguous forest tract now fragmented greatly in a matrix of ag fields	ag drainage in surrounding landscape probably influences inundation along forest edge	likely selectively logged	-
	pasture	-	cattle grazing	cattle grazing	runoff from slopes

Appendix 18. (cont.).

Site	Community Type	Habitat Destruction	Habitat Disturbance	Habitat Manipulation	Soil Erosion
	old field	-	former ag field with trash dumped in drainage ditch in center of field; drain tiled in center of field and drains into buttonbush depression	mowing and grazing likely occurred in past	likely in past when in ag; erosion on steep, south-facing slope in a narrow gully channel that meanders toward Buckeye Road