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Testing the Floristic Quality Assessment Index as an Indicator of Riparian Wetland Disturbance

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INTRODUCTION

Although riparian wetlands support many critically important ecological functions, most have been degraded by a variety of human disturbances including hydrologic alterations, non-point source pollution and sediment loads, and vegetation removal (Kentula, 1997, NRC 1992). Human actions in the watershed which modify water and sediment regimes may affect riparian zones and their restoration potential (Goodwin et al. 1997).

While wetlands are not as prevalent as they were prior to European settlement, they continue to be an integral component of a fully functional landscape. Wetlands provide a number of ecological and societal benefits, including:

- Nutrient removal and/or transformation;
- Sediment and/or contaminant retention;
- Water storage/flood flow alteration;
- Groundwater recharge/discharge;
- Maintenance of biodiversity;
- Shoreline stabilization;
- Recreation;
- Education/research (Mitsch and Gosselink 1993).

Recognizing the need to protect Ohio's remaining wetland resources, Ohio EPA has developed and adopted water quality standards for wetlands (WWQS). The goal in developing the wetland water quality standards was to make regulatory review and protection efforts commensurate with the ecological and functional integrity of the resource. The WWQS incorporate all components of water quality standards including a beneficial use designation, narrative criteria, and an antidegredation policy specific to wetlands. In order to fully implement the wetland water quality standards, objective, quantitative, and repeatable measures of wetland ecosystem condition, known as biological criteria or biocriteria, should be developed and incorporated.

One potential biocriteria tool is the Floristic Quality Assessment Index (FQAI), first devised by Swink and Wilhelm (1979) and subsequently explored by several other authors (Wilhelm and Ladd 1988; Herman et al. 1993; Andreas and Lichvar 1995; Wilhelm and Masters 1995). The conceptual basis of this index is that the "natural quality" of an area can be objectively evaluated by examining the aggregate degree of ecological conservatism (or tolerance) for all species at that site, irrespective of community type, abundance, dominance, growth form, showiness, or other factors.

Plant communities have been called one of the best indicators of the "unique combination of

climatic and hydrogeologic factors that shape wetlands within their landscape" (Bedford 1996). The rate of attrition of conservative plant species - species adapted to a specific, narrow set of biotic and abiotic factors - tends to escalate with increasingly rapid and severe disturbance. Change, a natural element of all ecological systems, usually occurs gradually, allowing sufficient time for system components to adapt. The magnitude and rapidity of disturbance associated with European settlement of North America resulted in the reduction and/or extirpation of numerous conservative plant species (Wilhelm and Ladd 1988; Andreas and Lichvar 1995; Wilhelm and Masters 1995).

Within a given geographical area, a numeric coefficient of conservatism can be assigned to each species based on the degree of conservatism displayed by that species in relation to the conservatism of all other species of the area (Wilhelm and Ladd 1988; Andreas and Lichvar 1995; Wilhelm and Masters 1995). The natural quality of any specific area can then be assessed by evaluating the aggregate conservatism of all species found there. Andreas and Lichvar (1995) developed a Floristic Quality Assessment Index (FQAI), tailored specifically to northern Ohio flora, based on the methodology devised by Swink and Wilhelm (1979). Andreas and Lichvar (1995) applied this methodology to two bog ecosystems, one least impacted and one mid-successional (i.e. recovering from disturbance) in northeastern Ohio. The least impacted bog had an FQAI score of 37.5 and the successional bog had a score of 26.2. These results indicate a potential relationship between FQAI scores and the degree of site disturbance.

This project was designed to test the use of wetland plant communities as indicators of wetland ecological health or integrity through the use of the Floristic Quality Assessment Index (FQAI). The project was also designed to indicate whether the index has merit as a wetland biological monitoring tool. The study entailed testing the FQAI in 10 forested riparian wetlands (a single hydrogeomorphic class) in Ohio throughout the growing season. We examined the vegetation composition, soil, hydrology, and disturbance history of ten riparian wetlands to (1) determine if the FQAI could distinguish between wetlands based on variations in vegetation composition; and (2) to determine if there was a relationship between FQAI score and the degree of site disturbance.

MATERIALS AND METHODS

Study Area and Sites

Ten riparian wetland sites were selected for this study based on similarity of wetland type and location in the watershed, and to represent a range of disturbance from least impacted to severely degraded. The sites are located within the Eastern Cornbelt Ecoregion of Ohio along tributaries or main channels of Little Darby Creek, Twin Creek, and the Stillwater River in Darke, Madison, Miami, Montgomery, and Preble Counties, Ohio.

Lessons in Site Selection

Initially, wetland sites that had the potential to serve as reference sites were chosen to coincide with Ohio EPA stream reference sites. This approach was thought to be beneficial to both programs, and would maximize the data available at each site. Qualitative habitat evaluation index (QHEI) data were gathered in September of 1995 from the Ecological Assessment Unit (Ohio EPA) for the Darby Creek, Stillwater River and the Twin Creek Watersheds. Information was collected for 11 sites in the Darby, 15 sites in the Stillwater and 47 sites in the Twin Creek watershed. Each QHEI data form contains information on the condition of the stream, the condition of the riparian zone and adjacent land use. These were used to select potential sites with potentially different levels of disturbance. In addition, at each location data on the in-stream Index of Biological Integrity (IBI) and the Invertebrate Community Index (ICI) were also available.

After a selection of potential sites was made using the QHEI data sheets, site locations were identified during October and November of 1995 using USGS quadrangle maps and river mile locations. NWI maps were consulted to check for the presence of wetlands at these sites, and soil surveys were also consulted. Sites were plotted on road maps and several scouting trips were made. A fact sheet and a letter to landowners was drawn up explaining the project so that some background information could be left with landowners if they so desired.

Two days were spent in the Darby Watershed scouting sites. Approximately 10 sites were visited. Of these, permission for site access was granted at one site. Of the other sites several landowners refused immediately, several took the information and refused later, and several could not be reached. Other potential sites were identified such as property owned by the Franklin County Metro Parks.

Similar procedures were conducted in the Stillwater and Twin Creek Watersheds in February and March, 1996. Eight sites were identified in Stillwater and twelve in Twin Creek. Conversations were held with many landowners. Several said no to our request immediately. In several other cases the landowner could not be identified (in these cases several adjacent houses were visited but no one knew who owned the riparian property). In one case the landowners said yes initially but contacted us later saying they had changed their minds. One landowner said yes but soils at

the site were well drained and so did not contain any jurisdictional wetlands. Many people were suspicious or startled by our visit and were not willing to participate in the project.

It quickly became clear that "cold" visits to landowners were not a successful strategy. Of all the landowners that we made contact with (approximately 15, with at least twice as many other attempts made where no one was home), only one gave us permission for a site that contained jurisdictional wetlands. Many people in rural areas expressed interest in the goals of the project but were fearful to have government workers on their property (several said they would like to help but were fearful that we might "find something valuable"). We considered looking up land records in the County Courthouses as a possible approach so that landowners could be contacted by phone, but concluded that this would be too time consuming.

During the late spring of 1996 we began contacting NRCS staff and, in the case of Darby Creek, contacted the leader of a watershed protection program that is in operation there. In order to find cooperative landowners, the stipulation that an FQAI site should be adjacent to a stream biomonitoring site was relaxed. NRCS soil conservationists in different counties provided the names of several landowners who they felt would be willing to allow the Ohio EPA wetlands unit on their property. Using this approach, sites were located in all three watersheds.

Site Descriptions

The ten sites included in this study are described below.

Akey Farm Site

The Akey Farm site is located in east-northeast Preble County, Ohio, along the east bank of Twin Creek (~39° 50' 02" N, ~84° 32' 15" W). Most of the site is forested, except for some small, patchy areas of shrub/sapling size vegetation. Surrounding land use is primarily agricultural; however, there was some light industry about one mile to the west and some rural homes to the east and the south. In addition, Interstate 70 is located about one half of a mile to the north of the site.

Brukner Nature Preserve Site

The Brukner Nature Preserve, a privately owned nature center, is located along the northwest bank of Horseshoe Bend of the Stillwater River in southwest Miami County, Ohio (~40° 58' 00" N, ~84° 21' 58" W). The study site is located on the floodplain approximately 3/4 mile north of the Stillwater River, within the boundaries of the controlled inundation zone of Englewood Dam. Spring seeps are a significant component of the hydrology of the site. The site is forested; however, numerous canopy gaps existed because of widely spaced canopy individuals. Forested wetland, forested floodplain, forested upland, and agricultural land surrounded the site. In addition, there were some rural homes nearby.

Germantown Nature Reserve Site

This site is located within the Germantown Nature Reserve of the Dayton-Miami County Park District, on the northwest bank of Twin Creek in southwest Montgomery County, Ohio (~39° 38' 22" N, ~84° 24' 50" W). The study area is located approximately 1 mile upstream of the Germantown dry Dam, and is frequently inundated after storm events as a result. Most of this site lies within an old borrow pit, which was probably created during construction of the dam. The entire preserve is forested. Most of the land surrounding the study area is forested floodplain, forested wetland, and agricultural land. In addition, rural homes are scattered throughout the area.

Gray Farm Site

The Gray Farm site is located along the south side of Greenville Creek (a tributary of the Stillwater River) in western Darke County, Ohio (~40° 08' 53" N, ~84° 44' 27" W). The confluence of Greenville Creek and Krout Creek is approximately 1000 feet upstream. There are several artesian springs located near the upland edge of this site. Most of the site is forested; however, there are several large open areas of herbaceous vegetation. The surrounding land uses are primarily agricultural (pasture and cropland), but also include some forested floodplain, forested wetland, and rural homes.

Marcella Site

The Marcella property is located along the northeast bank of Little Darby Creek in eastern Madison County, Ohio (~39° 55' 09" N, ~83° 15' 46" W). This forested riparian zone is the narrowest of the ten selected sites and is bordered by a steep bluff on the upland side. Most of the surrounding area is either forested floodplain or agricultural land. There are several homes immediately up slope of the site, and numerous rural homes scattered throughout the surrounding area. In addition, there is a sand and gravel mining operation immediately downstream of the site.

Rapp Farm Site

The RAPP site is located along the southern bank of the Spring Fork of Little Darby Creek in northwest Madison County, Ohio (~39° 59' 26" N, ~83° 23' 06" W). There were three vegetation communities present at this site: emergent marsh near the upland boundary; forested land near the creek; and wet meadow between the marsh and forested area. Several artesian springs exist near the upland boundary. Immediately up-slope of the site is moderately sloped pasture land. The surrounding land is either in agricultural use (pasture and cropland), or forested floodplain/forested wetland. In addition, a trailer home community and some rural homes are located nearby.

Shawnee Prairie Nature Preserve Site

The Shawnee Prairie site, a nature preserve owned by the Darke County Park District, is located

along the north-northwest bank of Mud Creek (a tributary of Greenville Creek, which is a tributary of the Stillwater River) in central Darke County, Ohio (~40° 05' 52" N, ~84° 38' 40" W). Most of this site is forested, except for a 10 m wide grass path that running parallel to the creek about 10 m from the creek bank. To the west, the surrounding land use is primarily agricultural, but also includes some scattered rural homes. The city of Greenville is located approximately one mile east of the site.

Sheppard Farm Site

The Sheppard Farm site is located along the east bank of Twin Creek in eastern Preble County, Ohio (~39° 42' 06" N, ~84° 31' 48" W). This site, located on an old channel island, is forested with a few canopy gaps where larger trees have fallen. Surrounding land use is primarily agricultural (pasture and cropland), but there is also some forested upland, forested floodplain, and rural homes nearby.

Walters Farm Site

The Walters Farm site is located along the east bank of Little Darby Creek in northwest Madison County, Ohio (~40° 04' 39" N, ~83° 24' 10" W). Most of the site is wooded, except for the oxbow channel located near the upland boundary. Site hydrology has probably been impacted by artificial levees along the creek. The surrounding land use is almost entirely agricultural; however, there are some forested floodplains and rural homes as well.

Warrick Farm Site

The Warrick Farm site is located along the west-northwest bank of an unnamed tributary of Boyd Creek (a tributary of the Stillwater River) in central Darke County, Ohio (~40° 11' 04" N, ~84° 36' 03" W). The site is forested with a few large individual trees comprised most of the cover. The surrounding land use is primarily agricultural.

Sampling Methods

Vegetation

Summer, 1996 Vegetation Survey

Vegetation was surveyed following a methodology that included both quantitative (quadrat sampling) and qualitative (between quadrat observation) examination of the plant community. Parallel transects were established perpendicular to the stream or river at each site. The length of and distance between transects were dependent on variations in site size and orientation. Transects were spaced to cover the entire site and to allow for equal distribution of thirty 0.45 m^2

circular sampling quadrats. The boundaries of the quadrats were defined by a 0.75 m diameter rigid plastic ring. All vascular species within each quadrat were identified and recorded. Species located between quadrats were identified and recorded qualitatively.

For the purposes of quality assurance/quality control, a random sample of ten percent or ten specimens (whichever was less) of the total number of species identified at each site were collected for subsequent confirmation by a botanical expert. A random numbers table was used to select specimens for collection as follows:

1) Prior to surveying the vegetation, a random numbers table was used to generate ten, two-digit (01, 02, etc.), non repeating, random numbers within the range of 01 to 30. These numbers identified quadrats in which quality control samples were to be collected.

2) Following the identification of all species in a quadrat randomly selected in step 1 above, a two-digit (01,02, etc.) random number in the range of the number of individual species found in that quadrat was generated. For example, if there were three species in a quadrat, a random number between 01 and 03 was generated. If that number was 03, a voucher sample of the third species on the list for that quadrat was collected.

A 10 m^2 circular plot was established from the center point of each 0.45 m^2 quadrat, within which the diameter at breast height (dbh - at ~1.4 m above ground surface) of all tree species with a dbh of greater than 1 cm was recorded.

Fall, 1996 and Spring, 1997 Vegetation Survey

Vegetation was also surveyed during the fall and spring seasons in order to satisfy the following objectives:

1) To develop a complete characterization of the vegetation of the site by identifying species that (1) were either absent or not observed during summer survey; and (2) were present during the summer survey but could not be identified due to immaturity or lack of flowering parts

2) To determine if the addition of species observed during the fall and spring seasons would significantly impact FQAI scores.

In order to conserve time for other activities, only qualitative surveys were completed during the fall and spring. At each site, field personnel surveyed the transects established during the summer survey. All species observed or collected were compared to the list of species that had been compiled during the summer survey. When a species was observed that was not on the summer list, it was added with the notation of the season in which it was identified. If field personnel

disagreed about, or did not know the identity of a specimen, a voucher sample was collected for subsequent identification by a botanical expert.

Groundwater

In order to investigate the relationship between groundwater levels and FQAI scores, three groundwater monitoring wells were installed at each site. Each well consisted of a 1.5 m length of 5.1 cm diameter PVC pipe with 1.3 cm diameter holes placed opposite each other at 15 cm intervals beginning approximately 20 cm below the top of the well. A single layer of vinyl window screen material was wrapped around the outer surface of each unit to prevent infiltration of debris and soil. A 7.6 cm diameter soil auger was used to produce an approximately 1.3 m deep hole. Because natural soil structure is often altered by the soil auger, the sides of the hole were scraped with a soil probe to promote natural water flow by restoring soil structure. Several handfuls of sand were placed in the bottom of the hole to provide a solid base. The well was inserted into the hole and examined to ensure that the top set of holes remained above the surface. The well hole was backfilled with sand to stabilize the well and promote water flow. A mound of bentonite clay was tightly packed around the top of the well at the soil surface to prevent surface water inflow into the well. Finally, a PVC cap was placed loosely on top of the well to prevent direct entry of water and debris.

The wells were placed in a triangular pattern in the riparian zone of each site; one near the edge of the stream or river, one near the edge of the riparian zone (upland boundary or change in land use), and one midway between the stream edge and riparian edge. The upland and streamside wells were placed parallel to each other and perpendicular to the stream. The middle unit was placed either upstream or downstream of the line formed by upland and streamside units (Figure 2). The exact placement of wells varied in relation to site size, site orientation, and ability to auger through the soil.

The distance to groundwater was measured during each site visit. A measuring tape was lowered to below water level in each well and the distance from the top of the well to the water level was noted. If the well was dry at the time of measurement, the depth to groundwater was noted as greater than the to the bottom of the well. The distance from ground surface to groundwater was obtained by subtracting the length of the portion of the well that was above ground surface.

At each well, a bottom draining, single check valve well bailer was thoroughly rinsed with deionized water, used to purge one to three well volumes (depending on the yield of the well), and then used to collect two (2) 1 liter groundwater samples. One sample was preserved with 2 ml of H_2SO_4, while no preservative was added to the other sample. In addition, field duplicates were collected at a frequency of 10%, and field blanks were prepared at a frequency of 5% to satisfy quality control requirements. The samples were stored in 1 liter capacity polyethylene cubitainers, each of which was labeled with site name, well location (upland, middle, or streamside), type of preservative (H_2SO_4 or "no preservative"), date, and, when appropriate, quality control indicator (field duplicate or field blank). Field blanks were not labeled with site

name or well location. All samples were stored at 4°C until analyzed.

Samples preserved with H_2SO_4 were collected for analysis of total organic carbon, ammonia, nitrate-nitrite, total Kjeldahl nitrogen, and total phosphorus. Samples without preservative were collected for chloride. All analyses were conducted at the Ohio EPA Division of Environmental Services laboratory.

Attempts to collect samples of groundwater from the monitoring wells for chemical analysis were made in November, 1996, and twice in early spring, 1997. At each attempt many of the wells had extremely low groundwater levels, making sample collection impossible. Even at times of high river flows, many wells were relatively dry, making sample collection difficult. Many samples that were collected were too turbid to undergo analysis. Because of this, the decision was made to cancel any further attempts to collect water samples.

Soil Profile Description

Prior to physical examination of soils, soil survey maps were consulted to identify which major soil mapping units were within the boundaries of each site. A soil probe was then used to find a representative pedon of each of the mapping units for description.

Three to four soil pedons were described at each site, all of which were sampled using a soil auger. In addition to descriptions generated during the creation of groundwater monitoring well holes, a pedon representative of the soil mapping unit which covered the largest proportion of site area (hereafter referred to as the dominant soil mapping unit) was also described. At sites with soils that were difficult to auger through, one of the descriptions generated during well hole creation was also used to describe the dominant soil mapping unit. All pedons were described in accordance with the USDA Soil Survey Manual (1993). Parameters described included: depth to and thickness of horizons, color, texture, consistence, and presence of carbonates. Depth to and thickness of horizons were estimated because of soil compaction within the auger or extreme soil wetness. Soil structure was eliminated as a parameter because accurate descriptions of structure cannot be obtained using an auger.

Gross Sedimentation

A gross sedimentation measuring device was installed approximately 5 m away from each groundwater monitoring well (three per site). Each device consisted of a 50 cm steel rebar rod and 2.5 cm diameter (1.1 cm center hole diameter) metal washer. One end of the rod was inserted through the washer and approximately 10 to 15 cm into the soil, with the washer resting on the soil surface (Jordan et al. 1993).

The distances from the top of the rod to (1) the upper surface of the washer, and (2) the soil surface, were measured at the time of installation and at the time of the final site visit. If the

washer was buried, deposition had occurred. The method is designed such that soil erosion is assumed if the washer is farther below the top of the rod at the end of the sampling period than it was at the time of installation (Jordan et al. 1993). Due to the movement of some of the rods overwinter, presumably due to frost heave, only sediment deposition data was used.

Disturbance

There is currently no method for assigning a quantitative disturbance level to a given site, therefore the final judgement was a relative ranking based on knowledge of the history of each site, its current condition, and best professional judgement. Evaluating the degree of disturbance to a dynamic system is extremely complex, if possible at all. Disturbance is defined as an event which has a direct physical impact on one or more plant communities of which the wetland is composed (Brooks et al. 1994). This implies an evaluation of "normal conditions", but the normal condition of a dynamic system is difficult to set boundaries upon. We assumed that a least-impacted site had not been impacted by the following types of events:

- Intensive logging, plowing, or grazing;
- Alterations of hydrology including
  - artificial drainage
  - stream channelization
  - levee construction
  - dam construction
- Human induced reduction or exacerbation of natural processes such as floods, fires, etc.;
- Alterations of surrounding habitat;

Several sources of information were consulted to determine which, if any, of the above listed disturbances had occurred at each site. First, visual evidence of disturbance observed during site visits was noted. Aerial photographs from several time periods were then examined to establish a basic understanding of changes in stream and riparian zone character (relocation, channelization, etc.), vegetation, and land use. Next, Natural Resources Conservation Service (NRCS) staff members from counties in which projects are located were interviewed where available to obtain detailed information about site history that could not be derived from aerial photos. Finally, property specific information was gathered from landowners if such information was known, and the owner chose to provide it.

Data Analysis

A master species list was compiled for each site in each sampling season. Each seasonal list is a cumulative listing of all species that had been observed during surveys prior to, and including, the specific season (i.e. summer lists included species observed during summer surveys, fall lists

included species observed during summer and fall surveys. etc.).

A coefficient of conservatism (C of C) value was assigned to each species on the lists. These values were gathered from the floristic checklist database developed for Ohio by Andreas and Lichvar (1995). Ratings of 0 - 10 were assigned as follows:

Value of 0: alien taxa and those native taxa that are opportunistic invaders or common components of ruderal communities;

Values of 1-3: widespread taxa that are found in a variety of communities, including disturbed sites;

Values of 4-6: taxa that display fidelity to a particular communities, but tolerate moderate disturbance to that community;

Values of 7-8: taxa that are typical of well established communities which have sustained only minor disturbance;

Values of 9-10: taxa that exhibit high degrees of fidelity to a narrow set of ecological (synecological) conditions.

These data were then used to calculate an FQAI score for each site and season. The FQAI score was calculated using the following formula:

$$I=\frac{R}{N}\sqrt{N} \quad \text{or} \quad I=\frac{R}{\sqrt{N}}$$

Where
I = FQAI Score
R = Sum of Coefficients of Conservatism (C of C)
N = Number of Native Species (N-native)

Correlation analyses were performed to determine if relationships existed between the FQAI scores and other characteristics of the sites. The significance of the results of these analyses were evaluated using Fishers r to z procedure. If an explanatory-response relationship existed between variables (e.g. overall FQAI score and soil organic matter), simple linear regression was used to evaluate the relationship. In addition, a matched t-test procedure was used to determine if the mean difference between Summer and Fall (overall) FQAI scores was significant. These analyses were conducted using Statview Version 4.0 software.

RESULTS AND DISCUSSION

Wetland Disturbance Levels

A description of each site's disturbance history and the relative disturbance rank that was assigned as a result are shown below. In this ranking, a value of 1 was assigned to the most disturbed site and a value of 10 was assigned to the least disturbed.

Akey Farm Site **Relative Disturbance Rank: 5**

This site consists of interspersed patches of forested floodplain and forested wetland. The land was probably used for agricultural purpose at some time in the past, but has undergone succession for at least twenty-five years. The land is currently owned by Carl S. Akey Inc. and is maintained as a recreation area for company employees. Several grass hiking/walking paths wind through the floodplain site. A 7.5 minute USGS topographic quadrangle indicates that a segment of Twin Creek located immediately upstream of the site has been modified recently. The adjacent upland (east of the site) is currently used for row crops. In addition, an experimental pig nursery is located on the adjacent upland (immediately east of the row crops). There are several industrial facilities approximately 0.5 miles west of the site, and Interstate 70 lies about 1 mile north. In general, agricultural land use is dominant in the surrounding area; however some rural homes and small towns also dot the landscape.

Brukner Nature Preserve Site **Relative Disturbance Rank: 9**

This wetland is located within the boundaries of the controlled inundation zone of Englewood Dam. It is surrounded by forested floodplain and forested upland habitats of the Brukner Nature Preserve. A boardwalk has been installed that allows visitor access while limiting visitor impact. This section of the floodplain probably was not used for agricultural purposes because it is bordered by moderately steep slopes which would limit machinery access. Timber was probably removed from the site at some point. Outside of the boundaries of the nature preserve, the landscape is dominated by agricultural uses. A moderate number of rural homes exist in the area, partially because the nature center is located in close proximity to the cities of Troy (~5 miles east-northeast) and Dayton (~25 miles south-southwest), Ohio.

Germantown Nature Reserve Site **Relative Disturbance Rank: 1 (most disturbed)**

In addition to disturbance associated with creation of a borrow pit (derived from construction of a dry dam just downstream), the frequency, intensity, and duration of flooding have all increased because of the proximity of the dam. There was evidence of a recent major flood event was observed during a site visit in June of 1996, including large drift piles and debris 10+ feet up in trees. In addition to the large volume of organic debris and trash, several inches of alluvial material were deposited as a result of that event. Events of this magnitude are no longer rare.

The site was inundated to a depth of several feet during a site visit in December of 1996. These flood events strip the land of vegetation and/or deposit large quantities of alluvial material on vegetation. As a result, the quantity, diversity, and quality of vegetation are severely limited. A large portion of the nearby land is also within the boundaries of the Germantown Nature Preserve and is forested floodplain, forested wetland, or forested upland. Agricultural land uses tend to dominate the landscape beyond the boundaries of the nature preserve; however, the number of homes in the area is increasing because the site is located within 15 or 20 miles of the southern half of Dayton, Ohio.

Gray Farm Site **Relative Disturbance Rank: 10 (least disturbed)**

There are several spring seeps near the upland boundary of this site and marl accumulations near the seeps. The hydrologic influence of the springs decreases with progression away from the upland towards Greenville Creek. The mucky nature of sapric soils probably prevented agricultural use of this land. There is a fallow agricultural field immediately upstream of the site indicating past agricultural use adjacent to the wetland. It is likely that timber was removed from the site at some point in the distant past. The site is now enrolled in a conservation trust. Most of the surrounding landscape is used for agricultural purposes (row crops and pasture), while most of the surrounding floodplain is forested. In addition, a few rural homes are scattered throughout the area.

Marcella Site **Relative Disturbance Rank: 4**

The upland boundaries of the riparian zone of this segment of the Little Darby are defined by moderately steep escarpments, and the floodplain at this site is fairly narrow. As a result, flooding is probably very flashy at this site. Flood events deposit large amounts alluvial material, but also cause some scour. Cut-bank erosion is occurring at a fairly rapid rate near the upstream bank of the site. An abandoned quarry operation is located immediately downstream of this site. The direct and indirect impacts of the quarry operation are not certain. This site was probably not used for agricultural purposes. Timber has probably been removed at some point, but it is difficult to say. It seems that this floodplain changes frequently because of meandering of the Little Darby, so tree growth might be limited by the actual existence of the floodplain.

Rapp Farm Site **Relative Disturbance Rank: 7**

There are several artesian springs near the upland boundary of this site, the influence of which diminishes with progression away from the upland towards the Little Darby. This site was probably used for agricultural purposes at some point in the past, at least for grazing. The site might have been drained at some point in the past; however, the presence of sapric soils within the marsh near the upland indicates that wet conditions have persisted for some time. The diversity of habitats (emergent marsh, forested floodplain, wet meadow) and associated micro habitats influences species diversity. The impacts of floods are not as significant at this site as at others because the riparian zone is fairly wide. The impact of floods would probably be most evident in the forested floodplain area. The adjacent upland area is moderately sloped and is currently used

as pasture land for cattle. Agricultural land use (row crops and pasture) is dominant on the surrounding landscape. A trailer home community is located approximately one mile south-southwest of the site. In addition, rural homes are scattered throughout the area.

Shawnee Prairie Site **Relative Disturbance Rank: 6**

This site is located in the floodplain of Mud Creek, which has been extensively channelized, approximately 1 mile upstream from the confluence of Mud Creek and Greenville Creek. The presence of scattered large bur oaks throughout the site indicates that the site was probably used as pasture land at some point. A grass path/road runs along the bank of the creek, separating the forested area from the creek. The Darke County Park District, current owners of the property, plan to restore some natural site features and to use the site as a nature preserve/education area. They are currently clearing some invasive understory vegetation to create paths/boardwalks through the property. In addition, the are restoring an area to oak savannah and are creating several wetlands on the property. Fields of row crops used to surround the site both on the upstream (south) and downstream (north) sides; however, wetlands are currently being created in those fields. Land use west of the site is dominated by agriculture, and land use to the east is primarily urbanized (Greenville, Ohio).

Sheppard Farm Site **Relative Disturbance Rank: 8**

This site is an old channel island located within the northern most boundaries of the controlled inundation zone of Germantown Dam. Human disturbance at the site appears to be minimal primarily because the land used to be isolated as an island. Moderately steep escarpments bound both sides of the riparian zone of this segment of Twin Creek. The site probably gets some agricultural runoff from adjacent upland activities. Flood impacts are uncertain because of incomplete data; however, note that the site was not flooded (groundwater was not even near the surface) following a two inch rain event in December of 1996. There are some large trees at this site indicating that vegetation has been established for some time; however, the quality of vegetation might be related to the fact that this site is "young" in a relative sense. Surrounding land use is primarily agricultural. In addition, rural homes and small towns (West Alexandria) are scattered across the landscape.

Walters Farm Site **Relative Disturbance Rank: 3**

This site is located between the current channel of Little Darby Creek and an old oxbow channel of the Little Darby. The presence of created levees and the straightness of the current channel indicate that this segment of the Little Darby has been channelized. The levee stops short of the point where the minor connection between the oxbow channel and current channel exists. Water drains from the oxbow to the Little Darby only when water levels within the oxbow are extremely high. The land might have been used for some agricultural purpose in the past. There are scattered large canopy trees with a dominant subcanopy of hawthorns, but poorly developed herbaceous and shrub/sapling layers. This structural composition would seem to suggest use as pasture land. Drift piles and the quantity of water in the oxbow channel suggest that the site

experiences flood events regularly. The shrub/sapling and herbaceous layers might be sparse because of flood damage. The site is surrounded by fields of row crops and scattered rural homes.

Warrick Farm Site **Relative Disturbance Rank: 2**

This site is a small, almost bowl shaped wetland on an unnamed secondary intermittent tributary of the Stillwater River. Flooding is probably flashy, occurring when stream flow flashes during significant precipitation events. The site was probably used for agriculture at some point. The presence of a few large canopy trees, but very few subcanopy individuals seems to indicate that the site was probably grazed. The site is currently surrounded by productive and fallow/early successional row crop fields, and probably suffers from edge effect due to limited interior area. In general, the surrounding land use is dominated by agriculture. In addition, some rural homes and small towns are scattered on the landscape.

FQAI Scores

The FQAI scores for each forested riparian wetland in each sampling season are shown in Table 1. The full species inventories and summary statistics for each site can be found in Appendix A. Table 1 also shows the proportion of each community that is made up of native species. These values ranged from a low of 75 percent to a high of 100 percent. The FQAI scores for the Fall, 1996 and Spring, 1997 sampling seasons are additive of the summer data, i.e., any additional species found on those sampling dates were added to the existing species list for that site. This provides the a conservative estimate of differences in score that might accrue due to seasonal differences in the vegetation community. FQAI values ranged from a low of 14.1 to 35.3 in the Summer '96 season, giving a spread of 21.2 to the data. The highest value reached in the study was 45.9 at the Gray Farm site. This was a very high quality site which has received little human disturbance. The spread in the data generally spans the range of values reported by Wilhelm and Ladd (1988), for other community types (for instance, scores ranging from 9 to 50 are reported for prairie ecosystems).

Table 1 also indicates the relative ranking of each site in each season (numbers in parentheses following site names). Four sites did not change rank in any season. Six sites did show very slight changes (although never changing position by more than one place), but all had the same rank for at least two of the three seasons. This indicates that, although the absolute scores did increase with subsequent sampling visits, the evaluation of the wetlands relative to each other was consistent. This provides a level of confidence in the use of FQAI scores to evaluate and compare sites. These results also give a preliminary indication that narrowing the sampling window to one season could provide representative results when comparing sites.

Data on the percent of the total species whose identities were confirmed in the lab are shown on Table 2. Throughout the study period lab confirmations ranged from 0 to 60 percent of the species identified in the field. In total each site had, at minimum, 17 percent of its total

Table 1. Seasonal comparisons of FQAI scores and the percent of the wetland community made up of native species at each site. Note FQAI scores for Fall '96 and Spring '97 are additive (new species were added to previous seasons list). Numbers in parentheses following site names indicate the relative rank of that site in each season (summer, fall, spring; 1 = highest score, 10 = lowest score).

Site Name	FQAI Score			% Native Species		
	Summer '96	Fall '96	Spring '97	Summer '96	Fall '96	Spring '97
Akey Farm (6,6,6)	22.4	27.3	30.1	87	83	80
Brukner Nature Center (3,3,2)	32.0	36.9	40.8	92	91	89
Germantown (10,9,9)	14.1	20.0	21.4	100	83	80
Gray Farm (1,1,1)	35.3	41.4	45.9	93	94	94
Marcella (7,7,7,)	20.4	24.5	29.9	93	90	92
Rapp (2,2,3)	32.3	37.5	39.7	75	79	79
Shawnee Prairie (5,4,5)	24.3	28.6	31.4	85	89	86
Sheppard Farm (4,5,4)	27.0	28.0	35.3	93	94	90
Walters Farm (8,8,8)	16.9	20.5	21.4	92	84	80
Warrick Farm (9,10,10)	16.3	17.4	18.9	92	93	84

Table 2. Percent of the total species identified at each site that were confirmed in the lab in each season. The total percent confirmed in the lab is also given for each site.

Site Name	Summer	Fall	Spring	Total
Akey Farm	42	42	50	44
Brukner Nature Center	33	43	39	36
Germantown	47	35	70	46
Gray Farm	34	37	0	30
Marcella	26	54	0	24
Rapp	38	53	0	39
Shawnee Prairie	26	25	0	21
Sheppard Farm	20	57	0	17
Walters Farm	12	41	25	24
Warrick Farm	20	60	38	29

community composition confirmed in the lab.

Table 3 details the total species added in the Fall and Spring sampling periods as a proportion of those collected in the summer period. The resulting increase in FQAI scores over that obtained for the Summer data is also shown. Proportionately more species were added in the Fall sampling season relative to the Spring. This result is not surprising given the paucity of understory vegetation at many sites in the spring period. High water levels (the result of overbank flooding) at many sites in the late winter-early spring delayed the emergence of understory vegetation. By contrast, the herbaceous layer in the Fall period (when many sites are dry) was well developed.

A correlation matrix showing the relationship between FQAI scores in the different sampling seasons is shown in Figure 1. Values of R were high (0.97 to 0.98) confirming that there appears to be no advantage in conducting field visits in more than one season, and that limiting the sampling window to the Summer index period will not reduce the sensitivity of the FQAI analysis in differentiating between sites.

FQAI scores along a gradient of disturbance

In order to investigate the relationship between disturbance levels and the FQAI scores, a correlation analysis was conducted for FQAI data as a function of the relative disturbance rank of each site. The results show a high degree of correlation between the two variables (Figure 2; R = 0.96). FQAI scores increase as disturbance levels increase, providing a strong biological "signal" of the relative level of human disturbance. In essence this is the ecological equivalent of the dose-response curve used in toxicological studies, and it indicates that the FQAI is sensitive to differing levels of site disturbance. In this case we can infer that the curve is a response to the cumulative effects of events and human actions which have occurred at each site (Karr and Chu 1997). These data show that there is a systematic difference in the biological condition of these riparian wetlands as measured by the FQAI. Comparing the scores for the least impacted and impaired sites shows that the FQAI is an effective measure of ecological condition.

The relationship between the relative disturbance rank and the proportion of each community that is made up of non-native species was also investigated (Figure 3). Interestingly, this measure of the vegetation community does not correlate with disturbance rank. It appears that the FQAI provides more comprehensive information about the condition of the ecosystem because it not only accounts for the presence of non-native species, but also the degree of fidelity that each native species has for specific environmental conditions. The fact that vegetation displays varying degrees of tolerance to disturbance gives the FQAI index much more sensitivity to the condition of an ecosystem than does the mere presence of alien taxa.

Diameter at Breast Height (DBH) and FQAI Scores

At each wetland site, DBH data was collected as an indicator of stand maturity. No relationship

Table 3. Percent total species added and the corresponding percent increase in FQAI scores for each season sampled relative to the summer sampling period.

	% total species:		% increase in FQAI score:	
Site Name	**added in Fall**	**added in Spring**	**Summer to Fall**	**Fall to Spring**
Akey Farm	28	19	22	10
Brukner Nature Center	21	18	15	11
Germantown	46	20	42	7
Gray Farm	23	14	18	11
Marcella	22	32	20	22
Rapp	22	7	16	6
Shawnee Prairie	25	18	18	10
Sheppard Farm	9	34	4	26
Walters Farm	33	16	21	4
Warrick Farm	13	21	7	9
Mean change	***24.2***	***19.9***	***18.3***	***11.6***

	FQAI Summer	FQAI Fall	FQAI Spring
FQAI Summer	-	0.98	0.98
FQAI Fall	-	-	0.97
FQAI Spring	-	-	-

Figure 1. Correlation matrix for FQAI scores in each sampling. season.

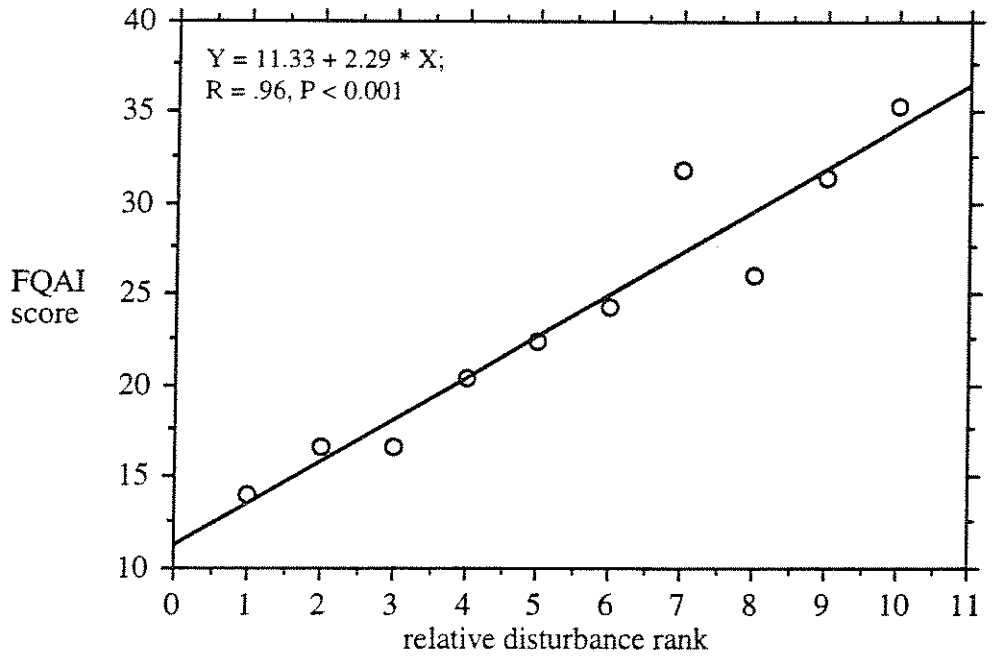


Figure 2. Relationship between the relative level of disturbance and Fall FQAI scores in 10 forested riparian wetlands.

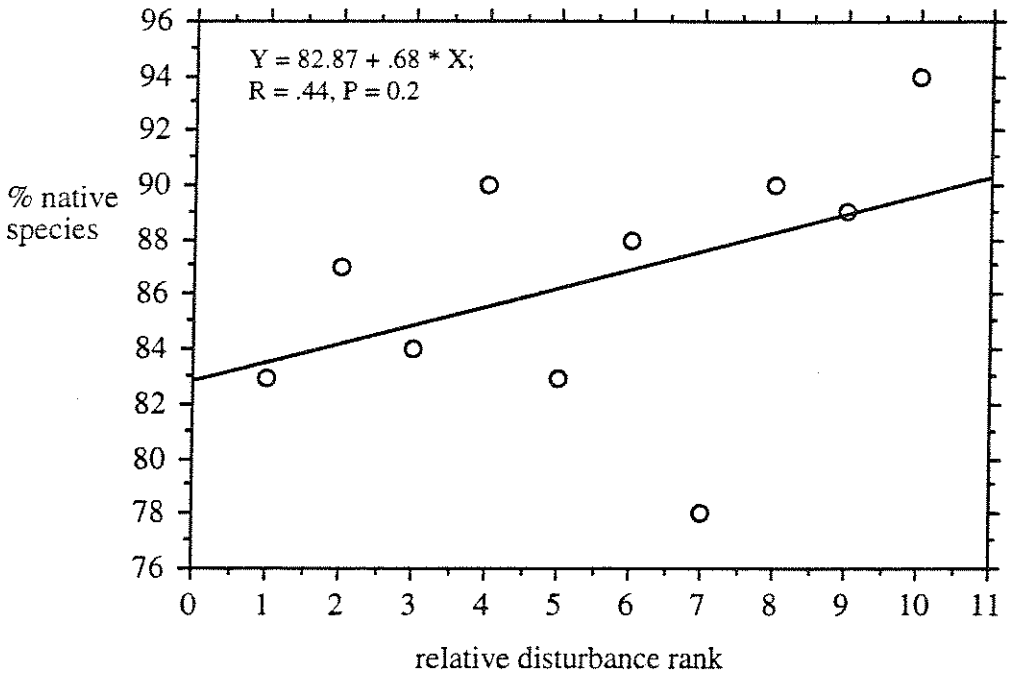


Figure 3. Relationship between the relative level of disturbance and the percent native species (Fall data) in 10 forested riparian wetlands.

was found between mean DBH scores for each site and the corresponding FQAI scores (Figure 4). Mature forested wetlands in Ohio are rare, and none of the sites included in this survey had characteristics of mature forested wetlands. All of the sites included in this study were, at minimum, selectively cut at some point during the last century.

Soils

Table 4 shows a summary of the characteristics of the upper soil profile (upper A horizon) at each site. Full soil descriptions, including all soil horizons, can be found in the Appendix. Under the pedon classification system, all soils rated as very poorly drained are considered hydric soils. Soils that were not very poorly drained are characteristic floodplain soils (e.g., the Fluventic Hapludoll at the Sheppard site). The most common pedon classification in this set of wetlands was Fluvaquentic Haplaquoll. These soils form under occasional flooding with sediment deposition at a rate too rapid for all the fresh sediment to become incorporated. They are common in back swamps on stream floodplains (USDA 1975). Chromas were low in all samples. Nearly all soil samples had chromas of 2 or less; a total of 3 samples (8 percent of the total) had chromas of 3.

Rates of Sedimentation

Sediment deposition was measured at three locations in each wetland (Table 5). Data was not obtained at several locations where sediment markers were missing at the end of the study period. Deposition rates ranged from areas of no net accumulation (0 cm yr^{-1}) to 9.9 cm yr^{-1}. The highest deposition rates were measured at the Germantown Nature Preserve. At this site, the wetland was located behind a dry dam which trapped floodwater behind it, including one flood event which resulted in water depths of approximately 10 feet on the wetland. Sediment deposition was extremely high at this site as a result. River water also transported a conspicuous amount of crop residue from up-watershed agricultural lands and deposited it on the surface of the wetland.

Previous studies have shown that sediment deposition negatively affects the growth of both wetland plant and tree species (Ewing 1996), particularly when accompanied by high rates of flooding (i.e., altered hydroperiods). The relationship between mean rates of sediment deposition and FQAI scores was investigated to determine if sediment deposition might be a specific agent of disturbance leading to lower FQAI scores (Figure 5). No relationship was found between these two variables. The limited data collected at each site (three point samples per site) in conjunction with the high degree of spatial heterogeneity inherent in sedimentation data may have obscured any relationship.

Groundwater Level Fluctuations

The hydrology of forested riparian areas can be very complex (Mitsch and Gosselink 1993). Because groundwater helps sustain these wetlands through most of the year, alterations caused by

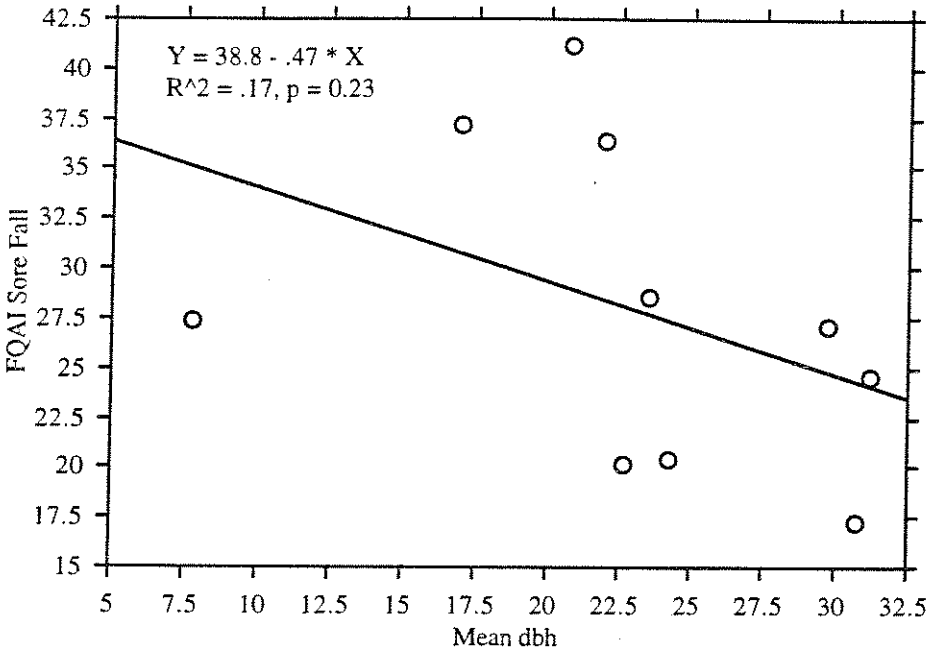


Figure 4. Regression of mean diameter of breast height (dbh) for woody species versus FQAI scores in the 10 riparian wetland forests.

Table 4. Summary of soil descriptions for each wetland. If more than one A horizon was present, only the uppermost was included in this table. Data for the Bruckner site were not available.

Site Name	Sample	Pedon Classification	Pedon Drainage	Characteristics of the Upper A Horizon			
				Color	Depth	Texture	pH
Akey Farm	1	Fluvaquentic Hapludoll	Well drained	10YR 3/2	11	silt loam	7.74
	2	Fluvaquentic Haplaquoll	Somewhat poorly drained	10YR 3/2	11	silt loam	
	3	Fluvaquentic Hapludoll	Moderately well drained	10YR 3/2	12	silty loam	
	4	Fluvaquentic Hapludoll	Moderately well drained	10YR 3/2	12	silt loam	
Germantown	1	Aquic Udorthent	Moderately well drained	10YR 4/2	3	silt loam	7.58
	2	Aquic Udorthent	Somewhat poorly drained	10YR 4/1	10	silt loam	
	3	Typic Udifluvent	Well drained	10YR 4/3	11	silt loam	
	4	Typic Udifluvent	Well drained	10YR 4/3	11	silt loam	
Gray Farm	1	Thapo-histic fluvaquent	Very poorly drained	10YR 4/1	12	silt loam	NA
	2	Aeric Fluvaquent	Somewhat poorly drained	10YR 4/3	8	silt loam	
	3	Typic Medisaprist	Very poorly drained	10YR 3/1	11	sapric	
	4	Typic Medisaprist	Very poorly drained	10YR 2/1	15	sapric	
Marcella	1	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/2	18	silt loam	8.02
	2	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/2	14	silt loam	
	3	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/2	22	loam	
	4	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/2	11	silt loam	
Rapp	1	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/2	5	silt loam	7.44
	2	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/2	12	loam	
	3	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/1	11	silt loam	
	4	Thapo-histic fluvaquent	Very poorly drained	2.5Y 2.5/1	5	silt loam	
Shawnee Prairie	1	Typic Haplaquoll	Very poorly drained	10YR 2/1	10	silt loam	7.46
	2	Typic Haplaquoll	Very poorly drained	10YR 3/2	8	silty clay loam	
	3	Typic Haplaquoll	Very poorly drained	10YR 3/1	13	silt loam	
	4	Typic Haplaquoll	Very poorly drained	10YR 3/2	6	silty clay loam	
Sheppard Farm	1	Fluventic Hapludoll	Well drained	10YR 3/2	10	loam	NA
	2	Fluventic Hapludoll	Well drained	10YR 3/2	10	gravelly loam	
	3	Fluventic Hapludoll	Well drained	10YR 3/2	10	loam	
Walters Farm	1	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/2	11	heavy silt loam	7.59
	2	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/2	10	silt loam	
	3	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/2	12	silt loam	
	4	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/2	7	silt loam	
Warrick Farm	1	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/1	10	silty clay loam	NA
	2	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/1	10	silty clay loam	
	3	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/1	10	silty clay loam	
	4	Fluvaquentic Haplaquoll	Very poorly drained	10YR 3/1	11	silty clay loam	

Table 5. Sediment deposition at each sampling station. Mean deposition for each site is also shown. "NA" indicates sedimentation markers were not found at the end of the study period.

Wetland Site Name	Deployment Date	Collection Date	No. Days Lapsed	Upland Edge Sediment Station				Center Sediment Station				Streamside Sediment Station				Mean Sedimentation (cm/yr)
				Accumulation (cm)			Net Sediment Rate (cm/yr)	Accumulation (cm)			Net Sediment Rate (cm/yr)	Accumulation (cm)			Net Sediment Rate (cm/yr)	
				Litter	Sediment	Total		Litter	Sediment	Total		Litter	Sediment	Total		
Akey Farm	7/18/96	7/25/97	372	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0.00
Brukner Nature Center	8/1/96	5/29/97	301	0	0	0	0.00	0.5	0	0.5	0.00	NA	NA	NA	NA	0.00
Germantown	7/3/96	7/25/97	387	NA	10.5	11	9.90	NA	10.3	10.3	9.71	NA	NA	NA	NA	9.81
Gray Farm	9/11/96	4/30/97	231	1.3	2.5	3.8	3.95	2.5	2.7	5.2	4.27	0.0	1.8	1.8	2.84	3.69
Marcella	4/26/96	5/2/97	371	0	4.6	4.6	4.53	3.3	1.6	4.9	1.57	NA	NA	NA	NA	3.05
Rapp	6/26/96	8/22/97	422	NA	NA	NA	NA	1.4	1.7	3.1	1.47	NA	1.4	1.4	1.21	1.34
Shawnee Prairie	7/12/96	4/30/97	292	1.2	0.6	1.8	0.75	0	0	0	0.00	1.1	0.8	1.9	1.00	0.58
Sheppard Farm	10/3/96	8/22/97	323	0	3.1	3.1	3.50	0	1.5	1.5	1.70	0	1.8	1.8	2.03	2.41
Walters Farm	6/26/96	5/2/97	310	0	0	0	0.00	1.1	2.9	4.0	3.41	1.0	0.5	1.5	0.59	1.33
Warrick Farm	8/22/96	5/8/97	259	2.2	2.0	4.2	2.82	2.6	0	2.6	0.00	2.2	1.5	3.7	2.11	1.64

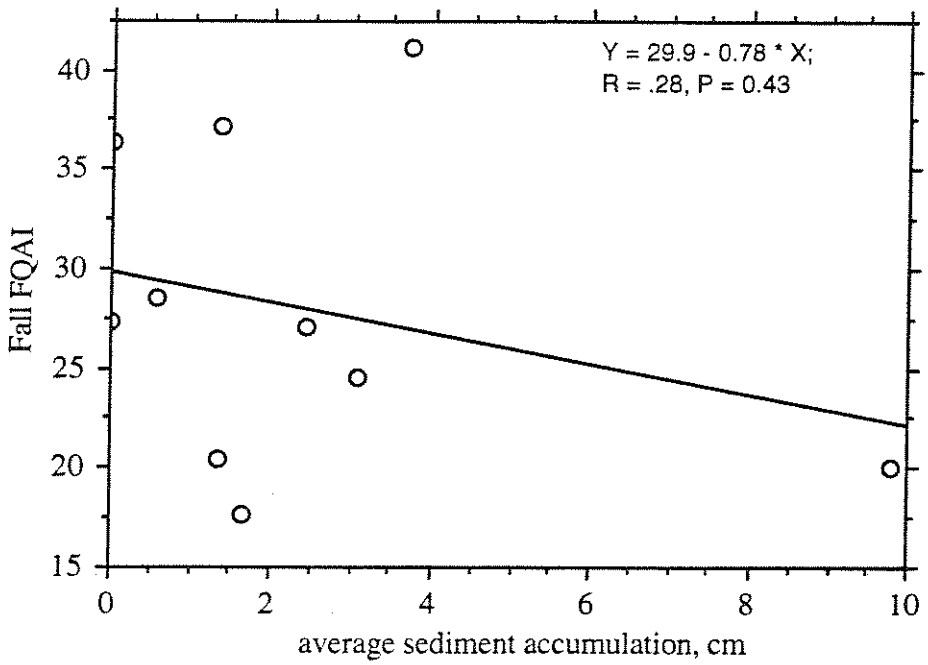


Figure 5. Response of the FQAI index to sediment deposition. Sedimentation data shown are means for each site.

human activities such as agricultural drainage or stream channelization, can compromise the functional and ecological integrity of the wetland. Altered hydroperiod, for example, can influence the attrition and/or establishment of plant species.

Groundwater levels in the upper soil profile were monitored at each site from approximately June of 1996 to the end of May l, 1997. The number of water level measurements taken from each well ranged from 8 to 3. On average, water depths in each well were measured 5 times. Because the depths to the bottom of each well was not constant (due to varying soil conditions at each site location), the data were standardized to include only the upper 30" of the soil profile. A summary of groundwater levels, including the average groundwater level at each site and the average water level fluctuation (calculated as the average difference (n = 3) between the highest and lowest water levels at each site) is shown in Table 6. The lowest average water levels were found at the Sheppard and Shawnee Prairie sites. At the Sheppard site water levels never reached the upper 30" of the soil profile (for an average of 0). Shawnee Prairie also shows a mean water level of 0, but high water levels in the winter months were not able to be recorded due to frozen well caps. Soils at the Sheppard site were classified as Fluventic Hapludoll, a well drained soil that did not retain water in the upper soil profile during the study period. The highest mean water levels were 15.9" at both the Gray and Rapp sites. Interestingly, both of these sites were fed by springs located at their upland boundary. This, in combination with their poorly drained soils (Table 4) acted to keep water levels relatively near the soil surface throughout the year. A third site, Brukner, was also fed by springs and had the second highest mean water level. The average maximum groundwater level fluctuations (cm) ranged from 0 to 30".

The amount of change in groundwater levels in the upper soil profile was investigated for its correlation to FQAI values. The results (Figure 6a) indicate that those sites with higher mean fluctuations in the upper 30" of the soil profile tended to have lower FQAI scores. Interestingly there is a data cluster consisting of the Brukner, Rapp and Gray sites at the top center of the graph. Each of these sites had a hydrologic regime which was substantially influenced by the inflow of groundwater seeps (springs) near the riparian wetland - upland boundary. These three sites also had the three highest FQAI scores of any of the sites included in the study.

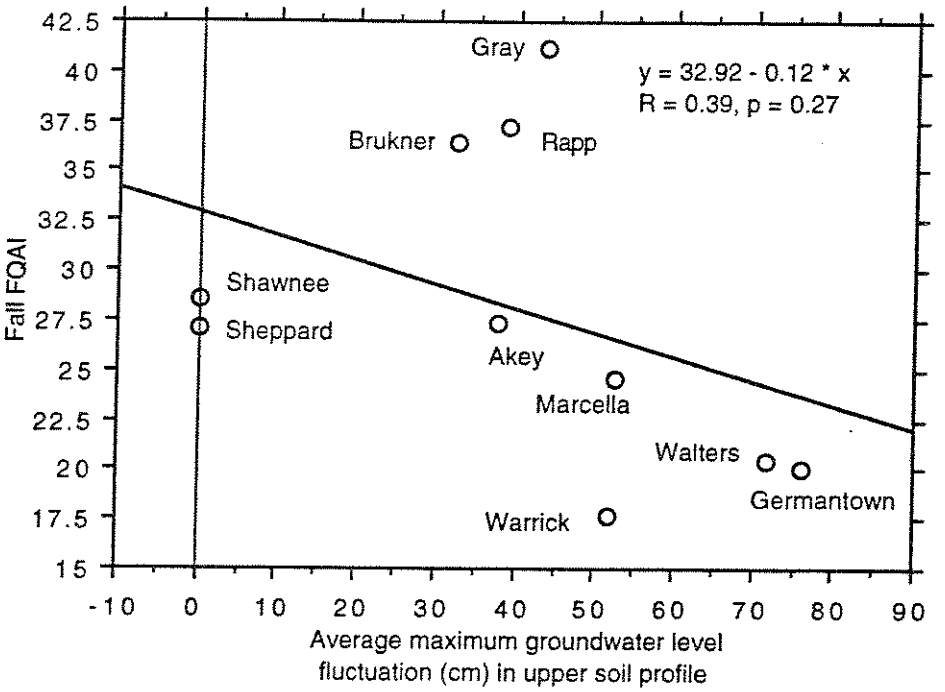
The discovery of springs feeding these three sites could constitute an argument that these sites should be partitioned into a separate HGM subclass. Under the HGM framework, this would represent a change from "conveyor" systems, which receive water from overland flow and convey it downstream (i.e., from overbank flooding), to "receptors", or systems which receive mostly groundwater and release it to overland flow (Brinson 1993). The analysis of FQAI values and groundwater level fluctuations was repeated, this time excluding the three spring fed sites (Figure 6b). The relationship became much stronger when comparing only "conveyor" wetlands. Figure 6b shows a significant trend in which sites with more amplitude in their hydrological regime had lower FQAI scores. This had implications for water management in urban and urbanizing watersheds where altered, "flashy" hydroperiods are common. The vegetation community as measured by the FQAI appears to be responding to hydrological differences between the sites.

Table 6. Summary of groundwater level data collected at each site. All data was standardized to include only the top 76 cm (30") of the soil profile (values are means of 3 wells per site). Values in parentheses following site names indicate the number of groundwater level measurements taken at each site (6/96 - 5/97).

Site Name	Mean water Level (cm)	Mean Water Level Fluctuation (cm)
Akey Farm (5)	9.4	37.6
Brukner Nature Center (4)	32.5	32.3
Germantown (5)	25.4	76.2
Gray Farm (4)	40.4	43.4
Marcella (7)	17.5	52.6
Rapp (8)	40.4	38.9
Shawnee Prairie* (5)	0	0
Sheppard Farm (5)	0	0
Walters Farm (8)	21.7	71.9
Warrick Farm (3)	17.3	51.8

* data collection incomplete due to frozen well caps.

a)



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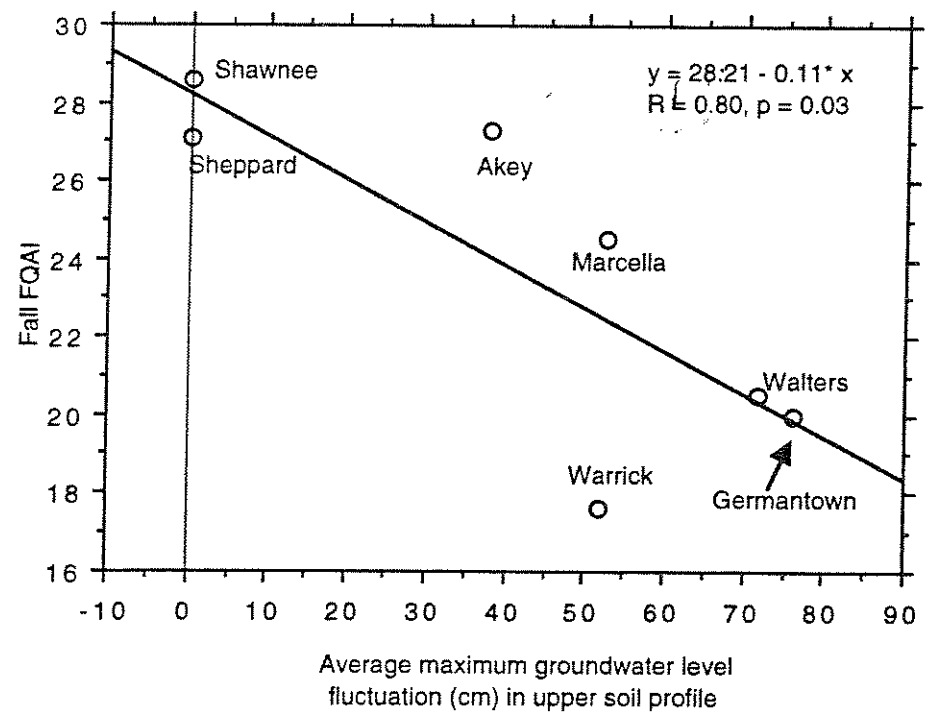
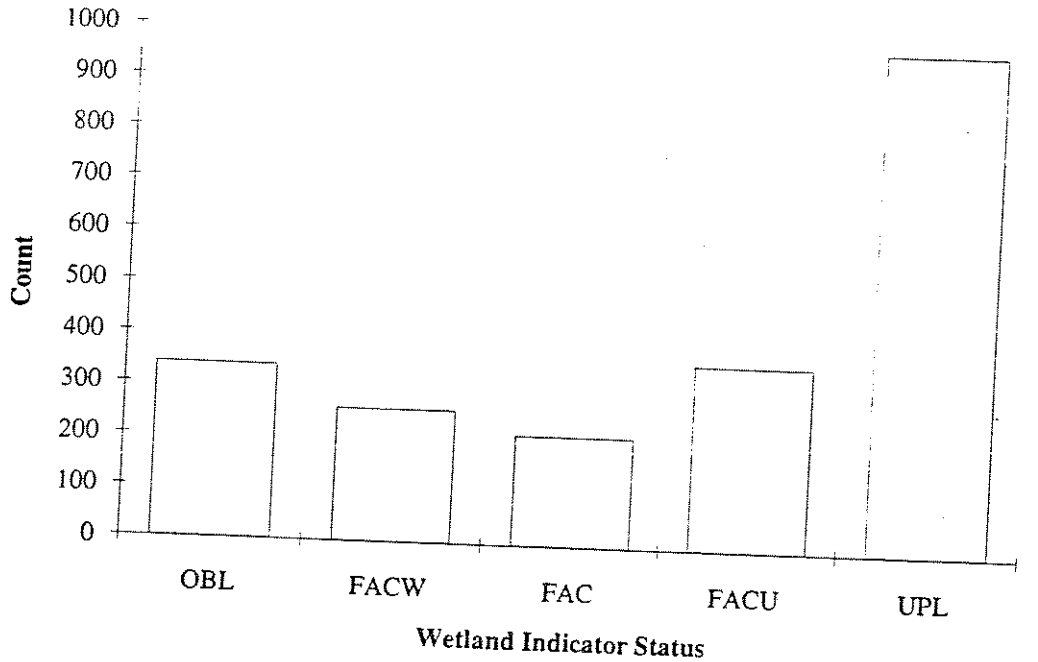


Figure 6. Regression analysis of average maximum water level fluctuations in the upper 76 cm (30") of the soil profile with FQAI scores for a) all sites; and b) excluding sites that are fed by spring water inflows. Values are means of 3 groundwater monitoring wells per site taken between summer 1996 and spring 1997.

FQAI and Wetland Indicator Status

The Wetland Indicator Status of each species defines the probability that a given species will be found in a wetland (Reed 1988). This information is used in wetland delineation and can be used to calculate a "Prevalence" Index to determine if wetland vegetation is present. In this scheme, the Indicator Status Categories are assigned scores as follows: obligate (OBL) = 1; facultative wetland (FACW) = 2; facultative (FAC) = 3; facultative upland (FACU) = 4; upland (not listed) (UPL (NL)) = 5. Scores for all species recorded are averaged, with a weighting for frequency or abundance. If this weighted average is less than 3.0, wetland vegetation is considered to be present. Herman et al. (1996) report a hypothesis that using only native species to calculate a Prevalence Index provides a stronger indication of wetland status than will be found if alien taxa are also included. This hypothesis is borne out by the Ohio data, as it was for Michigan flora used by Herman et al. (1996). Figure 7a shows the frequency distribution of the wetland indicator status categories for all species contained in the FQAI species list (2128 total species; see Andreas and Lichvar 1995). Figure 7a shows an approximate inverse normal distribution, except for the large number of species in the OBL category. Figure 7b shows the skewed distribution of non-native species (a total of 645 species), with a far greater number of species in the UPL category. Non-native species tend to be adapted to agricultural, well-drained soils, therefore their presence reveals more about post-European settlement land use and disturbance, rather than an indicator of the flora which has, over evolutionary time scales, evolved to life in wetland conditions (Wilhelm 1992).

a)



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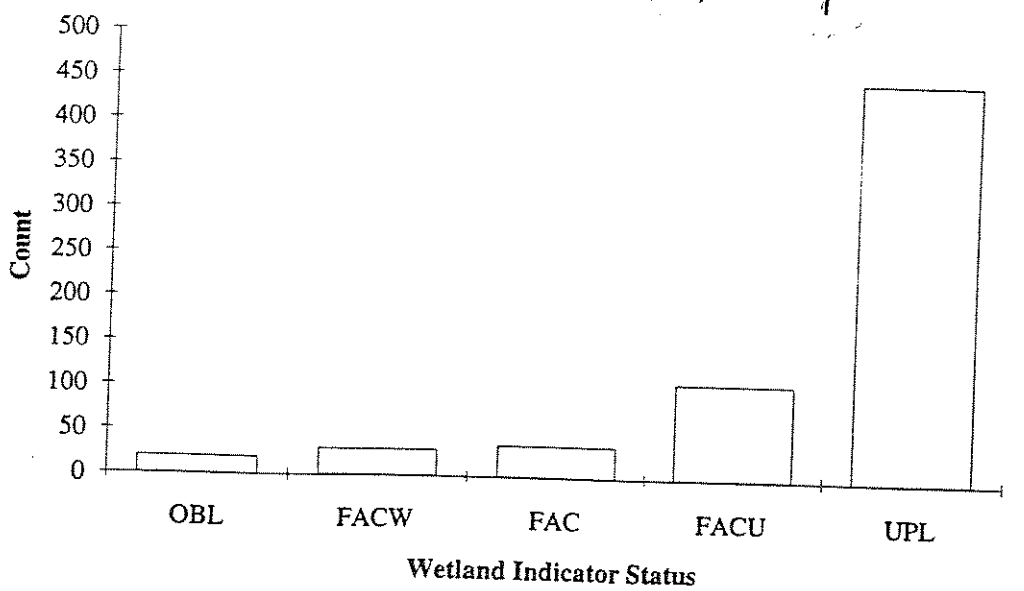

Figure 7. Frequency distribution of wetland status indicator categories for a) all species in the FQAI flora (2128 species) (Andreas and Lichvar 1995) and b) all non-native species (645 species).

Conclusions

The results of this pilot study to test the sensitivity of the Floristic Quality Assessment Index (FQAI) to a gradient of disturbance, show that FQAI scores vary as a function of the relative level of site disturbance, indicating that the index may serve as a useful indicator of wetland ecosystem condition. The correlation between the relative disturbance rank and FQAI was high ($R = 0.96$, $p < 0.001$) demonstrating the ability to the FQAI to discern differences in wetland condition from least impaired to highly impacted sites. FQAI scores increase as disturbance levels increase, providing a strong biological "signal" of the relative level of human disturbance. This is the ecological equivalent of the dose-response curve used in toxicological studies, indicating that the FQAI is sensitive to differing levels of site disturbance.

The FQAI scores in different sampling seasons were highly correlated. Values of R were high (0.97 to 0.98) confirming that there may be no advantage in conducting field visits in more than one season. Limiting the sampling window to the Summer index period does not appear to reduce the sensitivity of the FQAI analysis in differentiating between sites. This preliminary conclusion will require further testing.

The FQAI provides more information on the status of these wetlands (as judged by the correlation with disturbance rank) than did the proportion of non-native species within each site. The FQAI provides more comprehensive information about the condition of the ecosystem because it not only accounts for the presence of non-native species, but also the degree of fidelity that each native species has for specific environmental conditions. The fact that different species display varying degrees of tolerance to disturbance gives the FQAI index much more sensitivity to the condition of an ecosystem.

The approach taken in this study to develop "relative disturbance ranks" was necessitated by the lack of quantitative techniques with which to measure site disturbance. If we are to document the impact of human perturbations on ecosystems, tools must be developed to quantify human disturbance levels (i.e., quantify the "x-axis"). This is an area deserving further study.

The data collected in this study does give a preliminary indication that hydrologic disturbace may be having a measurable effect on riparian wetland quality. Hydrologic alterations are one of the most prevalent types of perturbation that wetland ecosystems sustain, and measures to quantify their impacts would be valuable in riparian wetland monitoring and restoration programs (Kentula 1997).

One concern commonly expressed about the wetland regulatory system in the United States is that we are "winning the battle but losing the war". While efforts have been successful to reverse the decades long trend of losing wetland acreage, little work had been done to measure the health and sustainability of the wetlands which remain. Attention must be turned to the issue of maintaining and restoring the "chemical, physical and biological integrity" of our wetland ecosystems. A

significant step in this effort will be the development of tools to measure their condition or integrity. A fully developed wetland biological monitoring program is a critical component in efforts to protect wetland ecosystems.

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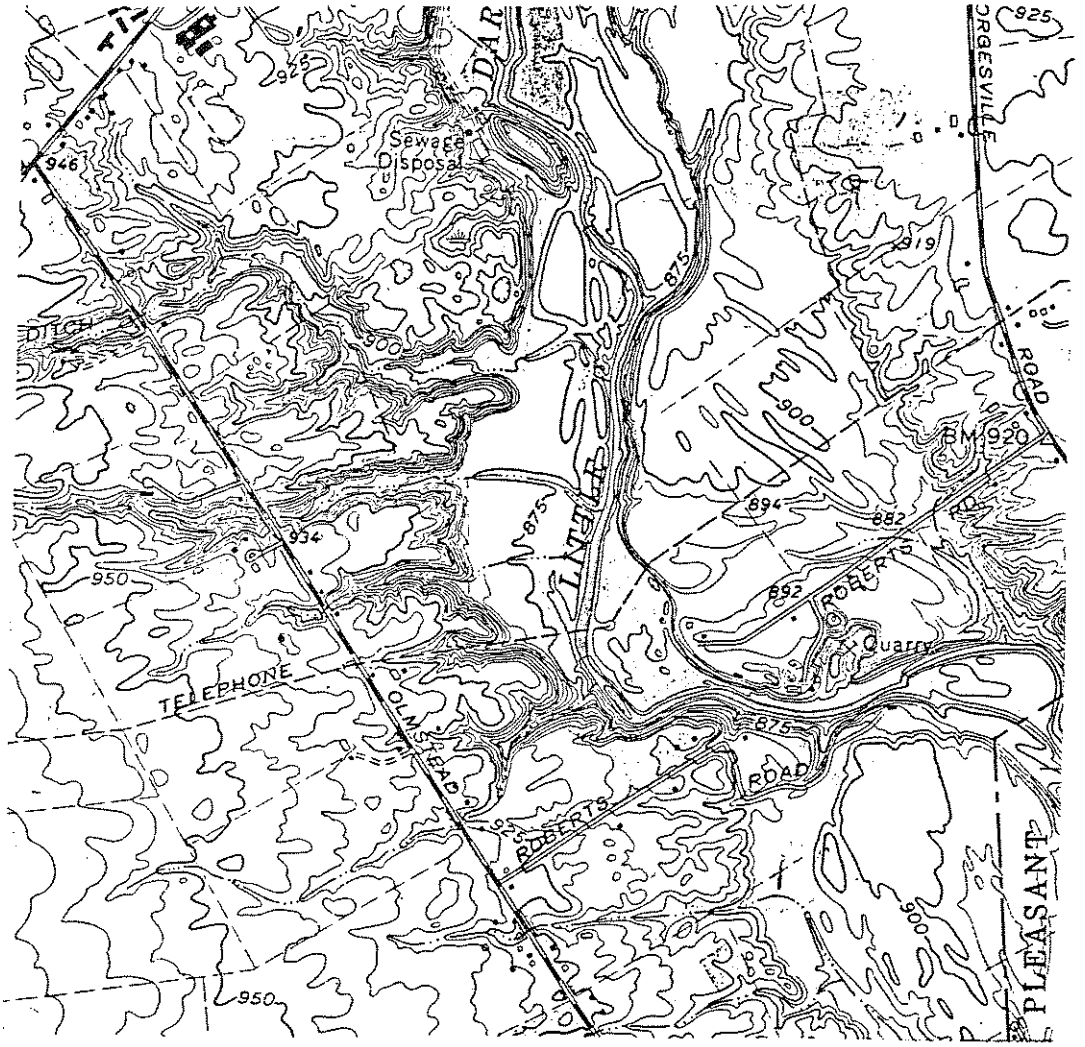
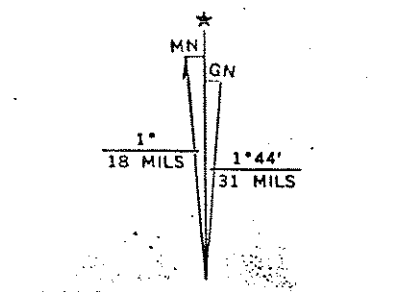
Appendix: Site Locations

Marcella/Thrasher FQAI Site





UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

County	Madison County
Quadrangle Name	West Jeferson Quadrangle
Township and Range Description	Located in Jefferson Township, 1.8 miles south-southeast of West Jefferson, 0.6 mile southwest of the intersection of Plain City-Georgesville Rd. and Roberts Rd. at the end of Roberts Rd., then ~50 yards south. Property lies within the former Virginia Military District. Property boundaries determined in haphazard fashion by owners. No township and range description exists.
Latitude	~39° 55' 09" N
Longitude	~83° 15' 46" W
UTM Grid Coordinate-North	~4,420,964 m N
UTM Grid Coordinate-East	~306,795 m E

SCALE 1:24 000

1 0 1 MILE

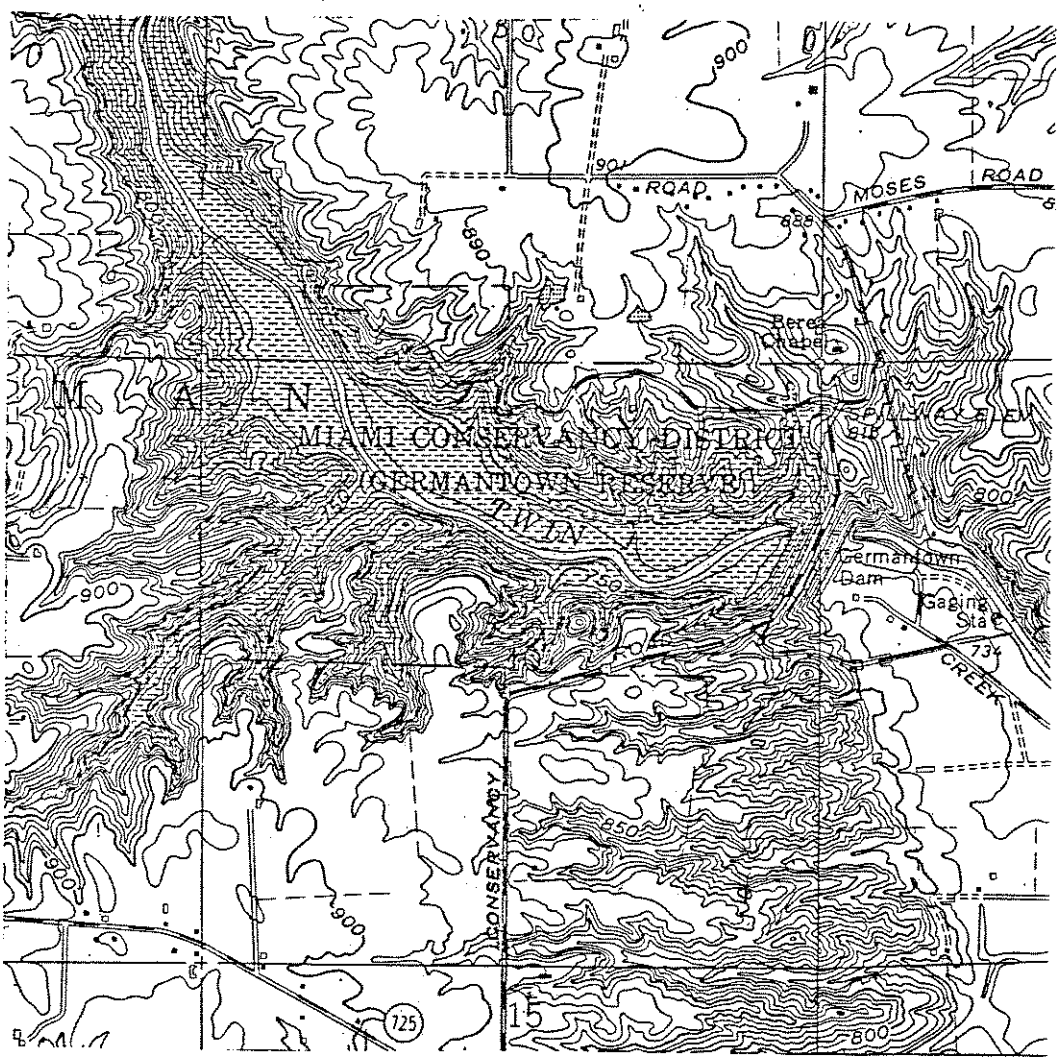
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

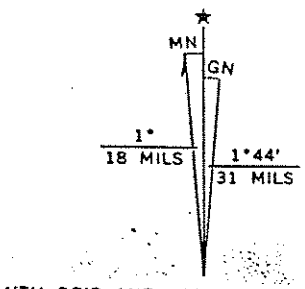
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Germantown Nature Reserve FQAI Site





UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

County	Montgomery County
Quadrangle Name	Farmersville Quadrangle
Township and Range Description	NE1/4, NW1/4, Sec. 10, R4E, T3N of the Great Miami River Base and the First Principal Meridian
Latitude	~39° 38' 22" N
Longitude	~84° 24' 50" W
UTM Grid Coordinate-North	~4,390,843 m N
UTM Grid Coordinate-East	~722,000 m E

SCALE 1:24 000

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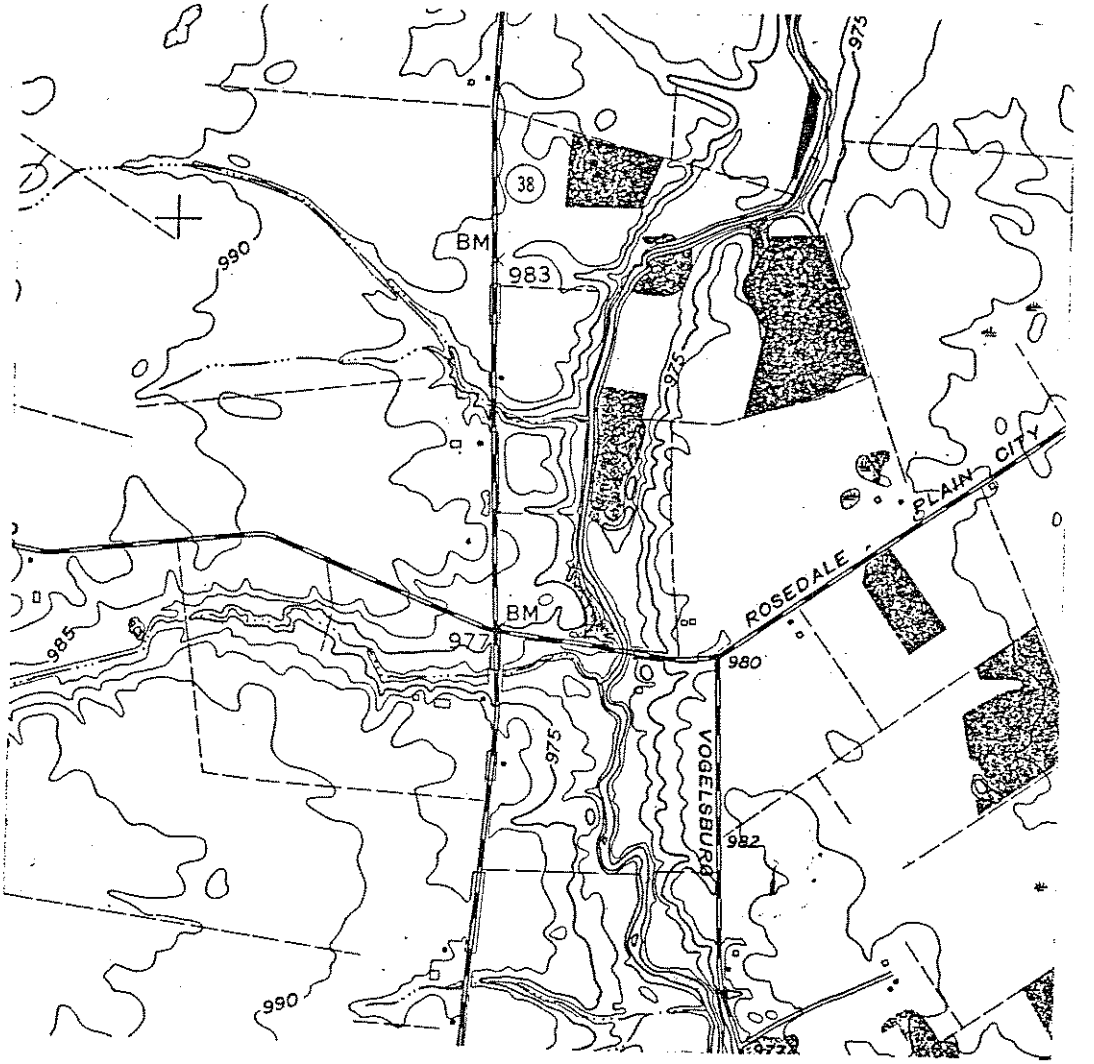
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

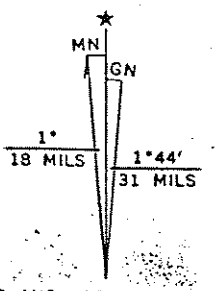
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Walters Farm FQAI Site





UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

County	Madison County
Quadrangle Name	Plumwood Quadrangle
Township and Range Description	Located in Pike Township, 2.7 miles east of Rosedale, 0.2 mile east of intersection of State Route 38 and Rosedale-Plain City Rd. along Rosedale Plain City Rd., then ~350 yards north. Property lies within the former Virginia Military District. Property boundaries determined in haphazard fashion by owners. No township and range description exists.
Latitude	~40° 04' 39" N
Longitude	~83° 24' 10" W
UTM Grid Coordinate-North	~4,438,879 m N
UTM Grid Coordinate-East	~294,747 m E

SCALE 1:24 000

1 ½ 0 1 MILE

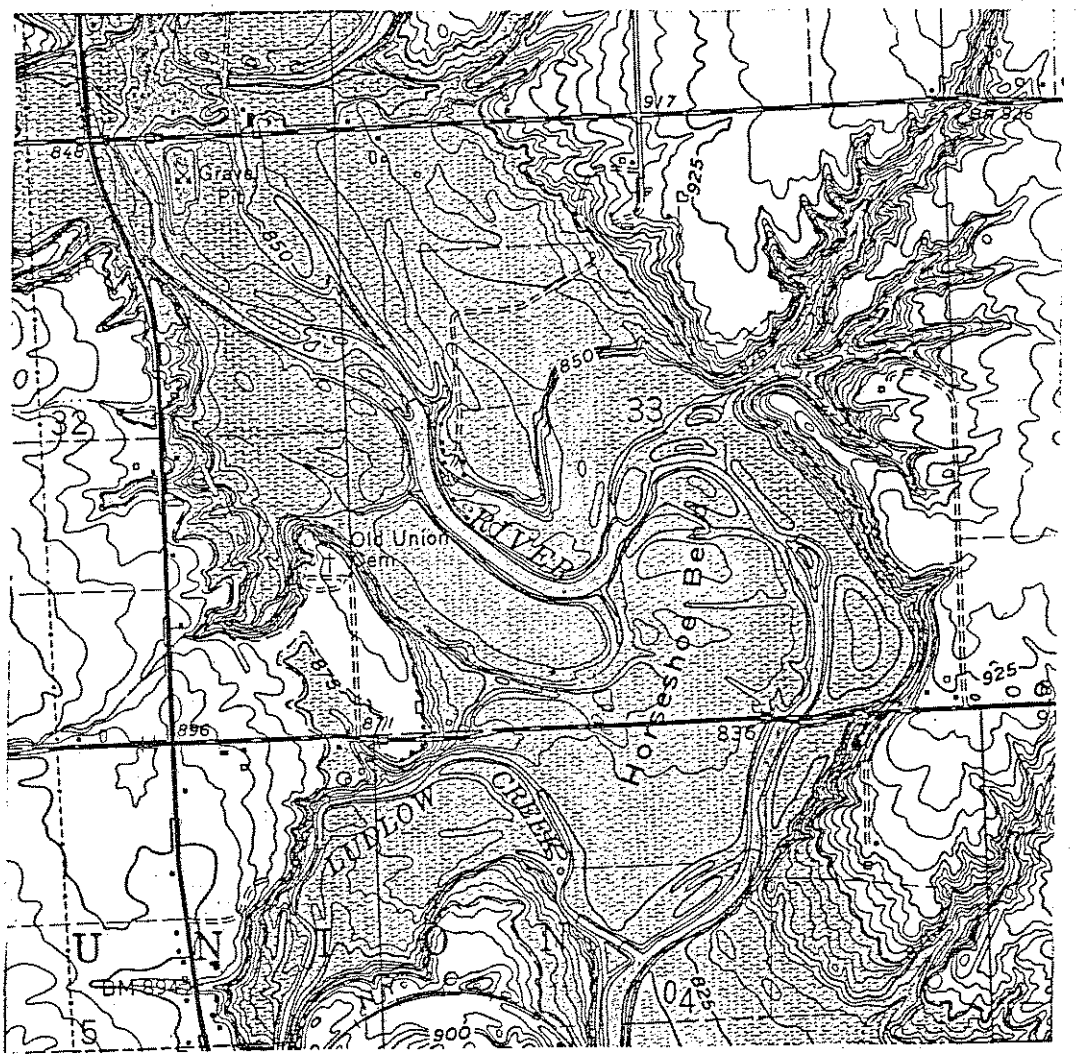
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

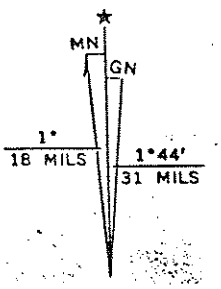
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Brukner Nature Center FQAI Site





UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

County	Miami County
Quadrangle Name	Pleasant Hill Quadrangle
Township and Range Description	NW1/4, SE1/4, Sec. 33, T7N, R5E of the Great Miami River Base and the First Principal Meridian
Latitude	–40° 00' 58" N
Longitude	–84° 19' 28" W
UTM Grid Coordinate-North	–4,432,578 m N
UTM Grid Coordinate-East	–728,530 m E

SCALE 1:24 000

1 0 1 MILE

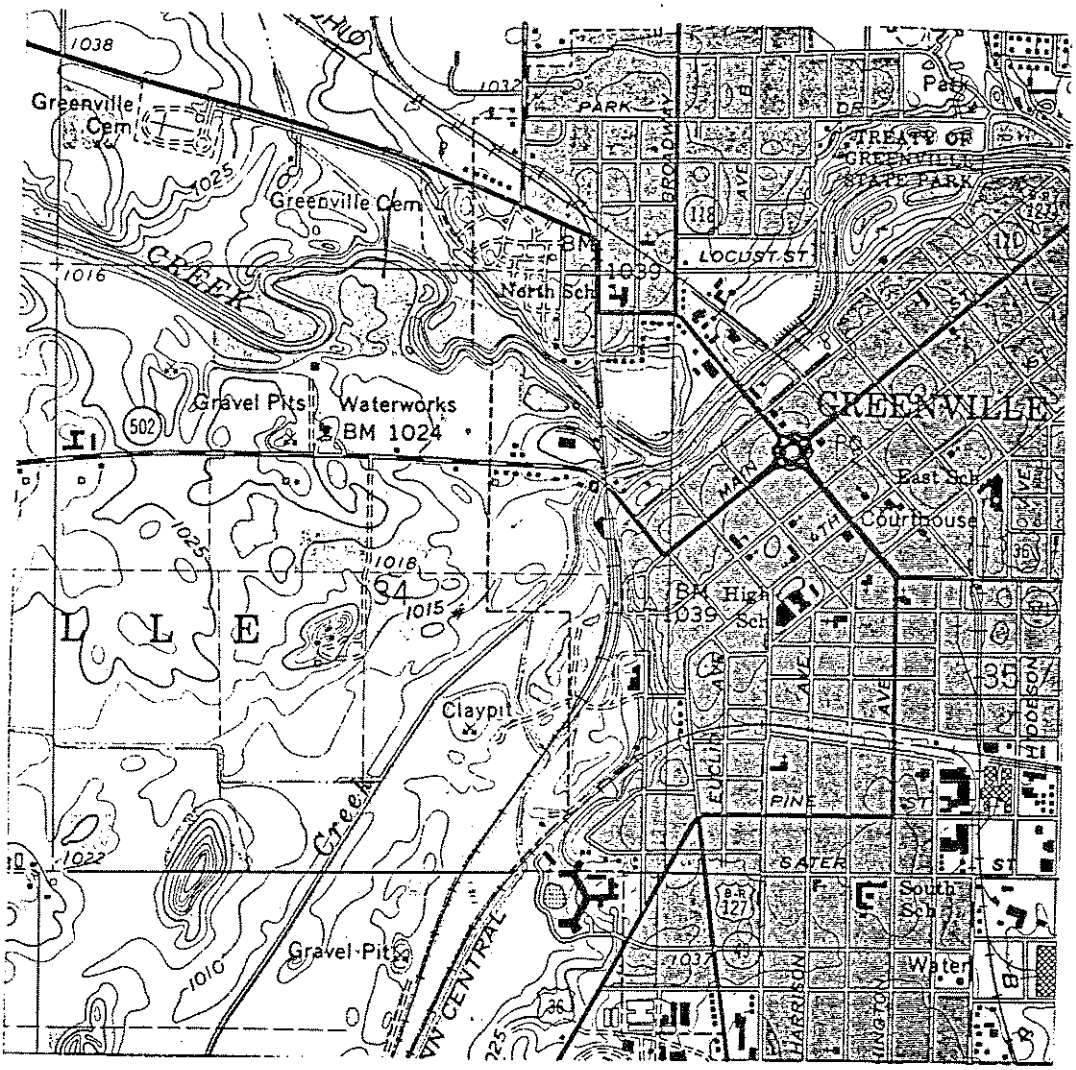
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

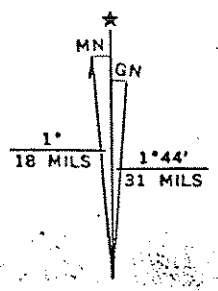
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Shawnee Prairie Preserve FQAI Site





UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

County	Darke County
Quadrangle Name	Greenville West Quadrangle
Township and Range Description	NW1/4, SE1/4, Sec. 34, T12N, R2E of the Great Miami River Base and the First Principal Meridian
Latitude	~40° 05' 52" N
Longitude	~84° 38' 40" W
UTM Grid Coordinate-North	~4,441,156 m N
UTM Grid Coordinate-East	~700,687 m E

SCALE 1:24 000

1 0 1 MILE

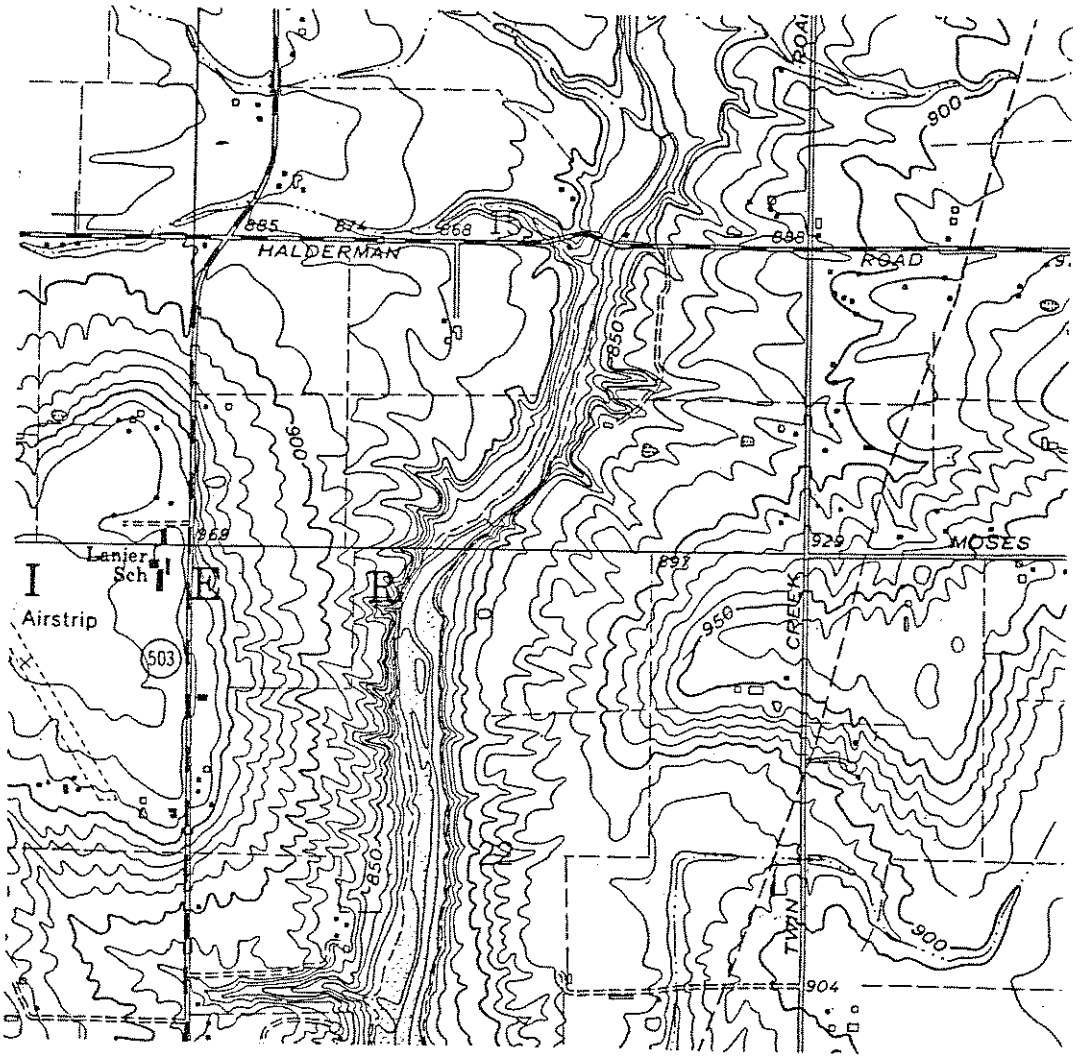
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

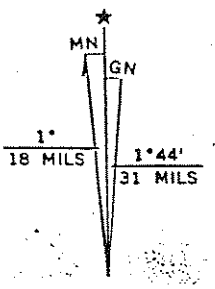
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Shepherd Farm FQAI Site

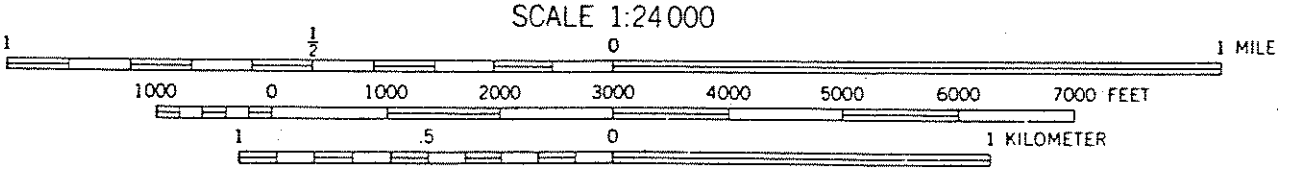




UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

County	Preble County
Quadrangle Name	West Alexandria Quadrangle
Township and Range Description	E1/2, NW1/4, Sec. 22, T5N, R3E of the Great Miami River Base and the First Principal Meridian
Latitude	~39° 42' 06" N
Longitude	~84° 31' 48" W
UTM Grid Coordinate-North	~4,397,193 m N
UTM Grid Coordinate-East	~712,000 m E

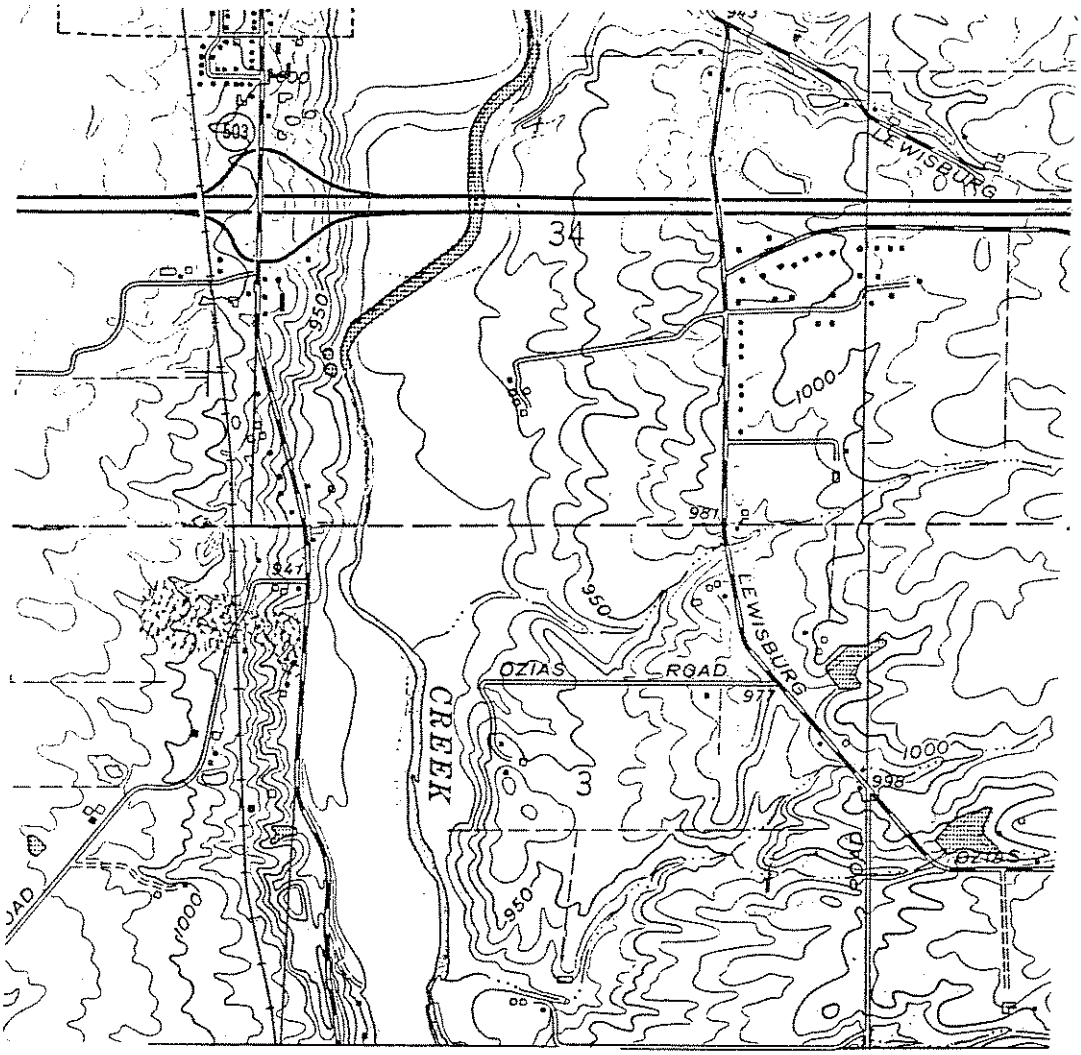
SCALE 1:24 000

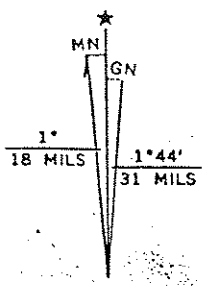


CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Akey Farm FQAI Site





UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

County	Preble County
Quadrangle Name	Lewisburg Quadrangle
Township and Range Description	SW1/4, SW1/4, Sec. 34, T7N, R3E of the Great Miami River Base and the First Principal Meridian
Latitude	~39° 50' 02" N
Longitude	~84° 32' 15" W
UTM Grid Coordinate-North	~4,412,121 m N
UTM Grid Coordinate-East	~710,783 m E

SCALE 1:24 000

1 0 1/2 0 1 MILE

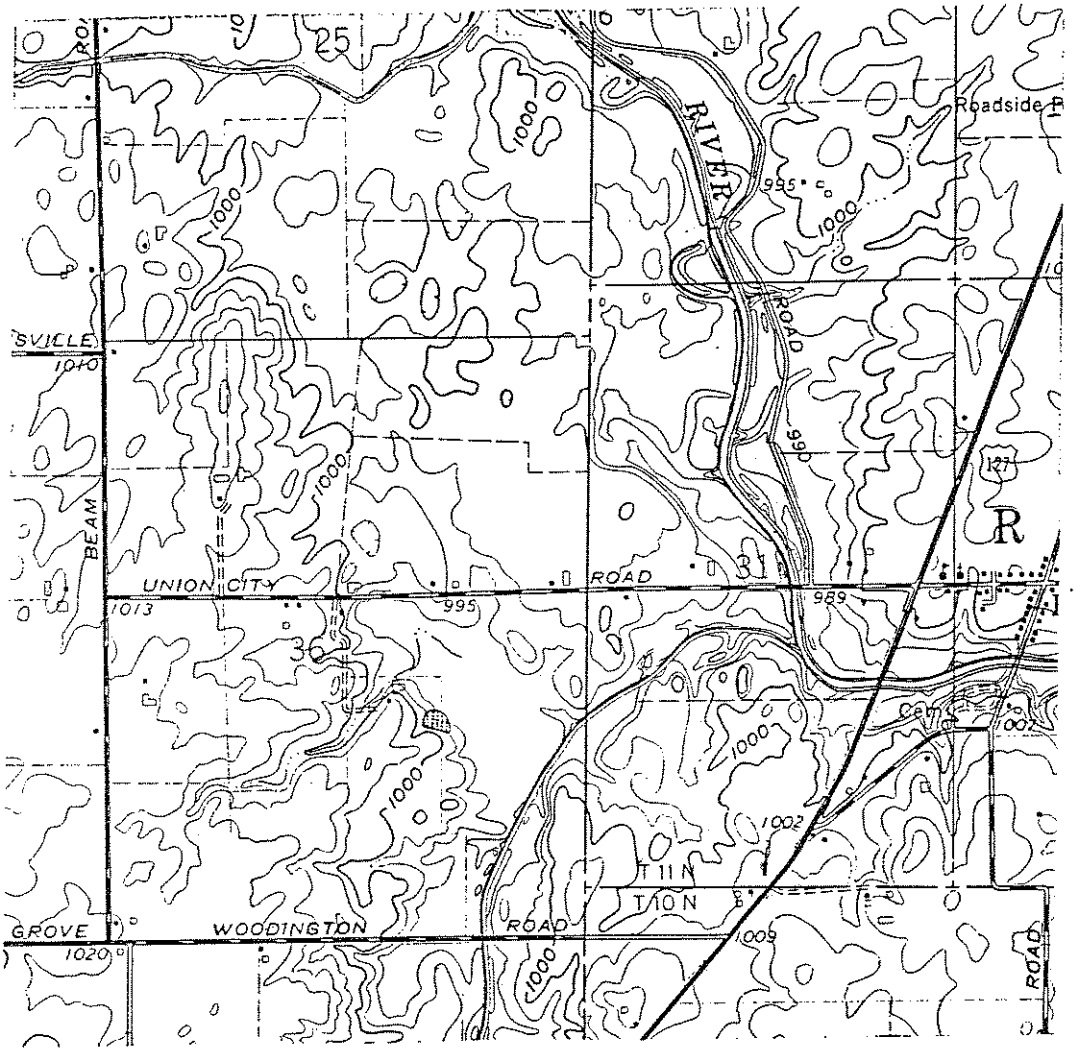
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

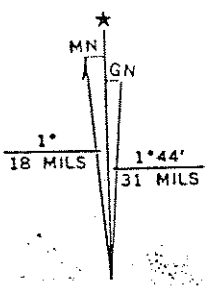
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Warrick Farm FQAI Site

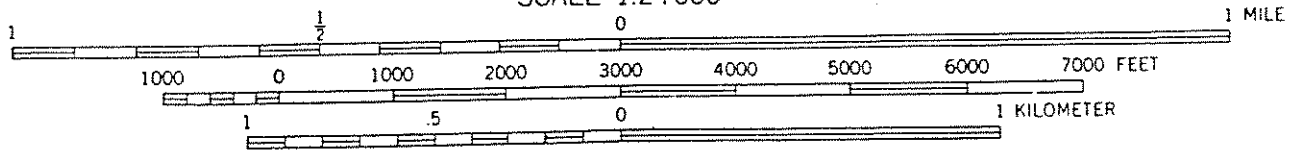




UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

County	Darke County
Quadrangle Name	Dawn Quadrangle
Township and Range Description	NW1/4, SE1/4, Sec. 36, T13N, R2E of the Great Miami River Base and the First Principal Meridian
Latitude	~40° 11' 04" N
Longitude	~84° 36' 03" W
UTM Grid Coordinate-North	~4,450,831 m N
UTM Grid Coordinate-East	~704,241 m E

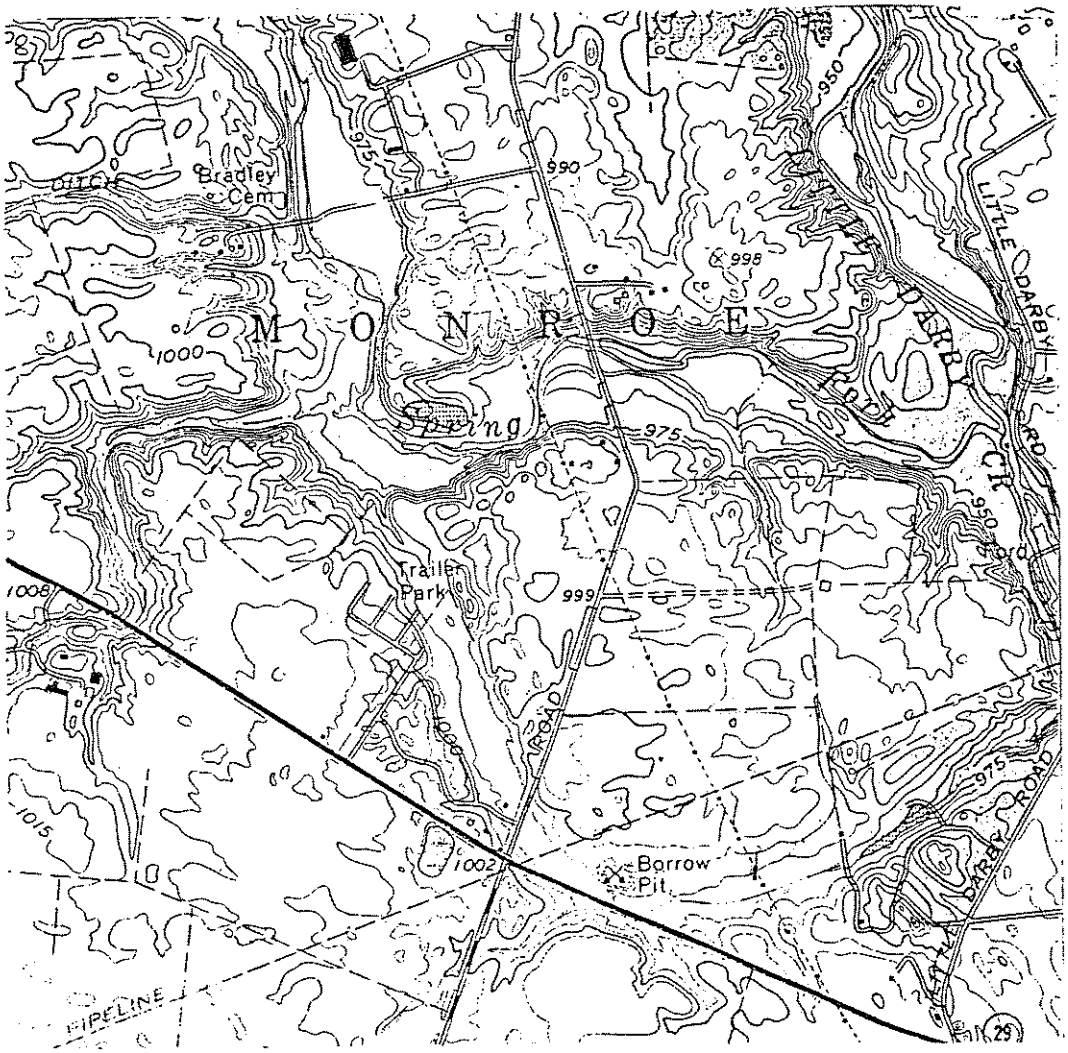
SCALE 1:24 000

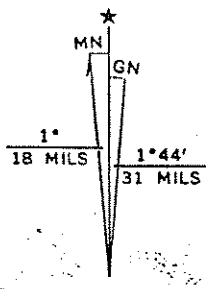


CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

RAPP Farm FQAI Site





UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

County	Madison County
Quadrangle Name	London Quadrangle
Township and Range Description	Located in Monroe Township, 1.4 miles southeast of Plumwood, 0.68 mile north of the intersection of State Route 29 and Lafayette-Plain City Rd. along Lafayette-Plain City Rd., then ~320 yards northeast. Property lies within the former Virginia Military District. Property boundaries determined in haphazard fashion by owners. No township and range description exists.
Latitude	~39° 59' 26" N
Longitude	~83° 23' 06" W
UTM Grid Coordinate-North	~4,429,229 m N
UTM Grid Coordinate-East	~296,397 m E

SCALE 1:24 000

1 0 1 MILE

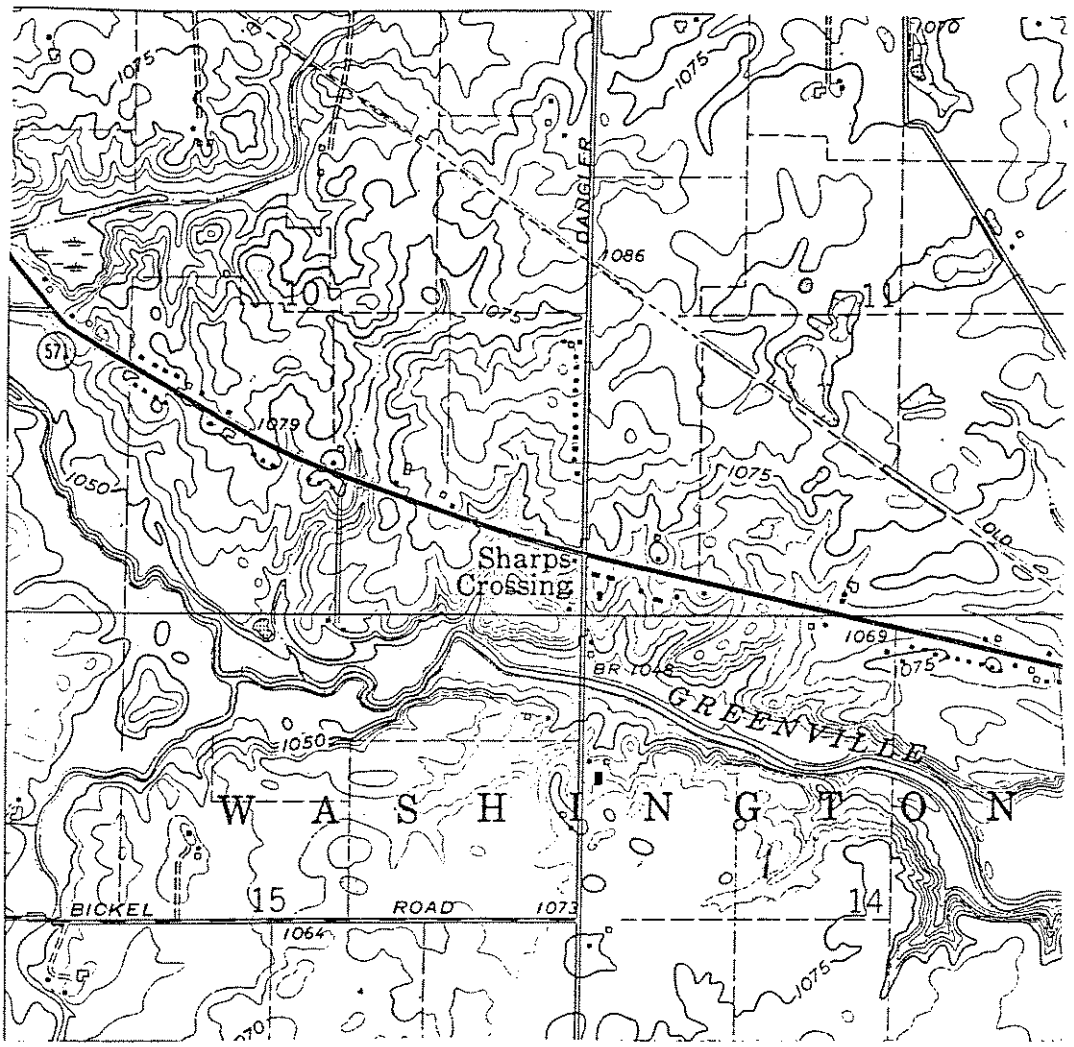
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

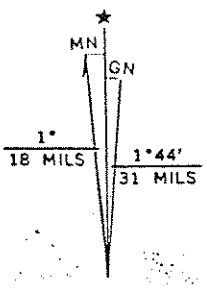
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Gray Farm FQAI Site

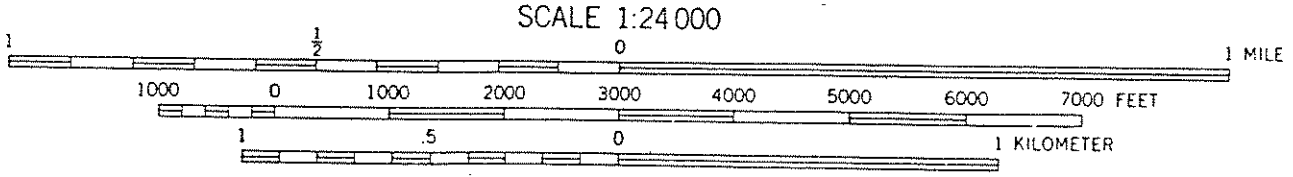




UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

County	Darke County
Quadrangle Name	Ansonia Quadrangle
Township and Range Description	NW1/4, NE1/4, Sec. 15, T12N, R1E of the Great Miami River Base and First Principal Meridian
Latitude	–40° 08' 53" N
Longitude	–84° 44' 27" W
UTM Grid Coordinate-North	–4,446,337 m N
UTM Grid Coordinate-East	–692,530 m E

SCALE 1:24 000



CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Appendix: Site Species Lists

Master species list for the Akey Farm Site (Summer 07/18/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Aesculus glabra	6		FACU+	1	
Ambrosia trifida	0		FAC	0	
Angelica atropurpurea	6		OBL	1	
Asimina triloba	6		FACU+	1	
Carex grayi	5		FACW+	1	
Celtis occidentalis	6		FACU	1	
Cryptotaenia canadensis	3		FAC	1	
Elymus virginicus	3		FACW-	1	
Erigeron strigosus	1		FACU+	0	
Fraxinus pennsylvanica var subintegge	6		FACW	1	
Galium aparine	2		FACU	0	
Galium triflorum	5		FACU	1	
Geum canadense	2		FACU	1	
Geum laciniatum	2		FAC+	1	
Glechoma hederacea	0	*	FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Heleopsis helianthoides	5		FAC-	1	
Heracleum maximum	4		FACU-	1	
Impatiens capensis	2		FACW	0	
Impatiens pallida	3		FACW	0	
Laportea canadensis	5		FACW	1	
Lonicera morrowi	0	*	NL	1	
Lysimachia nummularia	0	*	OBL	1	
Maclura pomifera	0	*	NL	1	
Mimulus alatus	6		OBL	1	
Phalaris arundinacea	0		FACW+	1	
Phytolacca americana	2		FACU+	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Populus deltoides	5		FAC	1	
Ptela trifoliata	6		FAC	1	
Rudbeckia laciniata	5		FACW	1	
Rumex crispus	0	*	FACU	1	
Rumex orbiculatus	3		OBL	1	
Sagittaria latifolia	2		OBL	1	
Sium suave	5		OBL	1	
Teucrium canadense	3		FACW-	1	var. canadense = 3; var. occidentale = 4
Thalictrum polygamum	4		FACW+	1	Also known as T. pubescens
Toxicodendron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	
Urtica dioica var. procera	1		FACU	1	
Verbesina alternifolia	4		FAC	1	
Vitis riparia	4		FACW	1	

Sum of FQAI values (R)	140
# of native species (N-Native)	39
Total number of species (N-Total)	45
FQAI Score (R/sq rt of N-Native)	**22.42**
Modified FQAI (R/sq rt N-Total)	**20.87**

Note: % total species which are native	87%
% species confirmed in lab (Summer)	42%
Perennial/Annual Ratio	6.5

Master species list for the Akey Farm Site (Summer 07/18/96 and Fall 10/03/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Aesculus glabra	6		FACU+	1	
Ambrosia trifida	0		FAC	0	
Angelica atropurpurea	6		OBL	1	
Asimina triloba	6		FACU+	1	
Carex grayi	5		FACW+	1	
Celtis occidentalis	6		FACU	1	
Cryptotaenia canadensis	3		FAC	1	
Elymus virginicus	3		FACW-	1	
Erigeron strigosus	1		FACU+	0	
Fraxinus pennsylvanica var subinteggerima	6		FACW	1	
Galium aparine	2		FACU	0	
Galium triflorum	5		FACU	1	
Geum canadense	2		FACU	1	
Geum laciniatum	2		FAC+	1	
Glechoma hederacea	0	*	FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Heleopsis helianthoides	5		FAC-	1	
Heracleum maximum	4		FACU-	1	
Impatiens capensis	2		FACW	0	
Impatiens pallida	3		FACW	0	
Laportea canadensis	5		FACW	1	
Lonicera morrowi	0	*	NL	1	
Lysimachia nummularia	0	*	OBL	1	
Maclura pomifera	0	*	NL	1	
Mimulus alatus	6		OBL	1	
Phalaris arundinacea	0		FACW+	1	
Phytolacca americana	2		FACU+	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Populus deltoides	5		FAC	1	
Ptela trifoliata	6		FAC	1	
Rudbeckia laciniata	5		FACW	1	
Rumex crispus	0	*	FACU	1	
Rumex orbiculatus	3		OBL	1	
Sagittaria latifolia	2		OBL	1	
Sium suave	5		OBL	1	
Teucrium canadense	3		FACW-	1	var. canadense = 3; var. occidentale = 4
Thalictrum polygamum	4		FACW+	1	Also known as T. pubescens
Toxicodendron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	
Urtica dioica var. procera	1		FACU	1	
Verbesina alternifolia	4		FAC	1	
Vitis riparia	4		FACW	1	
Amaranthus tuberculatus	0	*	FACW	0	
Asarum canadense	7		NL	1	
Aster lateriflorus	2		FACW-	1	
Aster simplex	2		FACW	1	
Bidens cernua	3		OBL	0	
Bidens frondosa	2		FACW	0	
Dipsacus sylvestris	0	*	NL	0	
Elymus villosus	4		FACU-	1	

Helenium atumnale	4		FACW+	1
Juglans nigra	5		FACU	1
Leersia virginica	3		FACW	1
Leonurus cardiaca	0	*	NL	1
Lycopus virginicus	4		OBL	1
Polygonum hydropiper	3		OBL	0
Polygonum persecaria	0	*	FACW	0
Polygonum scandens	2		FAC	1
Robina pseudoacacia	0	**	FACU-	1
Ruellia strepens	3		FAC	1
Rumex obtusifolius	0	*	FACU-	1
Salix nigra	3		FACW+	1
Scrophularia marilandica	5		FACU-	1
Sicyos angulatus	5		FACU	0
Smilax hispida	5		FAC	1
Smilax rotundifolia	4		FAC	1

Sum of FQAI values (R)	206
# of native species (N-Native)	57
Total number of species (N-Total)	69
FQAI Score (R/sq rt of N-Native)	**27.29**
Modified FQAI (R/sq rt N-Total)	**24.80**
Note: % total species which are native	83%
Perennial/Annual Ratio	4.31
% increase in FQAI score from summer to fall	22%
Number of new species added in Fall	24
Percent of total species added in Fall survey	35%
Percent of species confirmed in lab (Fall)	42%
Total % of species confirmed in lab (Summer and Fall)	42%
% species with "OBL" Ind. Stat.	13%
% species with "FACW+", "FACW", or "FACW-"	30%
% species with "FAC+", "FAC", or "FAC-"	22%
% species with "FACU+", "FACU", or "FACU-"	28%
% species with "NL"	7%

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Carex sp.
Impatiens sp.
Unknown Apiaceae - Ligusticum canadense?
Unknown trifoliate leaved forb
Unknown alternate leaved monocot
Unknown opposite, simple, entire, ciliate petioled forb
Viola sp. #1 - larger basal leaf
Viola sp. #2 - smaller leafy stem

Master species list for the Akey Farm Site (Summer 07/18/96, Fall 10/03/96, and Spring 04/24/97)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Aesculus glabra	6		FACU+	1	
Ambrosia trifida	0		FAC	0	
Angelica atropurpurea	6		OBL	1	
Asimina triloba	6		FACU+	1	
Carex grayi	5		FACW+	1	
Celtis occidentalis	6		FACU	1	
Cryptotaenia canadensis	3		FAC	1	
Elymus virginicus	3		FACW-	1	
Erigeron strigosus	1		FACU+	0	
Fraxinus pennsylvanica var subinteggerima	6		FACW	1	
Galium aparine	2		FACU	0	
Galium triflorum	5		FACU	1	
Geum canadense	2		FACU	1	
Geum laciniatum	2		FAC+	1	
Glechoma hederacea	0	*	FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Heleopsis helianthoides	5		FAC-	1	
Heracleum maximum	4		FACU-	1	
Impatiens capensis	2		FACW	0	
Impatiens pallida	3		FACW	0	
Laportea canadensis	5		FACW	1	
Lonicera morrowi	0	*	NL	1	
Lysimachia nummularia	0	*	OBL	1	
Maclura pomifera	0	*	NL	1	
Mimulus alatus	6		OBL	1	
Phalaris arundinacea	0		FACW+	1	
Phytolacca americana	2		FACU+	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Populus deltoides	5		FAC	1	
Prela trifoliata	6		FAC	1	
Rudbeckia laciniata	5		FACW	1	
Rumex crispus	0	*	FACU	1	
Rumex orbiculatus	3		OBL	1	
Sagittaria latifolia	2		OBL	1	
Sium suave	5		OBL	1	
Teucrium canadense	3		FACW-	1	var. canadense = 3; var. occidentale = 4
Thalictrum polygamum	4		FACW+	1	Also known as T. pubescens
Toxicodendron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	
Urtica dioica var. procera	1		FACU	1	
Verbesina alternifolia	4		FAC	1	
Vitis riparia	4		FACW	1	
Amaranthus tuberculatus	0	*	FACW	0	
Asarum canadense	7		NL	1	
Aster lateriflorus	2		FACW-	1	
Aster simplex	2		FACW	1	
Bidens cernua	3		OBL	0	
Bidens frondosa	2		FACW	0	
Dipsacus sylvestris	0	*	NL	0	
Elymus villosus	4		FACU-	1	
Helenium atumnale	4		FACW+	1	
Juglans nigra	5		FACU	1	
Leersia virginica	3		FACW	1	
Leonurus cardiaca	0	*	NL	1	

Lycopus virginicus	4		OBL	1	
Polygonum hydropiper	3		OBL	0	
Polygonum persecaria	0	*	FACW	0	
Polygonum scandens	2		FAC	1	
Robina pseudoacacia	0	**	FACU-	1	
Ruellia strepens	3		FAC	1	
Rumex obtusifolius	0	*	FACU-	1	
Salix nigra	3		FACW+	1	
Scrophularia marilandica	5		FACU-	1	
Sicyos angulatus	5		FACU	0	
Smilax hispida	5		FAC	1	
Smilax rotundifolia	4		FAC	1	
Alliaria officinalis	0	*	FACU-	1	Also known as A. petiolata
Allium canadense	3		FACU	1	
Allium schoenoprasum	0	*	NL	NL	
Cardamine douglassii	5		FACW+	1	
Cardamine pennsylvanica	3		OBL	0	
Claytonia virginica	3		FACU	1	
Dentaria laciniata	3		FACU	1	Also known as Cardamine concatenata
Floerkea prosersincoides	4		FAC	0	**FQAI Score**
Isopyrum biternatum	7		NL	NL	(R/sq rt of N-Native)
Lamium purpureum	0	*	NL	NL	**Modified FQAI**
Ranunculus abortivus	4		FACW-	1	Biennial (R/sq rt N-Total)
Sambucus canadensis	3		FACW-	NL	
Stellaria media	0	*	NL	NL	
Taraxacum officinale	0	*	FACU-	1	
Viola soraria	2		FAC-	1	
Viola striata	5		FACW	1	

Sum of FQAI values (R)	248
# of native species (N-Native)	68
Total number of species (N-Total)	85
FQAI Score (R/sq rt of N-Native)	**30.07**
Modified FQAI (R/sq rt N-Total)	**26.90**

FQAI Score

Note: % total species which are native	80%
Perennial/Annual Ratio	3.25
Number of new species added in Fall	24
Percent of total species added in Fall survey	28%
Number of new species added in Spring	16
Percent of total species added in Spring survey	19%
% increase in FQAI score from summer to fall	22%
% increase in FQAI score from fall to spring	10%
% increase in FQAI score from summer to spring	34%
Percent of species confirmed in lab (Summer)	42%
Percent of species confirmed in lab (Fall)	42%
Percent of species confirmed in lab (Spring)	50%
Total % of species confirmed in lab (Summer, Fall and Spring)	44%

% species with "OBL" Ind. Stat.	12%
% species with "FACW+", "FACW", or "FACW-"	29%
% species with "FAC+", "FAC", or "FAC-"	20%
% species with "FACU+", "FACU", or "FACU-"	28%
% species with "NL"	11%

Master species list for the Brukner Nature Center Wetland (Summer 08/01/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer nigrum	6		NL	1	
Acer saccharinum	3		FACW	1	
Acorus calamus	4		OBL	1	
Actaea pachypoda	7		NL		
Angelica atropurpurea	6		OBL	1	
Apios americana	4		FACW	1	
Boehmeria cylindrica	4		FACW+	1	
Caltha palustris	5		OBL	1	
Carex conjuncta	5		FACW	1	
Carpinus caroliniana	4		FAC	1	
Cicuta maculata	3		OBL	1	
Celtis occidentalis	6		FACU	1	
Cimicifuga racemosa	8		NL		
Cinna arundinacea	4		FACW+	1	
Cryptotaenia canadensis	3		FAC	1	
Elymus villosus	4		FACU-	1	
Eupatorium perfoliatum	3		FACW+	1	
Eupatorium purpureum	7		FAC	1	
Eupatorium rugosum	4		NL	1	
Filipendula ulmaria	0	*	NL	1	
Fraxinus nigra	7		FACW	1	
Fraxinus pennsylvanica var. subintegerrim	6		FACW	1	
Galium aparine	2		FACU	0	
Geum canadense	2		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Glyceria striata	2		OBL	1	
Hydrangea arborescens	10		FACU	1	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Leersia virginica	3		FACW	1	
Lysimachia nummularia	0	*	OBL	1	
Mimulus rigens	5		OBL	1	
Ostrya virginiana	5		FACU-	1	
Parthenocissus quinquefolia	3		FACU	1	
Physocarpus opulifolius	4		FACW-	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Polygonum virginianum	4		FAC	0	
Populus deltoides	5		FAC	1	
Quercus prinus	6		UPL	1	
Rosa palustris	4		OBL	1	
Rudbeckia laciniata	5		FACW	1	
Rumex obtusifolius	0	*	FACU-	1	
Sagittaria latifolia	2		OBL	1	

Salix eriocephala	1	OBL	1	Also known as S. rigida
Salix exigua	1	OBL	1	Also known as S. interior
Sanicula gregaria	4	FACU	1	
Saururus cernuus	7	OBL	1	
Smilax hispida	5	FAC	1	
Solidago caesia	5	FACU	1	
Stachys tenuifolia var. tenuifolia	4	FACW+	1	
Symplocarpus foetidus	6	OBL	1	
Toxicodendron radicans	1	FAC	1	
Urtia dioica var. procera	1	FACU	1	
Viburnum prunifolium	5	FACU	1	
Vitis riparia	4	FACW	1	

Sum of FQAI values (R)	237
# of native species (N-Native)	55
Total number of species (N-Total)	60
FQAI Score (R/sq rt of N-Native)	**31.96**
Modified FQAI (R/sq rt N-Total)	**30.60**

Note: % total species which are native	92%
% species confirmed in lab (Summer)	33%
Perennial/Annual Ratio	9.00

Master species list for the Brukner Nature Center Wetland (Summer 08/01/96 and Fall 10/11/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer nigrum	6		NL	1	
Acer saccharinum	3		FACW	1	
Acorus calamus	4		OBL	1	
Actaea pachypoda	7		NL		
Angelica atropurpurea	6		OBL	1	
Apios americana	4		FACW	1	
Boehmeria cylindrica	4		FACW+	1	
Caltha palustris	5		OBL	1	
Carex conjuncta	5		FACW	1	
Carpinus caroliniana	4		FAC	1	
Cicuta maculata	3		OBL	1	
Celtis occidentalis	6		FACU	1	
Cimicifuga racemosa	8		NL		
Cinna arundinacea	4		FACW+	1	
Cryptotaenia canadensis	3		FAC	1	
Elymus villosus	4		FACU-	1	
Eupatorium perfoliatum	3		FACW+	1	
Eupatorium purpureum	7		FAC	1	
Eupatorium rugosum	4		NL	1	
Filipendula ulmaria	0	*	NL	1	
Fraxinus nigra	7		FACW	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Galium aparine	2		FACU	0	
Geum canadense	2		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Glyceria striata	2		OBL	1	
Hydrangea arborescens	10		FACU	1	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Leersia virginica	3		FACW	1	
Lysimachia nummularia	0	*	OBL	1	
Mimulus rigens	5		OBL	1	
Ostrya virginiana	5		FACU-	1	
Parthenocissus quinquefolia	3		FACU	1	
Physocarpus opulifolius	4		FACW-	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Polygonum virginianum	4		FAC	0	
Populus deltoides	5		FAC	1	
Quercus prinus	6		FACW	1	
Rosa palustris	4		OBL	1	
Rudbeckia laciniata	5		FACW	1	
Rumex obtusifolius	0	*	FACU-	1	
Sagittaria latifolia	2		OBL	1	
Salix eriocephala	1		OBL	1	Also known as S. rigida
Salix exigua	1		OBL	1	Also known as S. interior
Sanicula gregaria	4		FACU	1	

Saururus cernuus	7		OBL	1	
Smilax hispida	5		FAC	1	
Solidago caesia	5		FACU	1	
Stachys tenuifolia var. tenuifolia	4		FACW+	1	
Symplocarpus foetidus	6		OBL	1	
Toxicodendron radicans	1		FAC	1	
Urtia dioica var. procera	1		FACU	1	
Viburnum prunifolium	5		FACU	1	
Vitis riparia	4		FACW	1	
Asarum canadense	7		NL	1	
Aster cordifolius	5		NL	1	
Aster lateriflorus	2		FACW-	1	
Aster puniceus	6		OBL	1	
Aster simplex	2		FACW	1	
Bidens connata	2		FACW+	0	
Bidens frondosa	2		FACW	0	
Cardamine parviflora var. arenicola	3		FACU	0	
Chelone glabra	8		OBL	1	
Cornus obliqua	2		NL	1	Also known as C. amomum
Impatiens capensis	2		FACW	0	
Ligusticum canadense	NL		FAC	1	
Lindera benzoin	6		FACW-	1	
Lobelia siphilitica	4		FACW+	1	
Lonicera maackii	0	*	NL	1	
Lycopus virginicus	4		OBL	1	
Osmorhiza longistylis	5		FACU	1	
Polygonum punctatum	6		OBL	1	
Polymania canadensis	5		NL	1	
Sium suave	5		OBL	1	
Thalictrum polygamum	4		FACW+	1	Also known as T. pubescens

Sum of FQAI values (R)	317
# of native species (N-Native)	74
Total number of species (N-Total)	81
FQAI Score (R/sq rt of N-Native)	**36.85**
Modified FQAI (R/sq rt N-Total)	**35.22**
Note: % total species which are native	91%
Perennial/Annual Ratio	6.36
% increase in FQAI score from summer to fall	15%
Number of new species added in Fall	21
Percent of total species added in Fall survey	26%
Percent of species confirmed in lab (Fall)	43%
Total % of species confirmed in lab (Summer and Fall)	36%
% species with "OBL" Ind. Stat.	23%
% species with "FACW+", "FACW", or "FACW-"	32%
% species with "FAC+", "FAC", or "FAC-"	11%
% species with "FACU+", "FACU", or "FACU-"	21%
% species with "NL"	12%

Species which could not be completely identified becau of poor specimens, lack of flowering parts, etc.

Carex sp. #1 - broad leaved tussocky
Carex sp. #2 - narrow leaved
Cuscata sp.
Iris sp.
Polygonum sp. - P. amphibium or P. coccineum?
Unknown tussocky grass
Unknown trifoliate basal leaved forb - Coptis groenlandic

Master species list for the Brukner Nature Center Wetland (Summer 08/01/96, Fall 10/11/96, and Spring 04/30/97)

Key: *=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer nigrum	6		NL	1	
Acer saccharinum	3		FACW	1	
Acorus calamus	4		OBL	1	
Actaea pachypoda	7		NL		
Angelica atropurpurea	6		OBL	1	
Apios americana	4		FACW	1	
Boehmeria cylindrica	4		FACW+	1	
Caltha palustris	5		OBL	1	
Carex conjuncta	5		FACW	1	
Carpinus caroliniana	4		FAC	1	
Cicuta maculata	3		OBL	1	
Celtis occidentalis	6		FACU	1	
Cimicifuga racemosa	8		NL		
Cinna arundinacea	4		FACW+	1	
Cryptotaenia canadensis	3		FAC	1	
Elymus villosus	4		FACU-	1	
Eupatorium perfoliatum	3		FACW+	1	
Eupatorium purpureum	7		FAC	1	
Eupatorium rugosum	4		NL	1	
Filipendula ulmaria	0	*	NL	1	
Fraxinus nigra	7		FACW	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Galium aparine	2		FACU	0	
Geum canadense	2		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Glyceria striata	2		OBL	1	
Hydrangea arborescens	10		FACU	1	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Leersia virginica	3		FACW	1	
Lysimachia nummularia	0	*	OBL	1	
Mimulus rigens	5		OBL	1	
Ostrya virginiana	5		FACU-	1	
Parthenocissus quinquefolia	3		FACU	1	
Physocarpus opulifolius	4		FACW-	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Polygonum virginianum	4		FAC	0	
Populus deltoides	5		FAC	1	
Quercus prinus	6		FACW	1	
Rosa palustris	4		OBL	1	
Rudbeckia laciniata	5		FACW	1	
Rumex obtusifolius	0	*	FACU-	1	
Sagittaria latifolia	2		OBL	1	
Salix eriocephala	1		OBL	1	Also known as S. rigida
Salix exigua	1		OBL	1	Also known as S. interior
Sanicula gregaria	4		FACU	1	
Saururus cernuus	7		OBL	1	
Smilax hispida	5		FAC	1	
Solidago caesia	5		FACU	1	
Stachys tenuifolia var. tenuifolia	4		FACW+	1	
Symplocarpus foetidus	6		OBL	1	
Toxicodendron radicans	1		FAC	1	
Urtica dioica var. procera	1		FACU	1	
Viburnum prunifolium	5		FACU	1	
Vitis riparia	4		FACW	1	
Asarum canadense	7		NL	1	
Aster cordifolius	5		NL	1	
Aster lateriflorus	2		FACW-	1	
Aster puniceus	6		OBL	1	
Aster simplex	2		FACW	1	
Bidens connata	2		FACW+	0	
Bidens frondosa	2		FACW	0	
Cardamine parviflora var. arenicola	3		FACU	0	
Chelone glabra	8		OBL	1	
Cornus obliqua	2		NL	1	Also known as C. amomum
Impatiens capensis	2		FACW	0	
Ligusticum canadense	NL		FAC	1	
Lindera benzoin	6		FACW-	1	
Lobelia siphilitica	4		FACW+	1	
Lonicera maackii	0	*	NL	1	
Lycopus virginicus	4		OBL	1	
Osmorhiza longistylis	5		FACU	1	
Polygonum punctatum	6		OBL	1	
Polymania canadensis	5		NL		
Sium suave	5		OBL	1	
Thalictrum polygamum	4		FACW+	1	Also known as T. pubescens

Alliaria officinalis	0	*	FACU-	Also known as A. petiolata
Allium canadense	0	*	FACU	
Cardamine bulbosa	4		OBL	
Clusterophyllum procumbens	4		FACW	var. procumbens = 4; var. shortii = 8
Claytonia virginica	3		FACU	
Corydalis flavula	7		FACU	
Dentaria laciniata	3		FACU	Also known as Cardamine concatenata
Filipendula rubra	8		FACW	
Floerkea proserpinacoides	4		FAC	
Isopyrum biternatum	7		NL	
Lamium purpureum	0	*	NL	
Ranunculus abortivus	4		FACW-	
Ranunculus hispidus	5		FAC	
Sambucus canadensis	3		FACW-	
Senecio aureus	5		FACW	
Stellaria media	0	*	NL	
Trillium sessile	7		NL	
Viola soraria	2		FAC-	

Sum of FQAI values (R)	383
# of native species (N-Native)	88
Total number of species (N-Total)	99
FQAI Score (R/sq rt of N-Native)	**40.83**
Modified FQAI (R/sq rt N-Total)	**38.49**

Note: % total species which are native	89%
Perennial/Annual Ratio	2.41
Number of new species added in Fall	21
Percent of total species added in Fall survey	21%
Number of new species added in Spring	18
Percent of total species added in Spring survey	18%
% increase in FQAI score from summer to fall	15%
% increase in FQAI score from fall to spring	11%
% increase in FQAI score from summer to spring	28%
Percent of species confirmed in lab (Summer)	33%
Percent of species confirmed in lab (Fall)	43%
Percent of species confirmed in lab (Spring)	39%
Total % of species confirmed in lab (Summer, Fall and Spring)	36%

% species with "OBL" Ind. Stat.	20%
% species with "FACW+", "FACW", or "FACW-"	31%
% species with "FAC+", "FAC", or "FAC-"	12%
% species with "FACU+", "FACU", or "FACU-"	22%
% species with "NL"	14%

Master species list for the Germantown Site (Summer 07/03/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key) Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3	FAC+	1	
Acer rubrum	2	FAC	1	
Acer saccharinum	3	FACW	1	
Ambrosia trifida	0	FAC	0	
Carex grayi	5	FACW+	1	
Cryptotaenia canadensis	3	FAC	1	
Echincystis lobata	3	FAC	0	
Fraxinus pennsylvanica var subinteggerima	6	FACW	1	
Laportea canadensis	5	FACW	1	
Leersia oryzoides	1	OBL	1	
Platanus occidentalis	7	FACW-	1	
Populus deltoides	5	FAC	1	
Rudbeckia laciniata	5	FACW	1	
Rumex altissimus	2	FACW-	1	
Solidago juncea	2	NL	1	
Ulmus rubra	2	FAC	1	
Vitis riparia	4	FACW	1	

Sum of FQAI values (R)	58
# of native species (N-Native)	17
Total number of species (N-Total)	17
FQAI Score (R/sq rt of N-Native)	**14.07**
Modified FQAI (R/sq rt N-Total)	**14.07**

Note: % total species which are native	100%
% species confirmed in lab (Summer)	47%
Perennial/Annual Ratio	7.50

Master species list for the Germantown Site (Summer 07/03/96 and Fall 10/03/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer rubrum	2		FAC	1	
Acer saccharinum	3		FACW	1	
Ambrosia trifida	0		FAC	0	
Carex grayi	5		FACW+	1	
Cryptotaenia canadensis	3		FAC	1	
Echinocystis lobata	3		FAC	0	
Fraxinus pennsylvanica var subinteggerima	6		FACW	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Platanus occidentalis	7		FACW-	1	
Populus deltoides	5		FAC	1	
Rudbeckia laciniata	5		FACW	1	
Rumex altissimus	2		FACW-	1	
Solidago juncea	2		NL	1	
Ulmus rubra	2		FAC	1	
Vitis riparia	4		FACW	1	
Amaranthus tuberculatus	0	*	FACW	0	
Artemisia annua	0	*	FACU	0	
Aster simplex	2		FACW	1	
Bidens cernua	3		OBL	0	
Bidens frondosa	2		FACW	0	
Celtis occidentalis	6		FACU	1	
Dipsacus sylvestris	0	*	NL	0	
Dracocephalum parviflorum	0	*	FACU-	1	
Eupatorium perfoliatum	3		FACW+	1	
Leersia virginica	3		FACW	1	
Lycopus virginicus	4		OBL	1	
Lysamachia nummularia	0	*	OBL	1	
Pilea pumila	4		FACW	0	
Polygonum persecaria	0	*	FACW	0	
Polygonum punctatum	6		OBL	1	
Polygonum virginianum	4		FAC	0	
Ranunculus sceleratus	2		OBL	1	
Rorippa palustris	1		OBL	0	
Sambucus canadensis	3		FACW-	1	
Scrophularia lanceolata	5		FACU+	1	
Sicyos angulatus	5		FACU	0	
Verbesina alternifolia	4		FAC	1	
Xanthium strumarium	0	*	FACU	1	

Sum of FQAI values (R)	115
# of native species (N-Native)	33
Total number of species (N-Total)	40
FQAI Score (R/sq rt of N-Native)	**20.02**
Modified FQAI (R/sq rt N-Total)	**18.18**

Note: % total species which are native	83%
Perennial/Annual Ratio	2.33
% increase in FQAI score from summer to fall	42%
Number of new species added in Fall	23
Percent of total species added in Fall survey	58%
Percent of species confirmed in lab (Fall)	35%
Total % of species confirmed in lab (Summer and Fall)	40%
% species with "OBL" Ind. Stat.	18%
% species with "FACW+", "FACW", or "FACW-"	40%
% species with "FAC+", "FAC", or "FAC-"	23%
% species with "FACU+", "FACU", or "FACU-"	15%
% species with "NL"	5%

Note: Species in **BOLD** print were recorded during the Fall site visit

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Unknown grass - probably young Cinna arundinacea

Master species list for the Germantown Site (Summer 07/03/96, Fall 10/03/96, and Spring 04/23/97)
Key:*=alien taxon; **=may include both native and nonnative populations
E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes	C of C
Acer negundo	3		FAC+	1		
Acer rubrum	2		FAC	1		
Acer saccharinum	3		FACW	1		
Ambrosia trifida	0		FAC	0		
Carex grayi	5		FACW+	1		
Cryptotaenia canadensis	3		FAC	1		
Echinocystis lobata	3		FAC	0		
Fraxinus pennsylvanica var subintegerrima	6		FACW	1		
Laportea canadensis	5		FACW	1		
Leersia oryzoides	1		OBL	1		
Platanus occidentalis	7		FACW-	1		
Populus deltoides	5		FAC	1		
Rudbeckia laciniata	5		FACW	1		
Rumex altissimus	2		FACW-	1		
Solidago juncea	2		NL	1		
Ulmus rubra	2		FAC	1		
Vitis riparia	4		FACW	1		
Amaranthus tuberculatus	0	*	FACW	0		
Artemisia annua	0	*	FACU	0		
Aster simplex	2		FACW	1		
Bidens cernua	3		OBL	0		
Bidens frondosa	2		FACW	0		
Celtis occidentalis	6		FACU	1		
Dipsacus sylvestris	0	*	NL	0		
Dracocephalum parviflorum	0	*	FACU-	1		
Eupatorium perfoliatum	3		FACW+	1		
Leersia virginica	3		FACW	1		
Lycopus virginicus	4		OBL	1		
Lysamachia nummularia	0	*	OBL	1		
Pilea pumila	4		FACW	0		
Polygonum persecaria	0	*	FACW	0		
Polygonum punctatum	6		OBL	1		
Polygonum virginianum	4		FAC	0		
Ranunculus sceleratus	2		OBL	1		
Rorippa palustris	1		OBL	0		
Sambucus canadensis	3		FACW-	1		
Scrophularia lanceolata	5		FACU+	1		
Sicyos angulatus	5		FACU	0		
Verbesina alternifolia	4		FAC	1		
Xanthium strumarium	0	*	FACU	1		
Allium shoenoprasum	0	*	NL			
Arabis laevigata	4		NL			
Chaerophyllum procumbens	4		FACW	0	var. procumbens = 4; var. shortii = 8	
Erythronium americanum	5		NL			
Phalaris arundinacea	0		FACW	1		
Ranunculus abortivus	4		FACW-	1		
Senecio glabellus	0	*	OBL	0		
Taraxacum officinale	0	*	FACU-	1		
Urtica dioica	1		FACU	1		
Viola soraria	2		FAC-	1		

Sum of FQAI values (R)	135
# of native species (N-Native)	40
Total number of species (N-Total)	50
FQAI Score (R/sq rt of N-Native)	**21.35**
Modified FQAI (R/sq rt N-Total)	**19.09**

FQAI Score (R/sq rt of N-Native)
Modified FQAI

Note: % total species which are native	80%
Perennial/Annual Ratio	1.94
Number of new species added in Fall	23
Percent of total species added in Fall survey	46%
Number of new species added in Spring	10
Percent of total species added in Spring survey	20%
% increase in FQAI score from summer to fall	42%
% increase in FQAI score from fall to spring	7%
% increase in FQAI score from summer to spring	52%
Percent of species confirmed in lab (Summer)	47%
Percent of species confirmed in lab (Fall)	35%
Percent of species confirmed in lab (Spring)	70%
Total % of species confirmed in lab (Summer, Fall and Spring)	46%
% species with "OBL" Ind. Stat.	16%
% species with "FACW+", "FACW", or "FACW-"	38%
% species with "FAC+", "FAC", or "FAC-"	20%
% species with "FACU+", "FACU", or "FACU-"	16%
% species with "NL"	10%

Master species list for the Gray Farm FQAI Site (Summer 09/11/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer saccharinum	3		FACW	1	
Aesculus glabra	6		FACU+	1	
Ambrosia trifida	0		FAC	0	
Amphicarpa bracteata	5		FAC	0	
Angelica atropurpurea	6		OBL	1	
Arisaema atrorubens	4		FACW-	1	Also known as A. triphyllum var. triphyllum
Aster puniceus	6		OBL	1	
Aster simplex	2		FACW	1	Also known as A. lanceolatus
Boehmeria cylindrica	4		FACW+	1	
Carex frankii	5		OBL	1	
Carex vulpinoidea	3		OBL	1	
Carpinus caroliniana	4		FAC	1	
Chelone glabra var. linifolia	8		OBL	1	
Cicuta maculata	3		OBL	1	
Cinna arundinacea	4		FACW+	1	
Circaea quadrisulcata	3		FACU	1	Also Known as C. lutetiana
Cornus drummondi	4		FAC	1	
Cryptotaenia canadensis	3		FAC	1	
Echinocystis lobata	3		FAC	0	
Elymus virginicus	3		FACW-	1	
Euonymus atropurpureus	4		FACU	1	
Eupatorium purpureum	7		FAC	1	
Eupatorium rugosum	4		NL	1	
Fraxinus pennsylvanica var subintegerrima	6		FACW	1	
Galium aparine	2		FACU	0	
Geum canadense	2		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Heliopsis helianthoides	5		NL	1	
Impatiens capensis	2		FACW	0	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Leersia virginica	3		FACW	1	
Lindera benzoin	6		FACW-	1	
Lobelia siphilitica	4		FACW+	1	
Lonicera prolifera	7		NL	1	
Lycopus uniflorus	3		OBL	1	
Lysamachia ciliata	4		FACW	1	
Lysamachia nummularia	0	*	OBL	1	
Monarda fistulosa	5		NL	1	
Parthenocissus quinquefolia	3		FACU	1	
Pedicularis lanceolata	8		FACW	1	
Physocarpus opulifolius	4		FACW-	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Podophyllum peltatum	5		FACU	1	
Polygonum scandens	2		FAC	1	

Master species list for the Gray Farm FQAI Site (Summer 9/11/96, Fall 10/17/96, and Spring 04/30/97)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer saccharinum	3		FACW	1	
Aesculus glabra	6		FACU+	1	
Ambrosia trifida	0		FAC	0	
Amphicarpa bracteata	5		FAC	0	
Angelica atropurpurea	6		OBL	1	
Arisaema arrorubens	4		FACW-	1	Also known as A. triphyllum var. triphyllum
Aster puniceus	6		OBL	1	
Aster simplex	2		FACW	1	Also known as A. lanceolatus
Boehmeria cylindrica	4		FACW+	1	
Carex frankii	5		OBL	1	
Carex vulpinoidea	3		OBL	1	
Carpinus caroliniana	4		FAC	1	
Chelone glabra var. linifolia	8		OBL	1	
Cicuta maculata	3		OBL	1	
Cinna arundinacea	4		FACW+	1	
Circaea quadrisulcata	3		FACU	1	Also Known as C. lutetiana
Cornus drummondi	4		FAC	1	
Cryptotaenia canadensis	3		FAC	1	
Echinocystis lobata	3		FAC	0	
Elymus virginicus	3		FACW-	1	
Euonymus atropurpureus	4		FACU	1	
Eupatorium purpureum	7		FAC	1	
Eupatorium rugosum	4		NL	1	
Fraxinus pennsylvanica var subintegerrima	6		FACW	1	
Galium aparine	2		FACU	0	
Geum canadense	2		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Helianthoides helianthoides	5		NL	1	
Impatiens capensis	2		FACW	0	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Leersia virginica	3		FACW	1	
Lindera benzoin	6		FACW-	1	
Lobelia siphilitica	4		FACW+	1	
Lonicera prolifera	7		NL	1	
Lycopus uniflorus	3		OBL	1	
Lysamachia ciliata	4		FACW	1	
Lysamachia nummularia	0	*	OBL	1	
Monarda fistulosa	5		NL	1	
Parthenocissus quinquefolia	3		FACU	1	
Pedicularis lanceolata	8		FACW	1	
Physocarpus opulifolius	4		FACW-	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Podophyllum peltatum	5		FACU	1	
Polygonum scandens	2		FAC	1	
Polygonum virginianum	4		FAC	0	
Quercus bicolor	7		FACW+	1	
Ribes cynosbati	5		NL	1	
Rosa palustris	4		OBL	1	
Rosa setigera	6		FACU	1	
Rudbeckia laciniata	5		FACW	1	
Salix alba	0	*	FACW	1	
Salix fragilis	0	*	FAC+	1	
Sambucus canadensis	3		FACW-	1	
Sanicula gregaria	4		FACU	1	
Silphium perfoliatum	6		FACU	1	
Sium suave	5		OBL	1	
Solidago patula	8		OBL	1	
Symplocarpus foetidus	6		OBL	1	
Thalictrum ploygamum	4		FACW+	1	Also known as T. pubescens
Thaspium trifoliatum	3		NL		
Tilia americana	6		FACU	1	
Toxicodendron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	
Verbesina alternifolia	4		FAC	1	
Vernonia altissima	3		FAC	1	Also known as V. gigantea
Viburnum prunifolium	5		FACU	1	
Vitis riparia	4		FACW	1	
Vitis vulpina	3		FAC	1	

Master species list for the Gray Farm FQAI Site (Summer 09/11/96 and Fall 10/17/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer saccharinum	3		FACW	1	
Aesculus glabra	6		FACU+	1	
Ambrosia trifida	0		FAC	0	
Amphicarpa bracteata	5		FAC	0	
Angelica atropurpurea	6		OBL	1	
Arisaema atrorubens	4		FACW-	1	Also known as A. triphyllum var. triphyllum
Aster puniceus	6		OBL	1	
Aster simplex	2		FACW	1	Also known as A. lanceolatus
Boehmeria cylindrica	4		FACW+	1	
Carex frankii	5		OBL	1	
Carex vulpinoidea	3		OBL	1	
Carpinus caroliniana	4		FAC	1	
Chelone glabra var. linifolia	8		OBL	1	
Cicuta maculata	3		OBL	1	
Cinna arundinacea	4		FACW+	1	
Circaea quadrisulcata	3		FACU	1	Also Known as C. lutetiana
Cornus drummondi	4		FAC	1	
Cryptotaenia canadensis	3		FAC	1	
Echinocystis lobata	3		FAC	0	
Elymus virginicus	3		FACW-	1	
Euonymus atropurpureus	4		FACU	1	
Eupatorium purpureum	7		FAC	1	
Eupatorium rugosum	4		NL	1	
Fraxinus pennsylvanica var subintegerrima	6		FACW	1	
Galium aparine	2		FACU	0	
Geum canadense	2		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Heliopsis helianthoides	5		NL	1	
Impatiens capensis	2		FACW	0	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Leersia virginica	3		FACW	1	
Lindera benzoin	6		FACW-	1	
Lobelia siphilitica	4		FACW+	1	
Lonicera prolifera	7		NL	1	
Lycopus uniflorus	3		OBL	1	
Lysamachia ciliata	4		FACW	1	
Lysamachia nummularia	0	*	OBL	1	
Monarda fistulosa	5		NL	1	
Parthenocissus quinquefolia	3		FACU	1	
Pedicularis lanceolata	8		FACW	1	
Physocarpus opulifolius	4		FACW-	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Podophyllum peltatum	5		FACU	1	
Polygonum scandens	2		FAC	1	
Polygonum virginianum	4		FAC	0	
Quercus bicolor	7		FACW+	1	
Ribes cynosbati	5		NL	1	
Rosa palustris	4		OBL	1	
Rosa setigera	6		FACU	1	
Rudbeckia laciniata	5		FACW	1	
Salix alba	0	*	FACW	1	
Salix fragilis	0	*	FAC+	1	
Sambucus canadensis	3		FACW-	1	
Sanicula gregaria	4		FACU	1	
Silphium perfoliatum	6		FACU	1	
Sium suave	5		OBL	1	
Solidago patula	8		OBL	1	
Symplocarpus foetidus	6		OBL	1	
Thalictrum ploygamum	4		FACW+	1	Also known as T. pubescens

Polygonum virginianum	4		FAC	0	
Quercus bicolor	7		FACW+	1	
Ribes cynosbati	5		NL	1	
Rosa palustris	4		OBL	1	
Rosa setigera	6		FACU	1	
Rudbeckia laciniata	5		FACW	1	
Salix alba	0	*	FACW	1	
Salix fragilis	0	*	FAC+	1	
Sambucus canadensis	3		FACW-	1	
Sanicula gregaria	4		FACU	1	
Silphium perfoliatum	6		FACU	1	
Sium suave	5		OBL	1	
Solidago patula	8		OBL	1	
Symplocarpus foetidus	6		OBL	1	
Thalictrum ploygamum	4		FACW+	1	Also known as T. pubescens
Thaspium trifoliatum	3		NL		
Tilia americana	6		FACU	1	
Toxicodendron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	
Verbesina alternifolia	4		FAC	1	
Vernonia altissima	3		FAC	1	Also known as V. gigantea
Viburnum prunifolium	5		FACU	1	
Vitis riparia	4		FACW	1	
Vitis vulpina	3		FAC	1	
Zanthoxylum americanum	5		NL	1	

Sum of FQAI values (R)	297
# of native species (N-Native)	71
Total number of species (N-Total)	76
FQAI Score (R/sq rt of N-Native)	**35.25**
Modified FQAI (R/sq rt N-Total)	**34.07**

Note: % total species which are native	93%
% species confirmed in lab (Summer)	34%
Perennial/Annual Ratio	7.44

Thaxpium trifoliatum	3	NL		
Tilia americana	6	FACU	1	
Toxicodendron radicans	1	FAC	1	
Ulmus rubra	2	FAC	1	
Verbesina alternifolia	4	FAC	1	
Vernonia altissima	3	FAC	1	Also known as V. gigantea
Viburnum prunifolium	5	FACU	1	
Vitis riparia	4	FACW	1	
Vitis vulpina	3	FAC	1	
Zanthoxylum americanum	5	NL	1	
Acer saccharum	6	FACW	1	
Apios americana	4	FACW	1	
Aster lateriflorus	2	FACW	1	
Celtis occidentalis	6	FACU	1	
Cephalanthus occidentalis	6	OBL	1	
Cornus florida	5	FACU-	1	
Cornus obliqua	2	NL	1	Also known as C. amomum
Cuscuta grunovii	3	NL		
Dioscorea villosa	4	FAC+	1	
Equisetum fluviatile	7	OBL	1	
Fllependula rubra	8	FACW	1	
Fraxinus nigra	7	FACW	1	
Glyceria striata	2	OBL	1	
Helenium atumnale	4	FACW+	1	
Lycopus virginicus	4	OBL	1	
Menispermum canadense	5	NL	1	
Onoclea sensibilis	3	FACW	1	
Osmorhiza longistylis	5	FACU	1	
Polygonum convolvulus	0 *	FACU	0	
Polygonum punctatum	6	OBL	1	
Polygonum sagittatum	3	OBL	0	
Prunus serrotina	3	FACU	1	
Quercus macrocarpa	6	FAC-	1	
Rubus occidentalis	1	NL	1	
Sagittaria brevirostra	7	OBL	1	
Solidago canadensis	1	FACU	1	
Ulmus americana	1	FACW-	1	

Sum of FQAI values (R)	408
# of native species (N-Native)	97
Total number of species (N-Total)	103
FQAI Score (R/sq rt of N-Native)	**41.43**
Modified FQAI (R/sq rt N-Total)	**40.20**
Note: % total species which are native	94%
Perennial/Annual Ratio	7.58
% increase in FQAI score from summer to fall	18%
Number of new species added in Fall	27
Percent of total species added in Fall survey	26%
Percent of species confirmed in lab (Fall)	37%
Total % of species confirmed in lab (Summer and Fall)	35%
% species with "OBL" Ind. Stat.	19%
% species with "FACW+", "FACW", or "FACW-"	31%
% species with "FAC+", "FAC", or "FAC-"	18%
% species with "FACU+", "FACU", or "FACU-"	20%
% species with "NL"	11%

Note: Species in **BOLD** print were recorded during the Fall site visit

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Carex sp. #1 - tussock, narrow leaves C. stricta?
Carex sp. #2 - Short triplyconduplicate
Carex sp. #3 - tall triply conduplicate
Crataegus sp.
Iris sp.
Viola sp. #1
Viola sp. #2 - Possibly Caltha palustris

Zanthoxylum americanum	5		NL	1	
Acer saccharum	6		FACW	1	
Apios americana	4		FACW	1	
Aster lateriflorus	2		FACW	1	
Celtis occidentalis	6		FACU	1	
Cephalanthus occidentalis	6		OBL	1	
Cornus florida	5		FACU-	1	
Cornus obliqua	2		NL	1	Also known as C. amomum
Cuscuta grunovii	3		NL		
Dioscorea villosa	4		FAC+	1	
Equisetum fluviatile	7		OBL	1	
Filependula rubra	8		FACW	1	
Fraxinus nigra	7		FACW	1	
Glyceria striata	2		OBL	1	
Helenium atumnale	4		FACW+	1	
Lycopus virginicus	4		OBL	1	
Menispermum canadense	5		NL	1	
Onoclea sensibilis	3		FACW	1	
Osmorhiza longistylis	5		FACU	1	
Polygonum convolvulus	0	*	FACU	0	
Polygonum punctatum	6		OBL	1	
Polygonum sagittatum	3		OBL	0	
Prunus serrotina	3		FACU	1	
Quercus macrocarpa	6		FAC-	1	
Rubus occidentalis	1		NL	1	
Sagittaria brevirostra	7		OBL	1	
Solidago canadensis	1		FACU	1	
Ulmus americana	1		FACW-	1	
Alliaria officinalis	0	*	FACU	1	Biennial. a.k.a. A. petiolata
Allium canadense	3		FACU	1	
Caltha palustris	5		OBL	1	
Cardamine douglassii	5		FACW+	1	
Cardamine pensylvanica	3		OBL	0	
Chaerophyllum procumbens	4		FACW	0	var. procumbens
Cirsium muticum	8		OBL	1	Biennial
Claytonia virginica	3		FACU	1	
Dodecatheon meadia	10		FACU	1	
Floerkea proserpinacoides	4		FAC	0	
Geum vernum	4		FACU	1	
Mitella diphylla	7		FACU	1	
Polemonium reptans	6		FACU	1	
Ranunculus hispidus	5		FAC	1	var. hispidus
Senecio aureus	5		FACW	1	
Thalictrum dioicum	6		FAC	1	
Viola sororia	2		FAC-	1	

FQAI Score (R/sq rt of N-Native)

Modified FQAI (R/sq rt N-Total)

Sum of FQAI values (R)	488
# of native species (N-Native)	113
Total number of species (N-Total)	120
FQAI Score (R/sq rt of N-Native)	**45.91**
Modified FQAI (R/sq rt N-Total)	**44.55**

Note: % total species which are native	94%
Perennial/Annual Ratio	7.00
Number of new species added in Fall	27
Percent of total species added in Fall survey	23%
Number of new species added in Spring	17
Percent of total species added in Spring survey	14%
% increase in FQAI score from summer to fall	18%
% increase in FQAI score from fall to spring	11%
% increase in FQAI score from summer to spring	30%
Percent of species confirmed in lab (Summer)	34%
Percent of species confirmed in lab (Fall)	37%
Percent of species confirmed in lab (Spring)	0%
Total % of species confirmed in lab (Summer and Fall)	30%

% species with "OBL" Ind. Stat.	19%
% species with "FACW+", "FACW", or "FACW-"	29%
% species with "FAC+", "FAC", or "FAC-"	19%
% species with "FACU+", "FACU", or "FACU-"	23%
% species with "NL"	9%

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Carex sp. #1 - tussock, narrow leaves C. stricta?
Carex sp. #2 - Short triplyconduplicate
Carex sp. #3 - tall triply conduplicate
Crataegus sp.
Iris sp.
Viola sp. #1
Viola sp. #2 - Possibly Caltha palustris

Master species list for the Marcella/Thrasher Wetland (Summer 07/25/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer saccharum	6		FACU	1	
Aesculus glabra	6		FACU+	1	
Arisaema atrorubens	4		FACW-	1	Also known as A. triphyllum var. triphyllum
Asarum canadense	7		NL	1	
Celtis occidentalis	6		FACU	1	
Cryptotaenia canadensis	3		FAC	1	
Eupatorium rugosum	4		NL	1	
Geum canadense	2		FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Laportea canadensis	5		FACW	1	
Lindera benzoin	6		FACW-	1	
Lysimachia nummularia	0	*	OBL	1	
Maclura pomifera	0	*	NL	1	
Parthenocissus quinquefolia	3		FACU	1	
Phalaris arundinacea	0		FACW+	1	
Pilea pumila	4		FACW	0	
Platanus occidentalis	7		FACW-	1	
Polygonum virginianaum	4		FAC	0	
Populus deltoides	5		FAC	1	
Rudbeckia laciniata	5		FACW	1	
Sambucus canadensis	3		FACW-	1	
Saururus cernuus	7		OBL	1	
Ulmus americana	1		FACW-	1	
Ulmus rubra	2		FAC	1	
Verbesina alternifolia	4		FAC	1	
Vitis riparia	4		FACW	1	

Sum of FQAI values (R)	102
# of native species (N-Native)	25
Total number of species (N-Total)	27
FQAI Score (R/sq rt of N-Native)	**20.40**
Modified FQAI (R/sq rt N-Total)	**19.63**

Note: % total species which are native	93%
% species confirmed in lab (Summer)	26%
Perennial/Annual Ratio	12.5

Master species list for the Marcella/Thrasher Wetland (Summer 07/25/96 and Fall 10/01/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer saccharum	6		FACU	1	
Aesculus glabra	6		FACU+	1	
Arisaema atrorubens	4		FACW-	1	Also known as A. triphyllum var. triphyllum
Asarum canadense	7		NL	1	
Celtis occidentalis	6		FACU	1	
Cryptotaenia canadensis	3		FAC	1	
Eupatorium rugosum	4		NL	1	
Geum canadense	2		FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Laportea canadensis	5		FACW	1	
Lindera benzoin	6		FACW-	1	
Lysimachia nummularia	0	*	OBL	1	
Maclura pomifera	0	*	NL	1	
Parthenocissus quinquefolia	3		FACU	1	
Phalaris arundinacea	0		FACW+	1	
Pilea pumila	4		FACW	0	
Platanus occidentalis	7		FACW-	1	
Polygonum virginianaum	4		FAC	0	
Populus deltoides	5		FAC	1	
Rudbeckia laciniata	5		FACW	1	
Sambucus canadensis	3		FACW-	1	
Saururus cernuus	7		OBL	1	
Ulmus americana	1		FACW-	1	
Ulmus rubra	2		FAC	1	
Verbesina alternifolia	4		FAC	1	
Vitis riparia	4		FACW	1	
Aster cordifolius	5		NL	1	
Aster lateriflorus	2		FACW-	1	
Aster simplex	2		FACW	1	Also known as A. lanceolatus
Cinna arundinacea	4		FACW+	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Juglans nigra	5		FACU	1	
Oxalis dilleni	0		NL	1	
Polygonum punctatum	6		OBL	1	
Rosa multiflora	0	*	FACU	1	
Sanicula gregaria	4		FACU	1	
Smilax hispida	5		FAC	1	
Staphylea trifolia	6		FAC	1	
Xanthium strumarium	0	*	FAC	0	

Sum of FQAI values (R)	147
# of native species (N-Native)	36
Total number of species (N-Total)	40
FQAI Score (R/sq rt of N-Native)	**24.50**
Modified FQAI (R/sq rt N-Total)	**23.24**

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Carex sp.
Unknown cress-like, spatulate shaped, basal leaved forb
Unknown simple, opposite, toothed, rough leaved forb
Viola sp.

Note: % total species which are native	90%
Perennial/Annual Ratio	12.33
% increase in FQAI score from summer to fall	20%
Number of new species added in Fall	13
Percent of total species added in Fall survey	33%
Percent of species confirmed in lab (Fall)	54%
Total % of species confirmed in lab (Summer and Fall)	35%
% species with "OBL" Ind. Stat.	8%
% species with "FACW+", "FACW", or "FACW-"	35%
% species with "FAC+", "FAC", or "FAC-"	25%
% species with "FACU+", "FACU", or "FACU-"	20%
% species with "NL"	13%

Note: Species in **BOLD** print were recorded during the Fall site visit

Master species list for the Marcella/Thrasher Wetland (Summer 07/25/96, Fall 10/01/96, and Spring 05/02/97)

Key: *=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer saccharum	6		FACU	1	
Aesculus glabra	6		FACU+	1	
Arisaema atrorubens	4		FACW-	1	Also known as A. triphyllum var. triphyllum
Asarum canadense	7		NL	1	
Celtis occidentalis	6		FACU	1	
Cryptotaenia canadensis	3		FAC	1	
Eupatorium rugosum	4		NL	1	
Geum canadense	2		FACU	1	
Gleditsia triacanthos	1		FAC-	1	
Laportea canadensis	5		FACW	1	
Lindera benzoin	6		FACW-	1	
Lysimachia nummularia	0	*	OBL	1	
Maclura pomifera	0	*	NL	1	
Parthenocissus quinquefolia	3		FACU	1	
Phalaris arundinacea	0		FACW+	1	
Pilea pumila	4		FACW	0	
Platanus occidentalis	7		FACW-	1	
Polygonum virginianum	4		FAC	0	
Populus deltoides	5		FAC	1	
Rudbeckia laciniata	5		FACW	1	
Sambucus canadensis	3		FACW-	1	
Saururus cernuus	7		OBL	1	
Ulmus americana	1		FACW-	1	
Ulmus rubra	2		FAC	1	
Verbesina alternifolia	4		FAC	1	
Vitis riparia	4		FACW	1	
Aster cordifolius	5		NL	1	
Aster lateriflorus	2		FACW-	1	
Aster simplex	2		FACW	1	Also known as A. lanceolatus
Cinna arundinacea	4		FACW+	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Juglans nigra	5		FACU	1	
Oxalis dillenii	0		NL	1	
Polygonum punctatum	6		OBL	1	
Rosa multiflora	0	*	FACU	1	
Sanicula gregaria	4		FACU	1	
Smilax hispida	5		FAC	1	
Staphylea trifolia	6		FAC	1	
Xanthium strumarium	0	*	FAC	0	
Alliaria officinalis	0	*	FACU-	1	Biennial
Allium canadense	3		FACU	1	
Arabis hirsuta	4		FACU	1	
Cardamine douglassii	5		FACW+	1	
Chaerophyllum procumbens	4		FACW	0	var. procumbens
Claytonia virginica	3		FACU	1	
Dentaria laciniata	3		FACU	1	a.k.a. Cardamine concatenata
Erythronium americanum	5		NL	NL	
Florkea proserpinacoides	4		FAC	0	
Geum vernum	4		FACU	1	
Hydrophyllum virginianum	5		FAC	1	
Osmorhiza longistylis	5		FACU	1	
Phlox divaricata	6		FACU	1	
Polygonatum commutatum	5		FACU	1	
Ranunculus abortivus	4		FACW-	1	Biennial
Ranunculus hispidus	5		FAC	1	var. hispidus
Urtica dioica	1		FACU	1	
Viola sororia	2		FAC-	1	
Viola striata	5		FACW	1	

Sum of FQAI values (R)	220
# of native species (N-Native)	54
Total number of species (N-Total)	59
FQAI Score (R/sq rt of N-Native)	**29.94**
Modified FQAI (R/sq rt N-Total)	**28.64**

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Carex sp.
Unknown cress-like, spatulate shaped, basal leaved forb
Unknown simple, opposite, toothed, rough leaved forb
Viola sp.

Note: % total species which are native	92%
Perennial/Annual Ratio	8.83
Number of new species added in Fall	13
Percent of total species added in Fall survey	22%
Number of new species added in Spring	19
Percent of total species added in Spring survey	32%
% increase in FQAI score from summer to fall	20%
% increase in FQAI score from fall to spring	22%
% increase in FQAI score from summer to spring	47%
Percent of species confirmed in lab (Summer)	26%
Percent of species confirmed in lab (Fall)	54%
Percent of species confirmed in lab (Spring)	0%
Total % of species confirmed in lab (Summer and Fall)	24%
% species with "OBL" Ind. Stat.	5%
% species with "FACW+", "FACW", or "FACW-"	31%
% species with "FAC+", "FAC", or "FAC-"	24%
% species with "FACU+", "FACU", or "FACU-"	31%
% species with "NL"	10%

Lippia lanceolata	6		OBL	1	*a.k.a. Phyla lanceolata*
Lycopus americanus	3		OBL	1	
Lysimachia nummularia	0	*	OBL	1	
Mentha arvensis	2		FACW	1	
Mentha piperita	0	*	FACW+	1	
Mentha spicata	0	*	FACW+	1	
Mimulus rigens	5		OBL	1	
Nepata cataria	0	*	FACU	1	
Panicum dichotomiflorum	1		FACW-	0	
Parthenocissus quinquefolia	3		FACU	1	
Phalaris arundinacea	0		FACW+	1	
Phleum pratense	0	*	FACU	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Polygonum hydropiperoides	5		OBL	1	
Polygonum persecaria	0	*	FACW	0	
Pycanthemum verticallatum	9		FACW	1	
Rorippa islandica var fernaldiana	1		OBL	0	Also known as R. palustris
Rosa multiflora	0	*	FACU	1	
Rosa setigera	6		FACU	1	
Rumex crispus	0	*	FACU	1	
Sagittaria latifolia	2		OBL	1	
Salix alba	0	*	FACW	1	
Salix nigra	3		FACW+	1	
Sambucus canadensis	3		FACW-	1	
Scirpus americanus	5		OBL	1	
Scirpus atrovirens	2		OBL	1	
Scirpus cyperinus	1		FACW+	1	
Scirpus lineatus	6		NL	1	Also known as S. pendulus
Scirpus validus	6		OBL	1	
Sium suave	5		OBL	1	
Solanum dulcamara	0	*	FAC-	1	
Solidago juncea	2		NL	1	
Stachys hispida	NL		OBL	1	
Stachys ridelli	NL		NL		
Stellaria puberia var pubera	5		NL	1	
Symplocarpus foetidus	6		OBL	1	
Toxicodendron radicans	1		FAC	1	
Trifolium repens	0	*	FACU-	1	
Typha latifolia	2		OBL	1	
Ulmus americana	1		FACW-	1	
Verbena hastata	4		FACW+	1	
Verbena urticifolia	4		FACU	1	
Vernonia altissima	3		FAC	1	Also known as V. gigantea
Veronica anagallis-aquatica	6		OBL	1	

Sum of FQAI values (R)	285
# of native species (N-Native)	78
Total number of species (N-Total)	104
FQAI Score (R/sq rt of N-Native)	**32.27**
Modified FQAI (R/sq rt N-Total)	**27.95**
Note: % total species which are native	75%
% species confirmed in lab (Summer)	38%
Perennial/Annual Ratio	5.93

Species to be confirmed during future sampling

Agrimonia sp.
Carex sp.
Craetegus sp.
Cuscata sp.
Eleocharis sp.
Epilobum sp.
Impatiens sp.
Lycopus sp.
Oxalis sp.
Polygonum sp.
Salix sp.
Scleria sp.
Viola sp.
Vitis sp.

Master species list for the RAPP Wetland (Summer 07/15/96 and Fall 10/01/96)

Key:*=alien taxon: **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Achillea millefolium	0	*	FACU	1	
Acorus calamus	4		OBL	1	
Agrostis alba	0	*	FACW	1	Also known as A. gigantea
Alisma plantago-aquatica	2		OBL	1	
Alliara petiolata	0	*	FACU-	0	
Ambrosia artemisiifolia	0		FACU	0	
Angelica atropurpurea	6		OBL	1	
Asclepias incarnata	5		OBL	1	
Boehmeria cylindrica	4		FACW+	1	
Brassica nigra	0	*	NL	0	
Carex conjuncta	5		FACW	1	
Carex cristatella	3		FACW	1	
Carex frankii	5		OBL	1	
Carex granularis	3		FACW+	1	
Carex hystricina	4		OBL	1	
Carex lanuginosa	6		OBL	1	Also known as C. pellita
Carex normalis	4		FACU	1	
Carex vulpinoidea	3		OBL	1	
Cerastium vulgatum	0	*	FACU-	1	
Chaerophyllum procumbens	4		FACW	0	var. procumbens=4; var shortii=8
Cichorium intybus	0	*	NL	1	
Cicuta maculata	3		OBL	1	
Cirsium arvense	0	*	FACU	1	
Convolvulus sepium	1		NL	1	Also known as Calystegia sepium
Crataegus mollis	3		FACU	1	
Cryptotaenia canadensis	3		FAC	1	
Daucus carota	0	*	NL	0	
Dipsacus sylvestris	0	*	NL	0	
Echinochloa crusgalli	0	*	FACU	0	
Echinocystis lobata	3		FAC	0	
Eleocharis acicularis	3		OBL	1	
Eleocharis palustris	4		OBL	1	
Erigeron strigosus	1		FACU+	0	
Eupatorium perfoliatum	3		FACW+	1	
Eupatorium purpureum	7		FAC	1	
Festuca eliator	0	*	FACU	1	
Festuca octoflora	5		NL	1	Also known as Vulpina octoflora
Fraxinus americana	4		FACW	1	
Fraxinus pennsylvanica var pennsylvanica	6		FACW	1	
Fraxinus pennsylvanica var subintegerrima	6		FACW	1	
Galium concinnum	4		NL	1	
Galium triflorum	5		FACU	1	
Geum canadense	2		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Glyceria striata	2		OBL	1	
Helianthus tuberosus	3		FAC	1	
Impatiens capensis	2		FACW	0	
Juglans nigra	5		FACU	1	
Juncus nodosus	4		OBL	1	
Juncus tenuis	1		FAC-	1	var. dichotomus=7; var. dudleyi=4; var. tenuis=1
Juncus torreyi	3		FACW	1	
Justicia americana	8		OBL	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Leersia virginica	3		FACW	1	
Lemna minor	4		OBL	1	
Lippia lanceolata	6		OBL	1	*a.k.a. Phyla lanceolata*
Lycopus americanus	3		OBL	1	
Lysimachia nummularia	0	*	OBL	1	
Mentha arvensis	2		FACW	1	
Mentha piperita	0	*	FACW+	1	
Mentha spicata	0	*	FACW+	1	
Mimulus rigens	5		OBL	1	
Nepeta cataria	0	*	FACU	1	
Panicum dichotomiflorum	1		FACW-	0	
Parthenocissus quinquefolia	3		FACU	1	
Phalaris arundinacea	0		FACW+	1	
Phleum pratense	0	*	FACU	1	
Pilea pumila	4		FACW	0	
Plantago major	0	*	FACU	1	
Platanus occidentalis	7		FACW-	1	
Polygonum hydropiperoides	5		OBL	1	
Polygonum persecaria	0	*	FACW	0	
Pycanthemum verticallatum	9		FACW	1	
Rorippa islandica var fernaldiana	1		OBL	0	Also known as R. palustris
Rosa multiflora	0	*	FACU	1	
Rosa setigera	6		FACU	1	
Rumex crispus	0	*	FACU	1	
Sagittaria latifolia	2		OBL	1	
Salix alba	0	*	FACW	1	
Salix nigra	3		FACW+	1	
Sambucus canadensis	3		FACW-	1	

Scirpus americanus	5		OBL	1	
Scirpus atrovirens	2		OBL	1	
Scirpus cyperinus	1		FACW+	1	
Scirpus lineatus	6		NL	1	Also known as S. pendulus
Scirpus validus	6		OBL	1	
Sium suave	5		OBL	1	
Solanum dulcamara	0	*	FAC-	1	
Solidago juncea	2		NL	1	
Stachys hispida	NL		OBL	1	
Stachys ridelli	NL		NL		
Stellaria pubera var pubera	5		NL	1	
Symplocarpus foetidus	6		OBL	1	
Toxicodendron radicans	1		FAC	1	
Trifolium repens	0	*	FACU-	1	
Typha latifolia	2		OBL	1	
Ulmus americana	1		FACW-	1	
Verbena hastata	4		FACW+	1	
Verbena urticifolia	4		FACU	1	
Vernonia altissima	3		FAC	1	Also known as V. gigantea
Veronica anagallis-aquatica	6		OBL	1	
Agrimonia parviflora	2		FAC	1	
Aster lateriflorus	2		FACW-	1	
Aster puniceus	6		OBL	1	
Aster simplex	2		FACW	1	Also known as A. lanceolatus
Bidens cernua	3		OBL	0	
Bidens frondosa	2		FACW	0	
Carpinus caroliniana	4		FAC	1	
Celtis occidentalis	6		FACU	1	
Cornus amomum	2		FACW	1	
Cyperus strigosus	2		FACW	1	
Elymus virginicus	3		FACW-	1	
Epilobium coloratum	2		OBL	1	
Galium tinctorium	6		OBL	1	
Helenium autumnale	4		FACW+	1	
Lobelia siphilitica	4		FACW	1	
Lycopus virginicus	4		OBL	1	
Penthorum sedoides	3		OBL	1	
Polygonum hydropiper	3		OBL	0	
Polygonum pensylvanicum	1		FACW	0	
Polygonum punctatum	6		OBL	1	
Prunella vulgaris	0	**	FACU+	1	
Robina pseudoacacia	0	**	FACU-	1	
Rudbeckia fulgida var. fulgida	7		FAC	1	
Rumex orbiculatus	3		OBL	1	
Salix amygdaloides	4		FACW	1	
Saururus cernuus	7		OBL	1	
Scutellaria lateriflora	3		FACW+	1	
Solidago canadensis	1		FACU	1	
Sparganium eurycarpum	4		OBL	1	
Urtica dioica var. procera	1		FACU	1	
Verbesina alternifolia	4		FAC	1	
Vitis riparia	4		FACW	1	

Sum of FQAI values (R)	390
# of native species (N-Native)	108
Total number of species (N-Total)	136
FQAI Score (R/sq rt of N-Native)	**37.53**
Modified FQAI (R/sq rt N-Total)	**33.44**
Note: % total species which are native	79%
Perennial/Annual Ratio	6.16
% increase in FQAI score from summer to fall	16%
Number of new species added in Fall	32
Percent of total species added in Fall survey	24%
Percent of species confirmed in lab (Fall)	53%
Total % of species confirmed in lab (Summer and Fall)	42%
% species with "OBL" Ind. Stat.	31%
% species with "FACW+", "FACW", or "FACW-"	30%
% species with "FAC+", "FAC", or "FAC-"	10%
% species with "FACU+", "FACU", or "FACU-"	21%
% species with "NL"	8%

Note: Species in **BOLD** print were recorded during the Fall site visit

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Carex sp.
Crataegus sp.
Cuscata sp.
Eleocharis sp.
Impatiens sp.
Oxalis sp.
Polygonum sp. - P. amphibium or P. coccineum
Scleria sp.
Uknown simple, opposite, spatulate leaved forb
Unknown toothed, cordate, basal leaved forb
Unknown toothed, trifoliate, basal leaved forb
Viola sp.

Master species list for the RAPP Wetland (Summer 07/15/96, Fall 10/01/96 and Spring 04/25/97)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)
Acer negundo	3		FAC+	1
Achillea millefolium	0	*	FACU	1
Acorus calamus	4		OBL	1
Agrostis alba	0	*	FACW	1
Alisma plantago-aquatica	2		OBL	1
Alliara petiolata	0	*	FACU-	0
Ambrosia artemisiifolia	0		FACU	0
Angelica atropurpurea	6		OBL	1
Asclepias incarnata	5		OBL	1
Boehmeria cylindrica	4		FACW+	1
Brassica nigra	0	*	NL	0
Carex conjuncta	5		FACW	1
Carex cristatella	3		FACW	1
Carex frankii	5		OBL	1
Carex granularis	3		FACW+	1
Carex hystricina	4		OBL	1
Carex lanuginosa	6		OBL	1
Carex normalis	4		FACU	1
Carex vulpinoidea	3		OBL	1
Cerastium vulgatum	0	*	FACU-	1
Chaerophyllum procumbens	4		FACW	0
Cichorium intybus	0	*	NL	1
Cicuta maculata	3		OBL	1
Cirsium arvense	0	*	FACU	1
Convolvulus sepium	1		NL	1
Crataegus mollis	3		FACU	1
Cryptotaenia canadensis	3		FAC	1
Daucus carota	0	*	NL	0
Dipsacus sylvestris	0	*	NL	0
Echinochloa crusgalli	0	*	FACU	0
Echinocystis lobata	3		FAC	0
Eleocharis acicularis	3		OBL	1
Eleocharis palustris	4		OBL	1
Erigeron strigosus	1		FACU+	0
Eupatorium perfoliatum	3		FACW+	1
Eupatorium purpureum	7		FAC	1
Festuca eliator	0	*	FACU	1
Festuca ocioflora	5		NL	1
Fraxinus americana	4		FACW	1
Fraxinus pennsylvanica var pennsylvanica	6		FACW	1
Fraxinus pennsylvanica var subintegerrima	6		FACW	1
Galium concinnum	4		NL	1
Galium triflorum	5		FACU	1
Geum canadense	2		FACU	1
Glechoma hederacea	0	*	FACU	1
Gleditsia tricanthos	1		FAC-	1
Glyceria striata	2		OBL	1
Helianthus tuberosus	3		FAC	1
Impatiens capensis	2		FACW	0
Juglans nigra	5		FACU	1
Juncus nodosus	4		OBL	1
Juncus tenuis	1		FAC-	1
Juncus torreyi	3		FACW	1
Justicia americana	8		OBL	1
Laportea canadensis	5		FACW	1
Leersia oryzoides	1		OBL	1
Leersia virginica	3		FACW	1
Lemna minor	4		OBL	1
Lappia lanceolata	6		OBL	1
Lycopus americanus	3		OBL	1
Lysimachia nummularia	0	*	OBL	1
Mentha arvensis	2		FACW	1
Mentha piperita	0	*	FACW+	1
Mentha spicata	0	*	FACW+	1
Mimulus rigens	5		OBL	1
Nepeta cataria	0	*	FACU	1
Panicum dichotomiflorum	1		FACW-	0
Parthenocissus quinquefolia	3		FACU	1
Phalaris arundinacea	0		FACW+	1
Phleum pratense	0	*	FACU	1
Pilea pumila	4		FACW	0
Plantago major	0	*	FACU	1
Platanus occidentalis	7		FACW-	1
Polygonum hydropiperoides	5		OBL	1
Polygonum persecaria	0	*	FACW	0
Pycanthemum verticillatum	9		FACW	1
Rorippa islandica var fernaldiana	1		OBL	0
Rosa multiflora	0	*	FACU	1
Rosa setigera	6		FACU	1
Rumex crispus	0	*	FACU	1
Sagittaria latifolia	2		OBL	1
Salix alba	0	*	FACW	1
Salix nigra	3		FACW+	1
Sambucus canadensis	3		FACW-	1
Scirpus americanus	5		OBL	1
Scirpus atrovirens	2		OBL	1
Scirpus cyperinus	1		FACW+	1

Scirpus lineatus	6		NL	1
Scirpus validus	6		OBL	1
Sium suave	5		OBL	1
Solanum dulcamara	0	*	FAC-	1
Solidago juncea	2		NL	1
Stachys hispida	NL		OBL	1
Stachys ridelli	NL		NL	
Stellaria pubera var pubera	5		NL	1
Symplocarpus foetidus	6		OBL	1
Toxicodendron radicans	1		FAC	1
Trifolium repens	0	*	FACU-	1
Typha latifolia	2		OBL	1
Ulmus americana	1		FACW-	1
Verbena hastata	4		FACW+	1
Verbena urticifolia	4		FACU	1
Vernonia altissima	3		FAC	1
Veronica anagallis-aquatica	6		OBL	1
Agrimonia parviflora	2		FAC	1
Aster lateriflorus	2		FACW-	1
Aster puniceus	6		OBL	1
Aster simplex	2		FACW	1
Bidens cernua	3		OBL	0
Bidens frondosa	2		FACW	0
Carpinus caroliniana	4		FAC	1
Celtis occidentalis	6		FACU	1
Cornus amomum	2		FACW	1
Cyperus strigosus	2		FACW	1
Elymus virginicus	3		FACW-	1
Epilobium coloratum	2		OBL	1
Galium tinctorium	6		OBL	1
Helenium atumnale	4		FACW+	1
Lobelia siphilitica	4		FACW	1
Lycopus virginicus	4		OBL	1
Penthorum sedoides	3		OBL	1
Polygonum hydropiper	3		OBL	0
Polygonum pensylvanicum	1		FACW	0
Polygonum punctatum	6		OBL	1
Prunella vulgaris	0	**	FACU+	1
Robina pseudoacacia	0	**	FACU-	1
Rudbeckia fulgida var. fulgida	7		FAC	1
Rumex orbiculatus	3		OBL	1
Salix amygdaloides	4		FACW	1
Saururus cernuus	7		OBL	1
Scutelaria lateriflora	3		FACW+	1
Solidago canadensis	1		FACU	1
Sparganium eurycarpum	4		OBL	1
Urtica dioica var. procera	1		FACU	1
Verbesina alternifolia	4		FAC	1
Vitis riparia	4		FACW	1
Geum vernum	4		FACU	1
Mertensia virginica	8		FACW	1
Osmorhiza longistylis	5		FACU	1
Ranunculus abortivus	4		FACW-	1
Ranunculus hispidus	5		FAC	1
Rudbeckia laciniata	5		FACW	1
Sanguinaria canadensis	5		NL	1
Stellaria media	0	*	NL	NL
Taraxacum officinale	0	*	FACU-	1
Viola sororia	2		FAC-	1

Sum of FQAI values (R)	428
# of native species (N-Native)	116
Total number of species (N-Total)	146
FQAI Score (R/sq rt of N-Native)	**39.74**
Modified FQAI (R/sq rt N-Total)	**35.42**

Note: % total species which are native	79%
Perennial/Annual Ratio	6.30
Number of new species added in Fall	32
Percent of total species added in Fall survey	22%
Number of new species added in Spring	10
Percent of total species added in Spring survey	7%
% increase in FQAI score from summer to fall	16%
% increase in FQAI score from fall to spring	6%
% increase in FQAI score from summer to spring	23%
Percent of species confirmed in lab (Summer)	38%
Percent of species confirmed in lab (Fall)	53%
Percent of species confirmed in lab (Spring)	0%
Total % of species confirmed in lab (Summer and Fall)	39%

% species with "OBL" Ind. Stat.	29%
% species with "FACW+", "FACW", or "FACW-"	30%
% species with "FAC+", "FAC", or "FAC-"	11%
% species with "FACU+", "FACU", or "FACU-"	21%
% species with "NL"	9%

Species which could not be compl
of poor specimens, lack of floweri

Carex sp.
Crataegus sp.
Cuscata sp.
Eleocharis sp.
Impatiens sp.
Oxalis sp.
Polygonum sp. - P. amphibium or P.
Scleria sp.
Uknown simple, opposite, spatulate
Unknown toothed, cordate, basal le
Unknown toothed, trifoliate, basal l
Viola sp.

Master species list for the Shawnee Prairie Preserve Wetland (Summer (08/20/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Agrimonia striata	7		FACU-	1	
Ambrosia trifida	0		FAC	0	
Arisaema dracontium	5		FACW	1	
Bidens coronata	3		OBL	0	
Campsis radicans	0	**	FAC	1	
Carex grayi	5		FACW+	1	
Carya cordiformis	4		FACU+	1	
Carya ovata	6		FACU-	1	
Celtis occidentalis	6		FACU	1	
Cornus drummondii	1		FAC	1	
Cryptotaenia canadensis	3		FAC	1	
Eounymus obovatus	5		NL	1	
Echinocystis lobata	3		FAC	0	
Elymus virginicus	3		FACW-	1	
Fraxinus pennsylvanica var. pennsylvanica	6		FACW	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Geum canadense	2		FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Impatiens capensis	2		FACW	0	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Ligustrum vulgare	0	*	FACU	1	
Lonicera maackii	0	*	NL	1	
Lysamachia nummularia	0	*	OBL	1	
Morus rubra	6		FACU	1	Corrected Fall
Parthenocissus quinquefolia	3		FACU	1	
Pilea pumila	4		FACW	0	
Podophyllum peltatum	5		FACU	1	
Polygonum pensylvanicum	1		FACW	0	
Polygonum punctatum	6		OBL	1	
Polygonum virginianum	4		FAC		
Populus deltoides	5		FAC	1	
Prunus serotinna	3		FACU	1	
Quercus bicolor	7		FACW+	1	
Rosa multiflora	0	*	FACU	1	
Smilax hispida	5		FAC	1	
Toxicodndron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	

Verbena urticifolia	4		FACU	
Verbesina alternifolia	4		FAC	1
Viburnum opulus var. opulus	0	*	NL	1
Vitis riparia	4		FACW	1
Vitis vulpina	3		FAC	1

Sum of FQAI values (R)	152
# of native species (N-Native)	39
Total number of species (N-Total)	46
FQAI Score (R/sq rt of N-Native)	**24.34**
Modified FQAI (R/sq rt N-Total)	**22.41**

Note: % total species which are native	85%
% species confirmed in lab (Summer)	26%
Perennial/Annual Ratio	4.11

Master species list for the Shawnee Prairie Preserve Wetland (Summer 08/20/96 and Fall 10/17/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Agrimonia striata	7		FACU-	1	
Ambrosia trifida	0		FAC	0	
Arisaema dracontium	5		FACW	1	
Bidens coronata	3		OBL	0	
Campsis radicans	0	**	FAC	1	
Carex grayi	5		FACW+	1	
Carya cordiformis	4		FACU+	1	
Carya ovata	6		FACU-	1	
Celtis occidentalis	6		FACU	1	
Cornus drummondii	1		FAC	1	
Cryptotaenia canadensis	3		FAC	1	
Euonymus obovatus	5		NL	1	
Echinocystis lobata	3		FAC	0	
Elymus virginicus	3		FACW-	1	
Fraxinus pennsylvanica var. pennsylvanica	6		FACW	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Geum canadense	2		FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Impatiens capensis	2		FACW	0	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Ligustrum vulgare	0	*	FACU	1	
Lonicera maackii	0	*	NL	1	
Lysamachia nummularia	0	*	OBL	1	
Morus rubra	6		FACU	1	Corrected Fall
Parthenocissus quinquefolia	3		FACU	1	
Pilea pumila	4		FACW	0	
Podophyllum peltatum	5		FACU	1	
Polygonum pensylvanicum	1		FACW	0	
Polygonum punctatum	6		OBL	1	
Polygonum virginianum	4		FAC	0	
Populus deltoides	5		FAC	1	
Prunus serotinna	3		FACU	1	
Quercus bicolor	7		FACW+	1	
Rosa multiflora	0	*	FACU	1	
Smilax hispida	5		FAC	1	
Toxicodndron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	
Verbena urticifolia	4		FACU	1	
Verbesina alternifolia	4		FAC	1	
Viburnum opulus var. opulus	0	*	NL	1	
Vitis riparia	4		FACW	1	
Vitis vulpina	3		FAC	1	
Aster cordifolius	5		NL	1	
Aster lateriflorus	2		FACW-	1	
Aster simplex	2		FACW	1	
Bidens frondosa	2		FACW	0	

Circea quadrisculata	3		FACU	1	Also known as C. lutetiana
Cornus obliqua	2		NL	1	Also known as C. amomum
Euonymus alatus	0	*	NL	1	
Euonymus obovatus	5		NL	1	
Menispermum canadense	5		NL	1	
Osmorhiza longistylis	5		FACU	1	
Penstemon digitalis	3		FAC	1	
Phryma leptostachya	5		NL		
Phytolacca americana	2		FACU+	1	
Polygonum hydropiper	3		OBL	0	
Quercus macrocarpa	6		FAC-	1	
Sambucus canadensis	3		FACW-	1	
Sanicula gregaria	4		FACU	1	
Thalictrum polygamum	4		FACW+	1	Also known as T. pubescens
Urtica dioica var. procera	1		FACU	1	
Viburnum lentago	6		FAC	1	

Sum of FQAI values (R)	220
# of native species (N-Native)	59
Total number of species (N-Total)	66
FQAI Score (R/sq rt of N-Native)	**28.64**
Modified FQAI (R/sq rt N-Total)	**27.08**
Note: % total species which are native	89%
Perennial/Annual Ratio	5.00
% increase in FQAI score from summer to fall	18%
Number of new species added in Fall	20
Percent of total species added in Fall survey	30%
Percent of species confirmed in lab (Fall)	25%
Total % of species confirmed in lab (Summer and Fall)	26%
% species with "OBL" Ind. Stat.	8%
% species with "FACW+", "FACW", or "FACW-"	26%
% species with "FAC+", "FAC", or "FAC-"	26%
% species with "FACU+", "FACU", or "FACU-"	27%
% species with "NL"	14%

Note: Species in **BOLD** print were recorded during the Fall site visit

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Carex sp.
Crataegus sp.
Impatiens sp.
Rubus sp.
Unknown alternate, simple, entire leaved forb
Unknown roundish, cordate, dentate, basal leaved forb
Viola sp. #1,
Viola sp. #2 - small leafy stem

Master species list for the Shawnee Prairie Preserve Wetland (Summer 08/20/96, Fall 10/17/96 and Spring 04/30/97)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Agrimonia striata	7		FACU-	1	
Ambrosia trifida	0		FAC	0	
Arisaema dracontium	5		FACW	1	
Bidens coronata	3		OBL	0	
Campsis radicans	0	**	FAC	1	
Carex grayi	5		FACW+	1	
Carya cordiformis	4		FACU+	1	
Carya ovata	6		FACU-	1	
Celtis occidentalis	6		FACU	1	
Cornus drummondii	1		FAC	1	
Cryptotaenia canadensis	3		FAC	1	
Euonymus obovatus	5		NL	1	
Echinocystis lobata	3		FAC	0	
Elymus virginicus	3		FACW-	1	
Fraxinus pennsylvanica var. pennsylvanica	6		FACW	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Geum canadense	2		FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Impatiens capensis	2		FACW	0	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Ligustrum vulgare	0	*	FACU	1	
Lonicera maackii	0	*	NL	1	
Lysamachia nummularia	0	*	OBL	1	
Morus rubra	6		FACU	1	Corrected Fall
Parthenocissus quinquefolia	3		FACU	1	
Pilea pumila	4		FACW	0	
Podophyllum peltatum	5		FACU	1	
Polygonum pensylvanicum	1		FACW	0	
Polygonum punctatum	6		OBL	1	
Polygonum virginianum	4		FAC	0	
Populus deltoides	5		FAC	1	
Prunus serotinna	3		FACU	1	
Quercus bicolor	7		FACW+	1	
Rosa multiflora	0	*	FACU	1	
Smilax hispida	5		FAC	1	
Toxicodndron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	
Verbena urticifolia	4		FACU	1	
Verbesina alternifolia	4		FAC	1	
Viburnum opulus var. opulus	0	*	NL	1	
Vitis riparia	4		FACW	1	
Vitis vulpina	3		FAC	1	
Aster cordifolius	5		NL	1	
Aster lateriflorus	2		FACW-	1	
Aster simplex	2		FACW	1	
Bidens frondosa	2		FACW	0	
Circea quadrisculata	3		FACU	1	Also known as C. lutetiana
Cornus obliqua	2		NL	1	Also known as C. amomum
Euonymus alatus	0	*	NL	1	
Euonymus obovatus	5		NL	1	

Menispermum canadense	5		NL	1	
Osmorhiza longistylis	5		FACU	1	
Penstemon digitalis	3		FAC	1	
Phryma leptostachya	5		NL		
Phytolacca americana	2		FACU+	1	
Polygonum hydropiper	3		OBL	0	
Quercus macrocarpa	6		FAC-	1	
Sambucus canadensis	3		FACW-	1	
Sanicula gregaria	4		FACU	1	
Thalictrum polygamum	4		FACW+	1	Also known as T. pubescens
Urtica dioica var. procera	1		FACU	1	
Viburnum lentago	6		FAC	1	
Alliaria officinalis	0	*	FACU-	1	Biennial; a.k.a. A. petiolata
Camassia scilloides	5		FAC	1	
Cardamine douglassii	5		FACW+	1	
Cicuta maculata	3		OBL	1	
Claytonia virginica	3		FACU	1	
Erythronium americanum	5		NL	NL	
Floerkea proserpincoides	4		FAC	0	
Geum vernum	4		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Lamium purpureum	0	*	NL	NL	
Rudbeckia laciniata	5		FACW	1	
Taraxacum officinale	0	*	FAC	1	
Viola pubescens	5		FACU-	1	
Viola sororia	2		FAC-	1	

Sum of FQAI values (R)	261
# of native species (N-Native)	69
Total number of species (N-Total)	80
FQAI Score (R/sq rt of N-Native)	**31.42**
Modified FQAI (R/sq rt N-Total)	**29.18**

Note: % total species which are native	86%
Perennial/Annual Ratio	4.71
Number of new species added in Fall	20
Percent of total species added in Fall survey	25%
Number of new species added in Spring	14
Percent of total species added in Spring survey	18%
% increase in FQAI score from summer to fall	18%
% increase in FQAI score from fall to spring	10%
% increase in FQAI score from summer to spring	29%
Percent of species confirmed in lab (Summer)	26%
Percent of species confirmed in lab (Fall)	25%
Percent of species confirmed in lab (Spring)	0%
Total % of species confirmed in lab (Summer and Fall)	21%

% species with "OBL" Ind. Stat.	8%
% species with "FACW+", "FACW", or "FACW-"	24%
% species with "FAC+", "FAC", or "FAC-"	26%
% species with "FACU+", "FACU", or "FACU-"	29%
% species with "NL"	14%

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Carex sp.
Crataegus sp.
Impatiens sp.
Rubus sp.
Unknown alternate, simple, entire leaved forb
Unknown roundish, cordate, dentate, basal leaved forb
Viola sp. #1
Viola sp. #2 - small leafy stem

Master species list for the Sheppard Farm Wetland (Summer 09/05/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer nigrum	6		FACU	1	
Acer saccharum	6		FACU-	1	
Aesculus glabra	6		FACU+	1	
Ambrosia trifida	0		FAC	0	
Asaram canadense	7		NL	1	
Asimina triloba	6		FACU+	1	
Celtis occidentalis	6		FACU	1	
Cryptotaenia canadensis	3		FAC	1	
Echinocystis lobata	3		FAC	0	
Elymus villosus	4		FACU-	1	
Euonymus atropurpureus	4		FACU	1	
Eupatorium rugosum	4		NL	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Geum canadense	2		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Heliopsis helianthoides	5		NL	1	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Lonicera maackii	0	*	NL	1	
Osmorhiza longistylis	5		FACU	1	
Parthenocissus quiquefolia	3		FACU	1	
Phlox paniculata	4		FACU	1	
Phryma leptostachya	5		NL		
Pilea pumila	4		FACW	0	
Platanus occidentalis	7		FACW-	1	
Polygonum virginianum	4		FAC	0	
Populus deltoides	5		FAC	1	
Robina pseudoacacia	0	**	FACU-	1	
Rudbeckia laciniata	5		FACW	1	
Sambucus canadensis	3		FACW-	1	
Sanicula gregaria	4		FACU	1	
Silphium perfoliatum	6		FACU	1	
Smilax hispida	5		FAC	1	
Solidago flexicaulis	6		FACU	1	
Tilia americana	6		FACU	1	
Toxicodendron radicans	1		FAC	1	
Tradescantia subaspera	4		NL	1	
Ulmus rubra	2		FAC	1	
Urtica dioica var. procera	1		FACU	1	
Verbesina alternifolia	4		FAC	1	
Vitis riparia	4		FACW	1	

Sum of FQAI values (R)	173
# of native species (N-Native)	41
Total number of species (N-Total)	44
FQAI Score (R/sq rt of N-Native)	**27.02**
Modified FQAI (R/sq rt N-Total)	**26.08**

Note: % total species which are native	93%
% species confirmed in lab (Summer)	20%
Perennial/Annual Ratio	6.33

Master species list for the Sheppard Farm Wetland (Summer 09/05/96 and Fall 10/03/96)

Key: *=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer nigrum	6		FACU	1	Sometimes considered subspecies of A. saccharum
Acer saccharum	6		FACU-	1	
Aesculus glabra	6		FACU+	1	
Ambrosia trifida	0		FAC	0	
Asarum canadense	7		NL	1	
Asimina triloba	6		FACU+	1	
Celtis occidentalis	6		FACU	1	
Cryptotaenia canadensis	3		FAC	1	
Echinocystis lobata	3		FAC	0	
Elymus villosus	4		FACU-	1	
Euonymus atropurpureus	4		FACU	1	
Eupatorium rugosum	4		NL	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Geum canadense	2		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Heliopsis helianthoides	5		NL	1	
Impatiens pallida	3		FACW	0	
Juglans nigra	5		FACU	1	
Laportea canadensis	5		FACW	1	
Lonicera maackii	0	*	NL	1	
Osmorhiza longistylis	5		FACU	1	
Parthenocissus quiquefolia	3		FACU	1	
Phlox paniculata	4		FACU	1	
Phryma leptostachya	5		NL		
Pilea pumila	4		FACW	0	
Platanus occidentalis	7		FACW-	1	
Polygonum virginianum	4		FAC	0	
Populus deltoides	5		FAC	1	
Robina pseudoacacia	0	**	FACU-	1	
Rudbeckia laciniata	5		FACW	1	
Sambucus canadensis	3		FACW-	1	
Sanicula gregaria	4		FACU	1	
Silphium perfoliatum	6		FACU	1	
Smilax hispida	5		FAC	1	
Solidago flexicaulis	6		FACU	1	
Tilia americana	6		FACU	1	
Toxicodendron radicans	1		FAC	1	
Tradescantia subaspera	4		NL	1	
Ulmus rubra	2		FAC	1	
Urtica dioica var. procera	1		FACU	1	
Verbesina alternifolia	4		FAC	1	
Vitis riparia	4		FACW	1	
Aster cordifolius	5		NL	1	
Aster lateriflorus	2		FACW-	1	
Aster simplex	2		FACW	1	
Lysimachia ciliata	4		FACW	1	
Monarda fistulosa	5		NL	1	
Polygonum scandens	2		FAC	1	
Rubus occidentalis	1		NL	1	

Sum of FQAI values (R)	194
# of native species (N-Native)	48
Total number of species (N-Total)	51
FQAI Score (R/sq rt of N-Native)	**28.00**
Modified FQAI (R/sq rt N-Total)	**27.17**

Note: % total species which are native	94%
Perennial/Annual Ratio	7.50
% increase in FQAI score from summer to fall	4%
Number of new species added in Fall	7
Percent of total species added in Fall survey	14%
Percent of species confirmed in lab (Fall)	57%
Total % of species confirmed in lab (Summer and Fall)	25%
% species with "OBL" Ind. Stat.	0%
% species with "FACW+", "FACW", or "FACW-"	22%
% species with "FAC+", "FAC", or "FAC-"	24%
% species with "FACU+", "FACU", or "FACU-"	37%
% species with "NL"	18%

Note: Species in **BOLD** print were recorded during the Fall site visit

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Allium sp.
Viola sp. #1
Viola sp. #2
Viola sp. #3

Master species list for the Sheppard Farm Wetland (Summer 09/05/96, Fall 10/03/96 and Spring 4/23/97)

Key: *=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (P) or Annual (A)	Notes
Acer negundo	3		FAC+	P	
Acer rubrum	6		FACU	P	Sometimes considered subspecies of A. saccharum
Acer saccharum	6		FACU-	P	
Aesculus glabra	6		FACU+	P	
Ambrosia trifida	0		FAC	A	
Asarum canadense	7		NL	P	
Asimina triloba	6		FACU+	P	
Celtis occidentalis	6		FACU	P	
Cryptotaenia canadensis	3		FAC	P	
Echinocystis lobata	3		FAC	A	
Elymus villosus	4		FACU-	P	
Euonymus atropurpureus	4		FACU	P	
Eupatorium rugosum	4		NL	P	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	P	
Geum canadense	2		FACU	P	
Glechoma hederacea	0	*	FACU	P	
Gleditsia triacanthos	3		FAC-	P	
Helianthus helianthoides	5		NL	P	
Impatiens pallida	3		FACW	A	
Juglans nigra	5		FACU	P	
Laportea canadensis	5		FACW	P	
Lonicera maackii	0	*	NL	P	
Osmorhiza longistylis	5		FACU	P	
Parthenocissus quinquefolia	3		FACU	P	
Phlox paniculata	4		FACU	P	
Phryma leptostachya	5		NL	P	
Pilea pumila	4		FACW	A	
Platanus occidentalis	7		FACW-	P	
Polygonum virginianum	4		FAC	A	
Populus deltoides	5		FAC	P	
Robinia pseudoacacia	0	**	FACU-	P	
Rudbeckia laciniata	5		FACW	P	
Sambucus canadensis	3		FACW-	P	
Sanicula gregaria	4		FACU	P	
Silphium perfoliatum	6		FACU	P	
Smilax hispida	5		FAC	P	
Solidago flexicaulis	6		FACU	P	
Tilia americana	6		FACU	P	
Toxicodendron radicans	1		FAC	P	
Tradescantia subaspera	4		NL	P	
Ulmus rubra	2		FAC	P	
Urtica dioica var. procera	1		FACU	P	
Verbesina alternifolia	4		FAC	P	
Vitis riparia	4		FACW	P	
Aster cordifolius	5		NL	P	
Aster lateriflorus	2		FACW-	P	
Aster simplex	2		FACW	P	
Lysimachia ciliata	4		FACW	P	
Monarda fistulosa	5		NL	P	
Polygonum scandens	2		FAC	A	
Rubus occidentalis	1		NL	P	
Alliaria officinalis	0	*	FACU-	B	Biennial; a.k.a. A. petiolata
Allium canadense	3		FACU	P	
Allium schoenoprasum	0	*	NL	P	
Cardamine douglassii	5		FACW+	P	
Chaerophyllum procumbens	4		FACW	B	var. procumbens
Claytonia virginica	3		FACU	P	
Dentaria laciniata	3		FACU	P	a.k.a. Cardamine concatenata
Dicentra cucullaria	2		NL	NL	
Erythronium americanum	5		NL	NL	
Floerkea proserpinacoides	4		FAC	B	
Hydrophyllum virginianum	5		FAC	P	
Impatiens biflorum	7		NL	NL	
Lamium purpureum	0	*	NL	NL	
Mertensia virginica	8		FACW	P	
Phalaris arundinacea	0		FACW	P	
Phlox divaricata	6		FACU	P	
Podophyllum peltatum	5		FACU	P	
Polemonium reptans	6		FACU	P	
Ranunculus abortivus	4		FACW-	B	Biennial
Sanguinaria canadensis	5		NL	P	
Stellaria media	0	*	NL	NL	
Trillium sessile	7		NL	P	
Verbena bracteata	0	*	NL	A	Annual/perennial
Viola pubescens	5		FACU-	P	
Viola sororia	2		FAC-	P	
Viola striata	5		FACW	P	

Sum of FQAI values (R)	293
# of native species (N-Native)	69
Total number of species (N-Total)	77
FQAI Score (R/sq rt of N-Native)	**35.27**
Modified FQAI (R/sq rt N-Total)	**33.39**

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Allium sp.
Viola sp. #1
Viola sp. #2
Viola sp. #3

Note: % total species which are native	90%
Perennial/Annual Ratio	4.50
Number of new species added in Fall	7
Percent of total species added in Fall survey	9%
Number of new species added in Spring	26
Percent of total species added in Spring survey	34%
% increase in FQAI score from summer to fall	4%
% increase in FQAI score from fall to spring	26%
% increase in FQAI score from summer to spring	31%
Percent of species confirmed in lab (Summer)	20%
Percent of species confirmed in lab (Fall)	57%
Percent of species confirmed in lab (Spring)	0%
Total % of species confirmed in lab (Summer and Fall)	17%
% species with "OBL" Ind. Stat.	0%
% species with "FACW+", "FACW", or "FACW-"	22%
% species with "FAC+", "FAC", or "FAC-"	19%
% species with "FACU+", "FACU", or "FACU-"	35%
% species with "NL"	23%

Master species list for the Walters Farm Wetland (Summer)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FACW	1	
Acer saccharinum	3		FACW	1	
Ambrosia trifida	0		FAC	0	
Carex grayi	5		FACW+	1	
Celtis occidentalis	6		FACU	1	
Fraxius pennsylvanica var. subintegerrima	6		FACW	1	
Gleditsia tricanthos	1		FAC-	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Lysamachia nummularia	0	*	OBL	1	
Maclura pomifera	0	*	NL	1	
Parthenocissus quinquefolia	3		FACU	1	
Phalaris arundinacea	0		FACW+	1	
Pilea pumila	4		FACW	0	
Polygonum punctatum	6		OBL	1	
Populus deltoides	5		FAC	1	
Quercus bicolor	7		FACW+	1	
Rudbeckia laciniata	5		FCW	1	
Rumex verticillatus	5		OBL	1	
Salix nigra	3		FACW+	1	
Sambucus canadensis	3		FACW-	1	
Saururus cernuus	7		OBL	1	
Toxicodendron radicans	1		FAC	1	
Ulmus americana	1		FACW-	1	
Ulmus rubra	2		FAC	1	
Vitis riparia	1		FACW	1	

Sum of FQAI values (R)	83
# of native species (N-Native)	24
Total number of species (N-Total)	26
FQAI Score (R/sq rt of N-Native)	**16.94**
Modified FQAI (R/sq rt N-Total)	**16.28**

Note: % total species which are native	92%
% species confirmed in lab (Summer)	12%
Perennial/Annual Ratio	12.00

Master species list for the Walters Farm Wetland (Summer 07/25/96 and Fall 10/01/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FACW	1	
Acer saccharinum	3		FACW	1	
Ambrosia trifida	0		FAC	0	
Carex grayi	5		FACW+	1	
Celtis occidentalis	6		FACU	1	
Fraxius pennsylvanica var. subintegerrima	6		FACW	1	
Gleditsia tricanthos	1		FAC-	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Lysamachia nummularia	0	*	OBL	1	
Maclura pomifera	0	*	NL	1	
Parthenocissus quinquefolia	3		FACU	1	
Phalaris arundinacea	0		FACW+	1	
Pilea pumila	4		FACW	0	
Polygonum punctatum	6		OBL	1	
Populus deltoides	5		FAC	1	
Quercus bicolor	7		FACW+	1	
Rudbeckia laciniata	5		FACW	1	
Rumex verticillatus	5		OBL	1	
Salix nigra	3		FACW+	1	
Sambucus canadensis	3		FACW-	1	
Saururus cernuus	7		OBL	1	
Toxicodendron radicans	1		FAC	1	
Ulmus americana	1		FACW-	1	
Ulmus rubra	2		FAC	1	
Vitis riparia	1		FACW	1	
Amaranthus tuberculatus	0	*	FACW	0	
Aster simplex	2		FACW	1	
Bidens frondosa	2		FACW	0	
Bidens vulgata	2		NL	0	
Cardamine parviflora var. americana	3		FACU	0	
Cinna arundinacea	4		FACW+	1	
Cryptotaenia canadensis	3		FAC	1	
Echinochloa crusgalli	0	*	FACU	0	
Echinocystis lobata	3		FAC	0	
Penthorum sedoides	3		OBL	1	
Physostegia virginiana	6	**	FAC+	1	
Polygonum persecaria	0	*	FACW	0	
Polygonum virginianum	4		FAC	0	Likely Annual
Salix alba	0	*	FACW	1	
Sium suave	5		OBL	1	
Vernonia gigantea	3		FAC	1	
Xanthium strumarium	0	*	FAC	0	

Sum of FQAI values (R)	123
# of native species (N-Native)	36
Total number of species (N-Total)	43

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

FQAI Score (R/sq rt of N-Native)	**20.50**
Modified FQAI (R/sq rt N-Total)	**18.76**
Note: % total species which are native	84%
Perennial/Annual Ratio	2.91
% increase in FQAI score from summer to fall	21%
Number of new species added in Fall	17
Percent of total species added in Fall survey	40%
Percent of species confirmed in lab (Fall)	41%
Total % of species confirmed in lab (Summer and Fall)	23%
% species with "OBL" Ind. Stat.	16%
% species with "FACW+", "FACW", or "FACW-"	44%
% species with "FAC+", "FAC", or "FAC-"	26%
% species with "FACU+", "FACU", or "FACU-"	9%
% species with "NL"	5%

Carex sp.
Crataegus sp. #1 - deltoid shaped leaves
Crataegus sp. #2 - spatulate shaped leaves
Polygonum sp. - P. amphibium or P. coccineum?
Viola sp.

Master species list for the Walters Farm Wetland (Summer 07/25/96, Fall 10/01/96, and Spring 05/02/97)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FACW	1	
Acer saccharinum	3		FACW	1	
Ambrosia trifida	0		FAC	0	
Carex grayi	5		FACW+	1	
Celtis occidentalis	6		FACU	1	
Fraxius pennsylvanica var. subintegerrima	6		FACW	1	
Gleditsia tricanthos	1		FAC-	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Lysamachia nummularia	0	*	OBL	1	
Maclura pomifera	0	*	NL	1	
Parthenocissus quinquefolia	3		FACU	1	
Phalaris arundinacea	0		FACW+	1	
Pilea pumila	4		FACW	0	
Polygonum punctatum	6		OBL	1	
Populus deltoides	5		FAC	1	
Quercus bicolor	7		FACW+	1	
Rudbeckia laciniata	5		FACW	1	
Rumex verticillatus	5		OBL	1	
Salix nigra	3		FACW+	1	
Sambucus canadensis	3		FACW-	1	
Saururus cernuus	7		OBL	1	
Toxicodendron radicans	1		FAC	1	
Ulmus americana	1		FACW-	1	
Ulmus rubra	2		FAC	1	
Vitis riparia	1		FACW	1	
Amaranthus tuberculatus	0	*	FACW	0	
Aster simplex	2		FACW	1	
Bidens frondosa	2		FACW	0	
Bidens vulgata	2		NL	0	
Cardamine parviflora var. americana	3		FACU	0	
Cinna arundinacea	4		FACW+	1	
Cryptotaenia canadensis	3		FAC	1	
Echinochloa crusgalli	0	*	FACU	0	
Echinocystis lobata	3		FAC	0	
Penthorum sedoides	3		OBL	1	
Phystostegia virginiana	6	**	FAC+	1	
Polygonum persecaria	0	*	FACW	0	
Polygonum virginianum	4		FAC	0	Likely Annual
Salix alba	0	*	FACW	1	
Sium suave	5		OBL	1	
Vernonia gigantea	3		FAC	1	
Xanthium strumarium	0	*	FAC	0	
Alliaria officinalis	0	*	FACU-	1	Also known as A. petiolata
Allium schoenoprasum	0	*	NL	NL	
Chaerophyllum procumbens	4		FACW	0	
Claytonia virginica	3		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Ranunculus abortivus	4		FACW-	1	Biennial
Urtica dioica	1		FACU	1	
Viola soraria	2		FAC-	1	

Sum of FQAI values (R)	137
# of native species (N-Native)	41
Total number of species (N-Total)	51
FQAI Score (R/sq rt of N-Native)	**21.40**
Modified FQAI (R/sq rt N-Total)	**19.18**

Note: % total species which are native	80%
Perennial/Annual Ratio	2.92
Number of new species added in Fall	17
Percent of total species added in Fall survey	33%
Number of new species added in Spring	8
Percent of total species added in Spring survey	16%
% increase in FQAI score from summer to fall	21%
% increase in FQAI score from fall to spring	4%
% increase in FQAI score from summer to spring	26%
Percent of species confirmed in lab (Summer)	12%
Percent of species confirmed in lab (Fall)	41%
Percent of species confirmed in lab (Spring)	25%
Total % of species confirmed in lab (Summer, Fall and Spring)	24%

% species with "OBL" Ind. Stat.	14%
% species with "FACW+", "FACW", or "FACW-"	41%
% species with "FAC+", "FAC", or "FAC-"	24%
% species with "FACU+", "FACU", or "FACU-"	16%
% species with "NL"	6%

Master species list for the Warrick Farm Wetland (Summer 08/22/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer saccharinum	3		FACW	1	
Ambrosia trifida	0		FAC	0	
Carex frankii	5		OBL	1	
Carex grayi	5		FACW+	1	
Celtis occidentalis	6		FACU	1	
Cornus drumondii	4		FAC	1	
Cryptotaenia canadensis	3		FAC	1	
Echinochloa crusgalli	0	*	FACU	0	
Elymus virginicus	3		FACW-	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Geum canadense	2		FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Juglans nigra	5		FACU	1	
Morus alba	0	*	NL	1	
Pilea pumila	4		FACW	0	
Polygonum hydropiper	3		OBL	0	
Rudbeckia laciniata	5		FACW	1	
Smilax hispida	5		FAC	1	
Toxicodendron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	
Urtica dioica var. procera	1		FACU	1	
Verbesina alternifolia	4		FAC	1	
Vernonia altissima	3		FAC	1	Also known as V. gigantea
Vitis riparia	4		FACW	1	

Sum of FQAI values (R)	78
# of native species (N-Native)	23
Total number of species (N-Total)	25
FQAI Score (R/sq rt of N-Native)	**16.26**
Modified FQAI (R/sq rt N-Total)	**15.60**

Note: % total species which are native	92%
% species confirmed in lab (Summer)	20%
Perennial/Annual Ratio	5.25

Master species list for the Warrick Farm Wetland (Summer 08/22/96 and Fall 10/11/96)

Key:*=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer saccharinum	3		FACW	1	
Ambrosia trifida	0		FAC	0	
Carex frankii	5		OBL	1	
Carex grayi	5		FACW+	1	
Celtis occidentalis	6		FACU	1	
Cornus drumondii	4		FAC	1	
Cryptotaenia canadensis	3		FAC	1	
Echinochloa crusgalli	0	*	FACU	0	
Elymus virginicus	3		FACW-	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Geum canadense	2		FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Juglans nigra	5		FACU	1	
Morus alba	0	*	NL	1	
Pilea pumila	4		FACW	0	
Polygonum hydropiper	3		OBL	0	
Rudbeckia laciniata	5		FACW	1	
Smilax hispida	5		FAC	1	
Toxicodendron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	
Urtica dioica var. procera	1		FACU	1	
Verbesina alternifolia	4		FAC	1	
Vernonia altissima	3		FAC	1	Also known as V. gigantea
Vitis riparia	4		FACW	1	
Aster simplex	2		FACW	1	Also known as A. lanceolatus
Bidens cernua	3		OBL	0	
Cornus obliqua	2		NL	1	Also known as C. amomum
Sambucus canadensis	3		FACW-	1	
Sanicula gregaria	4		FACU	1	

Sum of FQAI values (R)	92
# of native species (N-Native)	28
Total number of species (N-Total)	30
FQAI Score (R/sq rt of N-Native)	**17.39**
Modified FQAI (R/sq rt N-Total)	**16.80**

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Carex sp.
Unknown large basal leaf
Viola sp. #1
Viola sp. #2

Note: % total species which are native	93%
Perennial/Annual Ratio	5.00
% increase in FQAI score from summer to fall	7%
Number of new species added in Fall	5
Percent of total species added in Fall survey	17%
Percent of species confirmed in lab (Fall)	60%
Total % of species confirmed in lab (Summer and Fall)	27%
% species with "OBL" Ind. Stat.	10%
% species with "FACW+", "FACW", or "FACW-"	30%
% species with "FAC+", "FAC", or "FAC-"	33%
% species with "FACU+", "FACU", or "FACU-"	20%
% species with "NL"	7%

Note: Species in **BOLD** print were recorded during the Fall site visit

Master species list for the Warrick Farm Wetland (Summer 8/22/96, Fall 10/11/96, and Spring 5/8/97)

Key: *=alien taxon; **=may include both native and nonnative populations

E= Endangered: nl=no listing

Species Name	C of C value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Acer saccharinum	3		FACW	1	
Ambrosia trifida	0		FAC	0	
Carex frankii	5		OBL	1	
Carex grayi	5		FACW+	1	
Celtis occidentalis	6		FACU	1	
Cornus drumondii	4		FAC	1	
Cryptotaenia canadensis	3		FAC	1	
Echinochloa crusgalli	0	*	FACU	0	
Elymus virginicus	3		FACW-	1	
Fraxinus pennsylvanica var. subintegerrima	6		FACW	1	
Geum canadense	2		FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Juglans nigra	5		FACU	1	
Morus alba	0	*	NL	1	
Pilea pumila	4		FACW	0	
Polygonum hydropiper	3		OBL	0	
Rudbeckia laciniata	5		FACW	1	
Smilax hispida	5		FAC	1	
Toxicodendron radicans	1		FAC	1	
Ulmus rubra	2		FAC	1	
Urtica dioica var. procera	1		FACU	1	
Verbesina alternifolia	4		FAC	1	
Vernonia altissima	3		FAC	1	Also known as V. gigantea
Vitis riparia	4		FACW	1	
Aster simplex	2		FACW	1	Also known as A. lanceolatus
Bidens cernua	3		OBL	0	
Cornus obliqua	2		NL	1	Also known as C. amomum
Sambucus canadensis	3		FACW-	1	
Sanicula gregaria	4		FACU	1	
Alliaria petiolata	0	*	FACU-	1	Biennial
Conium maculatum	0	*	FACW	1	Biennial
Galium mollugo	0	*	NL	NL	
Geum vernum	4		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Osmorhiza claytonii	5		FACU-	1	
Ranunculus aboritivus	4		FACW-	1	Biennial
Viola sororia	2		FAC-	1	a.k.a. V. papilionacea

Sum of FQAI values (R)	107
# of native species (N-Native)	32
Total number of species (N-Total)	38
FQAI score (R/sq rt N-Native)	**18.92**
Modified FQAI (R/sq rt N-Total)	**17.36**
Note: % total species which are native	84%
Perennial/Annual Ratio	5.33
Number of new species added in Fall	5
Percent of total species added in Fall survey	13%
Number of new species added in Spring	8
Percent of total species added in Spring survey	21%
% increase in FQAI score from summer to fall	7%
% increase in FQAI score from fall to spring	9%
% increase in FQAI score from summer to spring	16%
Percent of species confirmed in lab (Summer)	20%
Percent of species confirmed in lab (Fall)	60%
Percent of species confirmed in lab (Spring)	38%
Total % of species confirmed in lab (Summer, Fall and Spring)	29%
% species with "OBL" Ind. Stat.	8%
% species with "FACW+", "FACW", or "FACW-"	29%
% species with "FAC+", "FAC", or "FAC-"	29%
% species with "FACU+", "FACU", or "FACU-"	26%
% species with "NL"	8%

Species which could not be completely identified because of poor specimens, lack of flowering parts, etc.

Aster spp.
Carex spp.
Unknown large basal leaf
Viola sp. #1
Viola sp. #2
Viola spp.

Appendix: Soil Data

Collected with the assisstance of Bill Schumacher,
Environmental Specialist, Ohio EPA

Location:	Preble Co.	**Site:**	Akey
Date:	7/18/96	**Weather:**	Cloudy
Time:	5:15 pm	**Pedon:**	General
Described by:	W. K. Schumacher	**Pedon Drainage:**	Well drained
Mapping Unit Classification (series):	Fluvaquentic Hapludoll (Medway)	**Pedon Classification:**	Fluvaquentic Hapludoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A	0-11	very dark grayish brown (10YR 3/2)	silt loam	friable	7.74
C1	11-19	brown (10YR 4/3)	silt loam	friable	7.88
C2	19-24	brown (10YR 4/3)	loam	friable	7.92
C3	24-30	brown (10YR 4/3)	sandy loam	very friable	8.28
C4	30-40	brown (10YR 4/3)	loamy sand	very friable	8.37 moderate effervescence
C5	40-45	brown (10YR 4/3)	sand	loose	8.40 moderate effervescence
C6	45-49	brown (10YR 5/3)	sand & gravel	loose	8.71 strong effervesence
Cg1	49-56	gray (10YR 5/1); common, fine & medium, prominent, brown (7.5YR 4/4) mottles	loamy sand	very friable	8.52 strong effervescence
Cg2	56+	gray (10YR 5/1)	sand & gravel	loose	8.26 strong effervescence

Location:	Preble	**Site:**	Akey
Date:	7/18/96	**Weather:**	Cloudy
Time:	1:45 pm	**Pedon:**	Upland
Described by:	W. K. Schumacher	**Pedon Drainage:**	Somewhat poorly drained
Mapping Unit Classification (series):	Fluvaquentic Hapludoll (Medway)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Notes: This pedon is on the edge of a drainageway; may be wetter than normal for the mapping unit.

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A	0-11	very dark grayish brown (10YR 3/2)	silt loam	friable	---
C1	11-28	brown (10YR 4/3); few, fine, distinct, dark yellowish brown (10YR 4/4) & few, fine, faint, dark gray (10YR 4/1) mottles	silt loam	friable	---
C2	28-36	brown (10YR 4/3); many, fine and medium, faint, dark gray (10YR 4/1) & common, fine, distinct, dark yellowish brown (10YR 4/4) mottles	loam	friable	---
C3	36-45	dark gray (10YR 4/1); common, medium, distinct, brown (7.5YR 4/4) mottles	sandy loam	friable	---
C4	45+	gray (10YR 5/1); common, medium, prominent, brown (7.5YR 4/4) & common, medium, distinct, dark yellowish brown (10YR 4/4) mottles	silt loam	firm	---

Location:	Preble Co	**Site:**	Akey
Date:	7/18/96	**Weather:**	Cloudy
Time:	2:30 pm	**Pedon:**	Middle
Described by:	W. K. Schumacher	**Pedon Drainage:**	Moderately well drained
Mapping Unit Classification (series):	Fluvaquentic Hapludoll (Medway)	**Pedon Classification:**	Fluvaquentic Hapludoll

Notes: The pedon seemed fairly typical of large part of the Medway map unit . There were also inclusions of sandier, well drained soils and also inclusions of some what poorly drained or poorly drained profiles in drainageways in the map unit.

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-9	very dark grayish brown (10YR 3/2)	loam	friable	---
A2	9-12	very dark grayish brown (10YR 3/2)	silty loam	friable	---
C1	12-32	brown (10YR 4/3)	silty loam	friable	---
C2	32-44	brown (10YR 4/3); common, fine, faint, dark grayish brown (10YR 4/2) & common, medium, distinct, dark yellowish brown (10YR 4/4) mottles	sandy loam	friable	--- moderate effervescence
C3	44+	dark grayish brown (10YR 4/2); common, medium, distinct, dark yellowish brown (10YR 4/4) & common, medium, prominent, brown (7.5YR 4/4) mottles	loamy sand	very friable	--- moderate effervescence

Location:	Preble	**Site:**	Akey
Date:	7/18/96	**Weather:**	Cloudy
Time:	3:30 pm	**Pedon:**	Stream
Described by:	W. K. Schumacher	**Pedon Drainage:**	Moderately well drained
Mapping Unit Classification (series):	Fluvaquentic Hapludoll (Medway)	**Pedon Classification:**	Fluvaquentic Hapludoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A	0-12	very dark grayish brown (10YR 3/2)	silt loam	friable	---
C1	12-17	brown (10YR 4/3)	sandy loam	friable	---
C2	17-22	dark yellowish brown (10YR 3/4)	sandy	loose	---
C3	22-34	brown (10YR 4/3)	loam	friable	---
C4	34-42	brown (10YR 4/3); few, fine, faint, dark yellowish brown (10YR 4/2) & dark grayish brown (10YR 4/2) mottles	loam	friable	---
C5	42-46	brown (10YR 4/3)	sand and gravel	loose	--- strong effervesence
C6	46+	brown (10YR 4/3); few, fine, faint, (10YR 4/2) mottles	loamy sand	very friable	--- moderate effervesence

Location:	Mongomery Co.	**Site:**	Germantown Preserve
Date:	7/3/96	**Weather:**	Partly sunny
Time:	4:00 pm	**Pedon:**	General
Described by:	W. K.Schumacher	**Pedon Drainage:**	Moderately well drained
Mapping Unit Classification (series):	(borrow pit)	**Pedon Classification:**	Aquic Udorthent

Horizon	Depth (in)	Color (Moist)	Texture	Consistency (Moist)	Reaction
A	0-3	dark grayish brown (10YR 4/2); many, fine and medium, faint, brown (10YR 4/3) mottles	silt loam	firm	7.58 moderate effervescence
Ab	3-14	very dark grayish brown (10YR 3/2); common, mdium, faint, brown (10YR 4/3) mottles	silt loam	firm	7.88 moderate effervescence
C1	14-30	brown (10YR 4/3); few, fine, distinct, dark yellowish brown (4/6) mottles	silt loam	firm	8.06 moderate effervescence
C2	30-50	brown (10YR 4/3); few, fine, faint, dark grayish brown (10YR 4/2) mottles	silty clay loam	firm	8.20 moderate effervescence
C3	50-55	brown (10YR 4/3); common, medium, distinct, grayish brown (10YR 5/2) mottles	silt loam	firm	8.17 moderate effervescence
C4	55-60	brown (10YR 4/3); few, fine, faint, dark grayish brown (10YR 4/2) & grayish brown (10YR 5/2) mottles	silt loam	firm	7.96 moderate effervescence

Location:	Mongomery Co.	**Site:**	Germantown Preserve
Date:	7/3/96	**Weather:**	Partly sunny
Time:	1:45 pm	**Pedon:**	Middle
Described by:	W. K. Schumacher	**Pedon Drainage:**	Somewhat poorly drained/poorly drained
Mapping Unit Classification (series):	(borrow pit)	**Pedon Classification:**	Aquic Udorthent

Horizon	Depth (in)	Color (moist)	Texture	Consistency (moist)	Reaction
A	0-10	dark gray (10YR 4/1); common, medium, distinct, dark yellowish brown (10YR 4/4) mottles	silt loam	firm	--- moderate effervescence
C1	19-28	brown (10YR 4/3); common, medium, fine, grayish brown (10YR 5/2) mottles	silt loam	firm	--- moderate effervescence
C2	28-42	brown (10YR 4/3); few, fine, faint, grayish brown (2.5Y 5/2) mottles	silt loam	firm	--- moderate effervescence
C3	42-50	brown (10YR 4/3); few, fine and medium, faint, grayish brown (10YR 5/2) mottles	silt loam	firm	--- moderate effervescence

Location:	Mongomery Co.	**Site:**	Germantown Preserve
Date:	7/3/96	**Weather:**	Partly sunny
Time:	2:45 pm	**Pedon:**	Stream
Described by:	W. K. Schumacher	**Pedon Drainage:**	Well drained
Mapping Unit Classification (series):	Cumulic Hapludoll (Ross)	**Pedon Classification:**	Typic Udifluvent

Horizon	Depth (in)	Color (Moist)	Texture	Consistency (Moist)	Reaction
A	0-11	brown (10YR 4/3)	silt loam	friable	--- moderate effervescence
C1	11-32	brown (10YR 4/3)	heavy silt loam	friable	--- moderate effervescence
C2	32-48	brown (10YR 4/3); few, fine, distinct, dark yellowish brown (10YR 4/6) mottles	silt loam	friable	--- moderate effervescence

Location:	Mongomery Co.	**Site:**	Germantown Preserve
Date:	7/3/96	**Weather:**	Partly sunny
Time:	2:45 pm	**Pedon:**	Stream
Described by:	W. K. Schumacher	**Pedon Drainage:**	Well drained
Mapping Unit Classification (series):	Cumulic Hapludoll (Ross)	**Pedon Classification:**	Typic Udifluvent

Horizon	Depth (in)	Color (Moist)	Texture	Consistency (Moist)	Reaction
A	0-11	brown (10YR 4/3)	silt loam	friable	--- moderate effervescence
C1	11-32	brown (10YR 4/3)	heavy silt loam	friable	--- moderate effervescence
C2	32-48	brown (10YR 4/3); few, fine, distinct, dark yellowish brown (10YR 4/6) mottles	silt loam	friable	--- moderate effervescence

Location:	Mongomery Co.	**Site:**	Germantown Preserve
Date:	7/3/96	**Weather:**	Partly sunny
Time:	1:00 pm	**Pedon:**	Upland
Described by:	W. K. Schumacher	**Pedon Drainage:**	Somewhat poorly drained/poorly drained
Mapping Unit Classification (series):	(borrow pit)	**Pedon Classification:**	Aquic Udorthent

Horizon	Depth (in)	Color (Moist)	Texture	Consistency (Moist)	Reaction
A	0-4	dark gray (2.5Y 4/1); few, medium, distinct olive brown (10YR 4/3) mottles	silt loam	firm	--- moderate effervesence
AC	4-16	dark grayish brown (2.5 Y 4/2); many, medium & coarse, faint brown (10YR 4/3) mottles	silt loam	firm	--- moderate effervesence
C1	16-28	brown (10YR 4/3); common, many & coarse, faint 10YR5/2 (grayish brown) mottles	silt loam	firm	--- moderate effervesence
C2	28-48	brown (10YR 4/3); few, fine, faint 10YR 5/2 (grayish brown) mottles	silt loam	firm	--- moderate effervesence
C3	48+	brown (10YR 5/3); few, fine, faint 10YR 5/2 (grayish brown) & few, fine, distinct 10YR 4/4 (dark yellowish brown) mottles	silt loam	firm	--- moderate effervesence

Location:	Darke Co.	**Site:**	Gray
Date:	10/17/96	**Weather:**	Sunny
Time:	1:00 pm	**Pedon:**	Middle
Described by:	W. K. Schumacher	**Pedon Drainage:**	Very poorly drained
Mapping Unit Classification (series):	Terric Medisaprist (Linwood)	**Pedon Classification:**	Thapo-histic fluvaquent

Horizon	Depth (in)	Color (moist)	Texture	Consistency (moist)	Reaction
A	0-12	dark gray (10YR 4/1); common, medium, distinct, brown (7.5YR 4/4) mottles	silt loam	friable	---
Ab	12-16	very dark grayish brown (10YR 3/2); black (10YR 2/1) organic stains	silt loam	friable	---
2Oa	16-48	black (10YR 2/1); few, fine, faint, dark brown (10YR 3/2) mottles	sapric	friable	---

Location:	Darke Co.	**Site:**	Gray
Date:	10/17/96	**Weather:**	Sunny
Time:	1:15 PM	**Pedon:**	Upland
Described by:	Schumacher	**Pedon Drainage:**	Somewhat poorly drained
Mapping Unit Classification (series):	Terric Medisaprist (Linwood)	**Pedon Classification:**	Aeric Fluvaquent

Horizon	Depth (in)	Color (Moist)	Texture	Consistency (moist)	Reaction
Ap	0-8	brown (10YR4/3); few, fine, faint, dark grayish brown (10YR 4/2) mottles	silt loam	friable	---
A	8-14	dark grayish brown (10YR 4/2); common, fine, faint, brown (10YR4/3) mottles	silt loam	friable	---
Cg1	14-30	dark gray (10YR 4/1); common, medium, distinct, brown (10YR 4/3) mottles	silt loam	firm	---
Cg2	30-40	gray (10YR 5/1); common, medium, prominent, brown (7.5YR 4/4) mottles	silt loam	firm	---
Cg3	40-45	gray (10YR 5/1); few, medium, distinct, brown (10YR 4/4) mottles	silt loam	firm	---
Cg4	45-48	gray (10YR 5/1)	loam	friable	---

Location:	Darke Co	**Site:**	Gray
Date:	10/17/96	**Weather:**	Sunny
Time:	3:00 PM	**Pedon:**	General
Described by:	W. K. Schumacher	**Pedon Drainage:**	Very poorly drained
Mapping Unit Classification (series):	Terric Madisaprist (Linwood)	**Pedon Classification:**	Typic Medisaprist

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
Oa1	0-11	very dark gray (10YR 3/1)	sapric	friable	---
Oa2	11-17	black (10YR 2/1)	sapric	friable	---
Oa3	17-22	black (10YR 2/1)	sapric	friable	---
Oa4	22-60	very dark gray (10YR 3/1)	sapric	friable	---

Location:	Darke Co.	**Site:**	Gray
Date:	10/17/96	**Weather:**	Sunny
Time:	--	**Pedon:**	Stream
Described by:	W. K. Schumacher	**Pedon Drainage:**	Very poorly drained
Mapping Unit Classification (series):	Terric Madisaprist (Linwood)	**Pedon Classification:**	Typic Madisaprist

Horizon	Depth (in)	Color (moist)	Texture	Consistency (moist)	Reaction	Other
Oa1	0-15	black (10YR 2/1)	sapric	friable	---	few woody fragments
Oa2	15-35	black (10YR 2/1)	sapric	friable	---	few woody fragments
Oa3	35-40	dark brown (7.5YR 3/2)	sapric	friable	---	few woody fragments
Oa4	40-48	very dark grayish brown (10YR 3/2)	sapric	friable	---	

Location:	Madison County	**Site:**	Marcella
Date:	6/19/96	**Weather:**	Sunny, warm
Time:	12:30 pm	**Pedon:**	Upland
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (series):	Fluvaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Note: Taken with a probe--soil compression occuring in probe, depths are approximations. At 42 inches soil material too liquid--could not probe.

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-18	very dark grayish brown (10YR 3/2)	silt loam	friable	--- slight effervesence
A2	18-30	very dark gray (10YR 3/1); common, fine & medium, distinct, brown (10YR 4/3) mottles	silt loam	friable	--- slight effervesence
Cg1	30-36	dark gray (10YR 4/1); common, medium, distinct, dark yellowish brown (10YR 4/4) mottles	silt loam	friable	--- slight effervesence
Cg2	36-42	dark gray (10YR 4/1); common, medium, distinct, dark yellowish brown (10YR 4/4) mottles	silty clay loam	firm	--- slight effervesence

Location:	Madison County	**Site:**	Marcella
Date:	6/19/96	**Weather:**	Sunny, warm
Time:	3:24 pm	**Pedon:**	General
Described by:	W . K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (series):	Fluvaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-14	very dark grayish brown (10YR 3/2)	silt loam	friable	8.02 slight effervesence
A2	14-27	very dark grayish brown (10YR 3/2)	silt loam	friable	8.20 slight effervesence
Cg1	27-37	dark gray (10YR 4/1); common, medium, distinct, yellowish brown (10YR 5/4) mottles	clay loam	firm	8.61 slight effervesence
Cg2	37-47	grayish brown (10YR 5/2); common, fine & medium, distinct, yellowish brown (10YR 5/4) mottles	gravelly clay loam	firm	8.28 slight effervesence
Cg3	47-60	gray (10YR 5/1); common, distinct, very dark grayish brown (10YR 3/2) organic stains few, medium, distinct, yellowish brown (10YR 5/4) mottles	gravelly sandy loam	friable	8.12 slight effervesence

Location:	Madison County	**Site:**	Marcella
Date:	6/19/96	**Weather:**	Sunny, warm
Time:	3:00 pm	**Pedon:**	Stream
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (series):	Fluvaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-22	very dark grayish brown (10YR 3/2)	loam	friable	--- slight efferevescence
A2	22-32	very dark grayish brown (10YR 3/2); few, fine, faint, dark brown (10YR 3/3) & dark gray (10YR 4/1) mottles	loam	friable	--- slight efferevescence
A3	32-38	very dark grayish brown (10YR 3/2); common, medium, distinct, brown (10YR 4/3) mottles	clay loam	firm	--- slight efferevescence
Cg1	38+	grayish brown (10YR 5/2)	gravelly loamy sand	loose	--- slight efferevescence

Location:	Madison County	**Site:**	Marcella
Date:	6/19/96	**Weather:**	Sunny, warm
Time:	11:15 am	**Pedon:**	Middle
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (series):	Fluavquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-11	very dark grayish brown (10YR 3/2)	silt loam	friable	---
A2	11-15	very dark grayish brown (10YR 3/2)	silty clay loam	firm	---
A3	15-24	very dark grayish brown (10YR 3/2); common, fine, faint, dark brown (10YR 3/3) & few, medium distinct, brown (10YR 4/3) mottles	silty clay loam	firm	---
Cg1	24-34	dark gray (10YR 4/1); common, medium, distinct, brown (10YR 4/3) mottles	silty clay loam	firm	---
Cg2	34-44	dark gray (10YR 4/1); very dark gray (10YR 3/1) organic coatings few, fine, distinct, brown (10YR 4/3) mottles	silty clay loam	firm	---
Cg3	44-48	dark gray (10YR 4/1); few, fine, faint, dark brown (10YR 3/3) mottles	gravelly loam	firm	---

Location:	Madison	**Site:**	Rapp
Date:	6/26/96	**Weather:**	Sunny, warm
Time:	---	**Pedon:**	General
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (series):	Fluvaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-5	very dark grayish brown (10YR 3/2)	silt loam	friable	7.44
A2	5-16	very dark grayish brown (10YR 3/2); few, fine, distinct, dark brown (7.5YR 3/4) mottles	silt loam	friable	7.71
A3	16-22	very dark gray (10YR 3/1); common, fine, distinct, dark yellowish brown (10YR 4/4) mottles	silty clay loam	firm	7.79
Cg1	22-38	dark gray (10YR 4/1); common, fine & medium, distinct, yellowish brown (10YR 5/6) mottles	silty clay loam	firm	7.76
Cg2	38-43	gray (10YR 5/1)	gravelly silt loam	friable	7.56
Cg3	43-49	gray (10YR 5/1)	very gravelly loam	friable	7.72

Location:	Madison	**Site:**	Rapp
Date:	6/23/96	**Weather:**	Sunny, warm
Time:	---	**Pedon:**	Stream
Described by:	W.K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (series):	Fluvaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction	Other
A	0-12	very dark grayish brown (10YR 3/2)	loam	friable	---	
Cg1	12-21	dark gray (10YR 4/1); common, medium, distinct, dark brown (7.5YR 3/3) mottles	loam	friable	---	
Cg2	21-27	dark grayish brown (10YR 4/2); few, fine, faint, brown (7.5YR 4/3) mottles	gravelly loam	friable	---	
Ab1	27-35	very dark gray (10YR 3/1); common, medium, distinct, dark yellowish brown (10YR 4/4) mottles	silty clay loam	firm	---	
Ab2	35-43	black (10YR 2/1); few, fine, prominent, (10.5YR 4/4) mottles	silt loam	friable	---	wood chunks and thin sapric layers
Cg	43+	very dark gray (10YR 3/1)	gravelly loam	friable	---	lens of gravel and sapric material

Location:	Madison	**Site:**	Rapp
Date:	6/26/96	**Weather:**	Sunny, clear, warm
Time:	---	**Pedon:**	Middle
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (series):	Fluvaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-11	very dark gray (10YR 3/1)	silt loam	friable	---
A2	11-18	very dark gray (10YR 3/1); few, coarse, distinct, brown (7.5YR 4/4) mottles	silty clay loam	firm	---
Cg1	18-26	yellowish brown (10YR 5/4); many, medium, distinct, very dark gray (10YR 3/1) mottles; common organic stains	heavy silty clay loam	firm	---
Cg2	26-35	gray (10YR 5/1); many, medium, distinct, yellowish brown (10YR 5/6) mottles	heavy silty clay loam	firm	---
Cg3	35-43	grayish brown (10YR 5/2); common, medium, distinct, yellowish brown (10YR 5/6) mottles	heavy silty clay loam	firm	---
Cg4	43-47	grayish brown (10YR 5/2)	heavy silty clay loam	firm	---

Location:	Madison Co.	**Site:**	Rapp
Date:	6/26/96	**Weather:**	Sunny, warm
Time:	10:45 am	**Pedon:**	Upland
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (series):	Fluaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Thapto-histic fluvaquent

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-5	black (2.5Y 2.5/1)	silt loam	friable	---
A2	5-11	black (N2.5/); oxidized rhizospheres; few, fine, prominant, brown (7.5YR 5/4) mottles	silt loam	friable	---
Bw	11-20	black (N2.5/)	silty clay loam	friable	---
2Oa1	20-25	black (2.5Y/) rubbed	sapric	friable	---
2Oa2	25-40	black (5YR 2.5/1) rubbed	sapric	friable	---
2Oa3	40-48	black (N2.5Y/) rubbed	sapric	friable	---
3C	48+	very dark gray (10YR 3/1); few, medium, prominant, gray (10YR 6/1) calcium carbonates	silty clay loam	firm	---

Location:	Darke Co.	**Site:**	Shawnee Prairie
Date:	7/12/96	**Weather:**	Sunny, warm
Time	2:30 pm	**Pedon:**	Middle
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (series):	Typic Argiaquoll (Westland)	**Pedon Classification:**	Typic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
Ap	0-10	black (10YR 2/1)	silt loam	friable	---
A1	10-18	black (10YR 2/1); few, medium, distinct, dark yellowish brown (10YR 4/4) mottles	loam	friable	---
A2	18-30	very dark gray (10YR 3/1); many, medium & coarse, distinct, dark yellowish brown (10YR 4/6) mottles	loam	friable	---
Bw	30-39	dark gray (10YR 4/1); common, medium & coarse, prominent, strong brown (7.5YR 4/6 & 5/6) mottles	loam	friable	---
2C	39+	dark yellowish brown (10YR 4/4); many, medium, distinct, light brownish gray & gray (2.5Y 6/2 & 10YR 5/1) mottles	sand	loose	--- moderate effervescence

Location:	Darke Co.	**Site:**	Shawnee Prairie
Date:	7/12/96	**Weather:**	Sunny, warm
Time:	2:00 pm	**Pedon:**	Stream
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (and series):	Typic Haplaquoll (Patton)	**Pedon Classification:**	Typic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
Ap	0-8	very dark grayish brown (10YR 3/2)	silty clay loam	friable	---
A1	8-13	very dark grayish brown (10YR 3/2); few, fine, faint, dark brown (10YR 3/3) mottles	silty clay loam	friable	---
A2	13-21	very dark gray (10YR 3/1); common, fine, distinct, dark brown (7.5YR 3/3) mottles	silty clay loam	friable	---
Ab3	21-33	black (10YR 2/1); few, fine, prominent, dark brown (7.5YR 3/4) & common, coarse, distinct, dark gray (10YR 4/1) mottles	silty clay loam	firm	---
Bw1	33-44	dark gray (10YR 4/1); common, fine, distinct, dark yellowish brown (10YR 4/4) mottles	clay loam with stratified silt & sand lenses	firm	---
Bw2	44-50	dark gray (10YR 4/1); common, fine, distinct, light olive brown (2.5Y 5/4) & few, fine, prominent, dark brown (7.5YR 3/4) mottles	sandy loam with stratified silt & clay lenses	friable	---
C	50+	gray (10YR 5/1); many, medium, distinct, yellowish brown (10YR 5/4) mottles	stratified layers of sandy loam, clay loam & silt loam	friable	--- moderate effervescence

Location:	Darke Co.	**Site:**	Shawnee Prairie
Date:	7/12/96	**Weather:**	Sunny, warm
Time:	1:30 pm	**Pedon:**	Upland
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (and series):	Typic Haplaquoll (Patton)	**Pedon Classification:**	Typic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
Ap	0-13	very dark gray (10YR 3/1)	silt loam	friable	---
A1	13-19	very dark gray (10YR 3/1)	silty clay loam	firm	---
A2	19-28	very dark grayish brown (10YR 3/2); few, fine, distinct, yellowish brown (10YR 5/6) mottles	silty clay loam	firm	---
B	28-35	dark gray (10YR 4/1); common, medium, distinct, dark yellowish brown (10YR 4/4) mottles	silty clay loam	firm	---
C1	35-45	gray (10YR 5/1); many, medium & coarse, distinct, yellowish brown (10YR 5/4) & dark yellowish brown (10YR 4/4) mottles	silty clay loam	firm	---
C2	45+	gray (10YR 5/1); many, medium & coarse, distinct, yellowish brown (10YR 5/6) mottles	silty clay loam	firm	---

Location:	Darke Co.	**Site:**	Shawnee Prairie
Date:	7/12/96	**Weather:**	Sunny, warm
Time:	3:30 pm	**Pedon:**	General
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (and series):	Typic Haplaquoll (Patton)	**Pedon Classification:**	Typic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
Ap	0-6	very dark grayish brown (10YR 3/2)	silty clay loam	friable	7.46
A1	6-12	very dark grayish brown (10YR 3/2)	silty clay loam	firm	7.40
A2	12-22	very dark gray (10YR 3/1); few, fine, distinct, dark gray (10YR 4/1) & dark yellowish brown (10YR 4/4) mottles	silty clay loam	firm	7.66
Bw1	22-30	dark gray (10YR 4/1); few, fine, prominent, strong brown (7.5YR 5/6) & common, medium, distinct, yellowish brown (10YR 5/4) mottles	silty clay loam	firm	8.28
Bw2	30-40	dark gray (10YR 4/1); common, fine, distinct, yellowish brown (10YR 5/6) mottles	silty clay loam	firm	7.66
C1	40-45	gray (10YR 5/1); many, medium, distinct, yellowish brown (10YR 5/4) mottles	silty clay loam	firm	7.67
C2	45-55	gray (10YR 5/1); common, medium, faint, brown (10YR 5/3) & common medium, distinct, yellowish brown (10YR 5/4) mottles	stratified layers of sandy loam, loam, & clay loam	firm	8.06
C3	55-60	gray (10YR 5/1); many, common, distinct yellowish brown (10YR 5/4)	silty clay loam	firm	8.02

Location:	Darke Co.	**Site:**	Shepherd
Date:	9/5/96	**Weather:**	Sunny, mild
Time:	---	**Pedon:**	Middle and general
Described by:	W . K. Schumacher	**Pedon Drainage:**	Well drained
Mapping Unit Classification (series):	Cumulic Hapludoll (Ross)	**Pedon Classification:**	Fluventic Hapludoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A	0-10	very dark grayish brown (10YR 3/2)	loam	friable	--- moderate effervesence
C1	10-40	brown (10YR 4/3)	loam	friable	--- moderate effervesence
C2	40-50	brown (10YR 4/3)	silt loam	friable	--- moderate effervesence

Location:	Darke Co.	**Site:**	Shepherd
Date:	9/5/96	**Weather:**	Sunny, mild
Time:	11:30 am	**Pedon:**	Stream
Described by:	W . K. Schumacher	**Pedon Drainage:**	Well drained
Mapping Unit Classification (series):	Cumulic Hapludoll (Ross)	**Pedon Classification:**	Fluventic Hapludoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A	0-10	very dark grayish brown (10YR 3/2)	gravelly loam	friable	--- moderate effervesence
C1	10-40	brown (10YR 4/3)	loam	friable	--- moderate effervesence
C2	40-48	dark yellowish brown (10YR 3/4)	silt loam	friable	--- moderate effervesence

Location:	Darke Co.	**Site:**	Shepherd
Date:	9/5/96	**Weather:**	Sunny, mild
Time:	---	**Pedon:**	Upland
Described by:	W . K. Schumacher	**Pedon Drainage:**	Well drained
Mapping Unit Classification (series):	Cumulic Hapludoll (Ross)	**Pedon Classification:**	Fluventic Hapludoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction	Other
A	0-10	very dark grayish brown (10YR 3/2)	loam	friable	--- moderate effervesence	
C	10-39	brown (10YR 4/3)	loam	friable	--- moderate effervesence	
A'b	39+	very dark grayish brown (10YR 3/2)	sandy loam	friable	--- slight effervesence	10-15% gravel

Location:	Madison Co.	**Site:**	Walters
Date:	6/20/96	**Weather:**	Hot, humid, sunny
Time:	12:40 pm	**Pedon:**	Upland
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly drained/very poorly drained
Mapping Unit Classification (series):	Fluvaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-11	very dark grayish brown (10YR 3/2)	heavy silt loam	friable	---
A2	11-16	very dark gray (10YR 3/1)	heavy silt loam	friable	---
A3	16-26	very dark gray (10YR 3/1)	silty clay loam	firm	---
Cg1	26-33	dark gray (10YR 4/1); common, fine, distinct, brown (10YR 4/3) mottles	silty clay loam	firm	---
Cg2	33-40	dark gray (10YR 4/1); common, medium, distinct, dark yellowish brown (10YR 4/4) mottles	heavy silty clay loam	firm	---
Cg3	40+	gray (10YR 5/1); many, medium, distinct, yellowish brown (10YR 5/6) mottles	silty clay loam	firm	---

Location:	Madison Co.	**Site:**	Walters
Date:	6/20/96	**Weather:**	Hot, humid, sunny
Time:	1:40 pm	**Pedon:**	General
Described by:	W.K. Schumacher	**Pedon Drainage:**	Poorly drained/very poorly drained
Mapping Unit Classification (series):	Fluvaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-10	very dark grayish brown (10YR 3/2)	silt loam	friable	7.59
A2	10-17	very dark grayish brown (10YR 3/2)	silt loam	firm	7.90
A3	17-25	very dark gray (10YR 3/1)	silt loam	firm	7.82
A4	25-32	very dark gray (10YR 3/1); few, fine, faint, dark brown (10YR 3/3) mottles	silty clay loam	firm	7.95
Cg1	32-41	dark gray (10YR 4/1); common, medium, distinct, yellowish brown (10YR 5/6) mottles	silty clay loam	firm	7.93
Cg2	41-52	gray (10YR 5/1); common, medium, distinct, yellowish brown (10YR 5/6) mottles; common, distinct, very dark gray (10YR 3/1) organic stains	heavy silty clay loam	firm	8.02
Cg3	52-56	gray (10YR 5/1); few, fine, distinct, yellowish brown (10YR 5/4) mottles	silt loam	firm	8.26
Cg4	56+	gray (10YR 5/1); common, distinct, very dark gray (10YR 3/1) organic stains	gravelly loamy sand	loose	8.01

Location:	Madison Co.	**Site:**	Walters
Date:	6/20/96	**Weather:**	Hot, humid, sunny
Time	1:30 pm	**Pedon:**	Stream
Described by:	W.K. Schumacher	**Pedon Drainage:**	Poorly drained/very poorly drained
Mapping Unit Classification (series):	Fluvaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Note: Sample taken with probe. This soil compressed a lot in the probe: depths are approximate.

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-12	very dark grayish brown (10YR 3/2)	silt loam	firm	---
A2	12-23	black (10YR 2/1)	silt loam	firm	---
A3	23-34	very dark gray (10YR 3/1); common, medium, distinct, dark yellowish brown (10YR 3/4) mottles	silt clay loam	firm	---
Cg1	34-42	dark gray (10YR 4/1); common, medium, distinct, yellowish brown (10YR 5/4) mottles	silt clay loam	firm	---
Cg2	42-48	gray (10YR 5/1); many, coarse, distinct, brownish yellow (10YR 6/6) mottles	silt clay loam	firm	---

Location:	Madison Co.	**Site:**	Walters
Date:	6/20/96	**Weather:**	Hot, humid, sunny
Time:	3:15 pm	**Pedon:**	Middle
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly drained/very poorly drained
Mapping Unit Classification (series):	Fluvaquentic Haplaquoll (Sloan)	**Pedon Classification:**	Fluvaquentic Haplaquoll

Horizon	Depth (in)	Color (moist)	Texture	Consistence (moist)	Reaction
A1	0-7	very dark grayish brown (10YR 3/2)	silt loam	friable	---
A2	7-18	very dark grayish brown (10YR 3/2)	silty clay loam	firm	---
A3	18-25	very dark grayish brown (10YR 3/2); few, fine, faint, dark brown (10YR 3/3) mottles	silty clay loam	firm	---
Cg1	25-32	dark gray (10YR 4/1); few, fine, faint, brown (10YR 4/3) mottles	silty clay loam	firm	---
Cg2	32-38	dark gray (10YR 4/1); common, coarse, distinct, dark yellowish brown (10YR 4/4) mottles	gravelly loamy sand	friable	---
Cg3	38-45	dark gray (10YR 4/1)	gravelly, sandy loam	friable	---
Cg4	45+	dark gray (10YR 4/1)	sand & gravel	loose	---

Location:	Darke Co.	**Site:**	Warrick
Date:	8/22/96	**Weather:**	Sunny
Time:	---	**Pedon:**	Upland
Described by:	W. K. Schumacher	**Pedon Drainage:**	Very poorly/poorly drained
Mapping Unit Classification (series):	Typic Haplaquoll (Mongomery)	**Pedon Classification:**	Fluaquentic Haplaquoll

Horizon	Depth (in)	Color (Moist)	Texture	Consistency (Moist)	Reaction
Ap	0-10	very dark gray (10YR 3/1)	silty clay loam	---	---
A1	10-18	very dark gray (10YR 3/1); common, fine, distinct, brown (7/5 YR) mottles	silty clay loam	---	---
A2	18-30	very dark gray (10YR 3/1); common, fine, prominent, (7.5 YR3/4) mottles	silty clay	---	---
C1	30-39	dark gray (10YR 4/1); common, medium, prominent, brown (7.5 YR 5/4) and strong brown (7.5 YR 5/6) mottles	silty clay	---	---
C2	39-48	gray (10YR 5/1); common, medium, distinct, yellowish brown (10YR 5/6) and many, coarse, faint 5/10 G mottles	silty clay	---	---
C3	48+	greenish gray (5/10 G); many, medium, coarse, strong brown (7.5 YR 5/6) mottles	silty clay loam	---	---

Location:	Darke Co.	**Site:**	Warrick
Date:	8/22/96	**Weather:**	Sunny
Time:	---	**Pedon:**	General
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly/very poorly drained
Mapping Unit Classification (series):	Typic Haplaquoll (Mongomery)	**Pedon Classification:**	Fluaquentic Haplaquoll

Horizon	Depth (in)	Color (Moist)	Texture	Consistency (Moist)	Reaction
Ap	0-10	very dark gray (10YR 3/1)	silty clay loam	firm	---
A	10-25	very dark gray (10YR 3/1); common, medium, distinct, yellowish brown (10YR 4/4) mottles	silty clay	firm	---
C1	25-35	gray (10YR 5/1); common, medium, distinct, yellowish brown (10YR 4/4) mottles; common, medium, distinct, black (10YR2/1) and (very dark gray (10 YR 3/1) organic stains	silty clay	firm	---
C2	35-45	gray (10YR 5/1); common, medium, distinct, yellowish brown (10YR 4/4) and brown (7.5 YR) mottles	silty clay	firm	---
C3	45-55	greenish gray (5/10 G); many, coarse, prominent, strong brown (10YR 5/6) mottles	silty clay loam	firm	---
C4	55+	greenish gray (5/10 G); common, medium, distinct, yellowish brown (10YR5/4) mottles	silty clay loam	firm	---

Location:	Darke Co.	**Site:**	Warrwick
Date:	8/22/96	**Weather:**	Sunny
Time:	--	**Pedon:**	Stream
Described by:	Schumacher	**Pedon Drainage:**	Poorly drainrd/very poorly drained
Mapping Unit Classification (series):	Typic Haplaquoll (Mongomery)	**Pedon Classification:**	Fluaquentic Haplaquoll

Horizon	Depth (in)	Color (Moist)	Texture	Consistency (Moist)	Reaction
Ap	0-10	very dark gray (10YR 3/1)	silty clay loam	—	—
A	10-22	black (10YR 2/1); common, fine, distinct, dark yellowish brown (10YR 4/4) mottles	silty clay loam	—	—
Bw	22-29	dark gray (10 YR 4/1); common, fine, distinct (10YR 4/4) and few, large, prominent, brown (7.5YR 4/4) mottles	silty clay loam	—	—
C1	29-41	gray (10YR 5/1); few, distinct, medium, yellowish brown (10YR 5/6) and common, medium, prominent, strong brown (7.5 YR 5/6) mottles	silty clay	—	—
C2	41-50	greenish gray (5/10G); many, medium, prominent, brown (7.5YR 4/4) and yellowish brown (10YR 5/6) mottles	silty clay loam	—	—

Location:	Darke Co.	**Site:**	Warrwick
Date:	8/22/96	**Weather:**	Sunny
Time:	---	**Pedon:**	Middle
Described by:	W. K. Schumacher	**Pedon Drainage:**	Poorly drained/very poorly drained
Mapping Unit Classification (series):	Typic Haplaquoll (Mongomery)	**Pedon Classification:**	Fluaquentic Haplaquoll

Horizon	Depth (in)	Color (Moist)	Texture	Consistency (Moist)	Reaction
Ap	0-11	very dark gray (10 YR 3/1)	silty clay loam	---	---
A	11-20	very dark gray (10 YR 3/1)	silty clay loam	---	---
Bw	20-33	dark gray (10 YR 4/1); common, medium, distinct, strong brown (10 YR 4/6) mottles	silty clay	---	---
C1	33-39	gray (10 YR 5/1); common, medium, distinct, brown (5/3 and 5/4) mottles	silty clay	---	---
C2	39-45	gray (10 YR 5/1); many, medium, distinct brown (10 YR 5/4) mottles and few, very dark gray (10 YR 3/1) organic stains	silty clay	---	---
C3	45-51	gray (10 YR 5/1); common, medium, prominent, brown (7.5 YR 4/4) mottles	silty clay	---	---

Master species list for the RAPP Wetland (Summer - 07/15/96)

Key: *=alien taxon; **=may include both native and nonnative populations

E = Endangered; nl = no listing

Species Name	C of C Value	(see key)	Indicator Status	Perennial (1) or Annual (0)	Notes
Acer negundo	3		FAC+	1	
Achillea millefolium	0	*	FACU	1	
Acorus calamus	4		OBL	1	
Agrostis alba	0	*	FACW	1	Also known as A. gigantea
Alisma plantago-aquatica	2		OBL	1	
Alliara petiolata	0	*	FACU-	0	
Ambrosia artemisiifolia	0		FACU	0	
Angelica atropurpurea	6		OBL	1	
Asclepias incarnata	5		OBL	1	
Boehmeria cylindrica	4		FACW+	1	
Brassica nigra	0	*	NL	0	
Carex conjuncta	5		FACW	1	
Carex cristatella	3		FACW	1	
Carex frankii	5		OBL	1	
Carex granularis	3		FACW+	1	
Carex hystricina	4		OBL	1	
Carex lanuginosa	6		OBL	1	Also known as C. pellita
Carex normalis	4		FACU	1	
Carex vulpinoidea	3		OBL	1	
Cerastium vulgatum	0	*	FACU-	1	
Chaerophyllum procumbens	4		FACW	0	var. procumbens=4; var shortii=8
Cichorium intybus	0	*	NL	1	
Cicuta maculata	3		OBL	1	
Cirsium arvense	0	*	FACU	1	
Convolvulus sepium	1		NL	1	Also known as Calystegia sepium
Craetegus mollis	3		FACU	1	
Cryptotaenia canadensis	3		FAC	1	
Daucus carota	0	*	NL	0	
Dipsacus sylvestris	0	*	NL	0	
Echinochloa crusgalli	0	*	FACU	0	
Echinocystis lobata	3		FAC	0	
Eleocharis acicularis	3		OBL	1	
Eleocharis palustris	4		OBL	1	
Erigeron strigosus	1		FACU+	0	
Eupatorium perfoliatum	3		FACW+	1	
Eupatorium purpureum	7		FAC	1	
Festuca eliator	0	*	FACU	1	
Festuca octoflora	5		NL	1	Also known as Vulpina octoflora
Fraxinus americana	4		FACW	1	
Fraxinus pennsylvanica var pennsylvanica	6		FACW	1	
Fraxinus pennsylvanica var subinteggerima	6		FACW	1	
Galium concinnum	4		NL	1	
Galium triflorum	5		FACU	1	
Geum canadense	2		FACU	1	
Glechoma hederacea	0	*	FACU	1	
Gleditsia tricanthos	1		FAC-	1	
Glyceria striata	2		OBL	1	
Helianthus tuberosus	3		FAC	1	
Impatiens capensis	2		FACW	0	
Juglans nigra	5		FACU	1	
Juncus nodosus	4		OBL	1	
Juncus tenuis	1		FAC-	1	var. dichotomus=7; var. dudleyi=4; var. tenuis=1
Juncus torreyi	3		FACW	1	
Justicia americana	8		OBL	1	
Laportea canadensis	5		FACW	1	
Leersia oryzoides	1		OBL	1	
Leersia virginica	3		FACW	1	
Lemna minor	4		OBL	1	