2004 WETLAND MITIGATION MONITORING REPORT
FAP 313 (U.S 34) Henderson County

Introduction

This document presents the 2004 wetland and vegetation monitoring results of the constructed wetland compensation for FAP 313 (US 34), Henderson County, Illinois (site location NE/4, NE/4, SW/4, Section 34, T 10 N, R 6 W, Burlington, IA quadrangle). Although this wetland compensation site had been previously monitored for five years, the U.S. Army Corps of Engineers had determined that permit conditions had not been met and that monitoring was to continue. The report follows monitoring guidelines and format set forth in the initial IDOT (Illinois Department of Transportation) monitoring request (Brooks 1999) and in five previously submitted monitoring reports (Cooprider et al. 1999, Cooprider et al. 2000, Wilm et al. 2002, Wilm et al. 2003, Wilm et al. 2004).

Originally a wetland (Plocher *et al.* 1995), the site was converted to agriculture before having been left fallow for several years prior to excavation for mitigation purposes in 1997. Reportedly, eight herbaceous wetland species were planted in the wetland portion of the site (*Iris shrevei, Nuphar luteum, Nymphaea odorata, Pontederia cordata, Elodea canadensis, Scirpus tabernaemontanii, Sagittaria latifolia,* and *Potamogeton nodosus*), along with four species of tree seedlings (*Quercus bicolor, Quercus palustris, Carya illinoensis,* and *Carya laciniosa*) planted around much of the perimeter. On-site monitoring was conducted for the sixth consecutive year on October 6, 2004.

Project goals, objectives, and performance criteria for the wetland compensation site are included in this report, as are monitoring methods, 2004 monitoring results, and summary information. Also addressed is the status of the compensation site, with respect to meeting the project goal, objectives, and performance criteria. The initially established 5-year monitoring period ended with the 2003 monitoring. The Army Corps of Engineers, however, required that site monitoring continue and, thus, the 2004 monitoring and the submittal of this report.

Project Goal, Objective, and Performance Standards

The project goal, objective, and performance standards included and evaluated in this report are those identified in the original IDOT tasking order (Brooks 1999) and are as follows:

Project Goal: The created wetland community should be a 10.13 acre (4.1 ha) emergent wetland.

Objective: A high quality marsh will develop through natural re-colonization and planting of obligate wetland species.

Performance Standards:

1. The entire created wetland (10.13 acres) should satisfy the three criteria of the federal wetland definition:

   a) Predominance of hydrophytic vegetation. More than 50% of the dominant plant species must be hydrophytic.

   b) Presence of hydric soils. Hydric soil characteristics should be present, or conditions favorable for hydric soil formation should be present at the site.

c) Presence of wetland hydrology. The compensation area must be either permanently or periodically inundated at averaged depths less then 2 m (6.6 ft) or have soils that are saturated to the surface for at least 12.5% of the growing season.

2. By the end of the fifth year, a native mean coefficient of conservatism value (native mean C value) of greater than or equal to 3.5 must be achieved, measured over the entire mitigation area. The native mean C value must increase each successive year.

3. By the end of the fifth year, the floristic quality index value (FQI) must be greater than or equal to 20 as measured over the entire mitigation site. The FQI must increase each successive year.

4. By the end of the fifth year, the native mean wetness coefficient (native mean W) must be less than or equal to 0 in the wetland community.

5. The relative importance value of total native plants (RIVn) must increase each successive year.

6. By the end of the fifth year, none of the three most dominant plant species in any of the wetland community zones may be non-native or weedy species, including, but not limited to *Phragmites australis*, *Poa compressa, Poa pratensis, Lythrum salicaria, Salix interior, Echinochloa crusgalli* or *Phalaris arundinacea,* unless otherwise indicated on the approved mitigation plan.

7. At the end of the five year monitoring period, at least 25% of the created wetland should be covered by hydrophytic vegetation. The interspersion of water and vegetation should be moderate to high. An open body of water surrounded by a continuous band of fringe vegetation is considered to have a low degree of interspersion, while a checkerboard of open water would have a high degree of interspersion.

8. The planned wetland community should be dominated by tall graminoid plants. Woody vegetation should account for less than 30% of the aerial cover.

9. A 75% survival rate shall be maintained each year for all tree species planted within the wetland mitigation site (Department of the Army, Corps of Engineers permit number: CENR-RD-328500).

Methods

Performance Standard 1

a) Predominance of Hydrophytic Vegetation

The method for determining dominant hydrophytic vegetation at a wetland site is described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and further explained in the *Federal Manual for Identifying and Delineating Jursidictional Wetlands* (Federal Interagency Committee for Wetland Delineation 1989). It is based on areal coverage estimates for individual plant species. Each of the dominant plant species is assigned its wetland indicator status rating (Reed 1988). Any plant rated facultative or wetter (i.e., FAC, FAC+, FACW, FACW-, FACW+, and OBL) is considered a hydrophyte. A predominance of

vegetation in the wetland plant community exists if more than 50% of the dominant species present are hydrophytic.

b) Occurrence of Hydric Soils

To monitor hydric soil development, soils were sampled in 1999 and verified in 2000, 2001, 2002, 2003, and 2004. Soil profile morphology, including horizon color, texture, and structure was described at representative points throughout the site. Additionally, the presence, type, size, and abundance of redoximorphic features were recorded. In the absence of hydric soils indicators, hydrologic data can be used to confirm that conditions favorable for hydric soil formation persist at the site.

c) Presence of Wetland Hydrology

The method for determining the presence of wetland hydrology at a site is described in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987). Hydrologic indicators may include, but are not limited to, drainage patterns, drift lines, sediment deposits on leaves, watermarks on trees, visual observations of saturated soils, and visual observation of inundation. Monitoring well data from the Illinois State Geological Survey (ISGS) (Fucciolo *et al.* 2004) was also used to determine wetland hydrology.

Performance Standards 2, 3, 6 and 8

Plant Community Quality and Composition

The Floristic Quality Assessment (Swink and Wilhelm 1994, Taft et al. 1997) was utilized to determine the floristic quality and nativity of the plant communities at the site. This method aids in identifying natural areas, monitoring restored and created wetlands, and comparing the quality of vegetation at different sites. First, each plant species native to Illinois is assigned a conservatism coefficient (C) ranging from zero to 10. Individual conservatism coefficients reflect the probability that a particular taxon correlates with anthropogenic disturbances. Plant species assigned zero tend to have low affinities for natural areas and those assigned 10 have very high affinities. A higher quality site will have more species with high conservatism coefficients. When a complete species list is compiled for a site, the mean coefficient value (mCv) and a site Floristic Quality Index can be calculated as follows:

N= the number of native plant species

$MCv = \Sigma C/N$

$FQI = mCv \sqrt{N}$

Sites with FQI values less than 10 indicate low natural quality. Sites with FQI values of 20 or more possess some evidence of natural character and may be considered environmental assets.

Planted Tree Seedling Survival

In the fall of 1999, 500 each of the following four tree species were reportedly planted: *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), *Carya illinoensis* (pecan), and *Carya laciniosa* (shellbark hickory) (letter from T. Brooks, IDOT, February 2000). All individual live trees were counted while walking the perimeter of the site, where trees were planted.

Performance Standards 4 and 7

Characterization and Extent of Hydrophytic Vegetation

In addition to being assigned a Coefficient of Conservatism, each species is also assigned a mean wetness coefficient based on the National Wetland Category for Region 3 of the U.S.

Fish and Wildlife Service (Reed 1998). Plants are designated as obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), or upland (UPL). Plus (+) and minus (-) signs are added when a plant falls between two of the above categories. For example, FACW+ indicates that a plant is more likely to be found in a wetland than a FACW plant. Likewise, a FACU- suggests that a plant is less likely to be found in a wetland than a FACU plant. Each category is assigned a numerical value, ranging from -5 for OBL, to 0 for FAC, to +5 for UPL. These values were used to determine the mean Coefficient of Wetness (W) and the percent of the wetland covered by hydrophytic vegetation.

Performance Standard 5

Relative Importance Value of Native Plants

A baseline was established along the long axis near U.S. 34 bearing 75° east of north. The first transect was set approximately 25 m (82 ft) east-northeast of a large silver maple in the southwestern corner of the site, bearing 25° west of north. This transect begins at photo station 1 (marked by a permanent metal stake). Transects were set 30 m (98 ft) apart along the baseline; there were seven transects. Transect length and the number of 0.25 m^2 quadrats per transect were variable because of the shape of the mitigation site. Quadrats were set 25 m (82 ft) apart along the transects. A total of 43 quadrats were sampled. The aerial cover (indicated by cover class) of each species in the quadrats was recorded using the categories listed in Table 1. Percent cover of plant species was analyzed using cover class mid-points (Table 1).

Sampling and analysis methods are based on standard vegetation sampling procedures (Smith 1980, Cox 1985). Plant species frequency values were determined by dividing the number of plots (quadrats in which an individual species occurred) by the total number of plots sampled (42). Relative importance values for individual species and for combined native (RIVn) and combined non-native (RIVa) were calculated by dividing the sum of relative coverage and relative frequency by two and multiplying by 100: [(RC + RF)/2 *100] = RIV.

Table 1. Cover classes used for quadrat sampling

Cover class	Range of Cover (%)	Midpoint of Range (%)
1	1-5	3.0
2	5-25	15.0
3	25-50	37.5
4	50-75	62.5
5	75-95	85.0
6	95-100	97.5

Photography Stations

As indicated and identified in the five previous monitoring reports (Cooprider et al. 1999, Cooprider et al. 2000, Wilm et al. 2002, Wilm et al. 2003, Wilm et al. 2004), seven photo stations were established along the perimeter of the wetland mitigation site to document changes in plant community over time. Photographs are contained in Appendix E.

Results

Performance Standard 1

a) Predominance of Hydrophytic Vegetation

Dominant plant species for the wetland are shown in Table 2. Four of the five dominant species are hydrophytic; four of five are obligate wetland species.

Table 2. Dominant plant species by stratum and wetland indicator status, October, 2004.

Species	Strata	Wetland Indicator Status
Typha angustifolia	herb	OBL
Eleocharis acicularis	herb	OBL
Eleocharis erythropoda	herb	OBL
Bidens cernua	herb	OBL
Solidago canadensis	herb	FACU

b) Occurrence of Hydric Soils

In the fall of 1994, the wetland portions of the site had saturated soils within 0.3 m (12 in) of the surface (Plocher et al. 1995). In the 1999 monitoring season, all soils in the excavated area were determined to be hydric; this was verified in 2000, 2001, 2002, 2003, and now again in 2004. Because the soils were excavated, assumptions were made about the characteristics of the former topsoil. Based on landscape position, morphological characteristics in the lower profile, the Soils Survey of Henderson County (USDA 1956), and soils data from the mitigation site assessment (Plocher et al. 1995), the Sawmill series was determined to be present. The mollic epipedon appears to have been completely removed and an iron depleted matrix containing numerous redoximorphic concentrations is now at the surface (Table 3). At the time of monitoring in 2003, standing water was observed in only a small portion of the site and saturated soils were only found in this same area. Because of the relative dryness of the site in 2003, soils were able to be probed under the wettest part of the site. Gray sand was found at 0.5 m (20 in); free water and multicolored gray sand were found at 0.8 m (32 in). The layer was unique to this portion of the excavated wetland.

Table 3. Soil profile description for excavated wetland compensation area, August, 2003.

Depth (in)	Matrix Color	Concentrations	Depletions	Texture	Structure
0 – 8	2.5YR 4/1	7.5YR 4/6 & 3/4		Sandy Clay	Massive
8 – 20	2.5YR 4/1			Sandy Clay	Massive
20 – 32	2.5YR 4/1	N 2.5/0		Sandy Clay	Massive
32 – 41	2.5YR 4/1			Sandy Clay	Massive

c) Presence of Wetland Hydrology

This site is located in the greater Mississippi River floodplain. Although the site may only flood occasionally, the site is affected directly by the Mississippi through water table fluctuations. Field evidence of wetland hydrology included water scouring, wetland drainage

patterns, depressional (excavated) landscape, surface soil saturation, and inundation. Unlike most monitoring years, very little of the site was inundated at the time of the survey in 2004 (less than 1% of the site). This amount of standing water was significantly less than in most previous monitoring years.

In 2004, the total area of the created wetland that conclusively satisfied the wetland hydrology criteria was 1.3 ha (3.3 acres) (Fucciolo et al. 2004). This area, as well as the acreages reported in past reports, is based on satisfying the wetland hydrology criterion for greater than 12.5% of the growing season. In 2004, the Illinois State Geological Survey also reported the area satisfying the wetland hydrology criterion for greater than 5% of the growing season; this area was 1.9 ha (4.7 acres). The estimated areal extent of 2004 wetland hydrology is shown in Appendix A. 2004 data shows a very substantial decrease in wetland hydrology as compared to all previous monitoring years (Table 4) (Fucciolo et al 2003, 2002, 2001, 2000, 1999). This decrease appears to be due to the lack of precipitation in 2004. The six-year average of area satisfying the wetland hydrology criterion was 2.6 ha (6.5 acres).

Table 4. Area conclusively satisfying the wetland hydrology criterion for greater than 12.5% of the growing season.

Year	hectares	acres
2004	1.3	3.3
2003	2.3	5.7
2002	3.1	7.8
2001	3.4	8.4
2000	2.8	6.8
1999	2.8	6.9
Average	2.6	6.5

Additional information regarding the presence of hydrophytic vegetation, hydric soils, and wetland hydrology can be found in the Wetland Determination Form (Appendix B).

Performance Standards 2, 3, 6, 8, and 9

Plant Community Quality and Composition

The performance standard indicates that the goal for the Mean Coefficient of Conservatism (C) is 3.5 at the end of the five year monitoring period (or at the completion of monitoring). This was not met in 2004 or in any of the five previous monitoring years. The mean C value, including planted species was 2.8, excluding them, 2.5, and excluding only planted trees, 2.7. Although not meeting the performance standard, the mean C value has typically maintained itself just below this level.

By the end of monitoring, the FQI is required to be twenty or greater. In 2004, the FQI, including all planted species, was 25.6, without these species 20.7, without only the planted trees 24.1. All of these values are above the performance standard.

In 2004, the three most dominant plant species (ranked by descending relative importance value) were *Typha anugustifolia, Eleocharis acicularis,* and *Eleocharis erythropoda.* Although the order has been altered, these same plants have been the three most dominant for several years. *Eleocharis acicularis* and *Eleocharis erythropoda* are both highly-desirable, native,

obligate wetland species. Narrowleaf cattail (*Typha angustifolia*) is generally considered an aggressive exotic in Illinois.

Of the five dominant plant species (Table 2), at least two are "graminoid" (*Eleocharis acicularis* and *Eleocharis erythropoda*), although definitely not "tall graminoids", as specified in stated project performance standards. Although considered an exotic, narrowleaf cattail could also be considered a "tall graminoid". Apparently the term "graminoid" is not truly a scientific term, but, instead, is a general term applying to grasses and grass-like plants.

Although woody vegetation appears to have generally increased over the monitoring period, primarily encroaching from the wooded margins of the site, it still remained a relatively minor component of the wetland plant community. Silver maple (*Acer saccharinum*), occurring principally as seedlings, was found to be the sixth most "important" species, having a relative importance value of 5.29 (Appendix C). However, quantitative sampling results revealed only a total relative importance value of 10.57 and a total relative cover percent of 7.30 for all woody species combined (Appendix C). In addition to silver maple, other woody species observed and/or sampled in 2004 included: river birch (*Betula nigra*), buttonbush (*Cephalanthus occidentalis*), rough-leaved dogwood (*Cornus drummondii*), green ash (*Fraxinus pennsylvanica*), white mulberry (*Morus alba*), cottonwood (*Populus deltoides*), pin oak (*Quercus palustris*), common blackberry (*Rubus allegheniensis*), peach-leaved willow (*Salix amygdaloides*), sandbar willow (*Salix exigua*), black willow (*Salix nigra*), and American elm (*Ulmus americana*) (Appendix D). Given that this monitoring year was very dry, increased woody encroachment was to be expected. Many of these woody seedlings will likely not survive long-term, unable to tolerate extended periods of inundation up to several inches in depth, conditions common in previous monitoring years.

Planted Tree Seedling Survival

Only three species of planted trees were observed during 2004 monitoring (Table 4). Pecan (*Carya illinoensis*), swamp white oak (*Quercus bicolor*), and pin oak (*Quercus palustris*) were all commonly sampled, but no shellbark hickory (*Carya laciniosa*) were recorded. As reported in previous monitoring reports, it seems likely that no shellbark hickory were ever planted. In 2000, Cooprider reported finding three shellbark hickory seedlings, but questioned their identification (Coorider et al. 2000).

The majority of planted trees seedlings (mostly now shrubs) appeared healthy and vigorous, with a good chance at long-term survival. In 2004, more planted trees were counted than in 2003, 813 compared to 614, a total very comparable to the 831 reported in 2002. Average survival was 54.2%. This survival rate is substantially lower than the 75% required in the performance standards set forth for this project. This survival rate also excludes the 500 shellbark hickory seedlings that were apparently never planted. Of the three observed species, pecans had the lowest survival rate survival rate (37.6%).

Table 4. Observed survival rates of planted tree seedlings, October, 2004.

Tree Species	Number Planted (reportedly)	Number Observed Alive	Survival Rate (%)
Carya illinoensis	500	188	37.6
Carya laciniosa	500	0	0.0
Quercus bicolor	500	315	63.0
Quercus palustris	500	310	62.0
Overall	2000	813	40.7
Overall (excluding *Carya laciniosa*)	1500	813	54.2

Performance Standards 4 and 7

Characterization and Extent of Hydrophytic Vegetation

The mean Coefficient of Wetness (mean W) for the entire excavated area was strongly negative, even more so than in 2003 (Appendix D). Overall, it was -2.5 when including all planted species, -2.3 when excluding all planted species, and -2.5 when excluding planted tree species. Mean W for native species only was -2.9 when including all planted species, -2.7 when excluding all planted species, and -2.9 when excluding planted tree species.

Similar to previous years, hydrophytic vegetation appeared to dominate throughout the entire excavated area. All quadrats sampled in 2004 contained dominant hydrophytic vegetation. As in past years, the periphery of the area tended to contain more species typical of non-wetland habitats (e.g., *Solidago canadensis, Cassia fasiculata, Aster pilosus, Setaria glauca, Coronilla varia*), but nonetheless, this fringe area was still dominated by hydrophytes. Canada goldenrod (*Solidago canadensis*), an aggressive, weedy, non-hydrophytic species, did show a noticeable increase in 2004. Although the vegetation of the fringe area was more mixed than the interior portion of the site, vegetation typical of marsh habitat still tended to dominate, especially *Eleocharis* spp. Based on these sampling results, the entire excavated area could be considered to be marsh.

The interspersion of water and vegetation was not as favorable as in most monitoring years, due to the lack of standing water. Open areas in the interior of the wetland, where standing water would normally would have been, were still evident. Less than 2% of the wetland was inundated at the time of monitoring in 2004. As in previous years, inundated and recently inundated areas of the wetland were comprised of plants such as *Eleocharis* spp., *Eleodea canadensis*, *Nymphaea odorata,* and *Potamogeton nodosus*, along with emergents such as *Typha* spp., *Scirpus* spp., *Sagittaria latifolia*, *Sparganium eurycarpum, Acorus calamus,* and *Alisma plantago-aquatica.*

Performance Standard 5

Relative Importance Value of Native Plants

The relative importance value of native plants (RIVn) in 2004 was 80.99 (Appendix C), a substantial decrease from the previous year (87.95), but very similar to 2002 (79.29) (Wilm et al. 2004, 2003). Some of this change was attributable to a sampled increase in narrowleaf cattail at 13.90, up from 10.23 in 2003. Although an increase, this level was a large decrease from the sampled level of 2002 (19.35). Narrowleaf cattail was the most "important" plant species overall in 2004, with a slightly higher value than a native spikerush (*Eleocharis acicularis*) at 13.26. Only four other species of non-native plants were sampled; among these, pigeon grass (*Setaria glauca*) had the highest value (2.67). Reed canary grass *(Phalaris arundinacea)*, an exotic species problematic in many Illinois wetlands, was infrequently observed and did not even appear in the quantitative sampling. Exotic, non-native species had a total relative importance value of 18.78, of which 74% was accounted for by narrowleaf cattail alone. By contrast, excluding planted species, 71 species native to Illinois were recorded, of which 59 were both native and perennial (Appendix D). Only 20 annual species were observed, 21.7% of all species occurring in the wetland.

Summary and Recommendations

At the conclusion of the sixth year of monitoring, results were comparable to those in recent monitoring years. Although this wetland compensation site has some attributes of a quality wetland community, based on 2004 results, the site meets only three of nine performance standards (3, 4, and 7) completely. The FQI for the site exceeded twenty (the performance standard), both when including (25.6) and excluding planted species (20.7). The native, mean Coefficient of Wetness (W) was strongly negative (as required in the performance standard). Native mean W was –2.9 when including all planted species, -2.7 when excluding all planted species, and –2.9 when excluding planted tree species. Hydrophytic vegetation appeared to dominate throughout the entire excavated area, as all sampled quadrats contained dominant hydrophytic vegetation. Although standing water was quite low at the time of survey in 2004, interspersion of water and vegetation was favorable. Areas of shallow open water, as well as bare, recently dry areas, were interspersed with stands of hydrophytic vegetation throughout much of the wetland.

Performance Standard 1 (satisfying the three wetland criteria for jurisdictional wetlands) is met for the majority of the site. Dominant hydrophytic vegetation and hydric soils are present across the entire excavated area, although according to the ISGS (Fucciolo et al. 2004) wetland hydrology was present for only 1.3 ha (3.3 acres) during the 2004 monitoring year. This acreage was the lowest among all monitoring years and was likely due to below average precipitation at the site during 2004.

The goal of a mean Coefficient of Conservatism (C) of 3.5 or greater (Performance Standard 2) was not met in 2004 or in any of the previous monitoring years. The mean C for the site, including planted species, was 2.8, excluding them, 2.5, and excluding only planted trees, 2.7. These values have decreased since 2002 (Wilm et al. 2003, 2004), probably due the invasion of more weedy, nonhydrophytic species during apparently dry years.

As specified in Performance Standard 5, the relative importance value of native plants (RIVn) must increase in each successive year. This has not been the consistent pattern throughout the six-year monitoring period and the RIVn did not increase in 2004. RIVn in 2004 was 80.99, compared to 87.95 in 2003 (Wilm et al. 2004). This year-to-year fluctuation can principally be attributed to the fluctuation in the sampled prevalence of narrowleaf cattail. RIVn

values above or near eighty can be considered a good result, despite the lack of a consistent, year-to-year upward trend.

In 2004, the three most dominant plant species (ranked by descending relative importance value) were *Typha anugustifolia, Eleocharis acicularis,* and *Eleocharis erythropoda.* The prevalence of narrowleaf cattail as the most dominant species conflicts with Performance Standard 6. Narrowleaf cattail is an aggressive, weedy exotic that tends to dominate wetlands, often to the point of excluding many desirable native plant species.

As specified in Performance Standard 8, tall graminoid plant species must dominate the created wetland, with woody vegetation remaining a minor component (<30% aerial cover). Based on 2004 sampling results, woody vegetation met the performance standard, having a total relative cover percent of only 7.30; this was virtually unchanged from the previous year. Silver maple (occurring principally as seedlings) was the sixth most "important" plant species (based on quantitative sampling results). In general, however, tall graminoids do not dominate the area. Although narrowleaf cattail may or may not be considered a graminoid species, it is generally not considered desirable. Two other graminoid species (*Eleocharis acicularis* and *E. erythropoda*) are among the dominant plants, although they would be definitely not be considered "tall".

With regard to survival of planted tree seedlings, sampling results clearly do not meet those set forth in Performance Standard 9. As previously stated in past monitoring reports, it appears that the 500 shellbark hickory seedlings that were supposed to be planted, never were. Even when excluding these trees, average survival for all planted trees in 2004 was only 54.2%. Due to the difficulty in observing planted tree seedlings over the entire monitoring period, counted tree numbers did vary beyond what can be attributed solely to year-to-year changes in survival. However, even given these inaccuracies, overall tree survival rate was well under the 75% required.

In summary, after six years of monitoring this created wetland site appears to have developed into a wetland representative of those typically found in this region of Illinois. While, from a floristic quality standpoint, it is definitely not natural area quality, it does, however, exhibit the desired structure of an emergent-dominated marsh. As documented and discussed in previous monitoring reports (Wilm et al. 2004, 2003, 2002), the prevalence of narrowleaf cattail is less than desirable. The dominance of this species directly contributes to the failure to meet three of the performance standards (2, 5, & 6), and possibly a fourth (Performance Standard 8), depending on whether or not cattail is to be considered a "graminoid". Although a dominant in the wetland, it has not taken over and the site remains a fairly diverse marsh; numerous other emergent wetland species also occur. Several performance standards will likely never be met without decreasing the prevalence of this species; however, as long as narrowleaf cattail continues to persist near its current level, it will likely have no substantial negative impact on the structure and functioning of the created wetland. It appears unlikely that this plant will decrease substantially on its own and control via herbicide treatment seems impractical. Narrowleaf cattail does not generally persist at this site as large, thick, monotypic stands, but is generally interspersed throughout much of the wetland.

As stated in the overall project goal, 10.13 acres (4.1 ha) of wetland habitat was to be created. Although substantial acreage has been created, it appears not to have reached the desired total. The area of the created wetland conclusively satisfying the wetland hydrology criterion (for greater than 12.5% of the growing season) in a given monitoring year varied from a low of 3.3 acres in 2004 to a high of 8.4 acres in 2001, averaging 6.5 acres (Table 4). These acreages, although significant, fall well below the desired acreage needed for the stated wetland compensation.

In order to meet project goals, the U.S. Army Corps of Engineers had requested that additional trees be planted. They also expressed concern about the prevalence of narrowleaf cattail. Based on 2004 monitoring, it appears that no actions have been taken to address either of these issues.

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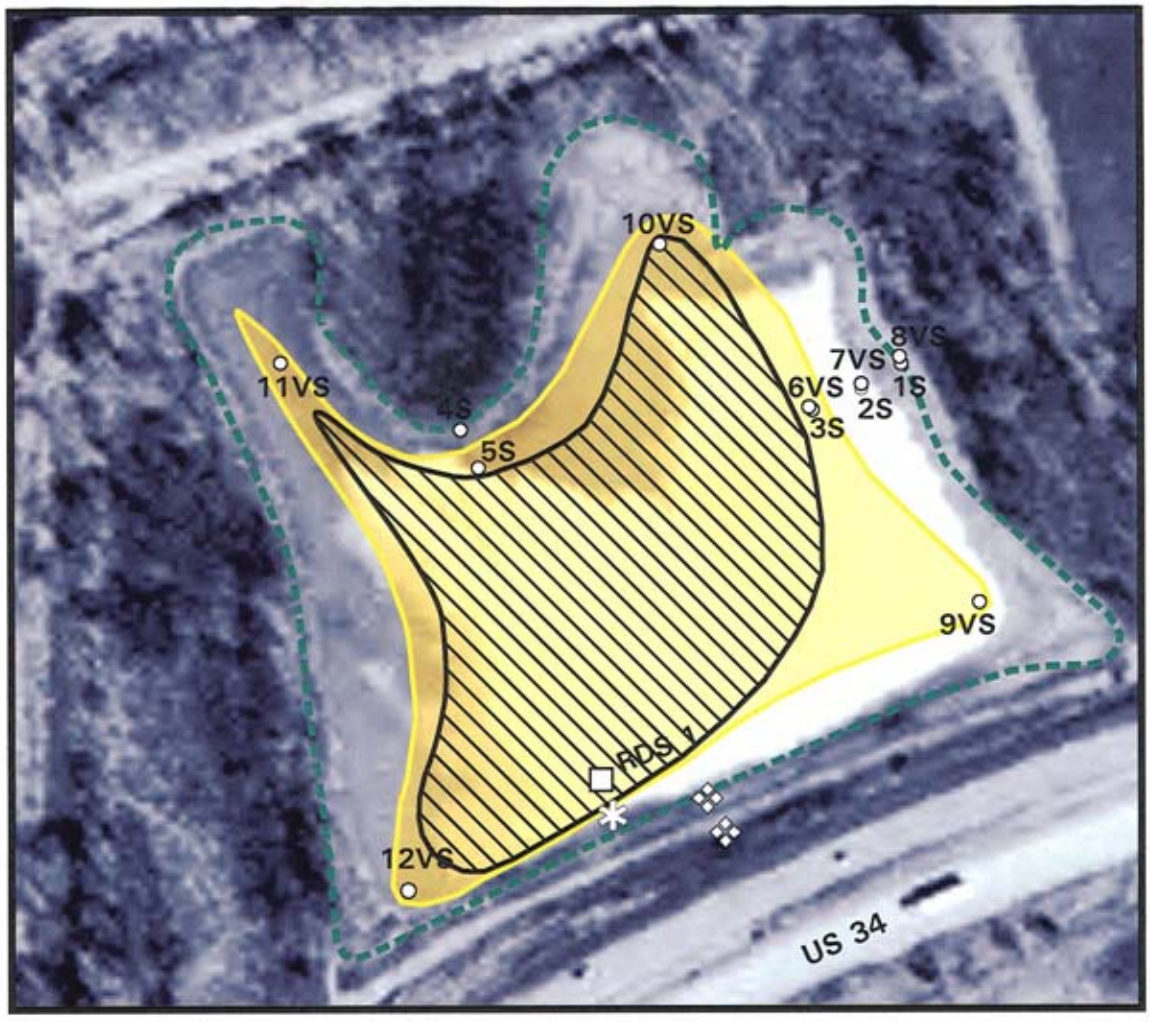
Appendix A. Estimated areal extent of 2004 wetland hydrology (Fucciolo et al. 2004).

Gulfport Wetland Compensation Site
(FAP 313)
Estimated Areal Extent of 2004 Wetland Hydrology

based on data collected between September 1, 2003 and September 1, 2004
map based on USGS digital orthophotograph, Burlington NW Quadrangle
produced from aerial photography (ISGS 1999)



- ISGS monitoring well
- ISGS benchmark
- rain gauge
- RDS data logger
- estimated areal extent of IDOT excavation

0 100 m
0 300 ft

N

2004 Wetland Hydrology

- > 12.5% of the growing season
- > 5% of the growing season

Appendix B. Routine wetland determination form, August 2003.

Routine On-site Wetland Determination
Excavated Wetland Compensation Area
(page 1 of 2)

Field Investigators: Wilm, Tessene, Zercher, Grigg **Date:** October 6, 2004
Contract Number: 88516 **Project Name:** FAP 313 (U.S. 34)
State: Illinois **County:** Henderson **Applicant:** IDOT District 4
Site Name: Marsh (Excavated Wetland Compensation Area)
Legal Description: NE1/4 NE 1/4 SW 1/4 sec. 34 T.10N. - R.6W.
Location: Begins approximately 23 m (75 ft) north of U.S 34, 91 m (300 ft) east of an excavated lake in Gulfport, and south of Crystal Lake.

Do normal environmental conditions exist at this site? Yes: X No:
Have the vegetation, soils and/or hydrology been significantly disturbed? Yes: No: X

VEGETATION

Dominant Plant Species	**Indicator Status**	**Stratum**
Bidens cernua	OBL	herb
Eleocharis acicularis	OBL	herb
Eleocharis erythropoda	OBL	herb
Solidago canadensis	FACU	herb
Typha angustifolia	OBL	herb

Percentage of plant species that are OBL, FACW, FAC+, or FAC: 80%
Hydrophytic vegetation? Yes: X No:
Rationale: More than 50% of the dominants are OBL, FACW, FACW+, FACW-, FAC+ or FAC.

SOILS
Series and phase: Sawmill silty clay loam

On county hydric soils list?	Yes: X	No:	
Is the soil a histosol?	Yes:	No: X	
Histic epipedon present?	Yes:	No: X	
Redox concentrations:	Yes: X	No:	Color: 7.5YR 4/6 & 3/4
Redox depletions:	Yes:	No: X	

Matrix color: 2.5YR 4/1
Other indicators: The site is an excavated depression within the overall landscape. Partial inundation was also observed.
Hydric soils: Yes: X No:
Rationale: The soils in this area are hydric. This is evidenced by a low chroma matrix and redoximorphic features. The soil also meets the NRCS hydric soil indicator F3 (depleted matrix).

Routine On-site Wetland Determination
Excavated Wetland Compensation Area
(page 2 of 2)

Field Investigators: Wilm, Tessene, Zercher, Grigg **Date:** October 6, 2004
Contract Number: 88516 **Project Name:** FAP 313 (U.S. 34)
State: Illinois **County:** Henderson **Applicant:** IDOT District 4
Site Name: Marsh (Excavated Wetland Compensation Area)
Legal Description: NE1/4 NE 1/4 SW 1/4 sec. 34 T.10N. - R.6W..
Location: Begins approximately 23 m (75 ft) north of U.S 34, 91 m (300 ft) east of an excavated lake in Gulfport, and south of Crystal Lake.

HYDROLOGY

Inundated? Yes: X (partially) No: Depth of standing water: Up to 0.08 m (3 in)
Depth to saturated soil: Surface to >1 m (40 in)
Overview of hydrological flow through the system: This site is located in an excavated area that is affected by the Mississippi River via water table fluctuations and occasional flooding. Additional hydrologic inputs include precipitation and sheet flow from higher ground. Evapotranspiration, soil infiltration, and possible ground water recharge are hydrologic outputs.
Size of watershed: Approximately 259,000 km^2 (100,000 mi^2) (estimated from 119,000 mi^2 drainage area at Keokuk, IA) (LaTour et al. 1995)
Other field evidence observed: Standing water, barren/cracked soil surface (from previously standing water), wetland drainage patterns, and presence of algal mats.

Wetland hydrology? Yes: X No:
Rationale: Observation of inundation, location in an excavated area, and field indicators of wetland hydrology suggest that this site is inundated for a significant duration during the growing season.

DETERMINATION AND RATIONALE

Is this site a wetland? Yes: X No:
Rationale for decision: This site has hydrophytic vegetation, hydric soils, and wetland hydrology.

Determined by: Brian Wilm, Paul Tessene, Christina Grigg, and Brad Zercher
(vegetation and hydrology)
Jesse Kurylo (soils)
Illinois Natural History Survey
Center for Wildlife Ecology
607 East Peabody Drive
Champaign, Illinois 61820
(217) 244-2176 (Wilm)

Appendix C. Vegetation sampling results for FAP 313 (U.S. 34) mitigation wetland (n=43), Henderson County, IL, October 6, 2004.

Species	Total Cover (%)	Average % Cover per Plot	Relative Cover (%)	Frequency	Relative Frequency (%)	Relative Importance Value
*Typha angustifolia**[P]	1259.0	29.28	16.65	0.67	11.15	13.90
Eleocharis acicularis[P]	1307.5	30.41	17.29	0.56	9.23	13.26
Eleocharis erythropoda[P]	719.0	16.72	9.51	0.47	7.69	8.60
Bidens cernua[A]	801.5	18.64	10.60	0.40	6.54	8.57
Solidago canadensis[P]	612.5	14.24	8.10	0.30	5.00	6.55
Acer saccharinum[P]	218.5	5.08	2.89	0.47	7.69	5.29
Bidens aristosa[A]	385.0	8.95	5.09	0.23	3.85	4.47
Cassia fasciulata[A]	377.5	8.78	4.99	0.19	3.08	4.03
Aster pilosus[P]	204.0	4.74	2.70	0.23	3.85	3.27
*Setaria glauca**[A]	141.5	3.29	1.87	0.21	3.46	2.67
Populus deltoides[P]	105.0	2.44	1.39	0.23	3.85	2.62
Leersia oryzoides[P]	183.5	4.27	2.43	0.14	2.31	2.37
Echinochloa muricata[A]	39.5	0.92	0.52	0.14	2.31	1.42
Salix exigua[P]	115.0	2.67	1.52	0.07	1.15	1.34
Polygonum punctatum[A]	83.5	1.94	1.10	0.09	1.54	1.32
*Hordeum jubatum**[P]	82.5	1.92	1.09	0.09	1.54	1.31
Carex frankii[P]	125.0	2.91	1.65	0.05	0.77	1.21
Aster simplex[P]	7.5	0.17	1.00	0.12	1.92	1.01
Andropogon virginicus[P]	45.0	1.05	0.60	0.07	1.15	0.87
Alisma plantago-aquatica[P]	52.5	1.22	0.69	0.05	0.77	0.73
Cyperus strigosus[P]	52.5	1.22	0.69	0.05	0.77	0.73
Nymphaea odorata[P]	52.5	1.22	0.69	0.05	0.77	0.73
Sagittaria latifolia[P]	52.5	1.22	0.69	0.05	0.77	0.73
Ambrosia artemisiifolia[A]	21.0	0.49	0.28	0.07	1.15	0.72
Hypericum mutilum[P]	18.5	0.43	0.24	0.07	1.15	0.70

*Indicates species not native to Illinois.
A – Annual; B – Biennial; P - Perennial
(Table continues on following page.)

Appendix C. Continued.

Species	Total Cover (%)	Average % Cover per Plot	Relative Cover (%)	Frequency	Relative Frequency (%)	Relative Importance Value
Ammania coccinea[A]	9.0	0.21	0.12	0.07	1.15	0.64
Eleocharis obtusa[A]	6.5	0.15	0.09	0.07	1.15	0.62
*Coronilla varia**[P]	62.5	1.45	0.83	0.02	0.38	0.61
Solidago gigantea[P]	30.0	0.70	0.40	0.05	0.77	0.58
Bidens tripartita[A]	18.0	0.42	0.24	0.05	0.77	0.50
Cyperus spp.[P]	18.0	0.42	0.24	0.05	0.77	0.50
Carex spp.[P]	15.5	0.36	0.20	0.05	0.77	0.49
Agalinis tenuifolia[A]	37.5	0.87	0.50	0.02	0.38	0.44
Rubus allegheniensis[P]	37.5	0.87	0.50	0.02	0.38	0.44
Salix amygdaloides[P]	37.5	0.87	0.50	0.02	0.38	0.44
Salix nigra[P]	37.5	0.87	0.50	0.02	0.38	0.44
Scirpus fluviatilis[P]	37.5	0.87	0.50	0.02	0.38	0.44
Sparganium eurycarpum[P]	37.5	0.87	0.50	0.02	0.38	0.44
Geum canadense[P]	6.0	0.14	0.08	0.05	0.77	0.42
Lycopus americanus[P]	6.0	0.14	0.08	0.05	0.77	0.42
Panicum dichotomiflorum[A]	3.5	0.08	0.05	0.05	0.77	0.41
Asclepias incarnata[P]	15.0	0.35	0.20	0.02	0.38	0.29
Conyza canadensis[A]	15.0	0.35	0.20	0.02	0.38	0.29
Cyperus esculentus[P]	15.0	0.35	0.20	0.02	0.38	0.29
Eupatorium serotinum[P]	15.0	0.35	0.20	0.02	0.38	0.29
*Prunella vulgaris**[P]	15.0	0.35	0.20	0.02	0.38	0.29
Acalypha rhomboidea[A]	3.0	0.07	0.04	0.02	0.38	0.21
Aster lateriflorus[P]	3.0	0.07	0.04	0.02	0.38	0.21
Carex vulpinoidea[P]	3.0	0.07	0.04	0.02	0.38	0.21
Eleocharis macrostachya[P]	3.0	0.07	0.04	0.02	0.38	0.21

*Indicates species not native to Illinois.
A – Annual; B – Biennial; P - Perennial
(Table continues on following page.)

Appendix C. Continued.

Species	Total Cover (%)	Average % Cover per Plot	Relative Cover (%)	Frequency	Relative Frequency (%)	Relative Importance Value
Juncus interior[P]	3.0	0.07	0.04	0.02	0.38	0.21
Juncus tenuis[P]	3.0	0.07	0.04	0.02	0.38	0.21
Oxalis stricta[P]	3.0	0.07	0.04	0.02	0.38	0.21
Unidentified Grass	3.0	0.07	0.04	0.02	0.38	0.21
Erigeron annuus[B]	0.5	0.01	0.01	0.02	0.38	0.20
Quercus palustris[P]	0.5	0.01	0.01	0.02	0.38	0.20
Ulmus americana[P]	0.5	0.01	0.01	0.02	0.38	0.20
Native Species	5999.0	139.51	80.27	5.02	82.60	80.99
Non-native Species	1560.5	36.29	20.64	1.01	16.91	18.78
Perennial Species**	5617.5	130.64	75.22	4.40	72.60	73.46
Native Perennial Species**	4198.5	97.64	56.45	3.60	59.15	57.35
Annual	1942.0	45.16	25.69	1.63	26.91	26.31
All Species	7562.5	175.87	100.95	6.05	99.89	99.98

*Indicates species not native to Illinois
**Includes biennial species
A – Annual; B – Biennial; P - Perennial

Appendix D. Plant species list for FAP 313 (U.S. 34) mitigation wetland, Henderson County, Illinois, October 6, 2004.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
Acalypha rhomboidea	three-seeded mercury	herb	FACU	3	0	A
Acer saccharinum	silver maple	shrub, herb	FACW	-3	1	P
Acorus calamus	sweetflag	herb	OBL	-5	4	P
Agalinus tenuifolia	slender false foxglove	herb	FACW	-3	5	A
Agrostis alba	redtop	herb	FACW	-3	0	P
Alisma plantago-aquatica	broad-leaf water-plantain	herb	OBL	-5	2	P
Ambrosia artemisiifolia	common ragweed	herb	FACU	3	0	A
Ammannia coccinea	long-leaved ammannia	herb	OBL	-5	5	A
Andropogon virginicus	broom sedge	herb	FAC-	1	1	P
Apocynum sibiricum	Indian hemp	herb	FAC+	-1	2	P
Asclepias incarnata	swamp milkweed	herb	OBL	-5	4	P
Aster lateriflorus	side-flowering aster	herb	FACW-	-2	2	P
Aster pilosus	hairy aster	herb	FACU+	2	0	P
Aster simplex	panicled aster	herb	FACW	-3	3	P
Betula nigra	river birch	shrub, herb	FACW	-3	4	P
Bidens aristosa	swamp marigold	herb	FACW	-3	1	A
Bidens cernua	nodding beggar-ticks	herb	OBL	-5	2	A
Bidens tripartita	beggartick	herb	OBL	-5	2	A
Boehmeria cylindrica	false nettle	herb	OBL	-5	3	P
Bromus japonicus	Japanese brome	herb	FACU	3	*	A
Campsis radicans	trumpet creeper	herb	FAC	0	2	P
Carex frankii	bristly cattail sedge	herb	OBL	-5	4	P
Carex spp.	sedges	herb	------	--	--	--
Carex vulpinoidea	fox sedge	herb	OBL	-5	3	P
Carya illinoensis	pecan	shrub	FACW	-3	6 (planted)	P
Cassia fasciculata	golden cassia	herb	FACU-	4	1	A
Cephalanthus occidentalis	buttonbush	shrub, herb	OBL	-5	4	P
Conyza canadensis	horseweed	herb	FAC-	1	0	A
Cornus drummondii	rough-leaved dogwood	shrub, herb	FAC	0	2	P
Coronilla varia	crown vetch	herb	UPL	5	*	P

*Species not native to Illinois

(Species list continues on following page.)

Appendix D. Continued.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
Cyperus aristatus	bearded flatsedge	herb	OBL	-5	2	A
Cyperus esculentus	chufa	herb	FACW	-3	0	P
Cyperus spp.	flatsedge	herb	-----	--	--	--
Cyperus strigosus	straw colored flatsedge	herb	FACW	-3	0	P
Daucus carota	Queen-Anne's-lace	herb	UPL	5	*	B**
Echinochloa muricata	barnyard grass	herb	OBL	-5	0	A
Eleocharis acicularis	needle spike rush	herb	OBL	-5	3	P
Eleocharis erythropoda	spikerush	herb	OBL	-5	3	P
Eleocharis smallii (macrostachya)	spikerush	herb	OBL	-5	5	P
Eleocharis obtusa	spikerush	herb	OBL	-5	2	A
Elodea canadensis	anacharis	herb	OBL	-5	5 (planted)	P
Epilobium coloratum	cinnamon willow herb	herb	OBL	-5	3	P
Erigeron annuus	annual fleabane	herb	FAC-	1	1	B**
Eupatorium perfoliatum	common boneset	herb	FACW+	-4	4	P
Eupatorium serotinum	late boneset	herb	FAC+	-1	1	P
Fraxinus pennsylvanica	green ash	shrub, herb	FACW	-3	2	P
Geum canadense	white avens	herb	FAC	0	2	P
Hordeum jubatum	fox-tail barley	herb	FAC+	-1	*	P
Hypericum mutilum	dwarf St. John's wort	herb	FACW	-3	5	P
Iris shrevei	southern blue flag	herb	OBL	-5	5 (planted)	P
Juncus effusus solutus	common rush	herb	OBL	-5	4	P
Juncus interior	inland rush	herb	FAC+	-1	3	P
Juncus tenuis	path rush	herb	FAC	0	0	P
Juncus torreyi	Torrey rush	herb	FACW	-3	3	P
Leersia oryzoides	rice cutgrass	herb	OBL	-5	3	P
Lemna minor	common duckweed	herb	OBL	-5	3	A
Lobelia cardinalis	cardinal-flower	herb	OBL	-5	6	P
Lycopus americanus	common water horehound	herb	OBL	-5	3	P

*Species not native to Illinois
**Biennial
(Species list continues on following page.)

Appendix D. Continued.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
Lythrum alatum	winged loosestrife	herb	OBL	-5	5	P
Morus alba	white mulberry	shrub, herb	FAC	0	*	P
Nymphaea odorata	fragrant water lily	herb	OBL	-5	6 (planted)	P
Oxalis stricta	wood sorrel	herb	FACU	3	0	P
Panicum capillare	witch grass	herb	FAC	0	0	A
Panicum dichotomiflorum	fall panicum	herb	FACW-	-2	0	A
Panicum virgatum	prairie switchgrass	herb	FAC+	-1	4	P
Phalaris arundinacea	reed canary grass	herb	FACW+	-4	*	P
Polygonum pensylvanicum	giant smartweed	herb	FACW+	-4	1	A
Polygonum punctatum	dotted smartweed	herb	OBL	-5	3	A
Pontederia cordata	pickerelweed	herb	OBL	-5	8 (planted)	P
Populus deltoides	eastern cottonwood	shrub, herb	FAC+	-1	2	P
Potamogeton nodosus	American pondweed	herb	OBL	-5	7 (planted)	P
Prunella vulgaris	self-heal	herb	FAC	0	*	P
Quercus bicolor	swamp white oak	shrub	FACW+	-4	7 (planted)	P
Quercus palustris	pin oak	shrub, herb	FACW	-3	4 (planted)	P
Rubus allegheniensis	common blackberry	shrub, herb	FACU+	2	2	P
Rumex crispus	curly dock	herb	FAC+	-1	*	P
Sagittaria latifolia	arrowhead	herb	OBL	-5	4 (planted)	P
Salix amygdaloides	peach-leaved willow	shrub, herb	FACW	-3	4	P
Salix exigua	sandbar willow	shrub, herb	OBL	-5	1	P
Salix nigra	black willow	shrub, herb	OBL	-5	3	P
Scirpus cyperinus	wool grass	herb	OBL	-5	5	P
Scirpus fluviatilis	river bulrush	herb	OBL	-5	3	P
Scirpus tabernaemontanii	great bulrush	herb	OBL	-5	4 (planted)	P
Setaria faberi	giant foxtail	herb	FACU+	2	*	A
Setaria glauca	pigeon grass	herb	FAC	0	*	A
Solidago canadensis	Canada goldenrod	herb	FACU	3	1	P
Solidago gigantea	late goldenrod	herb	FACW	-3	3	P

*Species not native to Illinois

(Species list continues on following page.)

Appendix D. Continued.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
Sorghastrum nutans	Indian grass	herb	FACU+	2	4	P
Sparganium eurycarpum	burreed	herb	OBL	-5	5	P
Spartina pectinata	freshwater cord grass	herb	FACW+	-4	4	P
Typha angustifolia	narrow-leaved cattail	herb	OBL	-5	*	P
Typha latifolia	cattail	herb	OBL	-5	1	P
Ulmus americana	American elm	herb	FACW-	-2	5	P
Verbena hastata	blue vervain	herb	FACW+	-4	3	P

*Species not native to Illinois
Total number of species (including all planted species) - 92
Total number of species (excluding all planted species) – 82
Total number of species (excluding all planted tree species) – 89
Number of hydrophytic species (including all planted species) – 77 (83.6%)
Number of hydrophytic species (excluding all planted species) – 67 (81.7%)
Number of hydrophytic species (excluding planted tree species) – 74 (83.1%)
Number of species native to Illinois (including all planted species) – 81 (88.0%)
Number of species native to Illinois (excluding all planted species) – 71 (86.6%)
Number of species native to Illinois (excluding planted tree species) – 78 (87.6%)
FQI (including all planted species) = $R/\sqrt{N} = 230/\sqrt{81} = 25.6$
FQI (excluding all planted species) = $R/\sqrt{N} = 174/\sqrt{71} = 20.7$
FQI (excluding planted tree species) = $R/\sqrt{N} = 213/\sqrt{78} = 24.1$
Mean Coefficient of Conservatism (C) (including all planted species) = R/N = 230/81 = 2.8
Mean Coefficient of Conservatism (C) (excluding all planted species) = R/N = 174/71 = 2.5
Mean Coefficient of Conservatism (C) (excluding planted tree species) = R/N = 213/78 = 2.7
Mean Coefficient of Wetness (including all planted species) = -232/92 = -2.5
Mean Coefficient of Wetness (excluding all planted species) = -187/82 = -2.3
Mean Coefficient of Wetness (excluding planted tree species) = -222/89= -2.5
(Summary information continues on the following page.)

Appendix D. Continued.

Mean Coefficient of Wetness for native species (including all planted species) = -236/81 = -2.9
Mean Coefficient of Wetness for native species (excluding all planted species) = -191/71= -2.7
Mean Coefficient of Wetness for native species (excluding planted tree species) = -226/78 = -2.9
Number of perennial species (including all planted species) – 70 (76.1%)
Number of perennial species (excluding all planted species) – 60 (73.2%)
Number of perennial species (excluding planted tree species) – 67 (75.3%)
Number of perennial species native to Illinois (including all planted species) – 63 (68.5%)
Number of perennial species native to Illinois (excluding all planted species) – 53 (64.6%)
Number of perennial species native to Illinois (excluding planted tree species) – 59 (66.3%)
Number of annual species – 20 (21.7%)

Appendix E. Photographs from permanent photograph stations.

Figure 1. Photo station 1, facing north

Figure 2. Photo station 2, facing northeast

Figure 3. Photo station 3, facing northwest

Figure 4. Photo station 4, facing west

Figure 5. Photo station 5, facing west

Figure 6. Photo station 6, facing south

Figure 7. Photo station 7, facing north