

**Wetland Mitigation Monitoring Report for the FAP 319 (US 36) site
near East Hannibal, Pike County, Illinois
(Fifth monitoring year--2003)**

by Paul Tessene, Brian Wilm, Jesse Kurylo, and Mary Ann Feist
Illinois Natural History Survey, Champaign

Summary

Based on observations made during the 2003 season (the fifth and final year of monitoring), the following is a summary that relates the likelihood that the compensation site has met each goal within the five-year monitoring period. The goals, objectives, and performance standards follow those outlined in the IDOT monitoring request (25 March 1999).

Overall Project goal: To create 18.3 acres of forested palustrine wetland, enhance 5.0 acres of emergent wetlands, and preserve 12.6 acres of existing forested wetlands and 13.3 acres of upland buffer.

Hydrophytic vegetation, hydric soils, and wetland hydrology are currently present over the wetland creation site, which is somewhat smaller than the originally planned size, because of the necessity of placing non-wetland buffers between the excavated site and existing wetlands. The average area meeting the wetland hydrology criterion over the five-year period is 6.8 ha (16.8 acres), within the excavated site of about 7.0 ha (17.4 acres)(according to ISGS measurements).

Vegetation that colonized the created site is dominated by native, aggressive species. Still, the site is rich in species, and could be considered an environmental asset. This year, the importance value of hydrophytic species was lower than in previous years of sampling. However, most of that difference can be explained by the relatively low precipitation of the past growing season, and the opportunistic generalist species that grow in the occasionally mowed rows between the planted trees, where the vegetation sampling takes place. Planted tree species appear to be doing well, and other woody species are colonizing the site. However, more tree planting would be necessary in order to meet the performance standard of 100 planted trees/acre. The original wet meadow adjacent to the created wetland site is becoming overgrown with woody species.

Introduction

This report describes the fifth year of monitoring of an excavated wetland created to mitigate for wetlands affected by the construction of the FAP 319 (US 36) bridge at Hannibal, Missouri. The wetlands affected were located on the Illinois side of the bridge. Earthwork for the mitigation site was completed in 1997; trees were planted in the fall of 1997. More trees were planted in 1998 to replace planted trees that had died (pers. comm. from Mike Vanderhoff of the IDOT to Allen Plocher 1999). We observed that more tree seedlings were planted late in 1999 or early in 2000 to replace lost individuals.

This report discusses the goals, objectives, and performance criteria for the mitigation project, the methods used for monitoring the site, monitoring results, and discussion and recommendations. Methods and results are discussed for performance criteria for each goal.

Vegetation monitoring was previously conducted on a pre-existing wetland area within the mitigation site (Plocher and Tessene 1995, 1997; Tessene *et al.* 2000, 2001, 2002, 2003). Results of these surveys will be discussed.

Goals, Objectives, and Performance Criteria

The goals, objectives, and performance criteria described below follow those listed in the request to monitor the site (Tom Brooks, IDOT, 25 March 1999). Each goal was to be attained by the end of a five-year monitoring period.

Project Goal 1: The created wetland community should be a jurisdictional wetland as defined by current federal standards.

Objective: The created wetland will be formed through excavation in an 18.3-acre former crop field.

Performance criteria:

- 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 persist at the site.
- c. Presence of wetland hydrology: The area must be either permanently or periodically inundated at average depths less than 2 m (6.6 ft), or be saturated to the surface, for at least 12.5% of the growing season.

Project Goal 2: The created wetland community should meet standards for floristic composition and vegetation cover.

Objective: A floodplain forest will be created by planting native woody species. Herbaceous vegetation will be allowed to colonize the site naturally.

Performance criteria:

- a. Planted species survivorship: At the end of the five-year monitoring period, at least 100 planted trees per acre will be present and healthy in the created wetland site.
- b. Native species abundance and cover: At the end of the five-year monitoring period, at least 75% of the area in the created wetland should be covered by persistent hydrophytic vegetation. In the first year, percent coverage should be at least 15%. Native plants should be at least 50% of total species at the end of five years, at least 10% in the first year.
- c. Dominant plant species: None of the three most dominant plant species in the planned wetland should be non-native species.

Project Goal 3: The previously existing wet meadow community will continue to be monitored.

Objective: A wet meadow community will be maintained through periodic prescribed fire.

Performance criteria:

Native species abundance and cover: Native perennial, non-woody species will continue to be the predominant species.

Methods

Project Goal 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), based on areal coverage estimates for individual plant species. Each of the dominant plant species is assigned its wetland indicator rating (Reed 1988). A plant species that is rated facultative or wetter (FAC, FAC+, FACW, or OBL) is considered to be hydrophytic. If more than 50% of the dominant species present are hydrophytic, this criterion of wetlands is met.

b) Occurrence of hydric soils

To monitor hydric soil development, the soil will be sampled each year. Soil profile morphology, including horizon color, texture, and structure are analyzed at representative points throughout the site. Additionally, the presence, type, size, and abundance of redoximorphic features are recorded. In the absence of hydric soil indicators, hydrologic data can be used to confirm that conditions favorable for hydric soil formation persist at the site (Environmental Laboratory 1987).

c) Presence of wetland hydrology

Indicators of wetland hydrology include, but are not limited to, drift lines, wetland drainage patterns, sediment deposits on leaves, watermarks on trees, and visual observation of inundated or saturated soils (Environmental Laboratory 1987). Personnel from the Illinois State Geological Survey (ISGS) installed stage gages and monitoring wells in order to monitor the hydrology of the site. Monitoring well data from the ISGS (Watson and Sabatini 2003) were used to determine the seasonal depth to the water table and the area of the site that meets the wetland hydrology criterion.

Project Goal 2

a) Planted species survivorship

In 1997 and 1998, 1951 saplings were planted on the site (Mike Vanderhoff, IDOT, pers. comm. to Allen Plocher, 1999). In 1999, the plantings were sampled rather than totally enumerated in the interest of time constraints. For each 1000 feet of a planted row of trees, 200 feet were sampled (20% sample), with each planted sapling assigned to species and noted if living or dead. Assuming that trees were planted regularly throughout the site, as was indicated, this method would provide a representation of the survival rate of each species.

Our observations during the 2000 survey suggested that more tree seedlings were planted to replace dead individuals. Thus, a total count of planted tree species was conducted to determine the total number of individuals. Because more seedlings were planted, direct comparisons between the 1999 and 2000 results cannot be made. Total counts of planted tree species were again attempted in 2001, 2002, and 2003.

- b) Native species abundance and cover, and
 c) Dominant plant species

A complete vegetation survey of the excavated wetland basin was performed to tally all naturally occurring plant species present. Vegetation was also sampled in the wetland basin by placing 0.5 m² quadrats along four transects perpendicular to the access road. Two transects were placed on either side of the existing wetland site at approximately 20 m intervals. Quadrats were placed at 20 m intervals along each transect, for a total of 46 plots. Cover of each species encountered in each plot was assigned a cover class (modified from Daubenmire 1959) (Table 1). Frequency (proportion of quadrats where a species occurred) and average cover (from midpoints for each cover class) were used to compute relative frequency (frequency of a species relative to total observations) and relative cover (or dominance)(cover relative to total observed cover). These two values were averaged to determine the importance value for each species sampled. Dominant species were determined by adding the importance values, listed in descending order. Those species that immediately exceed 50% of importance value, plus any additional species with an importance value of 20% or greater, are considered dominant species.

Table 1. Cover classes used in vegetation 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 |

Included with the assessment of a site is the site's Floristic Quality Index, as described by Swink and Wilhelm (1994) and Taft *et al.* (1997). Although the Index is not a substitute for quantitative vegetation analysis in assessing plant communities, it provides a measure of the floristic integrity or level of disturbance of a site. Each plant species native to Illinois is assigned a rating between 0 and 10 (the Coefficient of Conservatism) that is a subjective indicator of how likely a plant may be found on an undisturbed site in a natural plant community. A plant species that has a low Coefficient of Conservatism (c) tends to be common and is likely to tolerate disturbed conditions; a species with a high c is relatively rare and is likely to require specific, undisturbed habitats. Species not native to Illinois are not rated.

To calculate the Floristic Quality Index (FQI), first compute the mean c value (\bar{c}), $\bar{c} = (\sum C)/N$, where $\sum C$ represents the sum of the numerical ratings (c) for all species native to Illinois recorded for a site, and N represents the number of native species on the site. The c value for each species is shown in the species list for the site. The FQI of each site is determined by multiplying the mean c value by the square root of N ($\bar{c} \sqrt{N}$)(equivalent to $\sum C/\sqrt{N}$). An Index score below 10 suggests a site of low natural quality; below 5, a highly disturbed site. An FQI value of at least 10 (\bar{c} above 3.0) suggests that a site has evidence of native character and may be considered an environmental asset.

Project Goal 3

Vegetation in the pre-existing wet meadow was sampled in 1994 and 1996 (Plocher and Tessene 1995, 1997). This sampling compared vegetation before and after a prescribed burn in the spring of 1996. (No other prescribed burns were attempted at the site.) Vegetation sampling conducted during the monitoring of the wetland creation site in 1999 and 2000 followed the same methods. In the 2001, 2002, and 2003 surveys of the site, systematic sampling was not conducted in the pre-existing wetland. Herbaceous vegetation closely resembled that of previous surveys at first glance. However, the continued vigorous growth of woody vegetation, especially around the perimeter of this area, showed that the goal of maintaining a wet meadow may prove elusive.

Results and discussion

Project goal 1

a) Predominance of hydrophytic vegetation

Dominant plant species for the created wetland are listed in Table 2. Only 40% of the dominant species are hydrophytic. Possible reasons for this are discussed below. Species encountered during vegetation sampling at the site, used to determine the dominant species, are listed in Table 5. A full list of plant species observed is presented in the wetland determination form at the end of this report (Appendix 1).

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

| <u>Dominant Plant Species</u> | <u>Indicator Status</u> | <u>Stratum</u> |
|-------------------------------|-------------------------|----------------|
| 1. <i>Aster simplex</i> | FACW | herb |
| 2. <i>Bidens frondosa</i> | FACW | herb |
| 3. <i>Aster pilosus</i> | FACU+ | herb |
| 4. <i>Solidago canadensis</i> | FACU | herb |
| 5. <i>Cassia fasciculata</i> | FACU | herb |

The herbaceous species that colonized the site continue to be dominated by taxa that can thrive under disturbed conditions, such as the original site excavation, occasional mowing, and periodic, prolonged inundation or saturation. *Aster simplex* has been a dominant in the past four years of sampling. *Echinochloa* was a dominant in each of the first four surveys, but has become relatively less abundant in the past two years (see Table 5). *Typha latifolia* was a dominant in three of the five surveys of the created wetland site, but was present with lower importance this year, perhaps as a result of mowing and relatively low precipitation during the past growing season. *Aster* spp. and *Solidago* are rhizomatous perennials and are likely to remain common; they do well under an annual or semi-annual mowing. *Bidens* and *Cassia* are annuals that can grow quickly and compete well where the mowed areas lessen competition from perennial species.

Although only 40% of the dominant species are considered to be hydrophytic (hence, not meeting this goal of at least 50% of the dominant species being hydrophytic), vegetation over the entire site could still be considered to meet the criterion for several reasons. First, predominant hydrophytic vegetation was present in all the other years of monitoring (Tessene *et al.* 2000, 2001, 2002, 2003), and precipitation was relatively low in 2003. Second, overall sampled vegetation is hydrophytic. This includes 34 of 50 species sampled, and about 65% of overall importance value. Only one other

non-wetland species (*Pyrrhopappus carolinianus*) is one of the 15 most common species sampled (Table 5); thus most non-wetland species are of relatively little importance to the overall site.

When mowing ceases and the site is left on its own, the spaces between the rows of planted trees are likely to fill with more woody species and persistent perennials, while annual species are likely to diminish. Vegetation sampling as presently conducted does not take the vigorous growth of woody species along the rows of planted trees into account.

b) Presence of hydric soils

This site has been excavated. Soils mapped at the site include Fluvaquentic Hapludolls which are somewhat poorly drained (Shaffton silty clay loam and Coffeen silt loam) and Fluvaquentic Endoaquolls which are poorly drained (Ambraw silt loam and Beaucoup silty clay loam)(Struben and Lily 1999). Soils at the site were most similar to the Ambraw series, assuming that the mollic epipedon had been removed during excavation. Soils in the Ambraw series are commonly found in this part of the Mississippi River floodplain. They consist of very deep soils formed in stratified loamy alluvium.

Soil cores were examined from several different areas at the site. A typical pedon is described below. Soils in a large, expanding cattail patch had a thin organic layer at the surface. The cattails appeared stunted this year and the thin organic layer at the surface resembled dried brittle mats. Redoximorphic features began near the soil surface and were distinct throughout the profile. The depth to saturation was not observed at the time of visit, but there was evidence of episaturation. The site hydrology and the morphological characteristics of these soils suggest that they are saturated long enough for anaerobic conditions to occur in the upper profile for a significant duration. Therefore, these soils are hydric.

Table 3a. Description of the soils for the northwestern portion of the site

| Depth(in) | Matrix Color | Concentrations | Depletions | Texture | Structure |
|-----------|--------------------|---------------------|------------|------------|------------------------|
| 0 - 5 | 10YR 3.5/1 | 10YR 3/3 | none | Loam | Granular to Sub-blocky |
| 5 - 8 | N 3.5/0 & 10YR 3/1 | 10YR 3/6 & 10YR 3/3 | none | Sandy Loam | Massive |
| 8 - 13 | Multi-colored | | | Sand | Single Grain |

Table 3b. Description of the soils for the majority of the site

| Depth(in) | Matrix Color | Concentrations | Depletions | Texture | Structure |
|-----------|--------------|----------------|------------|-----------------|--------------|
| 0 - 2 | 10YR 3/1 | 10YR 4/6 | none | Loam | Granular |
| 2 - 18 | 10YR 3/1 | 7.5YR 3/4 | none | Silty Clay Loam | Sub-blocky |
| 18 - 25 | 10YR 4/1 | 7.5YR 3/4 | none | Sandy Clay Loam | Sub-blocky |
| 25 - 26 | 10YR 4/1 | | | Sand | Single Grain |

c) Presence of wetland hydrology

Field evidence of wetland hydrology included the excavated depression landscape position, water-borne sediment deposits, and stranded algal mats. Wetland hydrology on the site does not derive directly from river flooding, since the site is behind a levee, but from a rise in local water tables.

Well data from instruments placed by ISGS personnel suggest that the total area of the created wetland that conclusively meets the wetland hydrology criterion is 6.9 ha (16.9 acres)(Watson and Sabatini 2003)(Appendix 3). This compares with 6.7 ha (16.5 acres) in 1999 (Fucciolo *et al.* 1999), 6.5 ha (16.0 acres) in 2000 (Watson and Pociask 2000), and 7.0 ha (17.4 acres) in 2001 and 2002 (Watson and Pociask 2001, 2002). The average area meeting the wetland hydrology criterion over the five-year period is 6.8 ha (16.8 acres). This is fairly constant, considering that the site is a slight excavation in the Mississippi River floodplain, totally dependent on local and regional water tables.

Project Goal 2

a) Survival of planted trees

According to Mike Vanderhoff of the Illinois Department of Transportation (pers. comm. to Allen Plocher, 1999), 1636 trees (409 each of four different species) were originally planted on the 18.3 acre former crop field in the fall of 1997, after earth work was completed for the wetland compensation site. In the fall of 1998, 654 trees were planted to replace those that had died, in the original 20' by 20' spacing. Then, in order to avoid ponded areas on the site, the remaining 315 trees were planted between existing live stems, resulting in 10-foot spacing in some rows. As a result, the total number of live planted saplings on the planned wetland site was 1951 in the fall of 1998.

When we began to assess the planted trees during the 2000 survey, we observed that new individuals had been planted to replace those that had died. This was especially apparent with the large number of pecan seedlings that we observed. However, we were not certain how many were planted. Thus, a total count of live and dead trees was made, instead of the sampling of 20% of total row length that was conducted in 1999. A total count was also attempted in 2001 and 2002. Mowing between the rows of planted trees aided the counts (although a few trees were mowed down in the process). Site conditions allowed the mowers to work even in the dense cattail patches in lowest elevation areas on the site in 2002.

Table 4 presents data for planted tree survival, with numbers of observed live stems. Density of live stems of each species is also listed. Results from the counts in other years are provided for comparison (Table 4a).

Table 4. Observed survival of planted trees in 2003 at the East Hannibal wetland mitigation site.

| Species | Live stems | Density |
|-------------------------------|-------------|-----------------------|
| | Observed | live/acre (live/ha) |
| <i>Carya illinoensis</i> | 261 | 14.50 (35.82) |
| <i>Fraxinus pennsylvanica</i> | 500 | 27.78 (68.61) |
| <i>Quercus bicolor</i> | 453 | 25.18 (62.16) |
| <i>Quercus palustris</i> | 304 | 16.89 (41.72) |
| Total | 1518 | 84.33 (208.30) |

Table 4a. Observed survival of planted trees in each year at the East Hannibal wetland mitigation site.

| Species | Live stems observed each year | | | | |
|-------------------------------|-------------------------------|--------------|--------------|--------------|--------------|
| | 1999 (estimated) | 2000 | 2001 | 2002 | 2003 |
| <i>Carya illinoensis</i> | 135 | 310 | 264 | 297 | 261 |
| <i>Fraxinus pennsylvanica</i> | 450 | 503 | 460 | 479 | 500 |
| <i>Quercus bicolor</i> | 230 | 439 | 413 | 411 | 453 |
| <i>Quercus palustris</i> | 220 | 332 | 298 | 302 | 304 |
| <i>Prunus</i> sp. | 0 | 5 | 0 | 0 | 0 |
| Total | 1035 | 1589 | 1435 | 1486 | 1518 |
| Approx. #/acre | 56.56 | 88.56 | 79.72 | 82.56 | 84.33 |

The 2003 tree counts are somewhat greater for *Fraxinus* and *Quercus* than in 2002. Some of the ash saplings recorded may have been naturally established from the surrounding forests instead of from planted stock. This species is doing well on the site. A small increase in *Q. palustris* may have resulted from some individuals that had been previously overlooked, or that naturally established individuals were noted as planted stock. The number of pecans counted in 2002 also went up from the year before. Much of the variation in counts of pecans in 2002 and swamp white oak in 2003 may just be that some were overlooked or thought to be dead the previous year and were not counted at that time.

From the above tables, one can note that numbers of individuals of all species increased between 1999 and 2000, because more trees had been planted. *Fraxinus* remains the most common species in all surveys.

A small number of planted specimens, observed in 2000, that appeared to be individuals of the genus *Prunus*, did not survive under the site conditions. Members of this genus are generally not found in wetlands.

In any case, the number of planted tree stems on the site does not meet the performance standard, which states that 100 healthy stems per acre is necessary. Thus, more woody stems may need to be planted.

On the other hand, other woody species are colonizing the site. *Acer saccharinum*, *Betula nigra*, *Diospyros virginiana*, *Populus deltoides*, *Salix exigua*, *Salix nigra*, and *Ulmus americana* stems, as well as unplanted *Fraxinus pennsylvanica* and *Quercus palustris*, were all recorded from the excavated wetland site. Woody plants will certainly continue to invade the site from surrounding forests. Therefore, the site will eventually become floodplain forest, interspersed with patches of marsh where cattails and other herbaceous species dominate (in the wettest parts of the wetland creation site).

b) Abundance and cover of native species

Table 5 below presents the results of vegetation sampling in the created wetland site. We noted 50 species, 41 of which are native to Illinois, in the 46 sampling quadrats. (Interestingly, 38 species were sampled in each survey in 2000, 2001, and 2002.) Thus, about 82% of the species sampled and 92% of the importance value in the plots is contributed by native species. In 2001 and 2002, 33 of the 38 species sampled were native, and 28 of 38 in 2000 were native. The dominant species are all native species, as was in the case for all surveys except for 2000, where *Setaria faberi* was one of the dominants (Tessene *et al.* 2001).

Table 5. Results of vegetation sampling at the East Hannibal created wetland basin in 2003.

| Species | Frequency (%) | Relative Freq. (%) | Average Cover (%) | Relative Cover (%) | Importance Value |
|----------------------------------|---------------|--------------------|-------------------|--------------------|------------------|
| <i>Aster simplex</i> | 69.57 | 12.65 | 48.42 | 21.63 | 17.14 |
| <i>Bidens frondosa</i> | 52.17 | 9.49 | 22.30 | 9.96 | 9.72 |
| <i>Aster pilosus</i> | 47.83 | 8.70 | 23.42 | 10.46 | 9.58 |
| <i>Solidago canadensis</i> | 39.13 | 7.11 | 17.50 | 7.82 | 7.46 |
| <i>Cassia fasciculata</i> | 34.78 | 6.32 | 18.10 | 8.08 | 7.20 |
| <i>Typha latifolia</i> | 32.61 | 5.93 | 10.33 | 4.61 | 5.27 |
| <i>Echinochloa muricata</i> | 23.91 | 4.35 | 8.42 | 3.76 | 4.05 |
| <i>Pyrrhopappus carolinianus</i> | 23.91 | 4.35 | 5.05 | 2.26 | 3.30 |
| <i>Asclepias incarnata</i> | 17.39 | 3.16 | 5.41 | 2.42 | 2.79 |
| <i>Rumex crispus</i> | 17.39 | 3.16 | 4.57 | 2.04 | 2.60 |
| <i>Eupatorium serotinum</i> | 15.22 | 2.77 | 5.33 | 2.38 | 2.57 |
| <i>Eleocharis erythropoda</i> | 15.22 | 2.77 | 4.78 | 2.14 | 2.45 |
| <i>Cyperus esculentus</i> | 13.04 | 2.37 | 2.93 | 1.31 | 1.84 |
| <i>Juncus torreyi</i> | 6.52 | 1.19 | 5.54 | 2.48 | 1.83 |
| <i>Cyperus aristatus</i> | 8.70 | 1.58 | 3.80 | 1.70 | 1.64 |
| <i>Vitis riparia</i> | 15.22 | 2.77 | 0.72 | 0.32 | 1.54 |
| <i>Setaria faberi</i> | 6.52 | 1.19 | 4.02 | 1.80 | 1.49 |
| <i>Acer saccharinum</i> | 10.87 | 1.98 | 1.62 | 0.72 | 1.35 |
| <i>Eleocharis obtusa</i> | 4.35 | 0.79 | 3.48 | 1.55 | 1.17 |
| <i>Trifolium repens</i> | 4.35 | 0.79 | 3.48 | 1.55 | 1.17 |
| <i>Campsis radicans</i> | 8.70 | 1.58 | 1.30 | 0.58 | 1.08 |
| <i>Carex sp.</i> | 6.52 | 1.19 | 1.47 | 0.66 | 0.92 |
| <i>Bidens cernua</i> | 4.35 | 0.79 | 2.17 | 0.97 | 0.88 |
| <i>Festuca pratensis</i> | 4.35 | 0.79 | 2.17 | 0.97 | 0.88 |
| <i>Lythrum alatum</i> | 4.35 | 0.79 | 2.17 | 0.97 | 0.88 |
| <i>Trifolium pratense</i> | 6.52 | 1.19 | 1.21 | 0.54 | 0.86 |
| <i>Desmodium paniculatum</i> | 6.52 | 1.19 | 0.72 | 0.32 | 0.75 |
| <i>Andropogon virginicus</i> | 2.17 | 0.40 | 1.85 | 0.83 | 0.61 |
| <i>Eleocharis compressa</i> | 2.17 | 0.40 | 1.36 | 0.61 | 0.50 |
| <i>Polygonum hydropiperoides</i> | 2.17 | 0.40 | 1.36 | 0.61 | 0.50 |
| <i>Boltonia asteroides</i> | 2.17 | 0.40 | 0.82 | 0.36 | 0.38 |
| <i>Conyza canadensis</i> | 2.17 | 0.40 | 0.82 | 0.36 | 0.38 |
| <i>Juncus dudleyi</i> | 2.17 | 0.40 | 0.82 | 0.36 | 0.38 |
| <i>Polygonum hydropiper</i> | 2.17 | 0.40 | 0.82 | 0.36 | 0.38 |
| <i>Polygonum pennsylvanicum</i> | 2.17 | 0.40 | 0.82 | 0.36 | 0.38 |
| <i>Salix exigua</i> | 2.17 | 0.40 | 0.82 | 0.36 | 0.38 |
| <i>Solanum carolinense</i> | 2.17 | 0.40 | 0.82 | 0.36 | 0.38 |
| <i>Apocynum sibiricum</i> | 2.17 | 0.40 | 0.33 | 0.15 | 0.27 |
| <i>Bromus japonicus</i> | 2.17 | 0.40 | 0.33 | 0.15 | 0.27 |
| <i>Carex frankii</i> | 2.17 | 0.40 | 0.33 | 0.15 | 0.27 |
| <i>Lactuca saligna</i> | 2.17 | 0.40 | 0.33 | 0.15 | 0.27 |
| <i>Oxalis dillenii</i> | 2.17 | 0.40 | 0.33 | 0.15 | 0.27 |
| <i>Polygonum punctatum</i> | 2.17 | 0.40 | 0.33 | 0.15 | 0.27 |
| <i>Populus deltoides</i> | 2.17 | 0.40 | 0.33 | 0.15 | 0.27 |
| <i>Scirpus atrovirens</i> | 2.17 | 0.40 | 0.33 | 0.15 | 0.27 |
| <i>Silene antirrhina</i> | 2.17 | 0.40 | 0.33 | 0.15 | 0.27 |
| <i>Fraxinus pennsylvanica</i> | 2.17 | 0.40 | 0.07 | 0.03 | 0.21 |
| <i>Polygonum persicaria</i> | 2.17 | 0.40 | 0.07 | 0.03 | 0.21 |
| <i>Ulmus americana</i> | 2.17 | 0.40 | 0.07 | 0.03 | 0.21 |
| <i>Veronica peregrina</i> | 2.17 | 0.40 | 0.07 | 0.03 | 0.21 |
| Total | 550.00 | 100.00 | 223.92 | 100.00 | 100.00 |

Table 5b. Summary of the above values over four years of sampling the created wetland site.

| Aspect | 2000 value | 2001 value | 2002 value | 2003 value |
|-------------------|------------|------------|------------|------------|
| Species sampled | 38 | 38 | 38 | 50 |
| Native species* | 29 (77.2%) | 33 (93.0%) | 33 (93.4%) | 41 (91.9%) |
| Non-native spp. | 9 (22.8%) | 5 (7.0%) | 5 (6.6%) | 9 (8.1%) |
| Annual species | 19 (79.6%) | 18 (44.3%) | 13 (30.9%) | 16 (31.8%) |
| Perennial species | 19 (20.4%) | 20 (55.7%) | 25 (69.1%) | 34 (68.2%) |
| Woody species | 5 (3.0%) | 4 (3.1%) | 6 (4.3%) | 7 (5.0%) |
| Hydrophytes | 28 (78.6%) | 29 (86.6%) | 32 (88.2%) | 34 (64.9%) |
| Non-hydrophytes | 10 (21.4%) | 9 (13.4%) | 6 (11.8%) | 16 (35.1%) |

* Number of species in each category, followed by their collective importance value, in parentheses

After the first few years, site conditions appear relatively stable and native, persistent, hydrophytic vegetation is dominant. This is true even in the sample areas between tree planting rows that are mowed occasionally. However, the original project goal that 75% of the site be covered by persistent hydrophytic vegetation is not quite met, if by "persistent," one means "perennial." When mowing between the rows of planted trees ceases, it is likely that perennial, even woody, species will overtake annual species by a greater extent. The standard of 50% cover by native species has been exceeded throughout the monitoring period.

During a survey of naturally occurring plant species on the wetland creation site, 125 native and 29 non-native species were observed (see Appendix 1). A strong majority of the species observed includes perennials, hydrophytes, and plants that are native to Illinois. The FQI value for the site (unplanted species) was 30.5 with a mean C value of 2.7, indicating good natural quality and a site that could be considered an environmental asset. Including the planted saplings, the FQI value was 31.4 with a mean C value of 2.8. Table 6 below compares the 2003 values with those found from plant species surveys of the created wetland basin from 1999 through 2002 (Tessene *et al.* 2000, 2001, 2002, 2003). General trends suggest an increasing number of naturally occurring plant species on the site, with an increase in the proportion of perennial species as the site develops.

Table 6. Development of the plant community in the created wetland basin.

| Aspect | 1999 value | 2000 value | 2001 value | 2002 value | 2003 value |
|-------------------|------------|------------|------------|-------------|-------------|
| Species | 57 | 84 | 109 | 134 | 154 |
| Native species | 45 (78.9%) | 69 (82.1%) | 93 (85.3%) | 111 (82.8%) | 125 (81.2%) |
| Non-native spp. | 12 (21.1%) | 15 (17.9%) | 16 (14.7%) | 23 (17.2%) | 29 (18.8%) |
| Annual species | 28 (49.1%) | 36 (42.9%) | 39 (35.8%) | 41 (30.6%) | 49 (31.8%) |
| Perennial species | 29 (49.9%) | 48 (57.1%) | 70 (64.2%) | 93 (69.4%) | 105 (68.2%) |
| Woody species* | 6 (10.5%) | 11 (13.1%) | 17 (15.6%) | 21 (15.7%) | 25 (16.2%) |
| Hydrophytes | 43 (75.4%) | 65 (77.4%) | 86 (78.9%) | 101 (75.4%) | 114 (74.0%) |
| Non-hydrophytes | 14 (24.6%) | 19 (22.6%) | 23 (21.1%) | 33 (24.6%) | 40 (26.0%) |
| FQI** | 14.6 | 17.8 | 24.5 | 29.0 | 30.5 |
| Mean c value | 2.2 | 2.1 | 2.5 | 2.8 | 2.7 |

* shrubs and woody vines

** FQI for non-planted species

c) Dominant plant species

The herbaceous species that colonized the site are dominated by taxa that can tolerate disturbed conditions, such as the original site excavation, occasional mowing, and periodic, prolonged inundation. *Echinochloa*, a dominant species from 1999 to 2002, and *Setaria*, a non-native annual species that was among the dominants in 2000, have both become less common, as perennial species increased in number and importance after the first few years. *Bidens frondosa*, another annual, remained important in 2003, while *Cassia fasciculata* became more common. *Aster simplex*, *Aster pilosus*, and *Solidago canadensis*, the other dominants, are widespread, perennial, rhizomatous species.

Cattails appeared to increase noticeably on the site between 2000 and 2001, but were less common in 2003 than in the previous year. Locally, this species can form monotypic stands in the wettest parts of the site. Paths mown between the rows of planted trees may help check the growth of cattails, and diminish their ability to compete with the saplings. In the long run, the trees should be able to shade out the cattails, except in the wettest areas. If trends continue, the site will become a complex of marsh and floodplain forest, rather than merely floodplain forest.

Project Goal 3

A list of all species observed in the wet meadow is presented in Appendix 2. These remain unchanged from observations in 2000, 2001, and 2002. Quantitative vegetation sampling was not performed in 2001, 2002, or 2003. Overall, the original wet meadow site seemed similar to previous years, although woody growth continues encroaching on the fringes of the site.

Observations are comparable with previous sampling by Plocher and Tessene (1995, 1997), Tessene *et al.* (2000, 2001), and the original wetland determinations by Keene and Tessene in 1992, which showed the same three species (*Leersia oryzoides*, *Aster simplex*, *Apocynum sibiricum*) as dominants.

An original goal of this wetland mitigation project was that this pre-existing wet meadow persist, and that woody growth be kept in check by controlled fire. This goal is not being met, but given the vigorous growth of *Fraxinus*, *Populus*, *Salix*, and other woody species on the site, a burn would not be enough to slow their growth and eventual dominance of the site. The one prescribed burn on the site (Plocher and Tessene 1997) did not seem to slow the establishment of woody growth. Alterations of site hydrology that occurred when the adjacent wetland basin was created, and the cultivation of the wetland creation/restoration site ceased, may have contributed to the diminishing of the wet meadow; the abundant sources of propagules nearby certainly contributed. Cutting the trees, along with herbicide application to the cut stumps, may be necessary to control woody species, if this remains a project goal.

Recommendations

The excavated portion of the wetland creation site has developed into a wetland, given that dominant hydrophytic vegetation, hydric soils, and wetland hydrology are present throughout the excavation. However, it appears that the whole former field was 7.4 ha (18.3 acres), and that the excavated basin was 7.0 ha (17.4 acres) (Fucciolo *et al.* 1999). Thus, not all of the 7.4 ha (18.3 acre) site can be called jurisdictional wetland, as is called for in the mitigation plan. Given the nature of the site, there is not room to increase the basin.

In order to achieve the desired 100 live planted trees per acre called for in the initial mitigation site plan, replacement trees will need to be installed to allow for inevitable losses. On the other hand, natural colonization by woody species present in the surrounding wetlands is increasing, and may make up for much of the loss.

Unplanted herbaceous species in the created wetland basin are dominated by somewhat weedy species that tolerate disturbance, as one might expect on a recently created site. A majority of the species includes native hydrophytes, following project goals. Perennial species provide a majority of species present, as well as a majority of the cover.

Typha may come to pose a threat to a diverse herbaceous cover on the site, for it generally forms dense patches where found on the site. However, its dominance seemed diminished during the current survey. *Phalaris*, another potential threat, since it occurs in the surrounding area, has apparently not emerged as such during the monitoring period.

The wet meadow (originally present on the site before the excavated wetland basin was created) is becoming overgrown by woody vegetation, a natural process, but one that goes against project goals (Goal 3). At this point, only a concerted effort involving cutting all woody stems, followed by the application of herbicides to prevent resprouting, would work to meet that goal. After woody growth was removed, the use of controlled fire in subsequent years would promote herbaceous vegetation while keeping woody growth short.

Literature Cited

- Daubenmire, R. F. 1959. A canopy coverage method. *Northwest Science* 33: 43-64.
- Environmental Laboratory. 1987. Corps of engineers wetlands delineation manual. Vicksburg, MS: US Department of the Army Waterways Experiment Station. 100 pp. + Appendices A-D.
- Fucciolo, C. S., J. J. Miner, S. E. Benton, D. B. Ketterling, and M. B. Miller. 1999. Annual water-level report for active IDOT sites, September 1, 1998, to September 1, 1999. ISGS #10: Hannibal Bridge Wetland Compensation Site. Technical Report submitted to the Illinois Department of Transportation. 4 pp. introduction + 8 pp.
- Keene, D. J., and P. Tessene. 1992. Mitigation site assessment for US 36 (Hannibal Bridge) southeast of East Hannibal, Pike County. Technical Report submitted to the Illinois Department of Transportation. 18 pp.
- Plocher, A., and P. Tessene. 1995. East Hannibal Mitigation Site (Pike Co.) pretreatment vegetation sampling report. Technical Report submitted to the Illinois Department of Transportation. 6 pp.
- Plocher, A., and P. Tessene. 1997. East Hannibal Mitigation Site (Pike Co.) post-fire vegetation sampling report. Technical Report submitted to the Illinois Department of Transportation. 6 pp.
- Reed, P. B., Jr. 1988. National list of plant species that occur in wetlands: Illinois. St. Petersburg, FL: National Wetlands Inventory. 23 pp. + iv + four appendices

Struben, G. R., and M. E. Lilly. 1999. Soil survey of Pike County, Illinois. United States Department of Agriculture Natural Resources Conservation Service in cooperation with the Illinois Agricultural Experiment Station. Illinois Agricultural Experiment Station Soil Report No. 155. 305 pp. + 135 soil map sheets.

Swink, F., and G. Wilhelm. 1994. "Coefficients of Conservatism" and "Floristic Quality Assessment." In: Plants of the Chicago Region, fourth edition, pp. 8-9, 11-18. Indianapolis: Indiana Academy of Science. 921 pp. + xiv.

Taft, J. B., G. S. Wilhelm, D. M. Ladd, and L. A. Masters. 1997. Floristic Quality Assessment for vegetation in Illinois: a method for assessing vegetation integrity. *Erigenia* 15, 95 pp.

Tessene, P., M. Coopriider, A. Plocher, and B. Wilm. 2000. Wetland mitigation monitoring report for the FAP 319 (US 36) site near East Hannibal, Pike County, Illinois. Technical report submitted to the Illinois Department of Transportation. 12 pp.

Tessene, P., M. Coopriider, B. Wilm, and J. Kurylo. 2001. Wetland mitigation monitoring report for the FAP 319 (US 36) site near East Hannibal, Pike County, Illinois (second monitoring year—2000). Technical report submitted to the Illinois Department of Transportation. 16 pp.

Tessene, P., J. Kurylo, B. Wilm, and M. Feist. 2002. Wetland mitigation monitoring report for the FAP 319 (US 36) site near East Hannibal, Pike County, Illinois (third monitoring year—2001). Technical report submitted to the Illinois Department of Transportation. 18 pp.

Tessene, P., J. Kurylo, B. Wilm, and M. Feist. 2003. Wetland mitigation monitoring report for the FAP 319 (US 36) site near East Hannibal, Pike County, Illinois (fourth monitoring year—2002). Technical report submitted to the Illinois Department of Transportation. 18 pp.

Watson, B. A., and G. E. Pociask. 2001. Hannibal bridge wetland compensation site. ISGS #10. Technical report submitted to the Illinois Department of Transportation. 10 pp.

Watson, B. A., and G. E. Pociask. 2002. Hannibal bridge wetland compensation site. ISGS #10. Technical report submitted to the Illinois Department of Transportation. 10 pp.

Watson, B. A., and P. J. Sabatini. 2003. Hannibal bridge wetland compensation site. ISGS #10. Technical report submitted to the Illinois Department of Transportation. 11 pp.

Appendix 1
ROUTINE ONSITE WETLAND DETERMINATION
Site 1 (page 1 of 6)

Field Investigators: Tessene, Wilm, Kurylo, and Feist
Job No.: P96-037-73
State: Illinois
Site name: Marsh
Legal Description: NE/4, Sec. 17, T.4S., R.8W.
Location: Excavated part of wetland restoration/creation site at East Hannibal

Date: 13 August 2003
Project Name: FAP 319 (US 36)
Applicant: IDOT District 6

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

VEGETATION

| <u>Dominant Plant Species</u> | <u>Indicator Status</u> | <u>Stratum</u> |
|-------------------------------|-------------------------|----------------|
| 1. <i>Aster simplex</i> | FACW | herb |
| 2. <i>Bidens frondosa</i> | FACW | herb |
| 3. <i>Aster pilosus</i> | FACU+ | herb |
| 4. <i>Solidago canadensis</i> | FACU | herb |
| 5. <i>Cassia fasciculata</i> | FACU | herb |

Percentage of dominant species that are OBL, FACW, FAC+, or FAC: 40%

Hydrophytic vegetation: Yes: No:

Rationale: Although fewer than 50% of the dominants are OBL, FACW, FAC+, or FAC, overall vegetation that was sampled was hydrophytic. Also, this is the first year in five that the dominant species were not predominantly hydrophytic; no site conditions had changed, other than perhaps lower than average precipitation in the past growing season.

SOILS

Series and phase: Ambraw silt loam (Fluvaquentic Endoaquoll)

On Pike County hydric soils list? Yes: No:
Is the soil a histosol? Yes: No: Histic epipedon present? Yes: No:
Redox Concentrations? Yes: No: Colors: 10YR 4/6 & 7.5YR 3/4
Redox Depletions? Yes: No:
Matrix color: 10YR 3/1 over 10YR 4/1

Other hydric soil indicators: This site is located in a depressional area.

Hydric soils: Yes: No:

Rationale: Site hydrology and the morphological characteristics of this soil suggest that the soils are saturated long enough for anaerobic conditions to occur in the upper profile for a significant duration. These conditions are demonstrated by the low chroma matrix and redox features. Therefore, these soils are hydric. This soil also meets the F3 and F6 hydric soil indicators from NRCS.

ROUTINE ONSITE WETLAND DETERMINATION
 Site 1 (page 2 of 6)

Field Investigators: Tessene, Wilm, Kurylo, and Feist
 Job No.: P96-037-73
 State: Illinois
 Site name: Marsh
 Legal Description: NE/4, Sec. 17, T.4S., R.8W.
 Location: Excavated part of wetland restoration/creation site at East Hannibal

Date: 13 August 2003
 Project Name: FAP 319 (US 36)
 Applicant: IDOT District 6

HYDROLOGY

Inundated: Yes: No: X Depth of standing water: None
 Depth to saturated soil: More than 0.6 m (24 in)
 Overview of hydrologic flow through system: Precipitation and sheet flow contribute water to this site. Most wetland hydrology results from changing water table levels, which are greatly affected by levels on the Mississippi River and the tributary streams in the area such as Bird Slough. Water leaves the site by evapotranspiration and groundwater recharge.
 Size of watershed: More than 318,000 km² (120,000 mi²) for the Mississippi River
 Other field evidence observed: This site is an excavated depression in the floodplain of a large river. We observed some areas that lack vegetation and some algal mats, suggesting prolonged ponding.
 Wetland hydrology: Yes: X No:
 Rationale: Landscape position and the evidence of prolonged ponding suggest that the site is inundated or saturated long enough during the growing season to meet the wetland hydrology criterion.

WETLAND DETERMINATION AND RATIONALE

Is the site a wetland? Yes: X No:
 Rationale: This site meets all three wetland criteria. The site is not included in the NWI.

SPECIES LIST

| Scientific name | Common name | Stratum | Wetland Indicator | C* |
|---------------------------------|------------------------|-------------|-------------------|----|
| <i>Acalypha rhomboidea</i> | three-seeded mercury | herb | FACU | 0 |
| <i>Acer negundo</i> | box elder | shrub, herb | FACW- | 1 |
| <i>Acer saccharinum</i> | silver maple | shrub, herb | FACW | 1 |
| <i>Achillea millefolium</i> | yarrow | herb | FACU | ** |
| <i>Agalinis tenuifolia</i> | slender false foxglove | herb | FACW | 5 |
| <i>Alisma plantago-aquatica</i> | water plantain | herb | OBL | 2 |
| <i>Amaranthus tuberculatus</i> | water hemp | herb | OBL | 1 |
| <i>Ammannia coccinea</i> | scarlet loosestrife | herb | OBL | 5 |
| <i>Amorpha fruticosa</i> | false indigo bush | shrub | FACW+ | 6 |
| <i>Ampelopsis cordata</i> | raccoon grape | herb | FAC+ | 2 |
| <i>Andropogon virginicus</i> | broomsedge | herb | FAC- | 1 |
| <i>Apocynum sibiricum</i> | prairie dogbane | herb | FAC+ | 2 |
| <i>Asclepias incarnata</i> | swamp milkweed | herb | OBL | 4 |
| <i>Aster pilosus</i> | field aster | herb | FACU+ | 0 |
| <i>Aster praealtus</i> | willow-leaved aster | herb | FACW | 4 |
| <i>Aster simplex</i> | panicked aster | herb | FACW | 3 |
| <i>Betula nigra</i> | river birch | shrub, herb | FACW | 4 |

* Coefficient of Conservatism (see introduction)
 (Species list continues on next page)

** Species not native to Illinois

ROUTINE ONSITE WETLAND DETERMINATION
 Site 1 (page 3 of 6)

Field Investigators: Tessene, Wilm, Kurylo, and Feist
 Job No.: P96-037-73
 State: Illinois
 Site name: Marsh
 Legal Description: NE/4, Sec. 17, T.4S., R.8W.
 Location: Excavated part of wetland restoration/creation site at East Hannibal

Date: 13 August 2003
 Project Name: FAP 319 (US 36)
 Applicant: IDOT District 6

SPECIES LIST (continued)

| Scientific name | Common name | Stratum | Wetland Indicator | C* |
|-------------------------------|-------------------------|-------------|-------------------|----|
| <i>Bidens cernua</i> | nodding bur-marigold | herb | OBL | 2 |
| <i>Bidens frondosa</i> | beggar's ticks | herb | FACW | 1 |
| <i>Bidens tripartita</i> | beggar's ticks | herb | FACW | 2 |
| <i>Boehmeria cylindrica</i> | false nettle | herb | OBL | 3 |
| <i>Boltonia asteroides</i> | false aster | herb | FACW | 5 |
| <i>Bromus japonicus</i> | Japanese brome | herb | FACU | ** |
| <i>Campsis radicans</i> | trumpet creeper | shrub, herb | FAC | 2 |
| <i>Carduus nutans</i> | nodding thistle | herb | UPL | ** |
| <i>Carex annectens</i> | sedge | herb | FACW | 3 |
| <i>Carex frankii</i> | sedge | herb | OBL | 4 |
| <i>Carex hyalinolepis</i> | sedge | herb | OBL | 4 |
| <i>Carex laeviconica</i> | sedge | herb | OBL | 10 |
| <i>Carex lupulina</i> | hop sedge | herb | OBL | 5 |
| <i>Carex lurida</i> | bottlebrush sedge | herb | OBL | 7 |
| <i>Carex vulpinoidea</i> | fox sedge | herb | OBL | 3 |
| <i>Cassia fasciculata</i> | partridge pea | herb | FACU- | 1 |
| <i>Cassia marilandica</i> | Maryland senna | herb | FACW | 4 |
| <i>Catalpa speciosa</i> | catalpa | shrub | FACU | 0 |
| <i>Cercis canadensis</i> | redbud | shrub | FACU | 3 |
| <i>Cicuta maculata</i> | water hemlock | herb | OBL | 4 |
| <i>Cirsium discolor</i> | field thistle | herb | UPL | 3 |
| <i>Conyza canadensis</i> | horseweed | herb | FAC- | 0 |
| <i>Coreopsis tinctoria</i> | golden coreopsis | herb | FAC | ** |
| <i>Cornus drummondii</i> | rough-leaved dogwood | shrub | FAC | 2 |
| <i>Cyperus aristatus</i> | flatsedge | herb | OBL | 2 |
| <i>Cyperus esculentus</i> | yellow nutsedge | herb | FACW | 0 |
| <i>Cyperus strigosus</i> | straw nutsedge | herb | FACW | 0 |
| <i>Descurainia pinnata</i> | tansy mustard | herb | UPL | ** |
| <i>Desmodium paniculatum</i> | panicled tick trefoil | herb | FACU | 2 |
| <i>Digitaria ischaemum</i> | smooth crabgrass | herb | FACU | ** |
| <i>Digitaria sanguinalis</i> | hairy crabgrass | herb | FACU | ** |
| <i>Diospyros virginiana</i> | persimmon | shrub | FAC | 2 |
| <i>Echinochloa muricata</i> | barnyard grass | herb | OBL | 0 |
| <i>Echinodorus berteroi</i> | lance-leaved burhead | herb | OBL | 6 |
| <i>Eclipta prostrata</i> | yerba de tajo | herb | FACW | 2 |
| <i>Eleocharis acicularis</i> | spike rush | herb | OBL | 3 |
| <i>Eleocharis compressa</i> | flat-stemmed spike rush | herb | FACW | 7 |
| <i>Eleocharis erythropoda</i> | spike rush | herb | OBL | 3 |
| <i>Eleocharis obtusa</i> | spike rush | herb | OBL | 2 |

* Coefficient of Conservatism (see introduction)
 (Species list continues on next page)

** Species not native to Illinois

ROUTINE ONSITE WETLAND DETERMINATION
 Site 1 (page 4 of 6)

Field Investigators: Tessene, Wilm, Kurylo, and Feist
 Job No.: P96-037-73
 State: Illinois
 Site name: Marsh
 Legal Description: NE/4, Sec. 17, T.4S., R.8W.
 Location: Excavated part of wetland restoration/creation site at East Hannibal

Date: 13 August 2003
 Project Name: FAP 319 (US 36)
 Applicant: IDOT District 6

SPECIES LIST (continued)

| Scientific name | Common name | Stratum | Wetland Indicator | C* |
|--------------------------------|--------------------------|-------------|-------------------|----|
| <i>Elymus virginicus</i> | Virginia wild rye | herb | FACW- | 4 |
| <i>Epilobium coloratum</i> | cinnamon willow-herb | herb | OBL | 3 |
| <i>Eragrostis spectabilis</i> | purple love grass | herb | UPL | 3 |
| <i>Erechtites hieracifolia</i> | fireweed | herb | FACU | 2 |
| <i>Erigeron annuus</i> | daisy fleabane | herb | FAC- | 1 |
| <i>Eupatorium altissimum</i> | white snakeroot | herb | FACU | 1 |
| <i>Eupatorium serotinum</i> | late boneset | herb | FAC+ | 1 |
| <i>Euphorbia dentata</i> | wild poinsettia | herb | UPL | 0 |
| <i>Euphorbia maculata</i> | nodding spruce | herb | FACU- | 0 |
| <i>Euthamia graminifolia</i> | grass-leaved goldenrod | herb | FACW- | 3 |
| <i>Festuca pratensis</i> | tall fescue | herb | FACU- | ** |
| <i>Fraxinus pennsylvanica</i> | green ash | shrub, herb | FACW | 2 |
| <i>Glyceria striata</i> | fowl manna grass | herb | OBL | 4 |
| <i>Gnaphalium obtusifolium</i> | fragrant cudweed | herb | UPL | 2 |
| <i>Helenium autumnale</i> | sneezeweed | herb | FACW+ | 3 |
| <i>Ipomaea hederacea</i> | ivy-leaved morning glory | herb | FAC | ** |
| <i>Ipomaea lacunosa</i> | small morning glory | herb | FACW | 1 |
| <i>Juncus acuminatus</i> | rush | herb | OBL | 4 |
| <i>Juncus dudleyi</i> | rush | herb | FAC+ | 4 |
| <i>Juncus effusus</i> | soft rush | herb | OBL | 4 |
| <i>Juncus tenuis</i> | path rush | herb | FAC | 0 |
| <i>Juncus torreyi</i> | rush | herb | FACW | 3 |
| <i>Lactuca biennis</i> | biennial lettuce | herb | FAC | 4 |
| <i>Lactuca saligna</i> | willow lettuce | herb | FACU | ** |
| <i>Lactuca serriola</i> | prickly lettuce | herb | FAC | ** |
| <i>Lactuca sp.</i> | lettuce | herb | --- | - |
| <i>Leersia oryzoides</i> | rice cutgrass | herb | OBL | 3 |
| <i>Leptochloa fascicularis</i> | sprangletop | herb | OBL | 0 |
| <i>Lindernia dubia</i> | false pimpernel | herb | OBL | 5 |
| <i>Lobelia cardinalis</i> | cardinal flower | herb | OBL | 6 |
| <i>Lobelia siphilitica</i> | great blue lobelia | herb | FACW+ | 4 |
| <i>Ludwigia alternifolia</i> | seedbox | herb | OBL | 5 |
| <i>Lycopus americanus</i> | bugleweed | herb | OBL | 3 |
| <i>Lysimachia ciliata</i> | fringed loosestrife | herb | FACW | 4 |
| <i>Lythrum alatum</i> | winged loosestrife | herb | OBL | 5 |
| <i>Melilotus alba</i> | white sweet clover | herb | FACU | ** |
| <i>Mentha arvensis</i> | field mint | herb | FACW | 4 |
| <i>Mimulus alatus</i> | monkey flower | herb | OBL | 6 |
| <i>Mimulus ringens</i> | monkey flower | herb | OBL | 5 |
| <i>Mollugo verticillata</i> | carpetweed | herb | FAC | ** |

* Coefficient of Conservatism (see introduction)
 (Species list continues on next page)

** Species not native to Illinois

ROUTINE ONSITE WETLAND DETERMINATION
 Site 1 (page 5 of 6)

Field Investigators: Tessene, Wilm, Kurylo, and Feist
 Job No.: P96-037-73
 State: Illinois
 Site name: Marsh
 Legal Description: NE/4, Sec. 17, T.4S., R.8W.
 Location: Excavated part of wetland restoration/creation site at East Hannibal

Date: 13 August 2003
 Project Name: FAP 319 (US 36)
 Applicant: IDOT District 6

SPECIES LIST (continued)

| Scientific name | Common name | Stratum | Wetland Indicator | C* |
|----------------------------------|-----------------------|-------------|-------------------|----|
| <i>Monarda punctata</i> | horsemint | herb | UPL | 5 |
| <i>Morus alba</i> | white mulberry | shrub | FAC | ** |
| <i>Panicum capillare</i> | witchgrass | herb | FAC | 0 |
| <i>Panicum dichotomiflorum</i> | fall panic grass | herb | FACW- | 0 |
| <i>Penthorum sedoides</i> | ditch stonecrop | herb | OBL | 2 |
| <i>Phalaris arundinacea</i> | reed canary grass | herb | FACW+ | ** |
| <i>Phyla lanceolata</i> | fog-fruit | herb | OBL | 1 |
| <i>Physostegia virginiana</i> | obedient plant | herb | FACW | 6 |
| <i>Plantago rugelii</i> | Rugel's plantain | herb | FAC+ | 0 |
| <i>Platanus occidentalis</i> | sycamore | shrub | FACW | 3 |
| <i>Poa pratensis</i> | Kentucky bluegrass | herb | FAC- | ** |
| <i>Polygonum hydropiper</i> | water pepper | herb | OBL | ** |
| <i>Polygonum hydropiperoides</i> | water pepper | herb | OBL | 4 |
| <i>Polygonum lapathifolium</i> | mild water pepper | herb | FACW+ | 0 |
| <i>Polygonum pensylvanicum</i> | nodding smartweed | herb | FACW+ | 1 |
| <i>Polygonum persicaria</i> | smooth smartweed | herb | FACW | ** |
| <i>Polygonum punctatum</i> | lady's-thumb | herb | OBL | 3 |
| <i>Polygonum scandens</i> | dotted smartweed | herb | FAC | 2 |
| <i>Populus deltoides</i> | climbing knotweed | herb | FAC+ | 2 |
| <i>Potentilla norvegica</i> | cottonwood | shrub, herb | FAC | 0 |
| <i>Pycnanthemum tenuifolium</i> | rough cinquefoil | herb | FAC | 4 |
| <i>Pyrrhopappus carolinianus</i> | slender mountain mint | herb | UPL | 1 |
| <i>Quercus palustris</i> | false dandelion | herb | FACW | 4 |
| <i>Rorippa islandica</i> | pin oak | shrub, herb | OBL | 4 |
| <i>Rosa multiflora</i> | yellow marsh cress | herb | FACU | ** |
| <i>Rosa setigera</i> | multiflora rose | shrub | FACU+ | 5 |
| <i>Rubus allegheniensis</i> | Illinois rose | shrub | FACU+ | 2 |
| <i>Rumex crispus</i> | wild blackberry | shrub | FAC+ | ** |
| <i>Sagittaria latifolia</i> | curly dock | herb | OBL | 4 |
| <i>Salix amygdaloides</i> | common arrowhead | herb | FACW | 4 |
| <i>Salix exigua</i> | peach-leaved willow | shrub | OBL | 1 |
| <i>Salix nigra</i> | sandbar willow | shrub | OBL | 3 |
| <i>Scirpus atrovirens</i> | black willow | shrub, herb | OBL | 4 |
| <i>Scirpus cyperinus</i> | green bulrush | herb | OBL | 5 |
| <i>Scirpus pendulus</i> | woolgrass | herb | OBL | 3 |
| <i>Setaria faberi</i> | red bulrush | herb | FACU+ | ** |
| <i>Setaria glauca</i> | giant foxtail | herb | FAC | ** |
| <i>Sida spinosa</i> | yellow foxtail | herb | FACU | ** |
| | prickly mallow | herb | | |

* Coefficient of Conservatism (see introduction)
 (Species list concludes on next page)

** Species not native to Illinois

ROUTINE ONSITE WETLAND DETERMINATION
 Site 1 (page 6 of 6)

Field Investigators: Tessene, Wilm, Kurylo, and Feist
 Job No.: P96-037-73
 State: Illinois
 Site name: Marsh
 Legal Description: NE/4, Sec. 17, T.4S., R.8W.
 Location: Excavated part of wetland restoration/creation site at East Hannibal

Date: 13 August 2003
 Project Name: FAP 319 (US 36)
 Applicant: IDOT District 6

SPECIES LIST (concluded)

| Scientific name | Common name | Stratum | Wetland Indicator | C* |
|-------------------------------|--------------------|-------------|-------------------|----|
| <i>Silene antirrhina</i> | sleepy catchfly | herb | UPL | 1 |
| <i>Solanum carolinense</i> | horse nettle | herb | FACU- | 0 |
| <i>Solidago canadense</i> | Canada goldenrod | herb | FACU | 1 |
| <i>Sparganium eurycarpum</i> | common bur reed | herb | OBL | 5 |
| <i>Stachys tenuifolia</i> | hedge nettle | herb | FACW+ | 5 |
| <i>Strophostyles helvola</i> | wild bean | herb | FAC+ | 3 |
| <i>Taraxacum officinale</i> | dandelion | herb | FACU | ** |
| <i>Toxicodendron radicans</i> | dandelion | herb | FAC+ | 1 |
| <i>Tridens flavus</i> | poison ivy | herb | UPL | 1 |
| <i>Trifolium hybridum</i> | purpletop | herb | FAC- | ** |
| <i>Trifolium pratense</i> | alsike clover | herb | FACU+ | ** |
| <i>Trifolium repens</i> | red clover | herb | FACU+ | ** |
| <i>Typha angustifolia</i> | white clover | herb | FACU+ | ** |
| <i>Typha latifolia</i> | narrowleaf cattail | herb | OBL | 1 |
| <i>Ulmus americana</i> | common cattail | herb | OBL | 5 |
| <i>Ulmus pumila</i> | American elm | shrub, herb | FACW- | ** |
| <i>Verbascum thapsus</i> | Siberian elm | shrub | UPL | ** |
| <i>Verbena hastata</i> | common mullein | herb | UPL | ** |
| <i>Verbena urticifolia</i> | blue vervain | herb | FACW+ | 3 |
| <i>Veronica peregrina</i> | white vervain | herb | FAC+ | 3 |
| <i>Vitis riparia</i> | purslane speedwell | herb | FACW+ | 0 |
| <i>Xanthium strumarium</i> | riverbank grape | herb | FACW- | 2 |
| | cocklebur | herb | FAC | 0 |

* Coefficient of Conservatism (see introduction)
 Mean c value = $\Sigma C/N = 341/125 = 2.7$

** Species not native to Illinois
 $FQI = \bar{c} \sqrt{N} = \Sigma C/\sqrt{N} = 341/\sqrt{125} = 30.5$

Including planted tree species (unplanted individuals of *Fraxinus* and *Quercus palustris* are present on the site):

| | | | | |
|--------------------------|-----------------|----------------|-------|---|
| <i>Carya illinoensis</i> | pecan | sapling, shrub | FACW | 6 |
| <i>Quercus bicolor</i> | swamp white oak | sapling | FACW+ | 7 |

Mean c value = $\Sigma C/N = 354/127 = 2.8$

$FQI = \bar{c} \sqrt{N} = \Sigma C/\sqrt{N} = 354/\sqrt{127} = 31.4$

Determined by: Paul Tessene, Brian Wilm, and Mary Ann Feist
 (vegetation and hydrology)
 Jesse Kurylo (soils and hydrology)
 Illinois Natural History Survey
 Center for Wildlife Ecology
 607 East Peabody Drive
 Champaign, Illinois 61820
 (217) 244-7984, 244-2176, 244-2110, 244-0692

Appendix 2
Plant species observed in pre-existing wet meadow
at East Hannibal wetland compensation site, August 2003

| Scientific name | Common name | Stratum | Wetland Indicator | C* |
|----------------------------------|-----------------------|------------------|-------------------|----|
| <i>Acer saccharinum</i> | silver maple | shrub, herb | FACW | 1 |
| <i>Alisma plantago-aquatica</i> | water plantain | herb | OBL | 2 |
| <i>Apocynum sibiricum</i> | prairie dogbane | herb | FAC+ | 2 |
| <i>Asclepias incarnata</i> | swamp milkweed | herb | OBL | 4 |
| <i>Aster simplex</i> | panicked aster | herb | FACW | 3 |
| <i>Bidens frondosa</i> | beggar's ticks | herb | FACW | 1 |
| <i>Boehmeria cylindrica</i> | false nettle | herb | OBL | 3 |
| <i>Campsis radicans</i> | trumpet creeper | shrub, herb | FAC | 2 |
| <i>Carex frankii</i> | sedge | herb | OBL | 4 |
| <i>Carex lupulina</i> | hop sedge | herb | OBL | 5 |
| <i>Carex vulpinoidea</i> | fox sedge | herb | OBL | 3 |
| <i>Carex</i> sp. | sedge | herb | - | - |
| <i>Cephalanthus occidentalis</i> | buttonbush | shrub | OBL | 4 |
| <i>Cuscuta</i> sp. | dodder | herb | - | - |
| <i>Cyperus esculentus</i> | yellow nutsedge | herb | FACW | 0 |
| <i>Echinochloa muricata</i> | barnyard grass | herb | OBL | 0 |
| <i>Epilobium coloratum</i> | cinnamon willow-herb | herb | OBL | 3 |
| <i>Erechtites hieracifolia</i> | fireweed | herb | FACU | 2 |
| <i>Eupatorium serotinum</i> | late boneset | herb | FAC+ | 1 |
| <i>Fraxinus pennsylvanica</i> | green ash | shrub | FACW | 2 |
| <i>Hypericum mutilum</i> | dwarf St. John's wort | herb | FACW | 5 |
| <i>Ipomoea lacunosa</i> | small morning glory | herb | FACW | 1 |
| <i>Juncus interior</i> | rush | herb | FAC+ | 3 |
| <i>Leersia oryzoides</i> | rice cutgrass | herb | OBL | 3 |
| <i>Lobelia siphilitica</i> | great blue lobelia | herb | FACW+ | 4 |
| <i>Ludwigia palustris</i> | marsh purslane | herb | OBL | 4 |
| <i>Lycopus americanus</i> | bugleweed | herb | OBL | 3 |
| <i>Lythrum alatum</i> | winged loosestrife | herb | OBL | 5 |
| <i>Mimulus ringens</i> | monkey flower | herb | OBL | 5 |
| <i>Penthorum sedoides</i> | ditch stonecrop | herb | OBL | 2 |
| <i>Phalaris arundinacea</i> | reed canary grass | herb | FACW+ | ** |
| <i>Poa pratensis</i> | Kentucky bluegrass | herb | FAC- | ** |
| <i>Polygonum amphibium</i> | water smartweed | herb | OBL | 3 |
| <i>Polygonum lapathifolium</i> | nodding smartweed | herb | FACW+ | 0 |
| <i>Polygonum pennsylvanicum</i> | smooth smartweed | herb | FACW+ | 1 |
| <i>Populus deltoides</i> | cottonwood | shrub | FAC+ | 2 |
| <i>Sagittaria latifolia</i> | common arrowhead | herb | OBL | 4 |
| <i>Salix amygdaloides</i> | peachleaf willow | shrub | FACW | 4 |
| <i>Salix exigua</i> | sandbar willow | shrub | OBL | 1 |
| <i>Salix nigra</i> | black willow | sapling, shrub | OBL | 3 |
| <i>Scirpus atrovirens</i> | green bulrush | herb | OBL | 4 |
| <i>Scirpus validus</i> | soft-stemmed bulrush | herb | OBL | 4 |
| <i>Typha latifolia</i> | common cattail | herb | OBL | 1 |
| <i>Ulmus americana</i> | American elm | shrub | FACW- | 5 |
| <i>Vitis riparia</i> | riverbank grape | woody vine, herb | FACW- | 2 |

* Coefficient of Conservatism (see introduction)
 Mean c value = $\sum C/N = 110/41 = 2.7$

** Species not native to Illinois
 $FQI = \bar{c} \sqrt{N} = (2.7)\sqrt{41} = 17.2$

Appendix 3
 Estimated Aerial Extent of Wetland Hydrology for 2003
 At the FAP 319 (US 36) wetland creation site, East Hannibal, Pike County, Illinois



- | | | | |
|---|--|---|-----------------|
|  | estimated areal extent of 2003 wetland hydrology within excavated area |  | monitoring well |
| | |  | stage gauge |
| | |  | RDS data logger |
| | |  | rain gauge |

Figure prepared by ISGS



Figure 1: Boundary of created site and north edge of previously existing wet meadow, now overgrown with woody vegetation. East Hannibal wetland mitigation site (FAP 319/US 36), August 13, 2003



Figure 2: West central edge of site, facing north. Note tree plantings. East Hannibal site, 2003.



Figure 3: West central edge of site, facing east. Note tree plantings and *Cassia*. East Hannibal site, 2003.



Figure 4: Northwest part of site, facing east. Note tree plantings and *Cassia*. East Hannibal site, 2003.



Figure 5: Northwest edge of site, facing south. East Hannibal wetland mitigation site, 2003.



Figure 6: North central edge of site, facing east. East Hannibal wetland mitigation site, 2003.

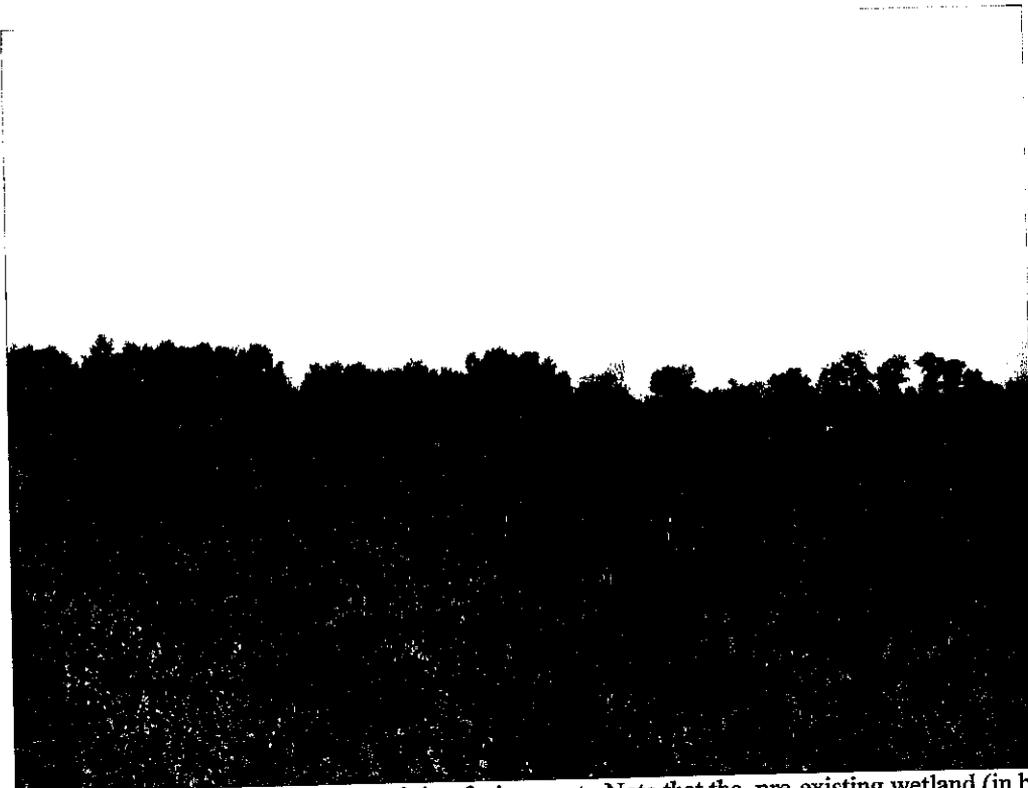


Figure 7: Near north central edge of site, facing west. Note that the pre-existing wetland (in background) is now overgrown with woody plants. East Hannibal wetland mitigation site, 2003.



Figure 8: Southwest corner of site, facing east. Note low area with cattails, and the pre-existing wetland in upper left, now overgrown with woody plants. East Hannibal wetland mitigation site, 2003.



Figure 9: Southwest corner of site, facing north. Pre-existing wetland is in the background. East Hannibal wetland mitigation site, 2003.



Figure 10: An opening in the middle of the pre-existing wetland, East Hannibal wetland mitigation site. The perimeter of the pre-existing wetland is overgrown with woody plants, but much of the interior is dominated by herbaceous species. August 13, 2003