

**Wetland Mitigation Monitoring Report for the FAP 319 (US 36) site
near East Hannibal, Pike County, Illinois
(Third monitoring year--2001)**

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

Summary

Based on observations made during the 2001 season (third year of monitoring), the following is a summary that relates the likelihood that the compensation site will meet 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. Vegetation that colonized the created site is mostly dominated by native, aggressive species. Planted tree species appear to be doing well, and other woody species are colonizing the site. However, more tree planting will be necessary in order to meet the performance standard of 100 trees/acre. The original wet meadow on the site is becoming overgrown with woody species.

Introduction

This report describes the third 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). 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 should 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 was sampled in 1999, 2000, and 2001. Soil profile morphology, including horizon color, texture, and structure was analyzed at representative points throughout the site. Additionally, the presence, type, size, and abundance of redoximorphic features were 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 Pociask 2001) 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. A total count of planted tree species was again attempted in 2001.

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 47 plots. Cover of each species encountered in each plot was assigned a cover class (Table 1) (modified from Daubenmire 1959).

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) is 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 20 (\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 Spring 1996. (Vegetation sampling conducted during the monitoring of the wetland creation site in 1999 and 2000, followed the same methods. In the 2001 survey of the site, systematic sampling was not conducted. Herbaceous vegetation closely resembled that of previous surveys at first glance, and the continued vigorous growth of woody vegetation showed that the goal of maintaining a wet meadow may prove elusive in the long term.

Results and discussion

Project goal 1

a) Predominance of hydrophytic vegetation

Dominant plant species for the created wetland are listed in Table 2. The majority of the dominant species are hydrophytic. 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.

Dominant Plant Species	Indicator Status	Stratum
1. <i>Aster simplex</i>	FACW	herb
2. <i>Cyperus esculentus</i>	FACW	herb
3. <i>Echinochloa muricata</i>	OBL	herb
4. <i>Typha latifolia</i>	OBL	herb

The herbaceous species that colonized the site continue to be dominated by taxa that tolerate or thrive under disturbed conditions, such as the original site excavation and periodic, prolonged inundation. *Echinochloa* remains a dominant, as it was in 1999 and 2000, but is relatively less abundant than in 2000 (see Table). The other dominant species are perennials and are likely to increase

b) Presence of hydric soils

This site has been excavated. Soils mapped at the site include Fluvaquentic Hapludolls which are somewhat poorly drained (Shaffton and Coffeen series) and Fluvaquentic Endoaquolls which are poorly drained (Ambraw and Beaucoup series)(Struben and Lily 1999). Soils at the site were most similar to the Ambraw series, assuming 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. Cattails are taking over much of the site, and soils in those areas that are no longer mowed are starting to develop a thin organic layer at the surface. Redoximorphic features as dark yellowish-brown iron masses began within 0.08 m (3 in) from the soil surface and were distinct throughout the profile. Iron-manganese concretions were also observed. The depth to saturation was not observed at the time of visit, but there was still evidence of episaturation. The site hydrology and 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 3. Description of the soils from the east-central part of the site

Depth(in)	Matrix Color	Concentrations	Depletions	Texture	Structure
+0.5 - 0	(Organic matter layer)				
0 - 6	10YR 2/1	10YR 3/4, 3/6 & N 2.5/0	none	Loam	Platy (compacted)
6 - 15	N 3.5/0	10YR 3/6	none	Sandy Loam	Massive
15 - 23	Mutli-colored		none	Sand	Massive

c) Presence of wetland hydrology

Field evidence of wetland hydrology included the excavated depressional landscape position, water-borne sediment deposits, and stranded algal mats. During a field visit on May 15, 2001, the entire excavation appeared to be covered by approximately 0.15 m (6 in) of water. At that time, the Mississippi River was out of its banks in that area. The presence of water on the site was not directly from flooding, for 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 7.0 ha (17.4 acres), effectively the entire excavated basin (Watson and Pociask 2001)(Appendix 3). This compares with 6.7 ha (16.5 acres) in 1999 (Fucciolo *et al.* 1999) and 6.5 ha (16.0 acres) in 2000 (Watson and Pociask 2000).

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. Mowing between some of the rows of planted trees aided the counts (although a few trees were mowed down in the process). The dense cattail patches in lower areas on the site confounded the process of following the rows in some places, but we believe that a thorough count was made.

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 2000 (Table 4a) and 1999 (Table 4b) counts are provided for comparison.

Table 4. Observed survival of planted trees in 2001 at East Hannibal wetland mitigation site.

Species	Live stems Observed	Density live/acre (live/ha)	% Survival (compared to 2000)
<i>Carya illinoensis</i>	264	14.67 (36.23)	85.2%
<i>Fraxinus pennsylvanica</i>	460	25.56 (63.12)	91.5%
<i>Quercus bicolor</i>	413	22.94 (56.67)	94.1%
<i>Quercus palustris</i>	298	16.56 (40.89)	89.8%
<i>Prunus sp.</i>	0	0	0.0%
Total	1435	79.72 (196.91)	90.3%

Table 4a. Observed survival of planted trees in 2000 at East Hannibal wetland mitigation site.

Species	Live stems Observed	Dead stems Observed	Density live/acre (live/ha)
<i>Carya illinoensis</i>	310	4	17.22 (42.54)
<i>Fraxinus pennsylvanica</i>	503	19	27.94 (69.02)
<i>Quercus bicolor</i>	439	23	24.39 (60.24)
<i>Quercus palustris</i>	332	19	18.44 (45.56)
<i>Prunus</i> sp.	5	6	0.28 (0.69)
Unidentified		142	
Total	1589	213	88.56(218.74)

For comparison, Table 4b presents data for planted tree survival in 1999, with numbers of observed live and dead stems projected to the whole site (sampling included 20% of total row length). Density of live stems of each species, percent survival of observed stems, and survival in proportion to the original planted stems (where equal numbers of each species were planted) are also listed.

Table 4b. Observed survival of planted trees in 1999 at East Hannibal wetland mitigation site.

Species	Live stems Obs. (per site)	Dead stems Obs. (per site)	Density live/acre (live/ha)	% Survival (% of planted)
<i>Carya illinoensis</i>	27 (135)	9 (45)	7.38 (18.23)	27.66
<i>Fraxinus pennsylvanica</i>	90 (450)	11 (55)	24.59 (60.74)	92.21
<i>Quercus bicolor</i>	46 (230)	57(285)	12.57 (31.05)	47.13
<i>Quercus palustris</i>	44 (220)	24(120)	12.02 (29.69)	45.08
Total	207(1035)	101(505)	56.56(139.70)	53.05

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. *Quercus bicolor* had the best survival between 2000 and 2001, which was not the case in the 1999 tree count. *Carya illinoensis* fared slightly worse than the other species in the 2001 survey; part of this may be attributable to the fact that its individuals were 0.3 m (1 ft) tall specimens, versus the 1.5-2.1 (5-7 ft) tall specimens of the other species that were planted. The smaller stems may have had a more difficult time competing in the dense herbaceous cover on the site.

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 performance standards, which state 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, and some will become trees. *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 38 species, 33 of which are native to Illinois, in the 47 quadrats. Thus, about 87% of the species sampled and 93% of the importance value in the plots is contributed by native species. In 2000, 38 species were also found in sample plots, of which 28 were native; about 75% of both species and importance value was contributed by natives. The dominant species are all native hydrophytes.

Species	Frequency (%)	Relative Freq. (%)	Average Cover (%)	Relative Cover (%)	Importance Value
<i>Echinochloa muricata</i>	80.85	15.90	43.46	28.71	22.30
<i>Aster simplex</i>	68.09	13.39	26.09	17.23	15.31
<i>Typha latifolia</i>	44.68	8.79	16.56	10.94	9.86
<i>Cyperus esculentus</i>	42.55	8.37	13.78	9.10	8.73
<i>Aster pilosus</i>	40.43	7.95	10.22	6.75	7.35
<i>Bidens frondosa</i>	40.43	7.95	8.27	5.46	6.71
<i>Setaria glauca</i>	10.64	2.09	5.11	3.37	2.73
<i>Ammania coccinea</i>	21.28	4.18	1.91	1.27	2.72
<i>Bidens cernua</i>	14.89	2.93	2.90	1.92	2.42
<i>Eleocharis obtusa</i>	12.77	2.51	1.91	1.27	1.89
<i>Trifolium pratense</i>	8.51	1.67	2.71	1.79	1.73
<i>Asclepias incarnata</i>	12.77	2.51	1.37	0.91	1.71
<i>Eupatorium serotinum</i>	6.38	1.26	2.98	1.97	1.61
<i>Solidago canadensis</i>	8.51	1.67	2.23	1.48	1.57
<i>Rumex crispus</i>	12.77	2.51	0.38	0.25	1.38
<i>Leersia oryzoides</i>	4.26	0.84	1.87	1.24	1.04
<i>Cyperus strigosus</i>	6.38	1.26	1.18	0.78	1.02
<i>Digitaria ischaemum</i>	4.26	0.84	1.60	1.05	0.95
<i>Vitis riparia</i>	8.51	1.67	0.26	0.17	0.92
<i>Acer saccharinum</i>	6.38	1.26	0.70	0.46	0.86
<i>Alisma plantago-aquatica</i>	4.26	0.84	1.12	0.74	0.79
<i>Campsis radicans</i>	4.26	0.84	0.86	0.57	0.70
<i>Populus deltoides</i>	4.26	0.84	0.64	0.42	0.63
<i>Bidens tripartita</i>	4.26	0.84	0.38	0.25	0.54
<i>Erigeron annuus</i>	4.26	0.84	0.38	0.25	0.54
<i>Euphorbia maculata</i>	4.26	0.84	0.38	0.25	0.54
<i>Polygonum pensylvanicum</i>	4.26	0.84	0.13	0.08	0.46
<i>Amaranthus tuberculatus</i>	2.13	0.42	0.32	0.21	0.31
<i>Cassia fasciculata</i>	2.13	0.42	0.32	0.21	0.31
<i>Cyperus acuminatus</i>	2.13	0.42	0.32	0.21	0.31
<i>Juncus tenuis</i>	2.13	0.42	0.32	0.21	0.31
<i>Xanthium strumarium</i>	2.13	0.42	0.32	0.21	0.31
<i>Eleocharis compressa</i>	2.13	0.42	0.06	0.04	0.23
<i>Euthamia graminifolia</i>	2.13	0.42	0.06	0.04	0.23
<i>Panicum dichotomiflorum</i>	2.13	0.42	0.06	0.04	0.23
<i>Plantago rugellii</i>	2.13	0.42	0.06	0.04	0.23
<i>Pyrrhopappus carolinianus</i>	2.13	0.42	0.06	0.04	0.23
<i>Trifolium repens</i>	2.13	0.42	0.06	0.04	0.23
Total	508.51	100.00		100.00	100.0

About 82% of species and 87% of importance value is supplied by hydrophytes, compared with 74% and 80%, respectively, in 2000. Annual species comprise 47% of species and 44% of importance value, quite a reduction from 50% of species and 80% of importance value in 2000. This suggests that site conditions are becoming stabilized and persistent hydrophytic vegetation is dominant. This is true even in sample areas between tree planting rows that are mowed occasionally. Thus, the site is well on its way toward meeting the original project goals that 75% of the site be covered by persistent hydrophytic vegetation, and at least 50% of cover by native species.

During a survey of naturally occurring plant species on the wetland creation site, 93 native and 16 non-native species were observed (see Appendix 1). A majority of species includes perennials, hydrophytes, and those that are native to Illinois. The FQI value for the site (unplanted species) was 24.5 with a mean C value of 2.5, indicating good natural quality. Including the planted saplings, the FQI value was 25.6 with a mean C value of 2.6. Table 6 below compares the 2001 values with those found from plant species surveys of the created wetland basin in 1999 and 2000 (Tessene 2000, 2001). General trends suggest an increasing number of naturally occurring plant species on the site, with increases in the proportion of native species, perennials, and hydrophytes, as the site develops.

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

Aspect	1999 value	2000 value	2001 value
Species	57	84	109
Native species	45 (78.9%)	69 (82.1%)	93 (85.3%)
Non-native spp.	12 (21.1%)	15 (17.9%)	16 (14.7%)
Annual species	28 (49.1%)	36 (42.9%)	39 (35.8%)
Perennial species	29 (49.9%)	48 (57.1%)	70 (64.2%)
Woody species*	6 (10.5%)	11 (13.1%)	17 (15.6%)
Hydrophytes	43 (75.4%)	65 (77.4%)	86 (78.9%)
Non-hydrophytes	14 (24.6%)	19 (22.6%)	23 (21.1%)
FQI**	14.6	17.8	24.5
Mean c value	2.2	2.1	2.5

* 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 or even thrive under disturbed conditions, such as the original site excavation and periodic, prolonged inundation. *Echinochloa* remains a dominant species, as it was in 1999 and 2000, though with a diminished importance value, as perennial species increase in number and importance. *Aster simplex*, *Cyperus esculentus*, and *Typha latifolia*, the other dominants, are widespread, perennial, rhizomatous species. *Setaria*, a non-native annual species that was among the dominants in 2000, is becoming less important on the site.

Cattails appeared to increase noticeably on the site between 2000 and 2001. Locally, this species can form monotypic stands in the wettest parts of the site. Paths were mown between some of the rows of planted trees to 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. Quantitative vegetation sampling was not performed in 2001. 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 top three species (*Leersia oryzoides*, *Aster simplex*, *Apocynum sibiricum*) as dominants.

An original goal of this wetland mitigation project was that this original 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 may 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 when the adjacent wetland basin was created, and the cessation of agricultural use of the site may have contributed to the diminishing of the wet meadow; the abundant sources of propagules nearby certainly contributed. Cutting, 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 is developing into a wetland within five years, given that dominant hydrophytic vegetation and hydric soils are already present and that wetland hydrology is present on most of the excavation. However, it appears that the whole former field was 18.3 acres, and that the excavated basin was 7.0 ha (17.4 acres) (Fucciolo *et al.* 1999). Thus, not all of the 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 trees per acre called for in the initial mitigation site plan, planting rates will need to be increased to allow for inevitable losses. On the other hand, natural colonization by woody species growing in the surrounding wetlands is increasing, and may make up for some of the loss.

Unplanted herbaceous species in the created wetland basin are somewhat weedy species that tolerate disturbance, as one might expect on a recently created site. Dominant species are native, perennial hydrophytes, following project goals.

Typha may come to pose a threat to a diverse herbaceous cover on the site, for it increased rapidly compared with the past year's survey, and generally forms dense patches where found on the site. Further monitoring is necessary, and some type of control may be needed in the future. *Phalaris*, another potential threat (since it occurs in the wet meadow and also along the slough near the road) (Keene and Tessene 1992, and personal observations), has apparently not emerged as such at this time.

The wet meadow (originally present on the site before the wetland basin was created) is becoming overgrown by woody vegetation, a natural process, but one that goes against project goals. Several controlled burns, and the cutting of woody stems along with herbicide treatment of cut stumps may be necessary if this goal is still desirable.

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

Field Investigators: Tessene, Wilm, Kurylo, and Feist Dates: 29 and 30 August 2001
Job No.: P96-037-73 Project Name: FAP 319 (US 36)
State: Illinois County: Pike Applicant: IDOT District 6
Site name: Marsh
Legal Description: NE/4, Sec. 17, T.4S., R.8W.
Location: Excavated part of wetland restoration/creation site at East Hannibal

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

VEGETATION

<u>Dominant Plant Species</u>	<u>Indicator Status</u>	<u>Stratum</u>
1. <i>Aster simplex</i>	FACW	herb
2. <i>Cyperus esculentus</i>	FACW	herb
3. <i>Echinochloa muricata</i>	OBL	herb
4. <i>Typha latifolia</i>	OBL	herb

Percentage of dominant species that are OBL, FACW, FAC+, or FAC: 100%

Hydrophytic vegetation: Yes: X No:

Rationale: More than 50% of the dominants are OBL, FACW, FAC+, or FAC.

SOILS

Series and phase: Ambraw clay loam (Fluvaquentic Endoaquoll)

On Pike 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: Colors: 10YR 3/6, 4/6 and N 2.5/0

Redox Depletions? Yes: No: X

Matrix color: 10YR 2/1 over N 3.5/0

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

Hydric soils: Yes: X No:

Rationale: The site hydrology and 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. Therefore, these soils are hydric.

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.

ROUTINE ONSITE WETLAND DETERMINATION

Site 1 (page 2 of 5)

Field Investigators: Tessene, Wilm, Kurylo, and Feist Dates: 29 and 30 August 2001
 Job No.: P96-037-73 Project Name: FAP 319 (US 36)
 State: Illinois County: Pike Applicant: IDOT District 6
 Site name: Marsh
 Legal Description: NE/4, Sec. 17, T.4S., R.8W.
 Location: Excavated part of wetland restoration/creation site at East Hannibal

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	FACW	1
<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>Ammania coccinea</i>	scarlet loosestrife	herb	OBL	5
<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 simplex</i>	panicked aster	herb	FACW	3
<i>Betula nigra</i>	river birch	shrub	FACW	4
<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>Campsis radicans</i>	trumpet creeper	shrub, herb	FAC	2
<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>Cercis canadensis</i>	redbud	shrub	FACU	3
<i>Cirsium discolor</i>	field thistle	herb	UPL	3
<i>Conyza canadensis</i>	horseweed	herb	FAC-	0
<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 iria</i>	iria flatsedge	herb	FACW	**
<i>Cyperus strigosus</i>	straw nutsedge	herb	FACW	0
<i>Desmodium paniculatum</i>	panicked 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

* 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 5)

Field Investigators: Tessene, Wilm, Kurylo, and Feist Dates: 29 and 30 August 2001
 Job No.: P96-037-73 Project Name: FAP 319 (US 36)
 State: Illinois County: Pike Applicant: IDOT District 6
 Site name: Marsh
 Legal Description: NE/4, Sec. 17, T.4S., R.8W.
 Location: Excavated part of wetland restoration/creation site at East Hannibal

SPECIES LIST (continued)

Scientific name	Common name	Stratum	Wetland Indicator	C*
<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
<i>Eragrostis spectabilis</i>	purple love grass	herb	UPL	3
<i>Erigeron annuus</i>	daisy fleabane	herb	FAC-	1
<i>Eupatorium serotinum</i>	late boneset	herb	FAC+	1
<i>Euphorbia maculata</i>	nodding spruce	herb	FACU-	0
<i>Euthamia graminifolia</i>	grass-leaved goldenrod	herb	FACW-	3
<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 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 serriola</i>	prickly lettuce	herb	FAC	**
<i>Leersia oryzoides</i>	rice cutgrass	herb	OBL	3
<i>Leptochloa fascicularis</i>	sprangletop	herb	OBL	0
<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>Lythrum alatum</i>	winged loosestrife	herb	OBL	5
<i>Mimulus alatus</i>	monkey flower	herb	OBL	6
<i>Mimulus ringens</i>	monkey flower	herb	OBL	5
<i>Monarda punctata</i>	horsemint	herb	UPL	5
<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>Physostegia virginiana</i>	obedient plant	herb	FACW	6

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

** Species not native to Illinois

ROUTINE ONSITE WETLAND DETERMINATION
 Site 1 (page 4 of 5)

Field Investigators: Tessene, Wilm, Kurylo, and Feist Dates: 29 and 30 August 2001
 Job No.: P96-037-73 Project Name: FAP 319 (US 36)
 State: Illinois County: Pike Applicant: IDOT District 6
 Site name: Marsh
 Legal Description: NE/4, Sec. 17, T.4S., R.8W.
 Location: Excavated part of wetland restoration/creation site at East Hannibal

SPECIES LIST (concluded)

Scientific name	Common name	Stratum	Wetland Indicator	C*
<i>Plantago rugelii</i>	Rugel's plantain	herb	FAC+	0
<i>Poa pratensis</i>	Kentucky bluegrass	herb	FAC-	**
<i>Polygonum hydropiper</i>	water pepper	herb	OBL	**
<i>Polygonum hydropiperoides</i>	mild water pepper	herb	OBL	4
<i>Polygonum lapathifolium</i>	nodding smartweed	herb	FACW+	0
<i>Polygonum pensylvanicum</i>	smooth smartweed	herb	FACW+	1
<i>Polygonum persicaria</i>	lady's-thumb	herb	FACW	**
<i>Polygonum punctatum</i>	dotted smartweed	herb	OBL	3
<i>Populus deltoides</i>	cottonwood	shrub, herb	FAC+	2
<i>Potentilla norvegica</i>	rough cinquefoil	herb	FAC	0
<i>Pyrhopappus carolinianus</i>	false dandelion	herb	UPL	1
<i>Quercus palustris</i>	pin oak	shrub, herb	FACW	4
<i>Rosa multiflora</i>	multiflora rose	shrub	FACU	**
<i>Rumex crispus</i>	curly dock	herb	FAC+	**
<i>Sagittaria latifolia</i>	common arrowhead	herb	OBL	4
<i>Salix amygdaloides</i>	peach-leaved willow	shrub	FACW	4
<i>Salix exigua</i>	sandbar willow	shrub	OBL	1
<i>Salix nigra</i>	black willow	shrub, herb	OBL	3
<i>Scirpus atrovirens</i>	green bulrush	herb	OBL	4
<i>Scirpus pendulus</i>	red bulrush	herb	OBL	3
<i>Setaria faberi</i>	giant foxtail	herb	FACU+	**
<i>Setaria glauca</i>	yellow foxtail	herb	FAC	**
<i>Sida spinosa</i>	prickly mallow	herb	FACU	**
<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>Toxicodendron radicans</i>	poison ivy	herb	FAC+	1
<i>Tridens flavus</i>	purpletop	herb	UPL	1
<i>Trifolium pratense</i>	red clover	herb	FACU+	**
<i>Trifolium repens</i>	white clover	herb	FACU+	**
<i>Typha latifolia</i>	common cattail	herb	OBL	1
<i>Ulmus americana</i>	American elm	shrub, herb	FACW-	5
<i>Verbena hastata</i>	blue vervain	herb	FACW+	3
<i>Verbena urticifolia</i>	white vervain	herb	FAC+	3
<i>Vitis riparia</i>	riverbank grape	herb	FACW-	2
<i>Xanthium strumarium</i>	cocklebur	herb	FAC	0

* Coefficient of Conservatism (see introduction)
 Mean c value = $\sum C/N = 238/94 = 2.5$

** Species not native to Illinois
 $FQI = \bar{c} \sqrt{N} = \sum C/\sqrt{N} = 238/\sqrt{94} = 24.5$

ROUTINE ONSITE WETLAND DETERMINATION

Site 1 (page 4 of 5)

Field Investigators: Tessene, Wilm, Kurylo, and Feist

Dates: 29 and 30 August 2001

Job No.: P96-037-73

Project Name: FAP 319 (US 36)

State: Illinois

County: Pike

Applicant: IDOT District 6

Site name: Marsh

Legal Description: NE/4, Sec. 17, T.4S., R.8W.

Location: Excavated part of wetland restoration/creation site at East Hannibal

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

$$\text{Mean } c \text{ value} = \Sigma C/N = 251/96 = 2.6$$

$$FQI = \bar{c} \sqrt{N} = \Sigma C/\sqrt{N} = 251/\sqrt{96} = 25.6$$

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

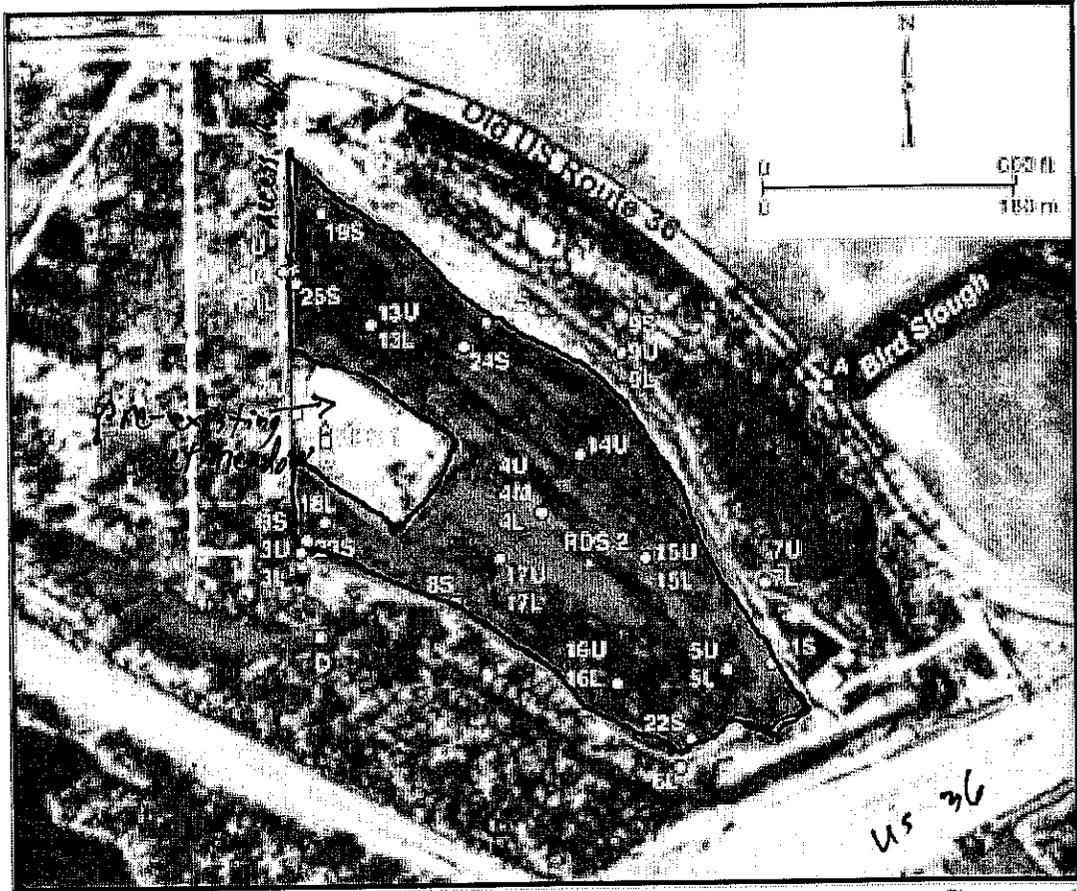
Appendix 2
Plant species observed in pre-existing wet meadow
at East Hannibal wetland compensation site, August 2001

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 sp.</i>	sedge	herb	-	-
<i>Cephalanthus occidentalis</i>	buttonbush	shrub	OBL	4
<i>Cuscuta sp.</i>	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 2001
FAP 319 (US 36) wetland creation site, East Hannibal, Pike County, Illinois



 estimated aerial extent of
2001 wetland hydrology
within excavated area

-  monitoring well
-  stage gauge
-  RDS data logger
-  rain gauge

Figure prepared
by ISGS