

Wetland Mitigation Monitoring Report for the FAP 319 (US 36) site near East Hannibal, Pike County, Illinois

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Summary

Based on observations made during the 1999 season, 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 nearly all the site, which is 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 dominated by native, weedy species. Planted tree species vary in their survival; overall, survival does not meet performance standards.

Introduction

This report details 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).

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 wetland area that existed when the mitigation site was a crop field (Plocher and Tessene 1995, 1997). 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 planned 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). Plant species rated facultative or wetter (FAC, FAC+, FACW, or OBL) is considered a hydrophyte. 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. 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). Monitoring well data from the Illinois State Geological Survey (Fucciolo *et al.* 1999) were used to determine the seasonal depth to the water table.

Project Goal 2

a) Planted species survivorship

Because 1951 total trees were planted on the site in 1997 and 1998 (Mike Vanderhoff, IDOT, pers. comm. to Allen Plocher, 1999), trees 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.

b) Native species abundance and cover, and

c) Dominant plant species

A complete survey of the excavated wetland basin was performed to tally all plant species present. Dominant herbaceous species were determined by visual estimates of abundance and cover. Systematic plant sampling was not conducted, but will take place in following years.

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* ($\bar{c} \sqrt{N}$). 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 ("farmed wetland") was sampled in 1994 and 1996 (Plocher and Tessene 1995, 1997) Previous sampling compared vegetation before and after a prescribed burn in Spring 1996. Vegetation sampling was also conducted during this survey of the site, following the same methods. Transects were established perpendicular to the long axis of the wetland, and 0.5 m² quadrats were placed at 15.2 m (50 ft) intervals. Cover of all species in each plot was assigned a cover class (Table 1) (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.

Table 1. Cover classes used in vegetation sampling.

Cover Class	Range of Cover (%)	Midpoint of Range (%)
1	0-5	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

Results and discussion

Project goal 1

a) Predominance of hydrophytic vegetation

Dominant plant species for the created wetland are listed in Table 2. All of the dominant species are hydrophytic. 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>Cyperus esculentus</i>	FACW	herb
2. <i>Echinochloa muricata</i>	OBL	herb
3. <i>Typha latifolia</i>	OBL	herb

The herbaceous species that colonized the site are dominated by weedy taxa that tolerate or even thrive under disturbed conditions, such as the original site excavation and periodic, prolonged inundation. *Cyperus* and *Echinochloa* are likely to become less important over time as they become out-competed or shaded out by other, more long-lived species. Cattails, on the other hand, may increase in number through rhizomatous spread and seeding. They are relatively tall and fast-growing plants. In parts of the site where planted trees become well-established, they should eventually shade out the cattails, but in other areas, cattails may come to predominate.

b) Presence of hydric soils

The soils in the excavated area are hydric. Prior to the excavation, several soil types were mapped (Keene and Tessene 1992). Since they were adjacent on the landscape and originate from similar alluvial parent material, the main difference among the soils was landscape position.

Soil cores were examined from 4 different areas at the site. The depth to a sandy alluvial layer ranged from 0.1 – 0.6 m (5 to 25 in), but little stratification was observed. A sandy substratum phase of this soil is recognized. Redoximorphic features as dark yellowish-brown iron masses were visible at approximately .08 m (3 in) from the current soil surface and were distinct throughout the profile. Iron-manganese concretions were also observed. The depth to saturation was approximately 0.6 m (24 in). 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.

Table 3. Soil profile description: Ambraw clay loam (Fluvaquentic Endoaquoll)

0 - 4 in	CBg	10YR 4/1, loam to clay loam, weak angular blocky to structureless and compacted with common, distinct, fine to medium 10YR 4/4 and 10YR 4/6 iron masses throughout
4 - 18 in	Cg1	10YR 4/1, silty clay loam, structureless, many, distinct, medium to coarse 10YR 4/4 and 10YR 4/6 iron masses throughout
18 - 24 in	Cg2	10YR 4/1 and 2.5Y 4/2, loamy sand

c) Presence of wetland hydrology

Field evidence of wetland hydrology included the excavated depressional landscape position, water-borne sediment deposits, and bare areas that suggest prolonged ponding. Well data suggest that the total area of the created wetland that conclusively meets the wetland hydrology criterion is 6.7 ha (16.5 acres) out of an excavated basin of 7.0 ha (17.4 acres)(Fucciolo *et al.* 1999).

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.

Table 4 presents data for planted tree survival, 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 4. Observed survival of planted trees 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 table, one can note that *Fraxinus pennsylvanica* has the greatest survival rate (92%) of the planted tree species, and that *Quercus bicolor* seems to have suffered a high rate of mortality recently (more observed dead than live stems). Relatively few of the original pecans (28%) are present, but once established, they appear to have fairly good survival, given the proportion of live versus dead stems (27 of 36 total observed stems). During sampling, some stems of planted species were noted to be missing where spacing would indicate a sapling should be present, possibly from herbivory or from toppling of unstable stems after prolonged soil saturation.

In any case, survival of planted trees (53% of originally planted stems) does not meet performance standards, which state that 100 healthy stems per acre is necessary. However, given the number of stems originally planted, this would have the unreasonable expectation of 90% or higher survival. Green ash may approach this rate, but the others will not. If 100 stems per acre (247 stems/hectare) of planted species are desired, planting rates will need to increase. On the other hand, other species will colonize the site, and some will become trees. *Acer saccharinum*, *Betula nigra*, (unplanted) *Fraxinus pennsylvanica*, *Populus deltoides*, *Salix exigua*, and *Salix nigra* stems were all recorded from the excavated wetland site in low numbers, and woody plants will certainly continue to invade the site from surrounding forests.

b) Abundance and cover of native species

During a survey of naturally occurring plant species on the wetland creation site, 45 native and 12 non-native species were observed (see Appendix 1). Most non-native species were annuals or short-lived perennials growing near the perimeter of the site, and are expected to diminish in importance as site conditions stabilize. The FQI value for the site (unplanted species) was 14.6 with a mean C value of 2.2, indicating fair natural quality. Including the planted saplings, the FQI value was 16.6 with a mean C value of 2.4.

c) Dominant plant species

The herbaceous species that colonized the site are dominated by weedy taxa that can tolerate or even thrive under disturbed conditions, such as the original site excavation and periodic, prolonged inundation. *Cyperus* and especially *Echinochloa* (an annual) are likely to become less important over time on most of the site as they are out-competed or shaded out by other, more long-lived species. Cattails, on the other hand, may increase in number through rhizomatous spread and seeding. They are relatively tall and fast-growing plants. In parts of the site where planted trees become well-established, they should eventually shade out the cattails, but in other areas, cattails may come to predominate. Whether or not these three dominant species are truly native to Illinois is a matter for debate, but it is likely that other species will increase in importance within the next five years.

Project Goal 3

Table 5 below provides the results of vegetation sampling on the wet meadow that existed at the wetland compensation site since the time when the adjacent land was a crop field. Information provided includes percent frequency, relative frequency, average percent cover, relative cover, and importance value for each species. A list of all species observed in the wet meadow is presented in Appendix 2.

Species	Freq.(%)	Rel.freq.(%)	Ave. Cover(%)	Rel. Cover(%)	IV
<i>Leersia oryzoides</i>	96.4	30.00	74.38	62.96	46.48
<i>Apocynum sibiricum</i>	85.7	26.67	17.14	14.51	20.59
<i>Aster simplex</i>	28.6	8.89	7.68	6.50	7.69
<i>Asclepias incarnata</i>	32.1	10.00	4.77	4.04	7.02
<i>Cyperus esculentus</i>	21.4	6.67	6.18	5.23	5.95
<i>Acer saccharinum</i>	14.3	4.44	0.86	0.73	2.59
<i>Campsis radicans</i>	3.6	1.11	1.34	1.13	1.12
<i>Carex lupulina</i>	3.6	1.11	1.34	1.13	1.12
<i>Eupatorium serotinum</i>	3.6	1.11	1.34	1.13	1.12
<i>Carex frankii</i>	3.6	1.11	0.54	0.45	0.78
<i>Cuscuta sp.</i>	3.6	1.11	0.54	0.45	0.78
<i>Ipomaea lacunosa</i>	3.6	1.11	0.54	0.45	0.78
<i>Phalaris arundinacea</i>	3.6	1.11	0.54	0.45	0.78
<i>Polygonum hydropiperoides</i>	3.6	1.11	0.54	0.45	0.78
<i>Carex vulpinoidea</i>	3.6	1.11	0.11	0.09	0.60
<i>Juncus interior</i>	3.6	1.11	0.11	0.09	0.60
<i>Poa pratensis</i>	3.6	1.11	0.11	0.09	0.60
<i>Vitis riparia</i>	3.6	1.11	0.11	0.09	0.60
Total	321.4	100.00	118.13	100.00	100.00

The results are comparable with previous sampling by Plocher and Tessene (1995, 1997), and the original wetland determinations by Keene and Tessene in 1992 showed the same top three species as dominants. The main difference in the sampling results is that *Echinochloa* (an annual) has dropped out in this survey, with *Cyperus* (a perennial) replacing it as an important component of the vegetation.

It is interesting to note, however, that several of the species recorded in the sampling were not observed in the created wetland, especially two dominants, *Leersia* and *Apocynum*. These vigorous, prolific native species are likely to colonize the created wetland. Only two non-native species were recorded in the sampling, *Poa* and *Phalaris*, both perennial, turf-forming grasses. The latter species has the greater potential to spread into the created wetland.

Recommendations

The excavated portion of the wetland creation site should develop into a wetland within five years, given that dominant hydrophytic vegetation and hydric soils are already present and that wetland hydrology is present on nearly all 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 site can be called jurisdictional wetland. Given the nature of the site, there is not room to increase the basin.

Planted sapling survival varied among species, but does not meet performance standards, except for *Fraxinus pennsylvanica*. In order to achieve the desired 100 live trees per acre, planting rates will need to be increased substantially to allow for inevitable losses. Natural colonization by woody species growing in the surrounding wetlands will add to density somewhat.

Unplanted herbaceous species in the planned wetland basin are weedy species that tolerate disturbance, as one might expect on a recently created site. *Typha* may come to pose a threat to a diverse herbaceous cover on the site; further monitoring is necessary, and some type of control may be needed in the future. *Phalaris* is 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).

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

Field Investigators: Tessene, Wilm, Coopridner, and Plocher Date: 11 August 1999
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: 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>Cyperus esculentus</i>	FACW	herb
2. <i>Echinochloa muricata</i>	OBL	herb
3. <i>Typha latifolia</i>	OBL	herb

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

Hydrophytic vegetation: Yes: 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: No:

Is the soil a histosol? Yes: No: Histic epipedon present? Yes: No:

Redox Concentrations? Yes: No: Colors: 10YR 4/4 and 10YR 4/6

Redox Depletions? Yes: No:

Matrix color: 10YR 4/1

Other hydric soil indicators:

Hydric soils: Yes: 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: Depth of standing water: None

Depth to saturated soil: 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, suggesting prolonged ponding.

Wetland hydrology: Yes: 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 3)

Field Investigators: Tessene, Wilm, Coopriider, and Plocher Date: 11 August 1999
 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>Acer saccharinum</i>	silver maple	shrub	FACW	1
<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>Aster pilosus</i>	field aster	herb	FACU+	0
<i>Aster simplex</i>	panicled 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>Bromus tectorum</i>	downy cheatgrass	herb	UPL	**
<i>Campsis radicans</i>	trumpet creeper	shrub, herb	FAC	2
<i>Carex vulpinoidea</i>	fox sedge	herb	OBL	3
<i>Cassia fasciculata</i>	partridge pea	herb	FACU-	1
<i>Conyza canadensis</i>	horseweed	herb	FAC-	0
<i>Cynanchum laeve</i>	climbing milkweed	herb	FAC	1
<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>Desmodium paniculatum</i>	panicled tick trefoil	herb	FACU	2
<i>Echinochloa muricata</i>	barnyard grass	herb	OBL	0
<i>Echinodorus berteroi</i>	lance-leaved burhead	herb	OBL	6
<i>Eleocharis compressa</i>	flat-stemmed spikerush	herb	FACW	7
<i>Eleocharis obtusa</i>	spike rush	herb	OBL	2
<i>Erigeron annuus</i>	daisy fleabane	herb	FAC-	1
<i>Euphorbia maculata</i>	nodding spruce	herb	FACU-	0
<i>Fraxinus pennsylvanica</i>	green ash	shrub	FACW	2
<i>Juncus tenuis</i>	path rush	herb	FAC	0
<i>Lactuca biennis</i>	biennial lettuce	herb	FAC	4
<i>Lactuca serriola</i>	prickly lettuce	herb	FAC	**
<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

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

** Species not native to Illinois

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

Field Investigators: Tessene, Wilm, Coopriders, and Plocher Date: 11 August 1999
 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>Lolium perenne</i>	perennial ryegrass	herb	FACU	**
<i>Lythrum alatum</i>	winged loosestrife	herb	OBL	5
<i>Mimulus ringens</i>	monkey flower	herb	OBL	5
<i>Mollugo verticillata</i>	carpetweed	herb	FAC	**
<i>Polygonum hydropiper</i>	water pepper	herb	OBL	**
<i>Polygonum pennsylvanicum</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	FAC+	2
<i>Potentilla norvegica</i>	rough cinquefoil	herb	FAC	0
<i>Pyrrolophaps carolinianus</i>	false dandelion	herb	UPL	1
<i>Rumex crispus</i>	curly dock	herb	FAC+	**
<i>Sagittaria latifolia</i>	common arrowhead	herb	OBL	4
<i>Salix exigua</i>	sandbar willow	shrub	OBL	1
<i>Salix nigra</i>	black willow	shrub	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>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>Xanthium strumarium</i>	cocklebur	herb	FAC	0

* Coefficient of Conservatism (see introduction)
 Mean c value = $\Sigma C/N = 98/45 = 2.2$

** Species not native to Illinois
 $FQI = \bar{c} \sqrt{N} = (2.2)\sqrt{45} = 14.6$

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Appendix 2
Plant species observed in pre-existing wet meadow
at East Hannibal wetland compensation site, August 1999

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>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>Epilobium coloratum</i>	cinnamon willow-herb	herb	OBL	3
<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>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 stoncrop	herb	OBL	2
<i>Phalaris arundinacea</i>	reed canary grass	herb	FACW+	**
<i>Poa pratensis</i>	Kentucky bluegrass	herb	FAC-	**
<i>Polygonum hydropiperoides</i>	mild water pepper	herb	OBL	4
<i>Polygonum pennsylvanicum</i>	smooth smartweed	herb	FACW+	1
<i>Sagittaria latifolia</i>	common arrowhead	herb	OBL	4
<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>Vitis riparia</i>	riverbank grape	woody vine, herb	FACW-	2

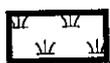
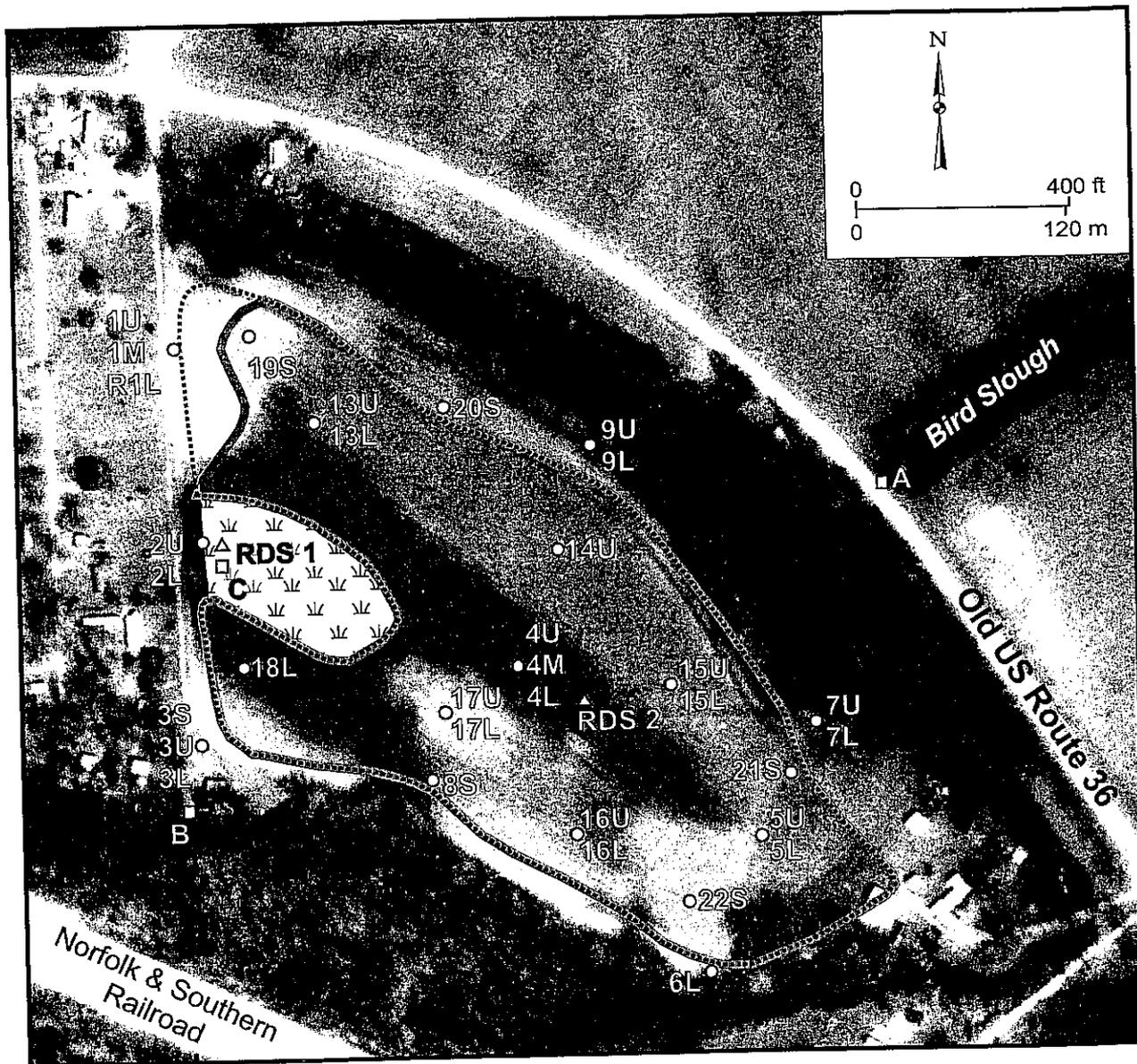
* Coefficient of Conservatism (see introduction)
 Mean c value = $\sum C/N = 90/31 = 2.9$

** Species not native to Illinois
 $FQI = \bar{c} \sqrt{N} = (2.9)\sqrt{31} = 16.2$

Hannibal Bridge Wetland Compensation Site (FAP 319)

Estimated Areal Extent of 1999 Wetland Hydrology

based on data collected between September 1, 1998 and September 1, 1999
map based on unrectified aerial photography from IDOT (March 16, 1994, NAPP 64-504)



pre-existing wetland

○ monitoring well



estimated areal extent of
1999 wetland hydrology

□ stage gauge



estimated areal extent of
excavated basin

△ RDS data logger