

**Mill River Freshwater Tidal Marshes:  
2007 Vegetation Monitoring**

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*Prepared for*

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## **Mill River Freshwater Tidal Marshes: 2007 Vegetation Monitoring**

As part of the ongoing evaluation of the lower Mill River corridor and the potential environmental effects of public water supply withdrawals, the South Central Connecticut Regional Water Authority (RWA) conducts annual monitoring of plant communities in the freshwater tidal marsh. This marsh, created in part by downstream tide gates belonging to the City of New Haven, is an unusual vegetation type that contributes significantly to the biological diversity and wildlife populations in the lower Mill River and East Rock Park.

The Water Authority's Environmental Study Team (EST), in its 1999 assessment of potential impacts of the proposed treatment plant, recommended that vegetation in the marsh be monitored annually or biennially, both prior to construction of the plant to provide baseline data and after the plant is placed in operation. Data from these vegetation studies, along with monitoring of soil salinity, river flow, water quality, and aquatic life in the lower Mill River, will be used to evaluate environmental impacts of treatment plant operation.

The new treatment plant was placed in operation on April 20, 2005. Prior to the operation of this plant, baseline data were collected from 1998 through 2004 (J. L. Rogers and P. Sharp 2005: "2004 Vegetation Monitoring in the Mill River Freshwater Tidal Marshes: A Summary of Six Years of Baseline Data Collection," prepared for the South Central Connecticut Regional Water Authority). The baseline sampling provided information on variation in plant communities in the marsh during six years (no monitoring was performed in 1999) when there were no withdrawals for water-supply use. Vegetation sampling was repeated in September 2006, during the first year of treatment plant operation, and continues to be performed annually in late summer. Soil water salinity measurements are made in spring and again in late summer from three monitoring wells on each transect, installed in September 2000.

### **Vegetation Sampling Methods**

Penni Sharp and Vincent Kay conducted quantitative vegetation sampling of the Mill River marshes on September 19 and 20, 2008. Monitoring in most previous years was performed between September 7 and September 25, except in 2000 when the site was sampled in mid-August. Sampling dates for each year are listed in Table 1 on page 6.

Vegetation sampling is conducted along two permanent transects. The upstream or northern transect, MR-N, is about 2,000 feet below the Whitney dam, just south of the East Rock Park footbridge and about 700 feet north of the East Rock Road bridge. This transect passes through one of the largest and most varied parts of the marsh. The downstream transect, MR-S, passes through a narrower and less varied marsh community about 300 feet south of the East Rock Road bridge.

Permanent transects at both sites are approximately perpendicular to the river with marker stakes placed every 5 meters. Transect MR-N is 100 m in length, but only 18 of the surveyed stakes are sampled regularly; the stake at the upland origin of the transect is outside the tidal

area, while the two stakes closest to the river are typically inundated and can be sampled only during unusually low flow conditions. Transect MR-S is 55 m long and ends at a low levee at the river; since it does not extend into the typically inundated low marsh along the river's edge, all 12 stakes are sampled regularly. Vegetation sampling is performed by extending 5-meter sampling chains south from each stake, perpendicular to the permanent transect. A dowel rod is inserted into the vegetation at 0.5 m. intervals along the sampling chain, for a total of 10 sampling points per chain, and all species touching the rod (or an imaginary upward extension of it) are recorded. Maps of these transects, and a detailed description of the methodology, appear in the report by Lee Rogers included in the *Lake Whitney Water Treatment Plant Environmental Evaluation: Volume Two* (January 1999).

## **Results**

### ***Precipitation and Soil Conditions***

Precipitation in the lower Mill River during the 2007 growing season (April-September) was near average overall (see Table 1). However, the distribution of precipitation was marked by an unusually wet April, when the area received 10.17 inches of rain, well more than twice the long-term average of 4.22 inches for the month. This was followed by a very dry May, when only 1.47 inches of rain fell, and precipitation remained below average for the remainder of the growing season, though only September had extremely low rainfall (1.58 inches). Overall, precipitation from May through September 2007 was the second lowest since the Mill River monitoring project began in 1998; only in the very dry year of 2005 was rainfall lower for the last five months of the growing season. Month-by-month precipitation data for the ten years since sampling began appear in Appendix A, Table A-1.

Withdrawals from Lake Whitney guided by a Management Plan intended to protect downstream and upstream environmental resources. Daily withdrawals during the spring high-rainfall period were generally 4-5 million gallons per day (mgd) in 2007. From early May to early June, withdrawals were at or near zero due to treatment plant maintenance activities, and they remained less than 5 mgd until mid-November. With the exception of a brief manual drawdown for dam inspection in June, Lake Whitney levels remained near or above spillway level throughout most of the growing season, and downstream flows remained above 10 mgd until late September.

Soil water in the transect monitoring wells was sampled on May 11 and July 12, 2007, during both high and low tide conditions. Monitoring well data for 2007 and for the two preceding years (2005 was a very dry year and 2006 had very high rainfall) are included in Appendix A, Table A2. Salinity in the Mill River adjacent to the transects during July generally remains around 0.1 parts per thousand (ppt), but in 2007 it reached 0.2-0.4 ppt in the July low-flow period. No such elevated salinities were observed for July even in the 2005 dry growing season, though salinities of 0.2 ppt were measured in the summer of 2002. Unusually high ground water salinities of 0.4 ppt were also measured in July 2007 in the monitoring well closest to the river at site MR-S. All other ground water measurements remained at 0.1-0.2 ppt. In previous years, peak soil-water salinity measurements reached 0.4-0.5 ppt in 2001 and as high as 0.7 ppt in 2002. In late summer, surface salinities in the adjacent river can reach 11

ppt or greater. These higher salinities are generally due to seasonal low flows that are unlikely to inundate the marsh, and they therefore have little or no effect on soil water salinities. Throughout the study, however, soil-water salinity has remained below 0.5 ppt as an annual average, considered the limit of tolerance for freshwater marsh plants.

**2007 Vegetation Monitoring Results**

Vegetation monitoring results in 2006, along with those obtained during the baseline years, are summarized in the tables below. Table 1 shows the total number of species and total percent cover measured on each transect during the nine years of sampling. Percent cover is the percentage of all points sampled at which a species occurred. Total percent cover, obtained by adding the percent cover for all species, is generally more than 100 percent, because several species are encountered at a single sampling point. Table 1 also shows growing-season precipitation conditions. For purposes of this table, rainfall more than 2 inches below the long-term growing-season average of 23 inches was considered “low,” 21-25 inches “normal,” and above 25 inches “high.” Since the time of sampling could also affect species distribution, the approximate sampling dates are also included in the table.

**Table 1**  
**Mill River Freshwater Tidal Marsh**  
**Total Cover and Number of Species on Each Transect, 1998-2007**

Year	Sampling date	Growing-season Rainfall (Apr.-Sept.)	Transect MR-N			Transect MR-S		
			Total Cover		Total # spp.	Total Cover		Total # spp.
			Percent	Rank		Percent	Rank	
1998	9/21	26.18" - high	215.6	9	31	228.3	9	23
2000	8/18	27.99" - high	259.4	8	29	244.2	8	17
2001	9/24	20.25" - low	359.4	2	40	258.3	6	27
2002	9/24	24.15" - average	315.0	4	28	279.0	5	23
2003	9/25	27.58" - high	290.0	7	31	256.7	7	21
2004	9/7	24.29" - average	366.7	1	26	338.3	2	17
2005	9/20	16.79" - low	348.3	3	32	359.2	1	27
2006	9/18-19	29.50" - high	314.4	5	32	291.6	4	35
2007	9/19-20	22.51" - average	306.1	6	33	322.5	3	25

Changes in cover by selected plant species over the past decade are shown in Table 2 for site MR-N and Table 3 for site MR-S. These tables indicate the dominant species of the herb and shrub strata in 2007. Dominants are those species that collectively make up more than half the total percent cover for that stratum of the community. Percent cover by several other common species that may have been dominant or subdominant in past years' samples are also included in these tables.

**Table 2**  
**Percent Cover of Principal Species – Transect MR-N**

Species (* dominant in 2007)	Year (Growing Season Precipitation)								
	2007 (avg.)	2006 (high)	2005 (low)	2004 (avg.)	2003 (high)	2002 (avg.)	2001 (low)	2000 (high)	1998 (high)
<b>HERBS</b>									
<i>*Typha angustifolia</i>	50.0	51.7	57.2	46.7	44.4	47.2	51.7	46.7	45.0
<i>*Lythrum salicaria</i>	35.6	31.7	31.7	30.6	15.6	20.6	17.2	17.8	7.2
<i>*Impatiens capensis</i>	33.9	10.6	34.4	66.7	40.6	45.0	42.8	23.3	13.9
<i>*Thelypteris palustris</i>	15.6	12.2	20.0	14.4	16.7	13.3	17.8	11.1	0.0
<i>Leersia oryzoides</i>	13.3	21.7	30.6	22.2	11.1	8.9	11.7	3.3	2.2
<i>Polygonum sagittatum</i>	12.8	6.7	13.9	20.0	1.7	0.0	10.6	0.0	0.0
<i>Polygonum hydropiper</i>	10.6	3.3	4.4	12.2	3.9	3.9	4.4	0.0	0.0
<i>Onoclea sensibilis</i>	10.0	11.1	8.9	6.1	8.3	5.6	7.2	7.2	2.2
<i>Cuscuta gronovii</i>	7.6	0.0	4.4	8.9	5.0	1.1	3.9	0.0	0.0
<i>Bohemeria cylindrica</i>	6.1	9.4	6.1	15.6	6.7	5.6	10.6	5.0	8.3
<i>Pilea pumila</i>	5.8	1.7	1.1	5.0	0.0	0.0	0.0	0.0	1.1
<i>Peltandra virginica</i>	5.0	4.4	6.7	7.2	6.1	2.8	3.9	3.3	2.2
<i>Mikania scandens</i>	4.4	47.8	24.4	15.6	30.6	48.3	28.9	21.7	31.1
<i>Polygonum arifolium</i>	1.7	6.1	2.8	2.2	2.2	0.6	2.8	3.3	1.7
<i>Bidens connata</i>	0.6	2.8	6.7	0.0	0.0	0.0	0.0	0.0	3.3
<b>SHRUBS</b>									
<i>*Cornus amomum</i>	45.6	41.7	37.8	46.1	40.6	45.6	37.8	47.2	41.1
<i>Hibiscus moscheutos</i>	8.9	10.6	9.4	6.1	7.8	5.0	5.0	5.0	2.8
<i>Viburnum dentatum</i>	7.2	11.7	14.4	8.3	20.0	20.0	25.6	17.8	15.6
<i>Cephalanthus occidentalis</i>	2.8	2.8	3.3	0.0	5.6	2.8	5.0	3.3	1.7

**Table 3**  
**Percent Cover of Principal Species – Transect MR-S**

Species (* dominant in 2007)	Year (Growing Season Precipitation)								
	2007 (avg.)	2006 (high)	2005 (low)	2004 (avg.)	2003 (high)	2002 (avg.)	2001 (low)	2000 (high)	1998 (high)
<b>HERBS</b>									
<i>*Impatiens capensis</i>	64.2	21.7	48.3	74.2	56.7	69.2	42.5	42.5	32.5
<i>*Typha angustifolia</i>	55.8	61.7	76.7	83.3	75.0	81.7	80.0	78.3	66.7
<i>*Pilea pumila</i>	17.5	9.2	9.2	14.2	0.0	0.0	0.0	0.0	0.0
<i>*Polygonum arifolium</i>	17.5	6.7	15.8	21.7	12.5	0.0	8.3	0.0	9.2
<i>*Polygonum sagittatum</i>	17.5	0.8	11.7	12.5	5.8	2.5	2.5	4.2	0.0
<i>*Lythrum salicaria</i>	16.7	20.8	23.3	11.7	14.2	10.8	15.8	6.7	0.8
<i>*Cuscuta gronovii</i>	16.7	0.0	11.7	2.5	0.0	4.2	8.3	0.0	3.3
<i>Peltandra virginica</i>	15.0	11.7	10.0	13.3	12.5	8.3	8.3	10.8	1.7
<i>Leersia oryzoides</i>	11.7	9.2	2.5	0.0	2.5	0.8	2.5	8.3	3.3
<i>Mikania scandens</i>	10.0	50.0	45.8	33.3	21.7	31.7	28.3	35.8	65.0
<i>Bohemeria cylindrica</i>	9.2	5.8	10.0	13.3	6.7	5.8	5.8	5.8	1.7
<i>Apios americana</i>	2.5	5.0	1.7	0.0	0.0	0.0	0.8	0.8	0.0
<i>Polygonum hydropiper</i>	1.5	5.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0
<b>SHRUBS</b>									
<i>*Viburnum dentatum</i>	18.3	20.8	15.0	11.7	12.5	11.7	10.0	14.2	8.3
<i>Cornus amomum</i>	10.0	10.8	12.5	12.5	9.2	5.0	8.3	8.3	5.8
<i>Lindera benzoin</i>	4.2	5.0	5.8	5.8	4.2	4.2	4.2	7.5	5.8
<i>Hibiscus moscheutos</i>	1.7	2.5	5.0	6.7	3.3	5.0	4.2	4.2	2.5

Complete vegetation monitoring results for 2007 are presented in Appendix B, along with a description of the plant communities on each transect. Appendix tables N (MR-N transect) and S (MR-S transect) show the data collected on the north and south transects, respectively. These tables illustrate the zonation in the marshes, providing a profile of the two marsh areas. The marshes are subdivided into zones based on topography and vegetation, as described in the vegetation report in the *Lake Whitney Water Treatment Plant Environmental Evaluation: Volume Two* (Rogers 1999).

Percent cover of all species encountered on the transects during 2007 and the eight previous years of sampling is included in Appendix C. For each transect, this information is arranged both in decreasing order of percent cover in 2007 and alphabetically by scientific name. Since the Whitney treatment plant went online in April 2005, monitoring for the years 1998 and 2000-2004 provides an extended period of baseline data.

The most striking change in the structure of the wetland communities in 2007 was a large decrease in the climbing composite *Mikania scandens*. This annual vine, generally found clambering over narrow-leaved cattails (*Typha angustifolia*) in the marshes, reached a near-peak in 2006, but in 2007 it fell to the lowest percent cover that has been observed during the study, less than a fifth of its previous year cover (see Tables 2 and 3). This plant is closely associated with the cattails, but the decrease in cattail cover observed in 2007 was much smaller; however, at MR-S, the cattail cover of 55.8 percent was the lowest yet observed in this study. At MR-N, cattail cover of 50 percent was near the average for the study.

Also notable was the increase in cover by spotted jewelweed (*Impatiens capensis*) at both sites compared with 2006, although its 2007 cover was well within the range previously observed. This annual is extremely variable from year to year at all the sites we have studied. The parasitic vine dodder (*Cuscuta gronovii*), which favors the succulent jewelweed as a host plant, also increased strongly in cover compared with 2006.

At transect MR-N, only two other common species in 2007 were outside the range observed during the baseline period (see Table 2). Clearweed (*Pilea pumila*), a highly variable annual, had 5.8 percent cover; it has usually been below 2 percent, though it reached 5 percent in 2004. Purple loosestrife (*Lythrum salicaria*) has increased steadily at this site from its 1998 cover of 7.2 percent, and its 35.6 percent cover in 2007 was the highest yet measured.

At transect MR-S, purple loosestrife cover in 2007 decreased from that in 2005 and 2006 (see Table 3). Several other species, however, did reach project highs in 2007. These included clearweed, as well as arrow-leaved tearthumb (*Polygonum sagittatum*), rice cutgrass (*Leersia oryzoides*), and arrow arum (*Peltandra virginica*).

Shrub cover at both sites has shown some increase since the study was initiated, but in 2007 the most abundant shrub species, silky dogwood (*Cornus amomum*) and northern arrowwood (*Viburnum dentatum*), remained within the previously observed range at both sites. However, swamp rosemallow (*Hibiscus moscheutos*) at site MR-S has decreased in cover over the past few years, from 6.7 percent in 2004 to a low of 1.7 percent in 2007.

## Discussion

### *Species Diversity and Total Plant Cover*

Tables 1, 2, and 3 illustrate the variability in the structure of the marsh communities from year to year. The total number of species in a plant community is an indication of its structure and complexity. A complex, diverse plant community generally is a richer wildlife habitat than an area with fewer species because the complex community can fill more of the requirements of a variety of animal species. As shown in Table 1, the transect at MR-N, the more complex of our two marsh sites, has yielded 26 to 40 plant species in 1998-2006; 33 species sampled in 2007 is near the middle of this range. At MR-S, the number of species from 1998 through 2005 ranged from 17 to 27, but in 2006, the number of species reached 35. This increase was largely due to the presence on the transect of just one or two individuals of several species that constitute a very minor part of the overall community. It is likely that this was simply a

statistical anomaly that does not indicate any long-term trend. The 25 species observed in 2007 was within the typical range.

Total plant cover is another indicator of complexity and overall health in a plant community since it reflects the presence of multiple species at each sampling point. Cover by each individual species is the percentage of total sampling points along the transect at which the species is found. These typically sum to more than 100 percent cover because several species are usually found at a sampling point. As Table 1 shows, total cover was generally highest in years of low to normal rainfall and lower in the years when growing-season precipitation was above normal. However, 2006, the wettest year, was anomalous in having both higher cover and greater species diversity than are typical in a year of high rainfall. Generally, diversity and cover are higher in relatively dry growing season because species that prefer dryer conditions can move deeper into the marsh while more hydric species persevere in the wettest areas. In 2007, cover and diversity at MR-S were typical of what would be expected in a season of average precipitation, but at MR-N these values were typical of a wetter year, perhaps because the high April rainfall interfered with germination and establishment by some species.

### ***Herbaceous and Shrub Cover***

The upper and middle marsh communities at both of the Mill River marsh sites are mosaics of herbaceous emergent marsh species intermixed with shrub thickets; intermittently submerged herbaceous species are dominant in the lower marsh zone which is more frequently inundated by tides. Shrubs tend to occur in drier portions of the marsh that are rarely flooded. The wetter parts of the Mill River marsh are dominated by narrow-leaved cattails (*Typha angustifolia*), but include a mixture of many other herbaceous species. The principal thicket-forming shrub species are silky dogwood (*Cornus amomum*) and northern arrowwood (*Viburnum dentatum*). Because the shrub areas support very little species diversity, a long-term increase in shrub areas at the expense of herbaceous area could indicate not only that the marsh is becoming drier, but that its complexity and diversity are reduced.

In the Mill River marshes, cattail cover at both sites has decreased over the past few years. At MR-N (Table 2), cattails in 2007 remained within the range observed during the baseline period before the water treatment plant was placed in service. At MR-S (Table 3), however, cattail cover reached new lows in both 2006 and 2007. This could indicate a long-term decline, and future changes should be evaluated carefully. It is also possible that extremely high water levels in the marsh in mid-April 2007 affected the establishment of the cattails. Slightly higher marsh elevation at MR-N and the fact that the cattail community is less well established may have contributed to the different effects on the two marsh communities.

There is also possible evidence of a long-term increase in cover by silky dogwood and northern arrowwood at MR-S between 1998 and 2007. Since this trend was evident during the 6-year baseline period, it is not considered to indicate a change due to operation of the treatment plant.



### ***Cover by Introduced Wetland Species***

Invasion by non-native species has become a serious problem in some wetland areas. Two of the most widespread invasive species are the tall reed *Phragmites australis* and the showy perennial, purple loosestrife (*Lythrum salicarium*). These species can spread extensively in a marsh community, especially one that has been disturbed or stressed, replacing most of the native vegetation. This produces a much less complex and varied marsh that is unable to support diverse wildlife.

Purple loosestrife has show a long-term increase at both sites. At MR-N, this species had an initial baseline cover of 7.2 percent in 1998 and reached a high of 35.6 percent in 2007. At MR-S, loosestrife cover was 0.8 percent in 1998 and reached a peak of 23.3 percent in 2005. Over the past two years, it has declined to 16.7 percent. The trend of increasing loosestrife cover was evident during the baseline period (1998-2004) and does not appear to have accelerated since the water treatment plant was placed in service.

No *Phragmites* occurs on the Mill River transects. There are isolated patches of this species within the marsh, primarily where dredging, draining, or pollution by storm sewer outfalls has occurred. We have found no evidence that these areas are expanding.

### **Conclusions**

There is some evidence from several years of vegetation sampling that freshwater tidal marshes in the lower Mill River are undergoing gradual changes. The gradual invasion by purple loosestrife, the increase in shrub cover, and the decrease in cattail cover at site MR-S could eventually result in an overall loss of diversity and wildlife habitat value of these marshes. Since the Whitney water treatment plant has only been in operation since 2005 and the changes in the plant communities have been occurring at least since 1998, these changes do not appear to indicate environmental impacts due to treatment plant operation. This is further supported by the fact that downstream flows have not been seriously affected and average groundwater salinities remain well below 0.5 ppt. It is possible that future operations could play a role in accelerating changes in marsh plant communities, so continued monitoring is needed to ensure that withdrawal management and mitigation measures are adequate and effective.

## **Mill River Freshwater Tidal Marshes**

### **Appendices**

#### **Appendix A: Precipitation and Salinity in the Mill River Marshes**

Table A1: Lake Whitney Precipitation, 1998 - 2007

Table A2: Groundwater Monitoring Well Data, 2004-2007

#### **Appendix B: Transect Descriptions and 2006 Vegetation Monitoring Results**

##### **1. MR-N Transect**

Table N: Mill River Freshwater Tidal Marsh Vegetation, North Site (MR-N) –  
Frequency by Species and Zone: 2007

##### **2. MR-S Transect**

Table S: Mill River Freshwater Tidal Marsh Vegetation, South Site (MR-S) –  
Frequency by Species and Zone: 2007

#### **Appendix C: Vegetation Sampling Data, 1998 - 2007**

##### **1. MR-N Transect**

List of Species by Percent Cover in 2007

Alphabetical List of Species and Percent Cover

##### **2. MR-S Transect**

List of Species by Percent Cover in 2007

Alphabetical List of Species and Percent Cover

## Appendix A Precipitation and Salinity in the Mill River Marshes

**Table A1  
Lake Whitney Precipitation, 1998-2006**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	G.S.*
1998	5.00	4.69	5.59	3.98	5.51	8.30	1.11	4.92	2.36	3.23	1.81	0.95	47.45	26.18
1999	6.85	4.76	3.90	1.50	2.75	0.32	1.22	3.42	7.05	3.86	2.91	2.41	40.95	16.26
2000	2.44	1.89	4.14	4.68	3.31	5.95	7.04	2.72	4.29	0.44	4.45	2.41	43.76	27.99
2001	1.62	2.05	7.29	1.53	5.32	4.26	2.87	3.43	2.84	1.18	1.03	2.18	35.60	20.25
2002	1.67	1.27	4.09	3.45	5.56	3.35	1.90	3.16	6.73	4.20	4.15	4.06	43.59	24.15
2003	1.47	2.48	4.13	2.92	4.11	6.57	1.57	5.47	6.94	5.36	2.18	3.62	46.82	27.58
2004	1.38	2.09	3.08	5.77	2.69	0.88	2.95	4.52	7.48	1.97	3.19	3.27	39.27	24.29
2005	3.61	2.31	3.16	6.14	1.31	2.68	2.83	1.35	2.48	14.03	3.90	4.25	48.05	16.79
2006	5.70	2.42	0.55	6.46	6.35	5.87	3.54	5.08	2.20	6.58	4.73	2.88	52.36	29.50
2007	3.64	1.28	5.71	10.17	1.47	3.39	3.54	2.36	1.58	3.80	2.00	N/A	N/A	22.51
<i>10-yr Aver.</i>	<i>3.38</i>	<i>2.52</i>	<i>4.16</i>	<i>4.66</i>	<i>3.84</i>	<i>4.16</i>	<i>2.86</i>	<i>3.64</i>	<i>4.40</i>	<i>4.47</i>	<i>3.04</i>	<i>2.89</i>	<i>44.21</i>	<i>23.55</i>
<i>95-yr Aver.</i>	<i>3.68</i>	<i>3.22</i>	<i>4.34</i>	<i>4.22</i>	<i>3.93</i>	<i>3.59</i>	<i>3.62</i>	<i>3.95</i>	<i>3.71</i>	<i>3.72</i>	<i>4.01</i>	<i>3.97</i>	<i>45.96</i>	<i>23.02</i>

\* Growing season precipitation, April through September.

**Table A2  
Groundwater Monitoring Well Data, 2004-2007**

Monitor well	2005				2006				2007			
	4/8/05 (high flow)		7/21/05 (low flow)		4/27/06 (high flow)		7/12/06 (low flow)		5/11/07 (high flow)		7/12/07 (low flow)	
	Low tide	High tide	Low tide	High tide	Low tide	High tide	Low tide	High tide	Low tide	High tide	Low tide	High tide
MRN-1	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1
MRN-2	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.2
MRN-3	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
River@ MR-N	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
MRS-1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1
MRS-2	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.1
MRS-3	0.1	0.1	0.3	0.1	0.1	0.4	0.2	0.1	0.2	0.1	0.4	0.4
River@ MR-S	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3

## Appendix B

### Transect Descriptions and 2007 Vegetation Monitoring Results

#### MR-N Transect

The upstream or northern transect, MR-N, is about 2,000 feet below the Whitney dam, just south of the East Rock Park footbridge and about 700 feet north of the East Rock Road bridge. This transect passes through one of the largest and most varied parts of the marsh. As surveyed, the transect is about 100 meters long; approximately 75 meters of this length passes through high marsh, a mosaic of shrubs and emergent marsh (primarily cattails), which is seasonally or occasionally flooded but not subject to daily tidal inundations. About 25 meters of low marsh bordering the river is alternately flooded and exposed as a result of daily tidal fluctuations in the river; portions of the low marsh are often inaccessible due to flooding by tidal action or high river flows. On transect MR-N, sampling begins at the second stake, since the stake at the origin of the transect is located within a swale with little vegetation other than canopy trees overhanging from the adjacent upland forest. A total of 18 stakes are sampled, for a total of 18 chains and 180 sampling points; two additional stakes were installed and surveyed on the riverward end of this transect but are typically inundated and have not been accessible for sampling.

As shown in Table N, the upper marsh on transect MR-N is dominated by spotted jewelweed (*Impatiens capensis*), which gradually gives way to narrow-leaved cattail (*Typha angustifolia*), an emergent marsh plant tolerant of relatively high salinities. Cattail dominates the middle marsh, along with the climbing composite *Mikania scandens*. The transect then passes through a broad area where emergent marsh intermingles with shrub thickets, apparently depending on small changes in elevation; this area appears in Table N as three zones, "Shrub thicket," "Shrub/marsh" (the lowest area), and "Dogwood thicket." In the higher areas of this complex, silky dogwood (*Cornus amomum*) dominates, intermixed with several herbaceous species, including cattail, mikania, jewelweed, and goldenrod (*Solidago gigantea*). Swamp rosemallow (*Hibiscus moscheutos*) is also among the shrubs in this area. In the lower swale, northern arrowwood (*Viburnum dentatum* var. *recognitum*) is the dominant shrub; buttonbush (*Cephalanthus occidentalis*), a shrub highly tolerant of periodic inundation, appears in the lowest and wettest areas. Cattails (*T. angustifolia*) are absent in the low shrub/marsh, and jewelweed (*I. capensis*) is the dominant herbaceous species. As the ground rises slightly on the riverward side, there is a dense thicket of silky dogwood (*C. amomum*), again intermixed with cattails as well as jewelweed. Below this rise, the substrate descends fairly rapidly toward the river. Silky dogwood is still common on higher ground, but cattails disappear in the low marsh, which is subject to frequent tidal inundation. *Mikania scandens*, purple loosestrife (*Lythrum salicaria*), and jewelweed occur among the dogwood, but give way to arrow arum (*Peltandra virginiana*), and then (beyond stake 18) to other species tolerant of regular submersion, including arrowhead (*Sagittaria* sp.), pickerel weed (*Pontederia* sp.), and white waterlily (*Nymphaea odorata*).

Table N: MILL RIVER FRESHWATER TIDAL MARSH VEGETATION, NORTH SITE (MR-N) -- FREQUENCY BY SPECIES AND ZONE, 2007

Vegetation Zone:	Upper marsh		Mid.marsh		Shrub thicket		Shrub/marsh		Dogwood thicket		Low marsh		2007								
Species	Chain no.: Chains are 5 m. apart and 5 m. long, with 10 sampling points per chain: Total 180 points																		Total	%Cover	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
<i>Iris pseudacorus</i>	1																		1	0.6	
<i>Viburnum lentago</i>																			0	0.0	
<i>Bidens connata</i>	1														1	1			3	1.7	
<i>Polygonum sagittatum</i>				3	5	1	1	5	6		2								23	12.8	
<i>Polygonum arifolium</i>		1				1	1												3	1.7	
<i>Impatiens capensis</i>	4	9	8	4	4	4	1	8	5	1	2	1		6	2	2			61	33.9	
<i>Onoclea sensibilis</i>		9	2							3	4								18	10.0	
<i>Mikania scandens</i>					1	1				5							1		8	4.4	
<i>Typha angustifolia</i>		9	10	10	10	10	10	10	4	7	2			6	1	1			90	50.0	
<i>Lythrum salicaria</i>		6	8	7	8	10	7	6	3	7				1		1			64	35.6	
<i>Todxocodendron radicans</i>			2																2	1.1	
<i>Thelypteris palustris</i>		4	7	10	5									2					28	15.6	
<i>Apios americana</i>			3																3	1.7	
<i>Pilea pumila</i>				1	6				1	3	1			1		1			14	7.8	
<i>Bohemeria cylindrica</i>		2		2		3	2	1						1					11	6.1	
<i>Cuscuta gronovii</i>						2		1	1				3		3				10	5.6	
<i>Verbena hastata</i>				2	1														3	1.7	
<i>Hibiscus moscheutos</i>							10	6											16	8.9	
<i>Parthenocissus quinquefolia</i>										5		7		1					13	7.2	
<i>Geum rivale</i>																			0	0.0	
<i>Vernonia novaboracensis</i>									2										2	1.1	
<i>Symplotrichum lanceolata</i>								4	2	3	3	1		1					14	7.8	
<i>Cornus amomum</i>								7	9	4		10	10	10	10	9	8	5	82	45.6	
<i>Solidago altissima</i>									2										2	1.1	
<i>Leersia oryzoides</i>									7										24	13.3	
<i>Viburnum dentatum</i>											2	8	3						13	7.2	
<i>Mimulus ringens</i>					3	1													4	2.2	
<i>Polygonum hydropiper</i>			1	1	1			1		4	1		1	2	2	4		1	19	10.6	
<i>Cephalanthus occidentalis</i>														5					5	2.8	
<i>Solanum dulcamara</i>														1					1	0.6	
<i>Pontaeaderia cordata</i>														1	2				3	1.7	
<i>Eupatorium maculatum</i>																1			1	0.6	
<i>Cicuta maculata</i>																			0	0.0	
<i>Nyphaea odorata</i>																			0	0.0	
<i>Bidens frondosa</i>																1			1	0.6	
<i>Peltandra virginiana</i>																2	2	5	9	5.0	
																			<b>TOTALS</b>	<b>551</b>	<b>306.1</b>

**MR-S Transect**

The downstream transect, MR-S, passes through a narrower and less varied marsh community about 300 feet south of the East Rock Road bridge. This transect is about 55 meters long from upland edge to river. The high marsh, about 45 meters wide, consists primarily of cattail marsh, with shrub thickets on elevated hummocks. The remaining 10 meters of the transect is in low marsh bordering the river. For transect MR-S, sampling begins at the origin of the permanent transect (stake 1) and extends through stake 12, for a total of 12 chains and 120 sampling points.

As shown in Table S, sampling at site MR-S, begins in an area of transition between upland forest and marsh, dominated by spicebush (*Lindera benzoin*), silky dogwood (*Cornus amomum*), and multiflora rose (*Rosa multiflora*); jewelweed is the dominant herb. In the upper marsh, narrow-leaved cattail (*Typha angustifolia*) and jewelweed (*Impatiens capensis*) are dominant, while in the middle marsh, jewelweed becomes less common and cattails share dominance with *Mikania scandens*. The transect then crosses a small rise or hummock, where a few shrubs such as swamp rosemallow (*Hibiscus moscheutos*) intermix with the cattail community. Beyond this is low marsh, where cattails and jewelweed are replaced by arrow arum. The last sampling chain crosses part of a small levee adjacent to the river, where a large silver maple (*Acer saccharinum*) and other upland species occur.

Table S: MILL RIVER SOUTH (MR-S) VEGETATION FREQUENCY BY SPECIES AND ZONE, 2007

Vegetation Zone:	Trans.shrub	Upper marsh	Middle marsh	Hummock	Lower marsh										
Species	Chain No. (Total of 12 chains, 120 sampling points)												2007		
	1	2	3	4	5	6	7	8	9	10	11	12	Total	%Cover	
<i>Lindera benzoin</i>	5												5	4.2	
<i>Acer rubrum</i>	10	4											14	11.7	
<i>Impatiens capensis</i>		9	7	9	10	6	8	9	10	9			77	64.2	
<i>Parthenocissus quinquefolia</i>	1												1	0.8	
<i>Cornus amomum</i>		8									4		12	10.0	
<i>Bidens connata</i>									6				6	5.0	
<i>Chelone glabra</i>													0	0.0	
<i>Polygonum arifolium</i>		3	2	3	2	1	8	2					21	17.5	
<i>Viburnum dentatum</i>		2	7	7							3	3	22	18.3	
<i>Leersia oryzoides</i>		5	4	5									14	11.7	
<i>Pilea pumila</i>			2	5	7				3	4			21	17.5	
<i>Typha angustifolia</i>		4	3	3	10	10	9	10	7	10	1		67	55.8	
<i>Mikania scandens</i>							2	6	2	2			12	10.0	
<i>Rosa multiflora</i>													0	0.0	
<i>Peltandra virginica</i>				1							7	10	18	15.0	
<i>Lythrum salicaria</i>			1	3	4	3		3		1		5	20	16.7	
<i>Bohemeria cylindrica</i>					1	5	2	1		2			11	9.2	
<i>Carex sp.</i>													0	0.0	
<i>Scutellaria laterifolia</i>													0	0.0	
<i>Lycopus americana</i>													0	0.0	
<i>Geum canadense</i>													0	0.0	
<i>Onoclea sensibilis</i>													0	0.0	
<i>Polygonum sagittatum</i>					3	3			7	8			21	17.5	
<i>Symplotrichium lanceolata</i>													0	0.0	
<i>Solanum dulcamara</i>					2								2	1.7	
<i>Cardamine sp.</i>													0	0.0	
<i>Hibiscus moscheutos</i>									2				2	1.7	
<i>Helenium autumnale</i>													0	0.0	
<i>Apios americana</i>										3			3	2.5	
<i>Eupatorium maculatum</i>													0	0.0	
<i>Mimulus ringens</i>													0	0.0	
<i>Polygonum hydropiper</i>				1						1			2	1.7	
<i>Polygonum pennsylvanium</i>											1		1	0.8	
<i>Lonicera morrowii</i>											4		4	3.3	
<i>Lobelia cardinalis</i>													0	0.0	
<i>Toxicodendron radicans</i>											1		1	0.8	
<i>Acer saccharinum</i> *											10		10	8.3	
													<b>TOTALS</b>	<b>366</b>	<b>305.0</b>

\* Overhanging canopy of tree rooted on adjacent levee

## **Appendix C**

### **Mill River Freshwater Tidal Marshes: Vegetation Sampling Data 1998-2007**

#### **1. MR-N Transect**

List of Species by Percent Cover in 2007

Alphabetical List of Species and Percent Cover

#### **2. MR-S Transect**

List of Species by Percent Cover in 2007

Alphabetical List of Species and Percent Cover



MR-N Transect - Summary of Species by Percent Cover in 2007																		
1998* - 2007																		
Year	1998		2000		2001		2002		2003		2004		2005		2006		2007	
Rainfall Apr.-Sept.	high		high		low		average		high		average		low		high		average	
Species	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover
<i>Typha angustifolia</i>	81	45.0	84	46.7	93	51.7	85	47.2	80	44.4	84	46.7	103	57.2	93	51.7	90	50.0
<i>Cornus amomum</i>	74	41.1	85	47.2	68	37.8	82	45.6	73	40.6	83	46.1	68	37.8	76	42.2	82	45.6
<i>Lythrum salicaria</i>	13	7.2	32	17.8	31	17.2	37	20.6	28	15.6	55	30.6	57	31.7	57	31.7	64	35.6
<i>Impatiens capensis</i>	25	13.9	42	23.3	77	42.8	81	45.0	73	40.6	120	66.7	62	34.4	19	10.6	61	33.9
<i>Thelypteris palustris</i>	0	0.0	20	11.1	32	17.8	24	13.3	30	16.7	26	14.4	36	20.0	22	12.2	28	15.6
<i>Leersia oryzoides</i>	4	2.2	6	3.3	21	11.7	16	8.9	20	11.1	40	22.2	55	30.6	39	21.7	24	13.3
<i>Polygonum sagittatum</i>	0	0.0	0	0.0	19	10.6	0	0.0	3	1.7	36	20.0	25	13.9	12	6.7	23	12.8
<i>Polygonum hydropiper</i>	0	0.0	0	0.0	8	4.4	7	3.9	7	3.9	22	12.2	8	4.4	6	3.3	19	10.6
<i>Onoclea sensibilis</i>	4	2.2	13	7.2	13	7.2	10	5.6	15	8.3	11	6.1	16	8.9	20	11.1	18	10.0
<i>Hibiscus moscheutos</i>	5	2.8	9	5.0	9	5.0	9	5.0	14	7.8	11	6.1	17	9.4	19	10.6	16	8.9
<i>Pilea pumila</i>	2	1.1	0	0.0	0	0.0	0	0.0	0	0.0	9	5.0	2	1.1	3	1.7	14	7.8
<i>Symplotrichum sp.</i>	0	0.0	0	0.0	13	7.2	20	11.1	8	4.4	9	5.0	3	1.7	8	4.4	14	7.8
<i>Parthenocissus quinquefolia</i>	11	6.1	13	7.2	12	6.7	0	0.0	10	5.6	7	3.9	6	3.3	9	5.0	13	7.2
<i>Viburnum dentatum</i>	28	15.6	32	17.8	46	25.6	36	20.0	36	20.0	15	8.3	26	14.4	21	11.7	13	7.2
<i>Bohemeria cylindrica</i>	15	8.3	9	5.0	19	10.6	10	5.6	12	6.7	28	15.6	11	6.1	17	9.4	11	6.1
<i>Cuscuta groenovi</i>	0	0.0	0	0.0	7	3.9	2	1.1	9	5.0	16	8.9	8	4.4	0	0.0	10	5.6
<i>Peltandra virginica</i>	4	2.2	6	3.3	7	3.9	5	2.8	11	6.1	13	7.2	12	6.7	8	4.4	9	5.0
<i>Mikania scandens</i>	56	31.1	39	21.7	52	28.9	87	48.3	55	30.6	28	15.6	44	24.4	86	47.8	8	4.4
<i>Cephalanthus occidentalis</i>	3	1.7	6	3.3	9	5.0	5	2.8	10	5.6	0	0.0	6	3.3	5	2.8	5	2.8
<i>Mimulus ringens</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	2	1.1	1	0.6	4	2.2
<i>Apios americana</i>	0	0.0	3	1.7	4	2.2	0	0.0	0	0.0	1	0.6	8	4.4	5	2.8	3	1.7
<i>Bidens connata</i>	6	3.3	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	12	6.7	5	2.8	3	1.7
<i>Polygonum arifolium</i>	3	1.7	6	3.3	5	2.8	1	0.6	4	2.2	4	2.2	5	2.8	11	6.1	3	1.7
<i>Pontederia cordata</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	1.1	0	0.0	3	1.7
<i>Verbena hastata</i>	1	0.6	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	6	3.3	4	2.2	3	1.7
<i>Solidago altissima</i>	3	1.7	9	5.0	9	5.0	13	7.2	2	1.1	5	2.8	6	3.3	3	1.7	2	1.1
<i>Toxicodendron radicans</i>	4	2.2	0	0.0	4	2.2	10	5.6	7	3.9	6	3.3	4	2.2	4	2.2	2	1.1
<i>Vernonia novaboracensis</i>	0	0.0	1	0.6	1	0.6	0	0.0	1	0.6	2	1.1	0	0.0	1	0.6	2	1.1
<i>Bidens frondosa</i>	0	0.0	0	0.0	6	3.3	0	0.0	2	1.1	2	1.1	0	0.0	0	0.0	1	0.6
<i>Eupatorium maculatum</i>	4	2.2	1	0.6	1	0.6	3	1.7	1	0.6	4	2.2	1	0.6	2	1.1	1	0.6
<i>Iris pseudacorus</i>	6	3.3	5	2.8	7	3.9	7	3.9	1	0.6	1	0.6	3	1.7	4	2.2	1	0.6
<i>Solanum dulcamara</i>	0	0.0	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6
<i>Cicuta maculata</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0
<i>Cinna latifolia</i>	6	3.3	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Epilobium coloratum</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	2.2	7	3.9	0	0.0	0	0.0
<i>Eupatorium perfoliatum</i>	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0
<i>Geum rivale</i>	4	2.2	1	0.6	0	0.0	1	0.6	0	0.0	3	1.7	0	0.0	1	0.6	0	0.0
<i>Helenium autumnale</i>	0	0.0	0	0.0	8	4.4	3	1.7	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0
<i>Laportea sp.</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0
<i>Lobelia cardinalis</i>	0	0.0	6	3.3	6	3.3	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0
<i>Nymphaea odorata</i>	8	4.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	1.1	0	0.0
<i>Quercus sp SDLG</i>	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Rorippa palustris</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0
<i>Sagittaria rigida</i>	7	3.9	4	2.2	4	2.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Sambucus canadensis</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0
<i>Scutellaria lateriflora</i>	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Sium suave</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	2	1.1	0	0.0	0	0.0	0	0.0
<i>Solidago uliginosa</i>	1	0.6	0	0.0	0	0.0	3	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Strophostyles helvola</i>	2	1.1	0	0.0	15	8.3	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0
<i>Symplocarpus foetidus</i>	0	0.0	1	0.6	1	0.6	0	0.0	0	0.0	4	2.2	0	0.0	0	0.0	0	0.0
<i>Trifolium sp.</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0
<i>Verbena urticifolia</i>	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Viburnum lentago</i>	7	3.9	5	2.8	4	2.2	5	2.8	4	2.2	3	1.7	5	2.8	2	1.1	0	0.0
<i>Viburnum dentatum SDLG</i>	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<b>TOTALS</b>	<b>388</b>	<b>215.6</b>	<b>438</b>	<b>243.3</b>	<b>618</b>	<b>343.3</b>	<b>567</b>	<b>315.0</b>	<b>522</b>	<b>290.0</b>	<b>660</b>	<b>366.7</b>	<b>627</b>	<b>348.3</b>	<b>566</b>	<b>314.4</b>	<b>551</b>	<b>306.1</b>
<b>Number of Species</b>	<b>31</b>		<b>29</b>		<b>40</b>		<b>28</b>		<b>31</b>		<b>26</b>		<b>32</b>		<b>32</b>		<b>33</b>	

\* A slightly different transect in this area was also sampled in 1991; the 1991 results are available in previous reports.

\*\*\* Occurred in 1991 sample only

MR-N Transect - Alphabetical List of Species and Percent Cover																		
1998* - 2007																		
Year	1998		2000		2001		2002		2003		2004		2005		2006		2007	
Rainfall Apr.-Sept.	high		high		low		average		high		average		low		high		average	
Species	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover
<i>Apios americana</i>	0	0.0	3	1.7	4	2.2	0	0.0	0	0.0	1	0.6	8	4.4	5	2.8	3	1.7
<i>Bidens connata</i>	6	3.3	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	12	6.7	5	2.8	3	1.7
<i>Bidens frondosa</i>	0	0.0	0	0.0	6	3.3	0	0.0	2	1.1	2	1.1	0	0.0	0	0.0	1	0.6
<i>Bohemeria cylindrica</i>	15	8.3	9	5.0	19	10.6	10	5.6	12	6.7	28	15.6	11	6.1	17	9.4	11	6.1
<i>Cephalanthus occidentalis</i>	3	1.7	6	3.3	9	5.0	5	2.8	10	5.6	0	0.0	6	3.3	5	2.8	5	2.8
<i>Cicuta maculata</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0
<i>Cinna latifolia</i>	6	3.3	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Cornus amomum</i>	74	41.1	85	47.2	68	37.8	82	45.6	73	40.6	83	46.1	68	37.8	76	42.2	82	45.6
<i>Cuscuta gronovii</i>	0	0.0	0	0.0	7	3.9	2	1.1	9	5.0	16	8.9	8	4.4	0	0.0	10	5.6
<i>Epilobium coloratum</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	2.2	7	3.9	0	0.0	0	0.0
<i>Eupatorium maculatum</i>	4	2.2	1	0.6	1	0.6	3	1.7	1	0.6	4	2.2	1	0.6	2	1.1	1	0.6
<i>Eupatorium perfoliatum</i>	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0
<i>Geum rivale</i>	4	2.2	1	0.6	0	0.0	1	0.6	0	0.0	3	1.7	0	0.0	1	0.6	0	0.0
<i>Helenium autumnale</i>	0	0.0	0	0.0	8	4.4	3	1.7	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0
<i>Hibiscus moscheutos</i>	5	2.8	9	5.0	9	5.0	9	5.0	14	7.8	11	6.1	17	9.4	19	10.6	16	8.9
<i>Impatiens capensis</i>	25	13.9	42	23.3	77	42.8	81	45.0	73	40.6	120	66.7	62	34.4	19	10.6	61	33.9
<i>Iris pseudacorus</i>	6	3.3	5	2.8	7	3.9	7	3.9	1	0.6	1	0.6	3	1.7	4	2.2	1	0.6
<i>Laportea sp.</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0
<i>Leersia oryzoides</i>	4	2.2	6	3.3	21	11.7	16	8.9	20	11.1	40	22.2	55	30.6	39	21.7	24	13.3
<i>Lobelia cardinalis</i>	0	0.0	6	3.3	6	3.3	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0
<i>Lythrum salicaria</i>	13	7.2	32	17.8	31	17.2	37	20.6	28	15.6	55	30.6	57	31.7	57	31.7	64	35.6
<i>Mikania scandens</i>	56	31.1	39	21.7	52	28.9	87	48.3	55	30.6	28	15.6	44	24.4	86	47.8	8	4.4
<i>Mimulus ringens</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	2	1.1	1	0.6	4	2.2
<i>Nymphaea odorata</i>	8	4.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	1.1	0	0.0
<i>Onoclea sensibilis</i>	4	2.2	13	7.2	13	7.2	10	5.6	15	8.3	11	6.1	16	8.9	20	11.1	18	10.0
<i>Parthenocissus quinquefolia</i>	11	6.1	13	7.2	12	6.7	0	0.0	10	5.6	7	3.9	6	3.3	9	5.0	13	7.2
<i>Peltandra virginica</i>	4	2.2	6	3.3	7	3.9	5	2.8	11	6.1	13	7.2	12	6.7	8	4.4	9	5.0
<i>Pilea pumila</i>	2	1.1	0	0.0	0	0.0	0	0.0	0	0.0	9	5.0	2	1.1	3	1.7	14	7.8
<i>Polygonum arifolium</i>	3	1.7	6	3.3	5	2.8	1	0.6	4	2.2	4	2.2	5	2.8	11	6.1	3	1.7
<i>Polygonum hydropiper</i>	0	0.0	0	0.0	8	4.4	7	3.9	7	3.9	22	12.2	8	4.4	6	3.3	19	10.6
<i>Polygonum sagittatum</i>	0	0.0	0	0.0	19	10.6	0	0.0	3	1.7	36	20.0	25	13.9	12	6.7	23	12.8
<i>Pontederia cordata</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	1.1	0	0.0	3	1.7
<i>Quercus sp SDLG</i>	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Rorippa palustris</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0
<i>Sagittaria rigida</i>	7	3.9	4	2.2	4	2.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Sambucus canadensis</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0
<i>Scutellaria lateriflora</i>	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Sium suave</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	2	1.1	0	0.0	0	0.0	0	0.0
<i>Solanum dulcamara</i>	0	0.0	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6
<i>Solidago altissima</i>	3	1.7	9	5.0	9	5.0	13	7.2	2	1.1	5	2.8	6	3.3	3	1.7	2	1.1
<i>Solidago uliginosa</i>	1	0.6	0	0.0	0	0.0	3	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Strophostyles helvola</i>	2	1.1	0	0.0	15	8.3	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0
<i>Symplocarpus foetidus</i>	0	0.0	1	0.6	1	0.6	0	0.0	0	0.0	4	2.2	0	0.0	0	0.0	0	0.0
<i>Symplotrimum sp.</i>	0	0.0	0	0.0	13	7.2	20	11.1	8	4.4	9	5.0	3	1.7	8	4.4	14	7.8
<i>Thelypteris palustris</i>	0	0.0	20	11.1	32	17.8	24	13.3	30	16.7	26	14.4	36	20.0	22	12.2	28	15.6
<i>Toxicodendron radicans</i>	4	2.2	0	0.0	4	2.2	10	5.6	7	3.9	6	3.3	4	2.2	4	2.2	2	1.1
<i>Trifolium sp.</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0
<i>Typha angustifolia</i>	81	45.0	84	46.7	93	51.7	85	47.2	80	44.4	84	46.7	103	57.2	93	51.7	90	50.0
<i>Verbena hastata</i>	1	0.6	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	6	3.3	4	2.2	3	1.7
<i>Verbena urticifolia</i>	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Vernonia novaboracensis</i>	0	0.0	1	0.6	1	0.6	0	0.0	1	0.6	2	1.1	0	0.0	1	0.6	2	1.1
<i>Viburnum lentago</i>	7	3.9	5	2.8	4	2.2	5	2.8	4	2.2	3	1.7	5	2.8	2	1.1	0	0.0
<i>Viburnum dentatum</i>	28	15.6	32	17.8	46	25.6	36	20.0	36	20.0	15	8.3	26	14.4	21	11.7	13	7.2
<i>Viburnum dentatum SDLG</i>	0	0.0	0	0.0	2	1.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<b>TOTALS</b>	<b>388</b>	<b>215.6</b>	<b>438</b>	<b>243.3</b>	<b>618</b>	<b>343.3</b>	<b>567</b>	<b>315.0</b>	<b>522</b>	<b>290.0</b>	<b>660</b>	<b>366.7</b>	<b>627</b>	<b>348.3</b>	<b>566</b>	<b>314.4</b>	<b>551</b>	<b>306.1</b>
<b>Number of Species</b>	<b>31</b>		<b>29</b>		<b>40</b>		<b>28</b>		<b>31</b>		<b>26</b>		<b>32</b>		<b>32</b>		<b>33</b>	

\* A slightly different transect in this area was also sampled in 1991; the 1991 results are available in previous reports.

\*\*\* Occurred in 1991 sample only

MR-S Transect - Summary of Species by Percent Cover in 2007																		
1998 - 2007																		
Year	1998		2000		2001		2002		2003		2004		2005		2006		2007	
Rainfall Apr.-Sept.	high		high		low		average		high		average		low		high		average	
Species	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover
<i>Impatiens capensis</i>	39	32.5	51	42.5	51	42.5	83	69.2	68	56.7	89	74.2	89	74.2	26	21.7	77	64.2
<i>Typha angustifolia</i>	80	66.7	94	78.3	96	80.0	98	81.7	90	75.0	100	83.3	92	76.7	74	61.7	67	55.8
<i>Viburnum dentatum</i>	10	8.3	17	14.2	12	10.0	14	11.7	15	12.5	14	11.7	18	15.0	25	20.8	22	18.3
<i>Pilea pumila</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	17	14.2	11	9.2	11	9.2	21	17.5
<i>Polygonum arifolium</i>	11	9.2	0	0.0	10	8.3	0	0.0	15	12.5	26	21.7	19	15.8	8	6.7	21	17.5
<i>Polygonum sagittatum</i>	0	0.0	5	4.2	3	2.5	3	2.5	7	5.8	15	12.5	14	11.7	1	0.8	21	17.5
<i>Cuscuta gronovii</i>	4	3.3	0	0.0	10	8.3	5	4.2	0	0.0	3	2.5	14	11.7	0	0.0	20	16.7
<i>Lythrum salicaria</i>	1	0.8	8	6.7	19	15.8	13	10.8	17	14.2	14	11.7	28	23.3	25	20.8	20	16.7
<i>Peltandra virginica</i>	2	1.7	13	10.8	10	8.3	10	8.3	15	12.5	16	13.3	12	10.0	14	11.7	18	15.0
<i>Acer rubrum</i>	0	0.0	0	0.0	4	3.3	4	3.3	5	4.2	5	4.2	5	4.2	7	5.8	14	11.7
<i>Leersia oryzoides</i>	4	3.3	10	8.3	3	2.5	1	0.8	3	2.5	0	0.0	3	2.5	11	9.2	14	11.7
<i>Cornus amomum</i>	7	5.8	10	8.3	10	8.3	6	5.0	11	9.2	15	12.5	15	12.5	13	10.8	12	10.0
<i>Mikania scandens</i>	78	65.0	43	35.8	34	28.3	38	31.7	26	21.7	40	33.3	55	45.8	60	50.0	12	10.0
<i>Boehmeria cylindrica</i>	2	1.7	7	5.8	7	5.8	7	5.8	8	6.7	16	13.3	12	10.0	7	5.8	11	9.2
<i>Acer saccharinum *</i>	10	8.3	10	8.3	10	8.3	10	8.3	10	8.3	9	7.5	10	8.3	13	10.8	10	8.3
<i>Bidens connata</i>	0	0.0	0	0.0	3	2.5	0	0.0	0	0.0	0	0.0	3	2.5	0	0.0	6	5.0
<i>Lindera benzoin</i>	7	5.8	9	7.5	5	4.2	5	4.2	5	4.2	7	5.8	7	5.8	6	5.0	5	4.2
<i>Lonicera morowii</i>	0	0.0	0	0.0	0	0.0	4	3.3	0	0.0	0	0.0	0	0.0	5	4.2	4	3.3
<i>Apios americana</i>	0	0.0	1	0.8	1	0.8	0	0.0	0	0.0	0	0.0	2	1.7	6	5.0	3	2.5
<i>Hibiscus moscheutos</i>	3	2.5	5	4.2	5	4.2	6	5.0	4	3.3	8	6.7	6	5.0	3	2.5	2	1.7
<i>Polygonum hydropiper</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	6	5.0	2	1.7
<i>Solanum dulcamara</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	2	1.7	2	1.7
<i>Parthenocissus quinquefolia</i>	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	1	0.8	2	1.7	1	0.8
<i>Polygonum pennsylvanum</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	1	0.8
<i>Toxicodendron radicans</i>	0	0.0	0	0.0	0	0.0	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
<i>Cardamine sp.</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
<i>#Carex sp.</i>	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
<i>Chelone glabra</i>	0	0.0	0	0.0	2	1.7	1	0.8	3	2.5	2	1.7	1	0.8	2	1.7	0	0.0
<i>Cinna latifolia</i>	3	2.5	0	0.0	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Cornus amomum SDLG</i>	0	0.0	1	0.8	1	0.8	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Epilobium coloratum</i>	0	0.0	1	0.8	0	0.0	2	1.7	1	0.8	3	2.5	3	2.5	0	0.0	0	0.0
<i>Eupatorium maculatum</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
<i>Geum lacinatedum</i>	1	0.8	0	0.0	0	0.0	0	0.0	2	1.7	0	0.0	0	0.0	2	1.7	0	0.0
<i>Helenium autumnale</i>	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	2	1.7	1	0.8	0	0.0
<i>Lobelia cardinalis</i>	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
<i>Lycopus americana</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	2	1.7	0	0.0
<i>Mentha arvensis</i>	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Mimulus ringens</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	3	2.5	2	1.7	0	0.0
<i>Onoclea sensibilis</i>	1	0.8	2	1.7	6	5.0	0	0.0	0	0.0	3	2.5	3	2.5	3	2.5	0	0.0
<i>Rosa multiflora</i>	2	1.7	5	4.2	1	0.8	5	4.2	1	0.8	0	0.0	0	0.0	2	1.7	0	0.0
<i>Sambucus canadensis</i>	1	0.8	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Scutellaria laterifolia</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
<i>Solidago uliginosa</i>	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Strophostylus helvola</i>	2	1.7	1	0.8	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Symplocarpus foetidus</i>	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0
<i>Symplotrichium lanceolata.</i>	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0	1	0.8	2	1.7	4	3.3	0	0.0
<i>Vernonia novaboracensis</i>	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>V. dentatum SDLG</i>	0	0.0	0	0.0	0	0.0	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<b>TOTALS</b>	<b>274</b>	<b>228.3</b>	<b>293</b>	<b>244.2</b>	<b>310</b>	<b>258.3</b>	<b>324</b>	<b>270.0</b>	<b>308</b>	<b>256.7</b>	<b>406</b>	<b>338.3</b>	<b>431</b>	<b>359.2</b>	<b>349</b>	<b>290.8</b>	<b>387</b>	<b>322.5</b>
<b>Number of Species</b>	<b>23</b>		<b>17</b>		<b>27</b>		<b>23</b>		<b>21</b>		<b>17</b>		<b>27</b>		<b>35</b>		<b>25</b>	

\* Overhanging branches of tree rooted on adjacent levee

MR-S Transect - Alphabetical List of Species and Percent Cover																		
1998 - 2007																		
Year	1998		2000		2001		2002		2003		2004		2005		2006		2007	
Rainfall Apr.-Sept.	high		high		low		average		high		average		low		high		average	
Species	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover	Total	%Cover
<i>Acer rubrum</i>	0	0.0	0	0.0	4	3.3	4	3.3	5	4.2	5	4.2	5	4.2	7	5.8	14	11.7
<i>Acer saccharinum</i> *	10	8.3	10	8.3	10	8.3	10	8.3	10	8.3	9	7.5	10	8.3	13	10.8	10	8.3
<i>Apios americana</i>	0	0.0	1	0.8	1	0.8	0	0.0	0	0.0	0	0.0	2	1.7	6	5.0	3	2.5
<i>Bidens connata</i>	0	0.0	0	0.0	3	2.5	0	0.0	0	0.0	0	0.0	3	2.5	0	0.0	6	5.0
<i>Bohemeria cylindrica</i>	2	1.7	7	5.8	7	5.8	7	5.8	8	6.7	16	13.3	12	10.0	7	5.8	11	9.2
<i>Cardamine sp.</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
# <i>Carex sp.</i>	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
<i>Chelone glabra</i>	0	0.0	0	0.0	2	1.7	1	0.8	3	2.5	2	1.7	1	0.8	2	1.7	0	0.0
<i>Cinna latifolia</i>	3	2.5	0	0.0	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Cornus amomum</i>	7	5.8	10	8.3	10	8.3	6	5.0	11	9.2	15	12.5	15	12.5	13	10.8	12	10.0
<i>Cornus amomum</i> SDLG	0	0.0	1	0.8	1	0.8	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Cuscuta gronovii</i>	4	3.3	0	0.0	10	8.3	5	4.2	0	0.0	3	2.5	14	11.7	0	0.0	20	16.7
<i>Epilobium coloratum</i>	0	0.0	1	0.8	0	0.0	2	1.7	1	0.8	3	2.5	3	2.5	0	0.0	0	0.0
<i>Eupatorium maculatum</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
<i>Geum laciniatum</i>	1	0.8	0	0.0	0	0.0	0	0.0	2	1.7	0	0.0	0	0.0	2	1.7	0	0.0
<i>Helenium autumnale</i>	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	2	1.7	1	0.8	0	0.0
<i>Hibiscus moscheutos</i>	3	2.5	5	4.2	5	4.2	6	5.0	4	3.3	8	6.7	6	5.0	3	2.5	2	1.7
<i>Impatiens capensis</i>	39	32.5	51	42.5	51	42.5	83	69.2	68	56.7	89	74.2	89	74.2	26	21.7	77	64.2
<i>Leersia oryzoides</i>	4	3.3	10	8.3	3	2.5	1	0.8	3	2.5	0	0.0	3	2.5	11	9.2	14	11.7
<i>Lindera benzoin</i>	7	5.8	9	7.5	5	4.2	5	4.2	5	4.2	7	5.8	7	5.8	6	5.0	5	4.2
<i>Lobelia cardinalis</i>	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
<i>Lonicera morowii</i>	0	0.0	0	0.0	0	0.0	4	3.3	0	0.0	0	0.0	0	0.0	5	4.2	4	3.3
<i>Lycopus americana</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	2	1.7	0	0.0
<i>Lythrum salicaria</i>	1	0.8	8	6.7	19	15.8	13	10.8	17	14.2	14	11.7	28	23.3	25	20.8	20	16.7
<i>Mentha arvensis</i>	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Mikania scandens</i>	78	65.0	43	35.8	34	28.3	38	31.7	26	21.7	40	33.3	55	45.8	60	50.0	12	10.0
<i>Mimulus ringens</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	3	2.5	2	1.7	0	0.0
<i>Onoclea sensibilis</i>	1	0.8	2	1.7	6	5.0	0	0.0	0	0.0	3	2.5	3	2.5	3	2.5	0	0.0
<i>Parthenocissus quinquefolia</i>	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	1	0.8	2	1.7	1	0.8
<i>Peltandra virginica</i>	2	1.7	13	10.8	10	8.3	10	8.3	15	12.5	16	13.3	12	10.0	14	11.7	18	15.0
<i>Pilea pumila</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	17	14.2	11	9.2	11	9.2	21	17.5
<i>Polygonum arifolium</i>	11	9.2	0	0.0	10	8.3	0	0.0	15	12.5	26	21.7	19	15.8	8	6.7	21	17.5
<i>Polygonum hydropiper</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	6	5.0	2	1.7
<i>Polygonum pennsylvanum</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	1	0.8
<i>Polygonum sagittatum</i>	0	0.0	5	4.2	3	2.5	3	2.5	7	5.8	15	12.5	14	11.7	1	0.8	21	17.5
<i>Rosa multiflora</i>	2	1.7	5	4.2	1	0.8	5	4.2	1	0.8	0	0.0	0	0.0	2	1.7	0	0.0
<i>Sambucus canadensis</i>	1	0.8	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Scutellaria laterifolia</i>	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
<i>Solanum dulcamara</i>	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	2	1.7	2	1.7
<i>Solidago uliginosa</i>	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Strophostylus helvola</i>	2	1.7	1	0.8	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Symplocarpus foetidus</i>	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0
<i>Symptochium lanceolata.</i>	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0	1	0.8	2	1.7	4	3.3	0	0.0
<i>Toxicodendron radicans</i>	0	0.0	0	0.0	0	0.0	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
<i>Typha angustifolia</i>	80	66.7	94	78.3	96	80.0	98	81.7	90	75.0	100	83.3	92	76.7	74	61.7	67	55.8
<i>Vernonia novaboracensis</i>	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<i>Viburnum dentatum</i>	10	8.3	17	14.2	12	10.0	14	11.7	15	12.5	14	11.7	18	15.0	25	20.8	22	18.3
<i>V. dentatum</i> SDLG	0	0.0	0	0.0	0	0.0	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
<b>TOTALS</b>	<b>274</b>	<b>228.3</b>	<b>293</b>	<b>244.2</b>	<b>310</b>	<b>258.3</b>	<b>324</b>	<b>270.0</b>	<b>308</b>	<b>256.7</b>	<b>406</b>	<b>338.3</b>	<b>431</b>	<b>359.2</b>	<b>349</b>	<b>290.8</b>	<b>387</b>	<b>322.5</b>
<b>Number of Species</b>	<b>23</b>		<b>17</b>		<b>27</b>		<b>23</b>		<b>21</b>		<b>17</b>		<b>27</b>		<b>35</b>		<b>25</b>	

\* Overhanging branches of tree rooted on adjacent levee