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# **First Annual Wetland Monitoring Report for the Spallation Neutron Source Bethel Valley Access Road, Oak Ridge, Tennessee**

**S P A L L A T I O N   N E U T R O N   S O U R C E**

A U.S. Department of Energy Multilaboratory Project

**SNS**



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**FIRST ANNUAL WETLAND MONITORING REPORT FOR THE  
SPALLATION NEUTRON SOURCE BETHEL VALLEY ACCESS ROAD,  
OAK RIDGE, TENNESSEE**

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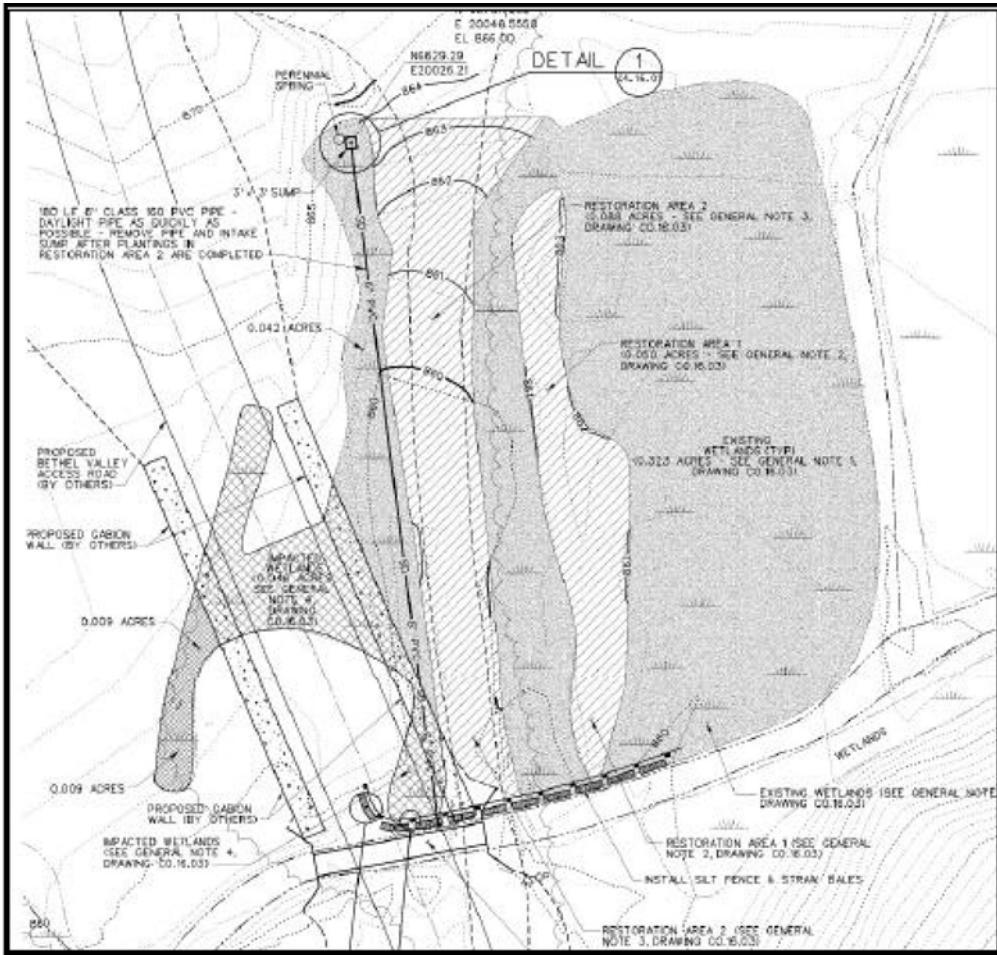
## 1. INTRODUCTION

The Spallation Neutron Source (SNS) is a large U.S. Department of Energy (DOE) research facility being constructed on Chestnut Ridge in Oak Ridge, Tennessee. During the initial site development phase, it was determined that the project required the construction of a two-lane paved road to connect the facility to Bethel Valley Road, providing access from the south. Studies conducted for the final environmental impact statement (FEIS) for the site (DOE 1999) and follow-up studies by Rosensteel (2000) determined that a number of small wetlands were located near White Oak Creek (WOC), which could be crossed by the planned access road. Wetlands provide important functions in preventing sedimentation to nearby streams, controlling flooding, improving water quality, and providing habitat for various unique species of plants and animals. When it was determined that construction of the access road to the SNS site could not avoid one of the wetlands located near WOC, key staff met to establish a plan to minimize wetland impacts and to create an effective mitigation strategy.

Whenever activities may affect wetlands, coordination with the U.S. Army Corps of Engineers (ACOE) and the Tennessee Department of Environment and Conservation (TDEC) is necessary. Generally, this coordination results in permits issued from the ACOE and the state. For the SNS access road activity, the ACOE approved the work under the authority of the Department of the Army Nationwide Permit (NWP) 14 on March 3, 2000. In the state of Tennessee, state wetland regulation (pursuant to the Tennessee Water Quality Control Act of 1977) is generally more restrictive in policy than the national requirements. It was determined that wetland mitigation was required for the SNS access road project. TDEC requires compensatory mitigation in the form of wetland restoration, creation, or enhancement whenever there is loss of jurisdictional wetlands or their function. Compensation ratios vary depending on the type of mitigation, with the overall goal of no net loss of wetlands in Tennessee.

As a result of a projected 0.055 acres of wetland being impacted by road construction (PTRL 2000), a wetland mitigation plan was developed for the SNS access road project in March 2000. The acreage of the impact was small because of design changes such as road realignment and the use of gabion structures to minimize the cross-sectional width of the road near the wetland area. The mitigation plan identified wetland restoration as the appropriate compensation for the anticipated wetland loss. Wetland restoration was possible in this case because a spring and its natural flow path to WOC were negatively effected by the old Chestnut Ridge Road that crossed the area and because construction of the new access road could allow restoration of the natural hydrology and wetland habitat surrounding the spring. As a result, the mitigation effort would establish 0.138 acres of restored wetland, compensating for the loss of 0.055 acres (a mitigation ratio of about 2.5:1)(Fig.1). This ratio exceeds the recommended mitigation requirement. The wetland mitigation plan was submitted to TDEC in April 2000. The TDEC issued an aquatic resources alteration permit (ARAP) for the project in June 2000, and construction activities near the wetland began that autumn.

Wetland mitigation activities included site grading and the planting of native wetland trees and shrubs. These activities were largely complete in December 2000. Final seeding of the site with native wetland herbs occurred in March 2001. The focus on planting native plants, where possible, rather than just plants good for wildlife, was a mitigation adaptation that addressed key preservation goals for the Oak Ridge National Environmental Research Park. TDEC requires annual monitoring of the wetland for five years (ARAP Permit 2000), with annual reports filed detailing vegetation, soils, and hydrology, as well as any remedial actions necessary to correct any deficiencies. This report presents the findings of the first annual monitoring of the SNS access road wetland restoration site.



**Fig. 1.** Drawing of the planned wetland mitigation showing the location of the new road, the wetland area to be impacted, and the areas of wetland restoration.

## 2. METHODS

Construction of the new access road included placing the gabion structures adjacent to the mitigation wetland and removing the gravel that had been put in place years ago when Chestnut Ridge Road was constructed. These activities were accomplished using backhoes and other heavy equipment in fall 2000 (Fig. 2). After removing the road debris, the excavated depression was backfilled with nearby fill and was topped with organically rich soil that had been collected previously from the impacted wetland (Fig. 3). Great attention was paid to final grading activities to ensure that water from the spring spread uniformly over the wetland site before draining into WOC.

### 2.1 PLANTING OF WOODY SPECIES

After final grading of the mitigation wetland's surface, two species of trees [red maple (*Acer rubrum*) and shumard oak (*Quercus shumardii*)] and two species of shrubs [buttonbush (*Cephalanthus occidentalis*) and silky dogwood (*Cornus ammonum*)] were planted at the site on December 20, 2000. Approximately 20 trees and 50 individual shrubs were planted. The trees were planted at a spacing interval of 15 ft; the shrubs were planted at a spacing interval of 6 ft. Trees sizes ranged from 0.5 to 1.0 in. in diameter at breast height (dbh), with total heights ranging from 8 to 10 ft. The planted shrubs were approximately 18 in. high.



**Fig. 2.** Heavy equipment was used to remove road debris from the mitigation wetland construction site, to backfill depressions left by removing road debris, and to move salvaged hydric soil into place.



**Fig. 3.** Mitigation wetland under construction. The image shows the rock gabions along the wetland's west (to the left) and southern boundaries. A silt curtain and straw bales along the southern boundary reduce runoff of wetland sediment into White Oak Creek (foreground).

## **2.2 MONITORING PLOTS AND HERB SEEDING**

To facilitate the evaluation of the mitigation efforts, we established twelve 10- × 10-ft monitoring plots within the mitigation wetland on December 20 and 21 (Fig. 4). The plots were positioned to allow better characterization of each species treatment: there were three plots each for red maple, shumard oak, buttonbush, and silky dogwood. The four corners of each plot were marked by wooden stakes. Because of the different spacing arrangements for the various species of plants, there was one individual tree within each tree plot and four individual shrubs within in each shrub plot.

Seed of native wetland herbs were broadcast by hand to the mitigation wetland's surface on March 23, 2000. We wanted to evaluate the potential benefits of herb planting (which is presumed to help stabilize the site and prevent erosion), so we established six additional 10- × 10-ft plots for this purpose. Three of these six plots were covered with tarp before seeding; the other three were situated within herb-seeded areas (Fig. 5). These plots allowed the possibility for future direct comparison of responses to seeding versus not seeding. The herb seed was a standard commercial mix consisting of 45% tall manna grass (*Glyceria septentrionalis*), 32% green bulrush (*Scirpus atrovirens*), 18% “other crop,” and 5% inert matter. After germination, the “other crop” constituent appeared to be primarily galingale (*Cyperus esculentus*). To further facilitate comparison of the effectiveness of the plantings, we also established three 10- × 10-ft plots in the natural wetland community adjacent to the mitigated area, where the vegetation had not been affected by road construction.

The plots associated with each planting regime will allow us to evaluate the relative success or failure of various wetland mitigation planting techniques over the length of the state-required monitoring period of five years. The results of these evaluations should help in the effective design of future mitigation efforts.

## **2.3 MONITORING FREQUENCY**

During the first year of monitoring at the mitigation wetland, we conducted site surveys every three months. These surveys were used to check on the progress of wetland hydrology and the influx of natural vegetation, as well as to determine the survival and growth of planted species. Site surveys in calendar year 2001 were conducted on March 23, June 21, September 25, and December 20. The two key periods for tracking vegetation changes were during the relatively warm months of June and September. Thus, it is primarily the results from these two periods that are presented in this report.

## **2.4 MONITORING METHODS**

Within each plot, wetland vegetation, soils, and hydrological characteristics were measured using Army Corps of Engineers' wetland delineation protocols (U.S. Army Corps of Engineers 1987). The use of established plots is consistent with the “comprehensive wetland delineation” method described in the Corps manual. Soil data were collected in June 2001 only, while surface hydrology and data on vegetation status were obtained on each sampling date. On each sampling date, we measured planted trees and shrubs (height and branching characteristics) and noted any mortality. We also estimated the percent cover of planted and volunteer herbs within each plot by means of visual inspection. All observed plants were identified to the nearest most likely taxon (the absence of flowering parts or other key indicators at times made positive identification difficult). The percentage of nonvegetated soil area, when present, was also estimated.

To be considered a jurisdictional wetland, a site must meet the necessary hydrology, soils, and wetland-vegetation criteria specified in the Corps protocols. The wetland vegetation criterion is met if more than 50% of the dominant species within each stratum are hydrophytic. To make this determination, species are assigned an indicator status based on the U.S. Fish and Wildlife Service (USFWS) *National List of Plant Species that Occur in Wetlands: 1988 National Summary* (Reed 1988). The indicator species status codes are: obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative



**Fig. 4.** Plots (each  $10 \times 10$  ft) were established in the mitigation wetland to facilitate monitoring the survival and growth of planted woody species, herbaceous species introduced by seeding, and “volunteer” plants. The corners of the monitoring plots were later marked by wooden stakes.



**Fig. 5.** Tarps ( $10 \times 10$  ft) were deployed just before seeding in three monitoring plots to keep the wetland sediment in these plots “seed-free.” Comparison of vegetation in the seed-free plots with vegetation in seeded plots allows some assessment of the benefits of seeding.

upland (FACU), and upland (UPL). A plus (+) or minus (-) sign following the indicator code denotes a tendency towards the wetter (+) or drier (-) end of the scale. Indicator definitions, as defined by the USFWS, are:

- Obligate Wetland (OBL). Occur almost always (estimated probability >99%) under natural conditions in wetlands.
- Facultative Wetland (FACW). Usually occur in wetlands (estimated probability 67-99%), but occasionally found in non-wetlands.
- Facultative (FAC). Equally likely to occur in wetlands or non-wetlands (estimated probability 34-66%).
- Facultative Upland (FACU). Usually occur in non-wetlands (estimated probability 67-99%), but occasionally found in wetlands (estimated probability 1-33%).
- Obligate Upland (UPL). Occur in wetlands in another region, but occur almost always (estimated probability >99%) under natural conditions in non-wetlands in the region specified.

For classifying an area as hydrophytic, vegetation species codes based on the definitions above are OBL, FACW+, FACW-, FAC+, or FAC.

In June 2001, a soil sample was extracted to a depth of several inches below the A horizon within each plot using a small shovel or auger. A shallower hole was dug in cases where the soil was too hard to penetrate or where surface water was present. The soil sample was examined for soil color, texture, and the presence of mottles, manganese concretions, high organic content, and other indicators of hydric- soil status.

Each plot was also examined for primary and secondary indicators of wetland hydrology. An estimate of the percentage of surface water coverage in each plot, and the average depth of this water, was recorded for this purpose. We also documented soil saturation and depth to free water in the soil boring hole. The presence of watermarks, drift lines, oxidized root channels, water-stained leaves, and other indicators of wetland hydrology was noted. An open-ended 1-in.-diameter pipe, approximately 2 in. long, was inserted vertically into the sediment in a shallow pool near the downstream end of the mitigation wetland. The pipe was pounded firmly into the sediment with a hammer until the top of the pipe was submersed several inches beneath the water's surface. By measuring the depth of the water overlying the top of the pipe, we could conveniently track the relative changes in hydrologic conditions each time the site was surveyed.

### 3. RESULTS

The results of the vegetation, soil, and hydrology assessments during the first year of monitoring at the SNS access road mitigation site are summarized in the following sections.

#### 3.1 VEGETATION

Detailed vegetation data for each plot are given in the Appendix, Table 1. Table 2 in the Appendix presents the results of a conventional wetland delineation for the mitigation site, as determined in June 2001. The following discussion focuses on the growth, cover, and mortality characteristics of the plants in June and September of 2001. During June and September, most of the mitigation wetland was well vegetated (Figs. 6 and 7). Plant cover in the plots was negligible in the December and March sampling periods.

##### 3.1.1 Planted Species

Trees planted in wetland monitoring plots did not fare well. By June 2001, shumard oak in all three shumard-oak plots were dead. One of the red maples, among those in the three red-maple plots, also had



**Fig. 6. Image of the mitigation wetland in June 2001, looking north.**



**Fig. 7. Image of the mitigation wetland in September 2001, looking south.**

died. By June, the two remaining red maple trees clearly appeared to be stressed, and by September, the last red maple had died.

Shrubs planted in the wetland monitoring plots fared better but also suffered mortality. Half of the buttonbush (6 of 12) were dead by June, and 75% (8 of 12) had died by September. Of the four living buttonbush that remained in September 2000, all appeared stressed and exhibited little or no new growth. In contrast, silky dogwood was relatively successful at the mitigation wetland site: only 1 of the 12 shrubs had died by June, and 11 of 12 were still alive as of September. Growth and condition of silky dogwood varied by plot, with all four plants in one of the plots showing signs of stress (e.g., negative “growth” or dying branches), while plants in another plot appeared healthy and had measurable growth (~ 4 in. on average). All of the plants came originally from the same lot and were presumed to be in similar condition before planting. Thus, it is likely that hydrological differences among plots accounted for the plot-to-plot differences in condition of the planted shrubs.

Late, severe frosts occurred on April 18 and 19, 2000. The frost events were thought to be a contributing factor to tree and shrub mortality. Mortality risk also would increase if the plants were already under stress trying to adapt to new soils and hydrologic conditions. For red maple, we noted in the June sampling period that although the trees had leafed out earlier, the larger leaves were mostly dead. Some new growth of leaves was noted, which we presumed occurred after the frost events. Shumard oak did not appear to have taken root at the site at all, perhaps because of unseasonably cold weather at the time of planting or because the site’s wet conditions exceeded the oak’s hydrological tolerance.

Some of the wetland herbs that had been seeded in March were evident in June. By September, these herbs had become the dominant species in many of the plots. Galingale and/or bulrush, for example, grew in dense patches within the wetland in spring, presumably because of the movement of the seed by water or wind. Fescue (*Festuca pratensis*) was not part of the wetland seed mix, but this grass was prevalent in the plots in June. *Festuca pratensis* was present on a hillside just west of the wetland (it was seeded there to provide vegetative cover) and was the likely source of the *F. pratensis* in the wetland. By September, the planted manna grass had become the dominant seeded species. This grass was often found alongside the more mature galingale and bulrush. The manna grass was dense in some plots and appeared to provide a useful purpose in stabilizing the site and in minimizing erosion.

### 3.1.2 Volunteer Species

Other “volunteer” species of wetland plants quickly colonized the wetland mitigation site, and in conjunction with the planted wetland herbs, provided dense coverage of the wetland throughout the summer months. In both June and September, two native rush species, *Juncus effusus* (FACW+) and *Juncus biflorus* (FACW), were the dominant herbaceous cover within many plots. Interspersed within the dense rushes were emergent wetland herbaceous species such as smartweed (*Polygonum sp.*, OBL), false loosestrife (*Ludwigia alternifolia*, OBL), common cattail (*Typha latifolia*, OBL), curly dock (*Rumex crispus*, FAC), and American bugleweed (*Lycompus americanus*, OBL). Watercress (*Nasturtium officinale*, OBL) was common where surface water was present.

Native tree and shrub species also colonized the site. These woody “volunteers” included Sycamore (*Platanus occidentalis*; FACW-), willow (*Salix sp.*; OBL), green ash (*Fraxinus pensylvanica*; FACW), and Alder (*Alnus serrulata*; FACW+).

The mitigation wetland is closely encroached upon from the east and northeast by a well-established, forested, natural wetland (Fig. 7). We established three plots in this wetland to evaluate the likely “end-state” for the wetland mitigation, and to evaluate the extent to which the natural wetland may be helping to recolonize the mitigation site. Mature trees in the non-impacted wetland area included sycamore, green ash, red maple, and tulip poplar. Shrubs include spicebush (*Linderna benzoin*), alder, silky dogwood, and blue beech (*Carpinus caroliniana*). The forest floor was more sparsely populated with herbs but included a variety of wetland sedges, rushes, and native grasses (Appendix, Table 1).

### **3.2 SOILS**

Because soils at the mitigation site were composed of fill from other areas, there has been little opportunity for the mitigation-site soils to undergo horizon development or develop characteristics of more mature wetland soils. Nevertheless, organically rich soil was taken from the impacted area, so the surface soils at the mitigation site exhibit wetland characteristics such as low chroma colors and mottling. The matrix of plot soils in the upper 6 to 17 in. was largely 10YR 3/1 or 4/1, or occasionally 7.5YR 3/1 (Munsell soil color charts, Munsell Company 1994). The low chroma value for these soils (i.e., “1”) satisfies an important criteria for jurisdictional wetland delineation. Mottles, when present, were clayey in texture and color, ranging from 7.5YR-10YR, 4/6. The organic soils were often mixed with 10-30% fine-to medium-granular stone and occasional coarse rock fragments. The percentage of dense clay and rock fragments underlying the organic soils increased with depth. Soils deeper than 17 in. were often impenetrable.

### **3.3 HYDROLOGY**

The wetland mitigation site showed strong evidence of sustained wet conditions. At least some surface water was recorded within almost all plots, in each sampling event. In some cases, 90 to 100% of the plot area was inundated. Even where surface water was not present, soils were usually saturated. Other primary hydrologic indicators included the evidence of watermarks, drift lines, and drainage patterns caused by spring flow to WOC. A secondary indicator was the presence of water-stained leaves. Hydrologic monitoring showed that the lowest water level in the wetland was in June (the water depth then, from the submersed pipe to the water surface, was 0.56 in.). For all other monitoring dates, water depth at the measuring point ranged from 5 to 7 in.

## **4. CONCLUSIONS**

After one year of monitoring, it is clear that the SNS mitigation wetland already is functioning as a viable wetland community. The site has the necessary wetland vegetation, soils, and hydrology to be classified a jurisdictional wetland (Appendix, Table 2). Pools of standing water near the spring are inhabited by minnows, amphibian species are reproducing in pools near both the upper and lower portions of the wetland, and the site is visited by wildlife such as deer, raccoon, and great blue heron, based on tracks left within the wetland mud.

The favorable condition of the site is likely caused in part by the careful attention to earth grading early in the project, which encouraged spring water to distribute very uniformly over the wetland area. As a result of careful grading, there is little surface channeling as water from the spring works its way to WOC. Measures of site hydrologic conditions consistently showed sustained wet conditions over most of the wetland area. Despite setbacks caused by the mortality of some of the planted trees and shrubs, the wetland herbs that were planted from seed grew quickly and stabilized the site. This stabilization reduced runoff of the organic topsoil, which is a resource essential to the success of many wetland plant species.

The colonization of the site by native wetland species has been both rapid and extensive. The nearby natural wetland is presumed to be an important source of immigrants. Because of the rapid rate of colonization, replanting of dead trees was deemed unnecessary; in fact, it was believed that digging and replanting activities probably would do more harm to the wetland than good.

We expect that continued quantitative monitoring of the wetland over the five-year TDEC reporting period will provide valuable guidance information regarding the relative success or failure of various mitigation planting techniques. Based on the first year of monitoring, it appears that the wetland is well on its way to being fully restored.

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**APPENDIX**  
**VEGETATION DATA**



**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Button Bush	BB1	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	1	3	yes	37	0		Undetermined
Button Bush	BB1	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	B	1	2	yes	34	0		Undetermined
Button Bush	BB1	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	C	1	1	yes	33	0		Undetermined
Button Bush	BB1	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	D	1	5	yes	43	0		Undetermined
Button Bush	BB2	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	1	4	yes	39	0		Undetermined
Button Bush	BB2	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	B	1	8	yes	46	0		Undetermined
Button Bush	BB2	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	C	1	2	yes	44.5	0		Undetermined
Button Bush	BB2	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	D	1	8	yes	31	0		Undetermined
Button Bush	BB3	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	1	8	yes	29	0		Undetermined
Button Bush	BB3	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	B	1	>10	yes	28.5	0		Undetermined
Button Bush	BB3	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	C	1	5	yes	33.5	0		Undetermined
Button Bush	BB3	12/20/2000	<i>Cephalanthus occidentalis</i>	P	shrub	0	D	1	1	yes	28.5	0		Undetermined
Silky Dogwood	SD1	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	A	1	1	yes	32	0		Undetermined
Silky Dogwood	SD1	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	B	1	1	yes	46	0		Undetermined
Silky Dogwood	SD1	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	C	1	1	yes	47.5	0		Undetermined
Silky Dogwood	SD1	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	D	1	1	yes	40	0		Undetermined
Silky Dogwood	SD2	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	A	1	1	yes	28	0		Undetermined
Silky Dogwood	SD2	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	B	1	1	yes	22	0		Undetermined
Silky Dogwood	SD2	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	C	1	1	yes	30.5	0		Undetermined
Silky Dogwood	SD2	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	D	1	1	yes	22	0		Undetermined
Silky Dogwood	SD3	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	A	1	2	yes	32.5	0		Undetermined
Silky Dogwood	SD3	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	B	1	2	yes	37.5	0		Undetermined
Silky Dogwood	SD3	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	C	1	2	yes	28.5	0		Undetermined
Silky Dogwood	SD3	12/20/2000	<i>Cornus ammonum</i>	P	shrub	0	D	1	2	yes	33	0		Undetermined
Red Maple	RM1	12/20/2000	<i>Acer rubrum</i>	P	tree	0	A	1	1	yes	0	1		Undetermined
Red Maple	RM2	12/20/2000	<i>Acer rubrum</i>	P	tree	0	A	1	1	yes	0	1		Undetermined
Red Maple	RM3	12/20/2000	<i>Acer rubrum</i>	P	tree	0	A	1	1	yes	0	1		Undetermined
Shumard Oak	SO1	12/20/2000	<i>Quercus shumardii</i>	P	tree	0	A	1	1	yes	0	0.5		Undetermined
Shumard Oak	SO2	12/20/2000	<i>Quercus shumardii</i>	P	tree	0	A	1	1	yes	0	0.5		Undetermined
Shumard Oak	SO3	12/20/2000	<i>Quercus shumardii</i>	P	tree	0	A	1	1	yes	0	0.5		Undetermined

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
No grass planting	NG1	12/20/2000	Bare ground								100			Undetermined
No grass planting	NG2	12/20/2000	Bare ground								100			Undetermined
No grass planting	NG3	12/20/2000	Bare ground								100			Undetermined
Planted grass only	GO1	12/20/2000	Bare ground								100			Undetermined
Planted grass only	GO2	12/20/2000	Bare ground								100			Undetermined
Planted grass only	GO3	12/20/2000	Bare ground								100			Undetermined
Positive reference	PR1	12/20/2000						0						
Positive reference	PR2	12/20/2000						0						
Positive reference	PR3	12/20/2000						0						
Button Bush	BB1	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	1		3	yes	37	0	Undetermined
Button Bush	BB1	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	B	1		2	yes	34	0	Undetermined
Button Bush	BB1	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	C	1		1	yes	33	0	Undetermined
Button Bush	BB1	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	D	1		5	yes	43	0	Undetermined
Button Bush	BB2	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	1		4	yes	39	0	Undetermined
Button Bush	BB2	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	B	1		8	yes	46	0	Undetermined
Button Bush	BB2	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	C	1		2	yes	44.5	0	Undetermined
Button Bush	BB2	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	D	1		8	yes	31	0	Undetermined
Button Bush	BB3	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	1		8	yes	29	0	Undetermined
Button Bush	BB3	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	B	1		>10	yes	28.5	0	Undetermined
Button Bush	BB3	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	C	1		5	yes	33.5	0	Undetermined
Button Bush	BB3	3/23/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	D	1		1	yes	28.5	0	Undetermined
Silky Dogwood	SD1	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	A	1		1	yes	32	0	Undetermined
Silky Dogwood	SD1	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	B	1		1	yes	46	0	Undetermined
Silky Dogwood	SD1	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	C	1		1	yes	47.5	0	Undetermined
Silky Dogwood	SD1	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	D	1		1	yes	40	0	Undetermined
Silky Dogwood	SD2	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	A	1		1	yes	28	0	Undetermined
Silky Dogwood	SD2	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	B	1		1	yes	22	0	Undetermined
Silky Dogwood	SD2	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	C	1		1	yes	30.5	0	Undetermined

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Silky Dogwood	SD2	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	D	1	1	yes	22	0		Undetermined
Silky Dogwood	SD3	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	A	1	2	yes	32.5	0		Undetermined
Silky Dogwood	SD3	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	B	1	2	yes	37.5	0		Undetermined
Silky Dogwood	SD3	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	C	1	2	yes	28.5	0		Undetermined
Silky Dogwood	SD3	3/23/2001	<i>Cornus ammonum</i>	P	shrub	0	D	1	2	yes	33	0		Undetermined
Red Maple	RM1	3/23/2001	<i>Acer rubrum</i>	P	tree	0	A	1	1	yes	0	1		Undetermined
Red Maple	RM2	3/23/2001	<i>Acer rubrum</i>	P	tree	0	A	1	1	yes	0	1		Undetermined
Red Maple	RM3	3/23/2001	<i>Acer rubrum</i>	P	tree	0	A	1	1	yes	0	1		Undetermined
Shumard Oak	SO1	3/23/2001	<i>Quercus shumardii</i>	P	tree	0	A	1	1	yes	0	0.5		Undetermined
Shumard Oak	SO2	3/23/2001	<i>Quercus shumardii</i>	P	tree	0	A	1	1	yes	0	0.5		Undetermined
Shumard Oak	SO3	3/23/2001	<i>Quercus shumardii</i>	P	tree	0	A	1	1	yes	0	0.5		Undetermined
No grass planting	NG1	3/23/2001	Bare ground						100			0		
No grass planting	NG2	3/23/2001	Bare ground						100			0		
No grass planting	NG3	3/23/2001	Bare ground						100			0		
Planted grass only	GO1	3/23/2001	<i>Glyceria septentrionalis</i>	P	herb	0								
Planted grass only	GO2	3/23/2001	<i>Glyceria septentrionalis</i>	P	herb	0								
Planted grass only	GO3	3/23/2001	<i>Glyceria septentrionalis</i>	P	herb	0								
Positive reference	PR1	3/23/2001							0					
Positive reference	PR2	3/23/2001							0					
Positive reference	PR3	3/23/2001							0					
Button Bush	BB1	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub	10	A	1	4	yes	31.5	-5.5		
Button Bush	BB1	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub		B	1	2	yes	38	4		stressed
Button Bush	BB1	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub		C	1	1	yes	38.5	5.5		living
Button Bush	BB1	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub		D	0	0	yes	0			healthy
Button Bush	BB1	6/21/2001	<i>Salix sp.</i>	V	tree				1	no				dead
Button Bush	BB1	6/21/2001	<i>Alnus serrulata</i>	V	shrub	5			1	no				9
Button Bush	BB1	6/21/2001	Bare ground	V					50					

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Button Bush	BB1	6/21/2001	<i>Elymus canadensis</i>	V	herb	25					yes			
Button Bush	BB1	6/21/2001	<i>Ambrosia artemisiifolia</i>	V	herb	10					yes			
Button Bush	BB1	6/21/2001	<i>Rumex crispus</i>	V	herb	3					yes			
Button Bush	BB1	6/21/2001	<i>Ambrosia trifida</i>	V	herb	3					yes			
Button Bush	BB1	6/21/2001	<i>Trifolium sp.</i>	V	herb	1					yes			
Button Bush	BB1	6/21/2001	<i>Polygonum sp. I</i>	V	herb	1					yes			
Button Bush	BB2	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub	3	A	0	0		yes	0		dead
Button Bush	BB2	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub		B	1	1		yes	36	-10	stressed
Button Bush	BB2	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub		C	0	0		yes	0		dead
Button Bush	BB2	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub		D	1	>10		yes	24	-7	healthy
Button Bush	BB2	6/21/2001	<i>Platanus occidentalis</i>	V	tree	5					no		24	
Button Bush	BB2	6/21/2001	<i>Cyperus esculentus</i>	P	herb	25					yes			
Button Bush	BB2	6/21/2001	<i>Juncus biflorus</i>	V	herb	25					yes			
Button Bush	BB2	6/21/2001	<i>Juncus effusus</i>	V	herb	5					yes			
Button Bush	BB2	6/21/2001	<i>Glyceria septentrionalis</i>	P	herb	5					yes			
Button Bush	BB2	6/21/2001	<i>Polygonum sp. I</i>	V	herb	5					yes			
Button Bush	BB2	6/21/2001	<i>Salix sp.</i>	V	herb	1					yes			
Button Bush	BB2	6/21/2001	<i>Elymus canadensis</i>	V	herb	1					yes			
Button Bush	BB2	6/21/2001	<i>Helianthus sp.</i>	V	herb	1					yes			
Button Bush	BB2	6/21/2001	<i>Panicum virgatum</i>	V	herb	1					yes			
Button Bush	BB3	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	0	0		yes	0		dead
Button Bush	BB3	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	B	0	0		yes	0		dead
Button Bush	BB3	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	C	0	0		yes	0		dead
Button Bush	BB3	6/21/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	D	1	12		yes	35	6.5	healthy
Button Bush	BB3	6/21/2001	<i>Juncus biflorus</i>	V	herb	90					yes			
Button Bush	BB3	6/21/2001	<i>Juncus effusus</i>	V	herb	25					yes			
Button Bush	BB3	6/21/2001	<i>Cyperus esculentus</i>	P	herb	10					yes			
Button Bush	BB3	6/21/2001	Bare ground	V	herb	5					yes			
Button Bush	BB3	6/21/2001	<i>Festuca pratensis</i>	V	herb	15					yes			
Button Bush	BB3	6/21/2001	<i>Nasturtium officinale</i>	V	herb	5					yes			

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Silky Dogwood	SD1	6/21/2001	<i>Cornus ammonum</i>	P	shrub	5	A	1	2	yes	32.25	0.25		living
Silky Dogwood	SD1	6/21/2001	<i>Cornus ammonum</i>	P	shrub		B	1	2	yes	52.5	6.5		healthy
Silky Dogwood	SD1	6/21/2001	<i>Cornus ammonum</i>	P	shrub		C	1	1	yes	41	-6.5		stressed
Silky Dogwood	SD1	6/21/2001	<i>Cornus ammonum</i>	P	shrub		D	1	2	yes	42.5	2.5		healthy
Silky Dogwood	SD1	6/21/2001	<i>Liriodendron tulipifera</i>	V	tree	10			1	no				
Silky Dogwood	SD1	6/21/2001	<i>Cyperus esculentus</i>	V	herb	25				yes				
Silky Dogwood	SD1	6/21/2001	Bare ground											
Silky Dogwood	SD1	6/21/2001	<i>Juncus biflorus</i>	V	herb	30					yes			
Silky Dogwood	SD1	6/21/2001	<i>Glyceria septentrionalis</i>	P	herb	5					yes			
Silky Dogwood	SD1	6/21/2001	<i>Mentha sp.</i>	V	herb	1					yes			
Silky Dogwood	SD1	6/21/2001	<i>Ludwigia alternifolia</i>	V	herb	5					yes			
Silky Dogwood	SD1	6/21/2001	<i>Scirpus atrocivens</i>	V	herb	1					yes			
Silky Dogwood	SD1	6/21/2001	<i>Verbena urticifolia</i>	V	herb	2					yes			
Silky Dogwood	SD2	6/21/2001	<i>Cornus ammonum</i>	P	shrub	2	A	1	2	yes	33	5		healthy
Silky Dogwood	SD2	6/21/2001	<i>Cornus ammonum</i>	P	shrub		B	1	2	yes	22	0		living
Silky Dogwood	SD2	6/21/2001	<i>Cornus ammonum</i>	P	shrub		C	0	0	yes	0			dead
Silky Dogwood	SD2	6/21/2001	<i>Cornus ammonum</i>	P	shrub		D	1	2	yes	24	2		living
Silky Dogwood	SD2	6/21/2001	<i>Juncus biflorus</i>	V	herb	75					yes			
Silky Dogwood	SD2	6/21/2001	<i>Juncus effusus</i>	V	herb	10					yes			
Silky Dogwood	SD2	6/21/2001	<i>Cyperus esculentus</i>	V	herb	10					yes			
Silky Dogwood	SD2	6/21/2001	<i>Mentha sp.</i>	V	herb	1					yes			
Silky Dogwood	SD2	6/21/2001	Bare ground								yes			
Silky Dogwood	SD2	6/21/2001	<i>Festuca pratensis</i>	V	herb	20					yes			
Silky Dogwood	SD2	6/21/2001	<i>Nasturtium officinale</i>	V	herb	2					yes			
Silky Dogwood	SD2	6/21/2001	<i>Polygonum sp. I</i>	V	herb	5					yes			
Silky Dogwood	SD3	6/21/2001	<i>Cornus ammonum</i>	P	shrub	5	A	1	2	yes	37	4.5		healthy
Silky Dogwood	SD3	6/21/2001	<i>Cornus ammonum</i>	P	shrub		B	1	2	yes	43	5.5		healthy
Silky Dogwood	SD3	6/21/2001	<i>Cornus ammonum</i>	P	shrub		C	1	2	yes	34	5.5		healthy
Silky Dogwood	SD3	6/21/2001	<i>Cornus ammonum</i>	P	shrub		D	1	2	yes	37	4		healthy
Silky Dogwood	SD3	6/21/2001	<i>Festuca pratensis</i>	V	herb	50					yes			
Silky Dogwood	SD3	6/21/2001	Bare ground								yes			

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Silky Dogwood	SD3	6/21/2001	<i>Juncus biflorus</i>	V	herb	20					yes			
Silky Dogwood	SD3	6/21/2001	<i>Nasturtium officinale</i>	V	herb	15					yes			
Silky Dogwood	SD3	6/21/2001	<i>Cyperus esculentus</i>	V	herb	20					yes			
Red Maple	RM1	6/21/2001	<i>Acer rubrum</i>	P	tree	0	A	0	1		yes			dead
Red Maple	RM1	6/21/2001	<i>Elymus canadensis</i>	V	herb	5					yes			
Red Maple	RM1	6/21/2001	<i>Juncus biflorus</i>	V	herb	40					yes			
Red Maple	RM1	6/21/2001	<i>Juncus effusus</i>	V	herb	5					yes			
Red Maple	RM1	6/21/2001	<i>Cyperus esculentus</i>	V	herb	5					yes			
Red Maple	RM1	6/21/2001	<i>Mentha sp.</i>	V	herb	1					yes			
Red Maple	RM1	6/21/2001	Bare ground			35								
Red Maple	RM1	6/21/2001	<i>Festuca pratensis</i>	V	herb	10					yes			
Red Maple	RM1	6/21/2001	<i>Nasturtium officinale</i>	V	herb	10					yes			
Red Maple	RM2	6/21/2001	<i>Acer rubrum</i>	P	tree	10	A	1	1		yes		0.25	1.25
Red Maple	RM2	6/21/2001	<i>Platanus occidentalis</i>	V	tree	5			1		no			24
Red Maple	RM2	6/21/2001	Bare ground			60								
Red Maple	RM2	6/21/2001	<i>Cyperus esculentus</i>	V	herb	10					yes			
Red Maple	RM2	6/21/2001	<i>Glyceria septentrionalis</i>	V	herb	10					yes			
Red Maple	RM2	6/21/2001	<i>Nasturtium officinale</i>	V	herb	25					yes			
Red Maple	RM2	6/21/2001	<i>Juncus biflorus</i>	V	herb	5					yes			
Red Maple	RM2	6/21/2001	<i>Platanus occidentalis</i>	V	herb	1					yes			
Red Maple	RM2	6/21/2001	<i>Elymus canadensis</i>	V	herb	1					yes			
Red Maple	RM2	6/21/2001	<i>Fraxinus pennsylvanica</i>	V	herb	1					yes			
Red Maple	RM3	6/21/2001	<i>Acer rubrum</i>	P	tree	0	A	1	1		yes			
Red Maple	RM3	6/21/2001	<i>Platanus occidentalis</i>	V	tree	5			1		no			24
Red Maple	RM3	6/21/2001	<i>Juncus biflorus</i>	V	herb	60					yes			
Red Maple	RM3	6/21/2001	Bare ground			35								
Red Maple	RM3	6/21/2001	<i>Glyceria septentrionalis</i>	V	herb	5					yes			
Red Maple	RM3	6/21/2001	<i>Nasturtium officinale</i>	V	herb	10					yes			
Shumard Oak	SO1	6/21/2001	<i>Quercus shumardii</i>	P	tree	0	A	0	1		yes		0	0.5
														dead

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Shumard Oak	SO1	6/21/2001	Bare ground			50								
Shumard Oak	SO1	6/21/2001	<i>Juncus biflorus</i>	V	herb	40								yes
Shumard Oak	SO1	6/21/2001	<i>Juncus effusus</i>	V	herb	10								yes
Shumard Oak	SO1	6/21/2001	<i>Festuca pratensis</i>	V	herb	10								yes
Shumard Oak	SO1	6/21/2001	<i>Ambrosia artemisiifolia</i>	V	herb	5								yes
Shumard Oak	SO1	6/21/2001	<i>Nasturtium officinale</i>	V	herb	20								yes
Shumard Oak	SO1	6/21/2001	<i>Elymus canadensis</i>	V	herb	1								yes
Shumard Oak	SO1	6/21/2001	<i>Mentha sp.</i>	V	herb	2								yes
Shumard Oak	SO2	6/21/2001	<i>Quercus shumardii</i>	P	tree	0	A	0	1	yes	0	0.5		
Shumard Oak	SO2	6/21/2001	Bare ground			50								
Shumard Oak	SO2	6/21/2001	<i>Juncus biflorus</i>	V	herb	40								yes
Shumard Oak	SO2	6/21/2001	<i>Ambrosia artemisiifolia</i>	V	herb	20								yes
Shumard Oak	SO2	6/21/2001	<i>Cyperus esculentus</i>	V	herb	10								yes
Shumard Oak	SO2	6/21/2001	<i>Festuca pratensis</i>	V	herb	5								yes
Shumard Oak	SO3	6/21/2001	<i>Quercus shumardii</i>	P	tree	0	A	0	1	yes	0	0.5		
Shumard Oak	SO3	6/21/2001	<i>Juncus biflorus</i>	V	herb	75								yes
Shumard Oak	SO3	6/21/2001	<i>Typha latifolia</i>	V	herb	5								yes
Shumard Oak	SO3	6/21/2001	<i>Elymus canadensis</i>	V	herb	5								yes
Shumard Oak	SO3	6/21/2001	<i>Cyperus esculentus</i>	V	herb	30								yes
Shumard Oak	SO3	6/21/2001	Bare ground			20								
No grass planting	NG1	6/21/2001	<i>Liriodendron tulipifera</i>	V	tree	10					3	no		
No grass planting	NG1	6/21/2001	Bare ground			40								
No grass planting	NG1	6/21/2001	<i>Microstegium</i>	V	herb	30								yes
No grass planting	NG1	6/21/2001	<i>Ambrosia artemisiifolia</i>	V	herb	1								yes
No grass planting	NG1	6/21/2001	<i>Elymus canadensis</i>	V	herb	5								yes
No grass planting	NG1	6/21/2001	<i>Ranunculus sp.</i>	V	herb	1								yes
No grass planting	NG1	6/21/2001	<i>Pilea pumila</i>	V	herb	1								yes
No grass planting	NG1	6/21/2001	<i>Salix sp.</i>	V	herb	1								yes
No grass planting	NG1	6/21/2001	<i>Verbena urticifolia</i>	V	herb	1								yes
No grass planting	NG1	6/21/2001	Vine, heart shaped	V	herb	1								yes

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Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Max hgt (in.)	Growth	dbh (in.)	Condition
No grass planting	NG2	6/21/2001	Bare ground			40							
No grass planting	NG2	6/21/2001	<i>Juncus biflorus</i>	V	herb	35							yes
No grass planting	NG2	6/21/2001	<i>Typha latifolia</i>	V	herb	2							yes
No grass planting	NG2	6/21/2001	<i>Cyperus esculentus</i>	V	herb	10							yes
No grass planting	NG2	6/21/2001	<i>Juncus effusus</i>	V	herb	20							yes
No grass planting	NG2	6/21/2001	<i>Mentha sp.</i>	V	herb	1							yes
No grass planting	NG2	6/21/2001	<i>Festuca pratensis</i>	V	herb	5							yes
No grass planting	NG3	6/21/2001	<i>Juncus biflorus</i>	V	herb	40							yes
No grass planting	NG3	6/21/2001	Bare ground			35							
No grass planting	NG3	6/21/2001	<i>Nasturtium officinale</i>	V	herb	5							yes
No grass planting	NG3	6/21/2001	<i>Typha latifolia</i>	V	herb	1							yes
No grass planting	NG3	6/21/2001	<i>Festuca pratensis</i>	V	herb	5							yes
No grass planting	NG3	6/21/2001	<i>Mentha sp.</i>	V	herb	1							yes
Planted grass only	GO1	6/21/2001	<i>Cyperus esculentus</i>	V	herb	70							yes
Planted grass only	GO1	6/21/2001	Bare ground			30							
Planted grass only	GO1	6/21/2001	<i>Elymus canadensis</i>	V	herb	5							yes
Planted grass only	GO1	6/21/2001	<i>Juncus biflorus</i>	V	herb	5							yes
Planted grass only	GO1	6/21/2001	<i>Ludwigia alternifolia</i>	V	herb	1							yes
Planted grass only	GO1	6/21/2001	<i>Mentha sp.</i>	V	herb	1							yes
Planted grass only	GO1	6/21/2001	<i>Liriodendron tulipifera</i>	V	herb	10							no
Planted grass only	GO2	6/21/2001	<i>Cyperus esculentus</i>	V	herb	20							yes
Planted grass only	GO2	6/21/2001	<i>Festuca pratensis</i>	V	herb	70							yes
Planted grass only	GO2	6/21/2001	<i>Juncus biflorus</i>	V	herb	25							yes
Planted grass only	GO2	6/21/2001	Bare ground			10							yes
Planted grass only	GO3	6/21/2001	<i>Glyceria septentrionalis</i>	P	herb	0							yes
Planted grass only	GO3	6/21/2001	Bare ground			50							
Planted grass only	GO3	6/21/2001	<i>Juncus biflorus</i>	V	herb	20							yes
Planted grass only	GO3	6/21/2001	<i>Elymus canadensis</i>	V	herb	1							yes

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Planted grass only	GO3	6/21/2001	<i>Festuca pratensis</i>	V	herb	25					yes			10,14,18
Planted grass only	GO3	6/21/2001	<i>Nasturtium officinale</i>	V	herb	3					yes			12,12
Positive reference	PR1	6/21/2001	<i>Liriodendron tulipifera</i>	V	tree	10					no			
Positive reference	PR1	6/21/2001	<i>Platanus occidentalis</i>	V	tree	20					no			
Positive reference	PR1	6/21/2001	<i>Acer rubrum</i>	V	tree	10					yes			3
Positive reference	PR1	6/21/2001	<i>Fraxinus pennsylvanica</i>	V	shrub	5					yes			4
Positive reference	PR1	6/21/2001	<i>Acer rubrum</i>	V	shrub	5					yes			3
Positive reference	PR1	6/21/2001	<i>Liquidambar syriacifolia</i>	V	shrub	7					yes			8
Positive reference	PR1	6/21/2001	<i>Aster sp. I</i>	V	herb	30					yes			
Positive reference	PR1	6/21/2001	<i>Toxicodendron radicans</i>	V	herb	25					yes			
Positive reference	PR1	6/21/2001	<i>Eupatorium serotinum</i>	V	herb	5					yes			
Positive reference	PR1	6/21/2001	<i>Bohemeria cylindrica</i>	V	herb	1					yes			
Positive reference	PR1	6/21/2001	<i>Partheniccus quinquefolia</i>	V	herb	5					yes			
Positive reference	PR1	6/21/2001	<i>Microstegium vimineum</i>	V	herb	10					yes			
Positive reference	PR1	6/21/2001	<i>Alder sp.</i>	V	herb	2					yes			
Positive reference	PR1	6/21/2001	<i>Lonicera japonica</i>	V	herb	15					yes			
Positive reference	PR1	6/21/2001	Bare ground	V	herb	35					yes			
Positive reference	PR2	6/21/2001	<i>Liriodendron tulipifera</i>	V	tree	40					no			
Positive reference	PR2	6/21/2001	<i>Alder sp.</i>	V	shrub	10					yes			
Positive reference	PR2	6/21/2001	<i>Lindernia benzoin</i>	V	shrub	30					yes			
Positive reference	PR2	6/21/2001	<i>Acer rubrum</i>	V	shrub	5					yes			
Positive reference	PR2	6/21/2001	<i>Liriodendron tulipifera</i>	V	shrub	5					yes			
Positive reference	PR2	6/21/2001	<i>Carex squarrosa?</i>	V	herb	20					yes			
Positive reference	PR2	6/21/2001	<i>Toxicodendron radicans</i>	V	herb	25					yes			
Positive reference	PR2	6/21/2001	<i>Aster sp. I</i>	V	herb	45					yes			
Positive reference	PR2	6/21/2001	<i>Eupatorium serotinum</i>	V	herb	2					yes			
Positive reference	PR2	6/21/2001	Bare ground			25								
Positive reference	PR2	6/21/2001	<i>Polystichum acrostichoides</i>	V	herb	1					yes			
Positive reference	PR2	6/21/2001	<i>Partheniccus quinquefolia</i>	V	herb	5					yes			
Positive reference	PR2	6/21/2001	<i>Campsis radicans</i>	V	herb	1					yes			
Positive reference	PR2	6/21/2001	<i>Cephalanthus occidentalis</i>	V	herb	10					yes			

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Rooted?	Max hgt (in.)	Growth	dbh (in)	Condition
Positive reference	PR2	6/21/2001	<i>Lonicera japonica</i>	V	herb	25				yes				
Positive reference	PR2	6/21/2001	<i>Trifolium sp.</i>	V	herb	2				yes				
Positive reference	PR2	6/21/2001	<i>Juncus effusus</i>	V	herb	3				yes				
Positive reference	PR3	6/21/2001	<i>Liriodendron tulipifera</i>	V	tree	80				2	yes			8,17
Positive reference	PR3	6/21/2001	<i>Liquidambar syracfolia</i>	V	tree	2.5				yes				3
Positive reference	PR3	6/21/2001	<i>Fraxinus americana</i>	V	tree	2.5				yes				3
Positive reference	PR3	6/21/2001	<i>Cornus ammonum</i>	V	shrub	20				yes				
Positive reference	PR3	6/21/2001	<i>Carpinus caroliniana</i>	V	shrub	5				3				
Positive reference	PR3	6/21/2001	<i>Alder sp.</i>	V	shrub	10				1	yes			
Positive reference	PR3	6/21/2001	<i>Juncus effusus</i>	V	herb	5				3	yes			
Positive reference	PR3	6/21/2001	<i>Eupatorium serotinum</i>	V	herb	1				yes				
Positive reference	PR3	6/21/2001	<i>Duchesnea indica</i>	V	herb	10				yes				
Positive reference	PR3	6/21/2001	<i>Viola sp.</i>	V	herb	2				yes				
Positive reference	PR3	6/21/2001	Bare ground			50								
Positive reference	PR3	6/21/2001	<i>Parthenocissus quinquefolia</i>	V	herb	5				yes				
Positive reference	PR3	6/21/2001	<i>Toxicodendron radicans</i>	V	herb	2				yes				
Positive reference	PR3	6/21/2001	<i>Lonicera japonica</i>	V	herb	10				yes				
Positive reference	PR3	6/21/2001	<i>Polygonatum acrostichoides</i>	V	herb	2				yes				
Positive reference	PR3	6/21/2001	<i>Juniperus virginiana</i>	V	herb	1				yes				
Positive reference	PR3	6/21/2001	<i>Trillium sp.</i>	V	herb	2				yes				
Positive reference	PR3	6/21/2001	<i>Aster sp.</i>	V	herb	5				yes				
Positive reference	PR3	6/21/2001	<i>Carex siccarrosa?</i>	V	herb	5				yes				
Button Bush	BB1	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	0		yes	0			
Button Bush	BB1	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub	1	1	1		yes	33	-1		
Button Bush	BB1	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub	1	1	1		yes	36	3		
Button Bush	BB1	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	D	0		yes	0			
Button Bush	BB1	9/25/2001	<i>Salix sp.</i>	V	tree			1		no				
Button Bush	BB1	9/25/2001	<i>Alnus serrulata</i>	V	shrub	5		1		no				
Button Bush	BB1	9/25/2001	Bare ground	V		10								
Button Bush	BB1	9/25/2001	<i>Elymus canadensis</i>	V	herb	0				yes				
Button Bush	BB1	9/25/2001	<i>Ambrosia artemisiifolia</i>	V	herb	25				yes				

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Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Button Bush	BB1	9/25/2001	<i>Rumex crispus</i>	V	herb	1					yes			
Button Bush	BB1	9/25/2001	<i>Ambrosia trifida</i>	V	herb	20					yes			
Button Bush	BB1	9/25/2001	<i>Trifolium sp.</i>	V	herb	0					yes			
Button Bush	BB1	9/25/2001	<i>Polygonum sp. I</i>	V	herb	0					yes			
Button Bush	BB1	9/25/2001	<i>Glyceria septentrionalis</i>	P	herb	65					yes			
Button Bush	BB1	9/25/2001	<i>Verbena urticifolia</i>	V	herb	10					yes			
Button Bush	BB1	9/25/2001	<i>Cirsium sp. (thistle)</i>	V	herb	2					yes			
Button Bush	BB2	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	0	0	0	yes	0		
Button Bush	BB2	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub		B	0	0	0	yes	0		
Button Bush	BB2	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub		C	0	0	0	yes	0		
Button Bush	BB2	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub		D	1	1	yes	26	-5		
Button Bush	BB2	9/25/2001	<i>Cyperus esculentus</i>	V	herb	25					yes			
Button Bush	BB2	9/25/2001	<i>Juncus biflorus</i>	V	herb	25					yes			
Button Bush	BB2	9/25/2001	<i>Juncus effusus</i>	V	herb	0					yes			
Button Bush	BB2	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	55					yes			
Button Bush	BB2	9/25/2001	<i>Polygonum sp. I</i>	V	herb	5					yes			
Button Bush	BB2	9/25/2001	<i>Salix sp.</i>	V	herb	0					yes			
Button Bush	BB2	9/25/2001	<i>Elymus canadensis</i>	V	herb	0					yes			
Button Bush	BB2	9/25/2001	<i>Helianthus sp.</i>	V	herb	1					yes			
Button Bush	BB2	9/25/2001	<i>Panicum virgatum</i>	V	herb	0					yes			
Button Bush	BB3	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub	5	A	0	0	0	yes	0		
Button Bush	BB3	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub		B	0	0	0	yes	0		
Button Bush	BB3	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub		C	0	0	0	yes	0		
Button Bush	BB3	9/25/2001	<i>Cephalanthus occidentalis</i>	P	shrub		D	1	2	yes	30	1.5		
Button Bush	BB3	9/25/2001	<i>Juncus biflorus</i>	V	herb	90					yes			
Button Bush	BB3	9/25/2001	<i>Juncus effusus</i>	V	herb	0					yes			
Button Bush	BB3	9/25/2001	<i>Cyperus esculentus</i>	V	herb	40					yes			
Button Bush	BB3	9/25/2001	Bare ground			0								
Button Bush	BB3	9/25/2001	<i>Festuca pratensis</i>	V	herb	0					yes			
Button Bush	BB3	9/25/2001	<i>Nasturtium officinale</i>	V	herb	0					yes			
Button Bush	BB3	9/25/2001	<i>Scirpus atrocivens</i>	V	herb	20					yes			

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Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Button Bush	BB3	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	10				yes				
Button Bush	BB3	9/25/2001	<i>Polygonum sp. I</i>	V	herb	10				yes				
Silky Dogwood	SD1	9/25/2001	<i>Cornus ammonum</i>	P	shrub	3	A	1	1	yes	30	-2		living
Silky Dogwood	SD1	9/25/2001	<i>Cornus ammonum</i>	P	shrub		B	1	2	yes	39	-7		stressed
Silky Dogwood	SD1	9/25/2001	<i>Cornus ammonum</i>	P	shrub		C	1	1	yes	39	-8.5		stressed
Silky Dogwood	SD1	9/25/2001	<i>Cornus ammonum</i>	P	shrub		D	1	2	yes	37	-3		stressed
Silky Dogwood	SD1	9/25/2001	<i>Cyperus esculentus</i>	V	herb	35				yes				
Silky Dogwood	SD1	9/25/2001	Bare ground								15			
Silky Dogwood	SD1	9/25/2001	<i>Juncus biflorus</i>	V	herb	30				yes				
Silky Dogwood	SD1	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	35				yes				
Silky Dogwood	SD1	9/25/2001	<i>Ludwigia alternifolia</i>	V	herb	5				yes				
Silky Dogwood	SD1	9/25/2001	<i>Verbena urticifolia</i>	V	herb	2				yes				
Silky Dogwood	SD1	9/25/2001	<i>Scirpus atrocivens</i>	V	herb	1				yes				
Silky Dogwood	SD1	9/25/2001	<i>Mentha sp.</i>	V	herb	0								
Silky Dogwood	SD2	9/25/2001	<i>Cornus ammonum</i>	P	shrub	1	A	1	2	yes	29	1		living
Silky Dogwood	SD2	9/25/2001	<i>Cornus ammonum</i>	P	shrub		B	1	1	yes	24	2		living
Silky Dogwood	SD2	9/25/2001	<i>Cornus ammonum</i>	P	shrub		C	0	0	yes	0			dead
Silky Dogwood	SD2	9/25/2001	<i>Cornus ammonum</i>	P	shrub		D	1	1	yes	21	-1		stressed
Silky Dogwood	SD2	9/25/2001	<i>Juncus biflorus</i>	V	herb	75				yes				
Silky Dogwood	SD2	9/25/2001	<i>Juncus effusus</i>	V	herb	0				yes				
Silky Dogwood	SD2	9/25/2001	<i>Cyperus esculentus</i>	V	herb	50				yes				
Silky Dogwood	SD2	9/25/2001	<i>Mentha sp.</i>	V	herb	0				yes				
Silky Dogwood	SD2	9/25/2001	Bare ground											
Silky Dogwood	SD2	9/25/2001	<i>Festuca pratensis</i>	V	herb	0				yes				
Silky Dogwood	SD2	9/25/2001	<i>Nasturtium officinale</i>	V	herb	0				yes				
Silky Dogwood	SD2	9/25/2001	<i>Polygonum sp. I</i>	V	herb	10				yes				
Silky Dogwood	SD2	9/25/2001	<i>Typha latifolia</i>	V	herb	1				yes				
Silky Dogwood	SD2	9/25/2001	<i>Rumex crispus</i>	V	herb	1				yes				
Silky Dogwood	SD2	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	35				yes				
Silky Dogwood	SD3	9/25/2001	<i>Cornus ammonum</i>	P	shrub	5	A	1	2	yes	38	5.5		healthy

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Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Silky Dogwood	SD3	9/25/2001	<i>Cornus ammonum</i>	P	shrub	B	1	2	yes	40	2.5			living
Silky Dogwood	SD3	9/25/2001	<i>Cornus ammonum</i>	P	shrub	C	1	2	yes	32	3.5			healthy
Silky Dogwood	SD3	9/25/2001	<i>Cornus ammonum</i>	P	shrub	D	1	2	yes	33	0			healthy
Silky Dogwood	SD3	9/25/2001	<i>Festuca pratensis</i>	V	herb	5			yes					
Silky Dogwood	SD3	9/25/2001	Bare ground	V	herb	5			yes					
Silky Dogwood	SD3	9/25/2001	<i>Juncus biflorus</i>	V	herb	25			yes					
Silky Dogwood	SD3	9/25/2001	<i>Nasturtium officinale</i>	V	herb	1			yes					
Silky Dogwood	SD3	9/25/2001	<i>Cyperus esculentus</i>	V	herb	35			yes					
Silky Dogwood	SD3	9/25/2001	<i>Polygonum sp. I</i>	V	herb	5			yes					
Silky Dogwood	SD3	9/25/2001	<i>Ludwigia alternifolia</i>	V	herb	2			yes					
Silky Dogwood	SD3	9/25/2001	<i>Poa sp.</i>	V	herb	1			yes					
Silky Dogwood	SD3	9/25/2001	<i>Scirpus atrovirens</i>	V	herb	15			yes					
Red Maple	RM1	9/25/2001	<i>Acer rubrum</i>	P	tree	0	A	0	1	1	yes			
Red Maple	RM1	9/25/2001	<i>Elymus canadensis</i>	V	herb	0			yes					
Red Maple	RM1	9/25/2001	<i>Juncus biflorus</i>	V	herb	40			yes					
Red Maple	RM1	9/25/2001	<i>Juncus effusus</i>	V	herb	5			yes					
Red Maple	RM1	9/25/2001	<i>Cyperus esculentus</i>	V	herb	10			yes					
Red Maple	RM1	9/25/2001	<i>Mentha sp.</i>	V	herb	1			yes					
Red Maple	RM1	9/25/2001	Bare ground	V		5			yes					
Red Maple	RM1	9/25/2001	<i>Festuca pratensis</i>	V	herb	1			yes					
Red Maple	RM1	9/25/2001	<i>Nasturtium officinale</i>	V	herb	0			yes					
Red Maple	RM1	9/25/2001	<i>Scirpus atrovirens</i>	V	herb	25			yes					
Red Maple	RM1	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	25			yes					
Red Maple	RM1	9/25/2001	<i>Eupatorium sp.</i>	V	herb	3			yes					
Red Maple	RM1	9/25/2001	<i>Verbena urticifolia</i>	V	herb	5			yes					
Red Maple	RM2	9/25/2001	<i>Acer rubrum</i>	P	tree	0	A	0	1	1	yes			
Red Maple	RM2	9/25/2001	<i>Platanus occidentalis</i>	V	tree	5			1	1	no			
Red Maple	RM2	9/25/2001	Bare ground	V		5								
Red Maple	RM2	9/25/2001	<i>Cyperus esculentus</i>	V	herb	5						yes		
Red Maple	RM2	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	95						yes		
Red Maple	RM2	9/25/2001	<i>Nasturtium officinale</i>	V	herb	0						yes		

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Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Red Maple	RM2	9/25/2001	<i>Juncus biflorus</i>	V	herb	0					yes			
Red Maple	RM2	9/25/2001	<i>Platanus occidentalis</i>	V	herb	0					yes			
Red Maple	RM2	9/25/2001	<i>Elymus canadensis</i>	V	herb	0					yes			
Red Maple	RM2	9/25/2001	<i>Fraxinus pennsylvanica</i>	V	herb	0					yes			
Red Maple	RM3	9/25/2001	<i>Acer rubrum</i>	P	tree	0	A	0	1		yes			dead
Red Maple	RM3	9/25/2001	<i>Platanus occidentalis</i>	V	tree	5			1		no			24
Red Maple	RM3	9/25/2001	<i>Juncus biflorus</i>	V	herb	60					yes			
Red Maple	RM3	9/25/2001	Bare ground											
Red Maple	RM3	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	20					yes			
Red Maple	RM3	9/25/2001	<i>Nasturtium officinale</i>	V	herb	10					yes			
Red Maple	RM3	9/25/2001	<i>Ludwigia alternifolia</i>	V	herb	2					yes			
Red Maple	RM3	9/25/2001	<i>Polygonum sp. I</i>	V	herb	1					yes			
Red Maple	RM3	9/25/2001	<i>Cyperus esculentus</i>	V	herb	15					yes			
Shumard Oak	SO1	9/25/2001	<i>Quercus shumardii</i>	P	tree	0	A	0	1		yes	0		dead
Shumard Oak	SO1	9/25/2001	Bare ground			2								
Shumard Oak	SO1	9/25/2001	<i>Juncus biflorus</i>	V	herb	45					yes			
Shumard Oak	SO1	9/25/2001	<i>Juncus effusus</i>	V	herb	10					yes			
Shumard Oak	SO1	9/25/2001	<i>Festuca pratensis</i>	V	herb	5					yes			
Shumard Oak	SO1	9/25/2001	<i>Ambrosia artemisiifolia</i>	V	herb	1					yes			
Shumard Oak	SO1	9/25/2001	<i>Nasturtium officinale</i>	V	herb	10					yes			
Shumard Oak	SO1	9/25/2001	<i>Elymus canadensis</i>	V	herb	0					yes			
Shumard Oak	SO1	9/25/2001	<i>Mentha sp.</i>	V	herb	5					yes			
Shumard Oak	SO1	9/25/2001	<i>Typha latifolia</i>	V	herb	3					yes			
Shumard Oak	SO1	9/25/2001	<i>Polygonum sp. I</i>	V	herb	1					yes			
Shumard Oak	SO1	9/25/2001	<i>Scirpus atrocivens</i>	V	herb	10					yes			
Shumard Oak	SO1	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	20					yes			
Shumard Oak	SO1	9/25/2001	<i>Verbena urticifolia</i>	V	herb	2					yes			
Shumard Oak	SO1	9/25/2001	<i>Polygonum sp. 2</i>	V	herb	1					yes			
Shumard Oak	SO2	9/25/2001	<i>Quercus shumardii</i>	P	tree	0	A	0	1		yes	0		dead
Shumard Oak	SO2	9/25/2001	Bare ground			5					yes			

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Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Shumard Oak	SO2	9/25/2001	<i>Juncus biflorus</i>	V	herb	50					yes			
Shumard Oak	SO2	9/25/2001	<i>Ambrosia artemissifolia</i>	V	herb	25					yes			
Shumard Oak	SO2	9/25/2001	<i>Cyperus esculentus</i>	V	herb	25					yes			
Shumard Oak	SO2	9/25/2001	<i>Festuca pratensis</i>	V	herb	1					yes			
Shumard Oak	SO2	9/25/2001	<i>Setaria sp. (foxtail)</i>	V	herb	1					yes			
Shumard Oak	SO2	9/25/2001	<i>Lycopus americanus</i>	V	herb	1					yes			
Shumard Oak	SO2	9/25/2001	<i>Scirpus atrocivens</i>	V	herb	1					yes			
Shumard Oak	SO2	9/25/2001	<i>Poa sp.</i>	V	herb	1					yes			
Shumard Oak	SO3	9/25/2001	<i>Quercus shumardii</i>	P	tree	0	A	0	1		yes	0		
Shumard Oak	SO3	9/25/2001	<i>Juncus biflorus</i>	V	herb	60					yes			
Shumard Oak	SO3	9/25/2001	<i>Typha latifolia</i>	V	herb	15					yes			
Shumard Oak	SO3	9/25/2001	<i>Elymus canadensis</i>	V	herb	0					yes			
Shumard Oak	SO3	9/25/2001	<i>Cyperus esculentus</i>	V	herb	35					yes			
Shumard Oak	SO3	9/25/2001	Bare ground			0								
Shumard Oak	SO3	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	80					yes			
Shumard Oak	SO3	9/25/2001	<i>Ludwigia alternifolia</i>	V	herb	5					yes			
Shumard Oak	SO3	9/25/2001	<i>Ludwigia palustris?</i>	V	herb	5					yes			
Shumard Oak	SO3	9/25/2001	<i>Polygonum sp. I</i>	V	herb	5					yes			
No grass planting	NG1	9/25/2001	<i>Liriodendron tulipifera</i>	V	tree	10			3		no			
No grass planting	NG1	9/25/2001	Bare ground			0								
No grass planting	NG1	9/25/2001	<i>Microstegium</i>	V	herb	90					yes			
No grass planting	NG1	9/25/2001	<i>Ambrosia artemissifolia</i>	V	herb	20					yes			
No grass planting	NG1	9/25/2001	<i>Elymus canadensis</i>	V	herb	0					yes			
No grass planting	NG1	9/25/2001	<i>Ranunculus sp.</i>	V	herb	0					yes			
No grass planting	NG1	9/25/2001	<i>Pilea pumila</i>	V	herb	0					yes			
No grass planting	NG1	9/25/2001	<i>Salix sp.</i>	V	herb	0					yes			
No grass planting	NG1	9/25/2001	<i>Verbena urticifolia</i>	V	herb	5					yes			
No grass planting	NG1	9/25/2001	Vine, heart shaped	V	herb	2					yes			
No grass planting	NG1	9/25/2001	<i>Cyperus esculentus?</i>	V	herb	10					yes			
No grass planting	NG1	9/25/2001	<i>Lycopus rubellus</i>	V	herb	5					yes			

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
No grass planting	NG2	9/25/2001	Bare ground			0								
No grass planting	NG2	9/25/2001	<i>Juncus biflorus</i>	V	herb	65					yes			
No grass planting	NG2	9/25/2001	<i>Typha latifolia</i>	V	herb	5					yes			
No grass planting	NG2	9/25/2001	<i>Cyperus esculentus</i>	V	herb	20					yes			
No grass planting	NG2	9/25/2001	<i>Juncus effusus</i>	V	herb	0					yes			
No grass planting	NG2	9/25/2001	<i>Mentha sp.</i>	V	herb	0					yes			
No grass planting	NG2	9/25/2001	<i>Festuca pratensis</i>	V	herb	0					yes			
No grass planting	NG2	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	50					yes			
No grass planting	NG2	9/25/2001	<i>Scirpus atrocivens</i>	V	herb	15					yes			
No grass planting	NG2	9/25/2001	<i>Polygonum sp. I</i>	V	herb	2					yes			
No grass planting	NG3	9/25/2001	<i>Juncus biflorus</i>	V	herb	55					yes			
No grass planting	NG3	9/25/2001	Bare ground	V	herb	10					yes			
No grass planting	NG3	9/25/2001	<i>Nasturtium officinale</i>	V	herb	10					yes			
No grass planting	NG3	9/25/2001	<i>Typha latifolia</i>	V	herb	1					yes			
No grass planting	NG3	9/25/2001	<i>Festuca pratensis</i>	V	herb	0					yes			
No grass planting	NG3	9/25/2001	<i>Mentha sp.</i>	V	herb	0					yes			
No grass planting	NG3	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	20					yes			
No grass planting	NG3	9/25/2001	<i>Lycopus americanus</i>	V	herb	1					yes			
No grass planting	NG3	9/25/2001	<i>Poa sp.</i>	V	herb	1					yes			
No grass planting	NG3	9/25/2001	<i>Verbena urticifolia</i>	V	herb	15					yes			
No grass planting	NG3	9/25/2001	<i>Scirpus atrocivens</i>	V	herb	10					yes			
Planted grass only	GO1	9/25/2001	<i>Glyceria septentrionalis</i>	P	herb	20					yes			
Planted grass only	GO1	9/25/2001	<i>Cyperus esculentus</i>	V	herb	80					yes			
Planted grass only	GO1	9/25/2001	Bare ground			10								
Planted grass only	GO1	9/25/2001	<i>Elymus canadensis</i>	V	herb	0					yes			
Planted grass only	GO1	9/25/2001	<i>Juncus biflorus</i>	V	herb	5					yes			
Planted grass only	GO1	9/25/2001	<i>Ludwigia alternifolia</i>	V	herb	5					yes			
Planted grass only	GO1	9/25/2001	<i>Mentha sp.</i>	V	herb	0					yes			
Planted grass only	GO1	9/25/2001	<i>Liriodendron tulipifera</i>	V	tree	10					1	no		
Planted grass only	GO1	9/25/2001	<i>Microstegium sp.</i>	V	herb	2					yes			
Planted grass only	GO1	9/25/2001	<i>Scirpus atrocivens</i>	V	herb	2					yes			

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Planted grass only	GO2	9/25/2001	<i>Cyperus esculentus</i>	V	herb	20						yes		
Planted grass only	GO2	9/25/2001	<i>Festuca pratensis</i>	V	herb	0						yes		
Planted grass only	GO2	9/25/2001	<i>Juncus biflorus</i>	V	herb	0						yes		
Planted grass only	GO2	9/25/2001	Bare ground			0								
Planted grass only	GO2	9/25/2001	<i>Glyceria septentrionalis</i>	V	herb	90						yes		
Planted grass only	GO3	9/25/2001	<i>Glyceria septentrionalis</i>	P	herb	40						yes		
Planted grass only	GO3	9/25/2001	Bare ground			25								
Planted grass only	GO3	9/25/2001	<i>Juncus biflorus</i>	V	herb	25						yes		
Planted grass only	GO3	9/25/2001	<i>Elymus canadensis</i>	V	herb	0						yes		
Planted grass only	GO3	9/25/2001	<i>Festuca sp.</i>	V	herb	0						yes		
Planted grass only	GO3	9/25/2001	<i>Nasturtium officinalis</i>	V	herb	1						yes		
Planted grass only	GO3	9/25/2001	<i>Platanus occidentalis</i>	V	tree	5						no		
Planted grass only	GO3	9/25/2001	<i>Ludwigia alternifolia</i>	V	herb	2						yes		
Planted grass only	GO3	9/25/2001	<i>Lycopus americanus</i>	V	herb	1						yes		
Planted grass only	GO3	9/25/2001	<i>Cyperus esculentus</i>	V	herb	15						yes		
Positive reference	PRI	9/25/2001	<i>Liriodendron tulipifera</i>	V	tree	10						10,14,18		
Positive reference	PRI	9/25/2001	<i>Platanus occidentalis</i>	V	tree	20						12, 12		
Positive reference	PRI	9/25/2001	<i>Acer rubrum</i>	V	tree	10						3		
Positive reference	PRI	9/25/2001	<i>Fraxinus pensylvanica</i>	V	shrub	5						4		
Positive reference	PRI	9/25/2001	<i>Acer rubrum</i>	V	shrub	5						3		
Positive reference	PRI	9/25/2001	<i>Liquidambar syracifolia</i>	V	shrub	7						8		
Positive reference	PRI	9/25/2001	<i>Aster sp. I</i>	V	herb	55						yes		
Positive reference	PRI	9/25/2001	<i>Toxicodendron radicans</i>	V	herb	30						yes		
Positive reference	PRI	9/25/2001	<i>Eupatorium serotinum</i>	V	herb	15						yes		
Positive reference	PRI	9/25/2001	<i>Boehmeria cylindrica</i>	V	herb	10						yes		
Positive reference	PRI	9/25/2001	<i>Parthenocissus quinquefolia</i>	V	herb	5						yes		
Positive reference	PRI	9/25/2001	<i>Microstegium vimineum</i>	V	herb	25						yes		
Positive reference	PRI	9/25/2001	<i>Alder sp.</i>	V	herb	20						yes		
Positive reference	PRI	9/25/2001	<i>Lonicera japonica</i>	V	herb	20						yes		
Positive reference	PRI	9/25/2001	Bare ground			10								

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Rooted?	Max hgt (in.)	Growth	dbh (in)	Condition
Positive reference	PR1	9/25/2001	<i>Viola</i> sp.	V	herb	1					yes			
Positive reference	PR2	9/25/2001	<i>Liriodendron tulipifera</i>	V	tree	40					no			
Positive reference	PR2	9/25/2001	<i>Alder</i> sp.	V	shrub	10					yes			
Positive reference	PR2	9/25/2001	<i>Lindernia benzoin</i>	V	shrub	30					yes			
Positive reference	PR2	9/25/2001	<i>Acer rubrum</i>	V	shrub	5					yes			
Positive reference	PR2	9/25/2001	<i>Liriodendron tulipifera</i>	V	shrub	5					yes			
Positive reference	PR2	9/25/2001	<i>Carex sphaeroides?</i>	V	herb	20					yes			
Positive reference	PR2	9/25/2001	<i>Toxicodendron radicans</i>	V	herb	10					yes			
Positive reference	PR2	9/25/2001	<i>Aster</i> sp. I	V	herb	65					yes			
Positive reference	PR2	9/25/2001	<i>Eupatorium serotinum</i>	V	herb	10					yes			
Positive reference	PR2	9/25/2001	Bare ground			35								
Positive reference	PR2	9/25/2001	<i>Polystichum acrostichoides</i>	V	herb	0					yes			
Positive reference	PR2	9/25/2001	<i>Parthenocissus quinquefolia</i>	V	herb	0					yes			
Positive reference	PR2	9/25/2001	<i>Campsis radicans</i>	V	herb	1					yes			
Positive reference	PR2	9/25/2001	<i>Cephaelanthus occidentalis</i>	V	herb	5					yes			
Positive reference	PR2	9/25/2001	<i>Lonicera japonica</i>	V	herb	20					yes			
Positive reference	PR2	9/25/2001	<i>Trifolium</i> sp.	V	herb	0					yes			
Positive reference	PR2	9/25/2001	<i>Juncus effusus</i>	V	herb	0					yes			
Positive reference	PR3	9/25/2001	<i>Liriodendron tulipifera</i>	V	tree	80					2	yes		
Positive reference	PR3	9/25/2001	<i>Liquidambar syracifolia</i>	V	tree	2.5					yes			
Positive reference	PR3	9/25/2001	<i>Fraxinus americana</i>	V	tree	2.5					yes			
Positive reference	PR3	9/25/2001	<i>Cornus amomum</i>	V	shrub	20					3	yes		
Positive reference	PR3	9/25/2001	<i>Carpinus caroliniana</i>	V	shrub	5					1	yes		
Positive reference	PR3	9/25/2001	<i>Alder</i> sp.	V	shrub	10					3	yes		
Positive reference	PR3	9/25/2001	<i>Juncus effusus</i>	V	herb	5					yes			
Positive reference	PR3	9/25/2001	<i>Eupatorium serotinum</i>	V	herb	0					yes			
Positive reference	PR3	9/25/2001	<i>Duchesnea indica</i>	V	herb	5					yes			
Positive reference	PR3	9/25/2001	<i>Viola</i> sp.	V	herb	2					yes			
Positive reference	PR3	9/25/2001	Bare ground								35			
Positive reference	PR3	9/25/2001	<i>Parthenocissus quinquefolia</i>	V	herb	0					yes			
Positive reference	PR3	9/25/2001	<i>Toxicodendron radicans</i>	V	herb	0					yes			

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Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Positive reference	PR3	9/25/2001	<i>Lonicera japonica</i>	V	herb	15				yes				
Positive reference	PR3	9/25/2001	<i>Polystichum acrostichoides</i>	V	herb	0				yes				
Positive reference	PR3	9/25/2001	<i>Juniperus virginiana</i>	V	herb	0				yes				
Positive reference	PR3	9/25/2001	<i>Trillium sp.</i>	V	herb	0				yes				
Positive reference	PR3	9/25/2001	<i>Aster sp.</i>	V	herb	15				yes				
Positive reference	PR3	9/25/2001	<i>Carex squarrosa?</i>	V	herb	5				yes				
Positive reference	PR3	9/25/2001	<i>Alder sp.</i>	V	herb	1				yes				
Positive reference	PR3	9/25/2001	<i>Microstegium vimineum</i>	V	herb	20				yes				
Positive reference	PR3	9/25/2001	<i>Festuca pratensis</i>	V	herb	5				yes				
Positive reference	PR3	9/25/2001	<i>Lycopus americanus</i>	V	herb	15				yes				
Positive reference	PR3	9/25/2001	<i>Chelone grabra</i>	V	herb	1				yes				
Button Bush	BB1	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	0	0	yes	0			
Button Bush	BB1	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub		B	1	1	yes	31.5	-5.5		dead stressed
Button Bush	BB1	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub		C	1	1	yes	33	-1		stressed
Button Bush	BB1	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub		D	0	0	yes	0			dead
Button Bush	BB1	12/20/2001	<i>Salix sp.</i>	V	tree			1	1	no				
Button Bush	BB1	12/20/2001	<i>Alder sp.</i>	V	shrub	0			1	no				
Button Bush	BB1	12/20/2001	Bare ground			25								
Button Bush	BB1	12/20/2001	<i>Elymus canadensis</i>	V	debris	0				yes				
Button Bush	BB1	12/20/2001	<i>Ambrosia artemisiifolia</i>	V	debris	0				yes				
Button Bush	BB1	12/20/2001	<i>Rumex crispus</i>	V	debris	0				yes				
Button Bush	BB1	12/20/2001	<i>Ambrosia trifida</i>	V	debris	0				yes				
Button Bush	BB1	12/20/2001	<i>Trifolium sp.</i>	V	debris	0				yes				
Button Bush	BB1	12/20/2001	<i>Polygonum sp. I</i>	V	debris	0				yes				
Button Bush	BB1	12/20/2001	<i>Glyceria septentrionalis</i>	P	herb	20				yes				
Button Bush	BB1	12/20/2001	<i>Verbena urticifolia</i>	V	debris	0				yes				
Button Bush	BB1	12/20/2001	<i>Cirsium sp. (thistle)</i>	V	debris	0				yes				
Button Bush	BB2	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	0	0	yes	0			
Button Bush	BB2	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub		B	0	0	yes	0			dead
Button Bush	BB2	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub		C	0	0	yes	0			dead
Button Bush	BB2	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub		D	1	1	yes	23.5	-7.5		stressed

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Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Button Bush	BB2	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0				yes				yes
Button Bush	BB2	12/20/2001	<i>Juncus biflorus</i>	V	herb	25				yes				yes
Button Bush	BB2	12/20/2001	<i>Juncus effusus</i>	V	debris	0				yes				yes
Button Bush	BB2	12/20/2001	<i>Glyceria septentrionalis</i>	P	debris	0				yes				yes
Button Bush	BB2	12/20/2001	<i>Polygonum sp. 1</i>	V	debris	0				yes				yes
Button Bush	BB2	12/20/2001	<i>Salix sp.</i>	V	debris	0				yes				yes
Button Bush	BB2	12/20/2001	<i>Elymus canadensis</i>	V	debris	0				yes				yes
Button Bush	BB2	12/20/2001	<i>Helianthus sp.</i>	V	debris	0				yes				yes
Button Bush	BB2	12/20/2001	<i>Panicum virgatum</i>	V	debris	0				yes				yes
Button Bush	BB2	12/20/2001	Bare ground			10								
Button Bush	BB3	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	A	0	0	yes	0			dead
Button Bush	BB3	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	B	0	0	yes	0			dead
Button Bush	BB3	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	C	0	0	yes	0			dead
Button Bush	BB3	12/20/2001	<i>Cephalanthus occidentalis</i>	P	shrub	0	D	1	2	yes	30	1.5		stressed
Button Bush	BB3	12/20/2001	<i>Juncus biflorus</i>	V	herb	90				yes				
Button Bush	BB3	12/20/2001	<i>Juncus effusus</i>	V	debris	0				yes				
Button Bush	BB3	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0				yes				
Button Bush	BB3	12/20/2001	Bare ground			0								
Button Bush	BB3	12/20/2001	<i>Festuca pratensis</i>	V	debris	0				yes				
Button Bush	BB3	12/20/2001	<i>Nasturtium officinale</i>	V	debris	0				yes				
Button Bush	BB3	12/20/2001	<i>Scirpus atrocivens</i>	V	debris	0				yes				
Button Bush	BB3	12/20/2001	<i>Glyceria septentrionalis</i>	P	debris	0				yes				
Button Bush	BB3	12/20/2001	<i>Polygonum sp. 1</i>	V	debris	0								
Silky Dogwood	SD1	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	A	1	1	yes	30	-2		living
Silky Dogwood	SD1	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	B	1	2	yes	50	4		stressed
Silky Dogwood	SD1	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	C	1	1	yes	39	-8.5		stressed
Silky Dogwood	SD1	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	D	1	2	yes	40	0		stressed
Silky Dogwood	SD1	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0				yes				
Silky Dogwood	SD1	12/20/2001	<i>Juncus biflorus</i>	V	herb	30				yes				
Silky Dogwood	SD1	12/20/2001	<i>Glyceria septentrionalis</i>	V	debris	0				yes				

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Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Silky Dogwood	SD1	12/20/2001	<i>Ludwigia alternifolia</i>	V	debris	0				yes				
Silky Dogwood	SD1	12/20/2001	<i>Verbena urticifolia</i>	V	debris	0				yes				
Silky Dogwood	SD1	12/20/2001	<i>Scirpus atrocivens</i>	V	debris	0				yes				
Silky Dogwood	SD1	12/20/2001	<i>Mentha sp.</i>	V	debris	0								
Silky Dogwood	SD2	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	A	1	2	yes	24.5	-3.5		living
Silky Dogwood	SD2	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	B	1	1	yes	22.5	0.5		living
Silky Dogwood	SD2	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	C	0	0	yes	0			dead
Silky Dogwood	SD2	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	D	1	1	yes	20.5	-1.5		stressed
Silky Dogwood	SD2	12/20/2001	<i>Juncus biflorus</i>	V	herb	80				yes				
Silky Dogwood	SD2	12/20/2001	<i>Juncus effusus</i>	V	debris	0				yes				
Silky Dogwood	SD2	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0				yes				
Silky Dogwood	SD2	12/20/2001	<i>Mentha sp.</i>	V	debris	0				yes				
Silky Dogwood	SD2	12/20/2001	Bare ground			0								
Silky Dogwood	SD2	12/20/2001	<i>Festuca pratensis</i>	V	debris	0				yes				
Silky Dogwood	SD2	12/20/2001	<i>Nasturtium officinale</i>	V	debris	0				yes				
Silky Dogwood	SD2	12/20/2001	<i>Polygonum sp. I</i>	V	debris	0				yes				
Silky Dogwood	SD2	12/20/2001	<i>Typha latifolia</i>	V	debris	0				yes				
Silky Dogwood	SD2	12/20/2001	<i>Rumex crispus</i>	V	herb	1				yes				
Silky Dogwood	SD2	12/20/2001	<i>Glyceria septentrionalis</i>	V	debris	0				yes				
Silky Dogwood	SD3	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	A	1	2	yes	35.5	3		healthy
Silky Dogwood	SD3	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	B	1	2	yes	40.25	2.75		living
Silky Dogwood	SD3	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	C	1	2	yes	30.5	2		healthy
Silky Dogwood	SD3	12/20/2001	<i>Cornus ammonum</i>	P	shrub	0	D	1	2	yes	33.5	0.5		healthy
Silky Dogwood	SD3	12/20/2001	<i>Festuca pratensis</i>	V	herb	5				yes				
Silky Dogwood	SD3	12/20/2001	<i>Juncus biflorus</i>	V	herb	25				yes				
Silky Dogwood	SD3	12/20/2001	<i>Nasturtium officinale</i>	V	debris	0				yes				
Silky Dogwood	SD3	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0				yes				
Silky Dogwood	SD3	12/20/2001	<i>Polygonum sp. I</i>	V	debris	0				yes				
Silky Dogwood	SD3	12/20/2001	<i>Ludwigia alternifolia</i>	V	debris	0				yes				
Silky Dogwood	SD3	12/20/2001	<i>Poa sp.</i>	V	debris	0				yes				

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Max hgt (in.)	Growth	dbh (in.)	Condition
Silky Dogwood	SD3	12/20/2001	<i>Scirpus atrocivens</i>	V	debris	0	A	0	1	yes			dead
Red Maple	RM1	12/20/2001	<i>Acer rubrum</i>	P	tree	0	A	0	1	yes			yes
Red Maple	RM1	12/20/2001	<i>Elymus canadensis</i>	V	herb	0							yes
Red Maple	RM1	12/20/2001	<i>Juncus biflorus</i>	V	herb	75							yes
Red Maple	RM1	12/20/2001	<i>Juncus effusus</i>	V	debris	0							yes
Red Maple	RM1	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0							yes
Red Maple	RM1	12/20/2001	<i>Mentha sp.</i>	V	debris	0							yes
Red Maple	RM1	12/20/2001	Bare ground			10							
Red Maple	RM1	12/20/2001	<i>Festuca pratensis</i>	V	debris	0							yes
Red Maple	RM1	12/20/2001	<i>Nasturtium officinale</i>	V	debris	0							yes
Red Maple	RM1	12/20/2001	<i>Scirpus atrocivens</i>	V	debris	0							yes
Red Maple	RM1	12/20/2001	<i>Glyceria septentrionalis</i>	V	debris	0							yes
Red Maple	RM1	12/20/2001	<i>Eupatorium sp.</i>	V	debris	0							yes
Red Maple	RM1	12/20/2001	<i>Verbena urticifolia</i>	V	debris	0							yes
Red Maple	RM2	12/20/2001	<i>Acer rubrum</i>	P	tree	0	A	0	1	yes			dead
Red Maple	RM2	12/20/2001	<i>Platanus occidentalis</i>	V	tree	0							24
Red Maple	RM2	12/20/2001	Bare ground			50							
Red Maple	RM2	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0							yes
Red Maple	RM2	12/20/2001	<i>Glyceria septentrionalis</i>	V	debris	0							yes
Red Maple	RM2	12/20/2001	<i>Nasturtium officinale</i>	V	debris	0							yes
Red Maple	RM2	12/20/2001	<i>Juncus biflorus</i>	V	herb	5							yes
Red Maple	RM2	12/20/2001	<i>Platanus occidentalis</i>	V	debris	0							yes
Red Maple	RM2	12/20/2001	<i>Elymus canadensis</i>	V	debris	0							yes
Red Maple	RM2	12/20/2001	<i>Fraxinus pennsylvanica</i>	V	debris	0							yes
Red Maple	RM3	12/20/2001	<i>Acer rubrum</i>	P	tree	0	A	0	1	yes			dead
Red Maple	RM3	12/20/2001	<i>Platanus occidentalis</i>	V	tree	0			1	no			24
Red Maple	RM3	12/20/2001	<i>Juncus biflorus</i>	V	herb	30							yes
Red Maple	RM3	12/20/2001	Bare ground			45							yes
Red Maple	RM3	12/20/2001	<i>Glyceria septentrionalis</i>	V	debris	0							yes
Red Maple	RM3	12/20/2001	<i>Nasturtium officinale</i>	V	herb	15							yes

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Red Maple	RM3	12/20/2001	<i>Ludwigia alternifolia</i>	V	debris	0								yes
Red Maple	RM3	12/20/2001	<i>Polygonum sp. 1</i>	V	debris	0								yes
Red Maple	RM3	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0								yes
Shumard Oak	SO1	12/20/2001	<i>Quercus shumardii</i>	P	tree	0	A	0	1		yes	0		dead
Shumard Oak	SO1	12/20/2001	Bare ground			5								
Shumard Oak	SO1	12/20/2001	<i>Juncus biflorus</i>	V	herb	45								yes
Shumard Oak	SO1	12/20/2001	<i>Juncus effusus</i>	V	herb	10								yes
Shumard Oak	SO1	12/20/2001	<i>Festuca pratensis</i>	V	debris	0								yes
Shumard Oak	SO1	12/20/2001	<i>Ambrosia artemissifolia</i>	V	debris	0								yes
Shumard Oak	SO1	12/20/2001	<i>Nasturtium officinale</i>	V	herb	5								yes
Shumard Oak	SO1	12/20/2001	<i>Elymus canadensis</i>	V	debris	0								yes
Shumard Oak	SO1	12/20/2001	<i>Mentha sp.</i>	V	debris	0								yes
Shumard Oak	SO1	12/20/2001	<i>Typha latifolia</i>	V	debris	0								yes
Shumard Oak	SO1	12/20/2001	<i>Polygonum sp. 1</i>	V	debris	0								yes
Shumard Oak	SO1	12/20/2001	<i>Scirpus atrocivens</i>	V	debris	0								yes
Shumard Oak	SO1	12/20/2001	<i>Glyceria septemfotalis</i>	V	debris	0								yes
Shumard Oak	SO1	12/20/2001	<i>Verbena urticifolia</i>	V	debris	0								yes
Shumard Oak	SO1	12/20/2001	<i>Polygonum sp. 2</i>	V	debris	0								yes
Shumard Oak	SO2	12/20/2001	<i>Quercus shumardii</i>	P	tree	0	A	0	1		yes	0		dead
Shumard Oak	SO2	12/20/2001	Bare ground			5								yes
Shumard Oak	SO2	12/20/2001	<i>Juncus biflorus</i>	V	herb	75								yes
Shumard Oak	SO2	12/20/2001	<i>Ambrosia artemissifolia</i>	V	debris	0								yes
Shumard Oak	SO2	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0								yes
Shumard Oak	SO2	12/20/2001	<i>Festuca pratensis</i>	V	debris	0								yes
Shumard Oak	SO2	12/20/2001	<i>Setaria sp. (foxtail)</i>	V	debris	0								yes
Shumard Oak	SO2	12/20/2001	<i>Lycopus americanus</i>	V	debris	0								yes
Shumard Oak	SO2	12/20/2001	<i>Scirpus atrocivens</i>	V	debris	0								yes
Shumard Oak	SO2	12/20/2001	<i>Poa sp.</i>	V	debris	0								yes
Shumard Oak	SO3	12/20/2001	<i>Quercus shumardii</i>	P	tree	0	A	0	1		yes	0		dead
Shumard Oak	SO3	12/20/2001	<i>Juncus biflorus</i>	V	herb	90								yes

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Shumard Oak	SO3	12/20/2001	<i>Typha latifolia</i>	V	debris	0					yes			
Shumard Oak	SO3	12/20/2001	<i>Elymus canadensis</i>	V	debris	0					yes			
Shumard Oak	SO3	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0					yes			
Shumard Oak	SO3	12/20/2001	Bare ground											
Shumard Oak	SO3	12/20/2001	<i>Glyceria septentrionalis</i>	V	debris	0					yes			
Shumard Oak	SO3	12/20/2001	<i>Ludwigia alternifolia</i>	V	debris	0					yes			
Shumard Oak	SO3	12/20/2001	<i>Ludwigia palustris?</i>	V	debris	0					yes			
Shumard Oak	SO3	12/20/2001	<i>Polygonum sp. I</i>	V	debris	0					yes			
No grass planting	NG1	12/20/2001	<i>Liriodendron tulipifera</i>	V	tree	0					3	no		10,14,18
No grass planting	NG1	12/20/2001	Bare ground			50								
No grass planting	NG1	12/20/2001	<i>Microstegium</i>	V	debris	0						yes		
No grass planting	NG1	12/20/2001	<i>Ambrosia artemisiifolia</i>	V	debris	0						yes		
No grass planting	NG1	12/20/2001	<i>Elymus canadensis</i>	V	debris	0						yes		
No grass planting	NG1	12/20/2001	<i>Ranunculus sp.</i>	V	debris	0						yes		
No grass planting	NG1	12/20/2001	<i>Pilea pumila</i>	V	debris	0						yes		
No grass planting	NG1	12/20/2001	<i>Salix sp.</i>	V	debris	0						yes		
No grass planting	NG1	12/20/2001	<i>Verbena urticifolia</i>	V	debris	0						yes		
No grass planting	NG1	12/20/2001	Vine, heart shaped	V	debris	0						yes		
No grass planting	NG1	12/20/2001	<i>Cyperus esculentus?</i>	V	debris	0						yes		
No grass planting	NG1	12/20/2001	<i>Lycopus rubellus</i>	V	debris	0						yes		
No grass planting	NG2	12/20/2001	Bare ground											
No grass planting	NG2	12/20/2001	<i>Juncus biflorus</i>	V	herb	95						yes		
No grass planting	NG2	12/20/2001	<i>Typha latifolia</i>	V	debris	0						yes		
No grass planting	NG2	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0						yes		
No grass planting	NG2	12/20/2001	<i>Juncus effusus</i>	V	debris	0						yes		
No grass planting	NG2	12/20/2001	<i>Mentha sp.</i>	V	debris	0						yes		
No grass planting	NG2	12/20/2001	<i>Festuca pratensis</i>	V	debris	0						yes		
No grass planting	NG2	12/20/2001	<i>Glyceria septentrionalis</i>	V	debris	0						yes		
No grass planting	NG2	12/20/2001	<i>Scirpus atrocivens</i>	V	debris	0						yes		
No grass planting	NG2	12/20/2001	<i>Polygonum sp. I</i>	V	debris	0						yes		

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Survival (no.)	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
No grass planting	NG3	12/20/2001	<i>Juncus biflorus</i>	V	herb	70				yes				yes
No grass planting	NG3	12/20/2001	Bare ground	V	herb	10				yes				yes
No grass planting	NG3	12/20/2001	<i>Nasturtium officinalis</i>	V	herb	1				yes				yes
No grass planting	NG3	12/20/2001	<i>Typha latifolia</i>	V	debris	0				yes				yes
No grass planting	NG3	12/20/2001	<i>Festuca pratensis</i>	V	debris	0				yes				yes
No grass planting	NG3	12/20/2001	<i>Mentha sp.</i>	V	debris	0				yes				yes
No grass planting	NG3	12/20/2001	<i>Glyceria septentrionalis</i>	V	debris	0				yes				yes
No grass planting	NG3	12/20/2001	<i>Lycopus americanus</i>	V	debris	0				yes				yes
No grass planting	NG3	12/20/2001	<i>Poa sp.</i>	V	debris	0				yes				yes
No grass planting	NG3	12/20/2001	<i>Verbena urticifolia</i>	V	debris	0				yes				yes
No grass planting	NG3	12/20/2001	<i>Scirpus atrocivens</i>	V	debris	0				yes				yes
Planted grass only	GO1	12/20/2001	<i>Glyceria septentrionalis</i>	P	debris	0				yes				yes
Planted grass only	GO1	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0				yes				yes
Planted grass only	GO1	12/20/2001	Bare ground			35								
Planted grass only	GO1	12/20/2001	<i>Elymus canadensis</i>	V	debris	0				yes				yes
Planted grass only	GO1	12/20/2001	<i>Juncus biflorus</i>	V	debris	0				yes				yes
Planted grass only	GO1	12/20/2001	<i>Ludwigia alternifolia</i>	V	debris	0				yes				yes
Planted grass only	GO1	12/20/2001	<i>Mentha sp.</i>	V	debris	0				yes				yes
Planted grass only	GO1	12/20/2001	<i>Liriodendron tulipifera</i>	V	tree	0				1	no			18
Planted grass only	GO1	12/20/2001	<i>Microstegium sp.</i>	V	debris	0				yes				yes
Planted grass only	GO1	12/20/2001	<i>Scirpus atrocivens</i>	V	debris	0				yes				yes
Planted grass only	GO2	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0				yes				yes
Planted grass only	GO2	12/20/2001	<i>Festuca pratensis</i>	V	debris	0				yes				yes
Planted grass only	GO2	12/20/2001	<i>Juncus biflorus</i>	V	herb	20				yes				yes
Planted grass only	GO2	12/20/2001	Bare ground			0								
Planted grass only	GO2	12/20/2001	<i>Glyceria septentrionalis</i>	V	debris	0				yes				yes
Planted grass only	GO3	12/20/2001	<i>Glyceria septentrionalis</i>	P	debris	0				yes				yes
Planted grass only	GO3	12/20/2001	Bare ground			25								
Planted grass only	GO3	12/20/2001	<i>Juncus biflorus</i>	V	herb	25				yes				yes
Planted grass only	GO3	12/20/2001	<i>Elymus canadensis</i>	V	debris	0				yes				yes

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Planted grass only	GO3	12/20/2001	<i>Festuca sp.</i>	V	debris	0					yes		
Planted grass only	GO3	12/20/2001	<i>Nasturtium officinale</i>	V	herb	2					yes		
Planted grass only	GO3	12/20/2001	<i>Platanus occidentalis</i>	V	tree	0			1		no		
Planted grass only	GO3	12/20/2001	<i>Ludwigia alternifolia</i>	V	debris	0					yes		
Planted grass only	GO3	12/20/2001	<i>Lycopus americanus</i>	V	debris	0					yes		
Planted grass only	GO3	12/20/2001	<i>Cyperus esculentus</i>	V	debris	0					yes		
Positive reference	PRI	12/20/2001	<i>Liriodendron tulipifera</i>	V	tree	0				3	no		
Positive reference	PRI	12/20/2001	<i>Platanus occidentalis</i>	V	tree	0			2		no		
Positive reference	PRI	12/20/2001	<i>Acer rubrum</i>	V	tree	0			1		yes		
Positive reference	PRI	12/20/2001	<i>Fraxinus pennsylvanica</i>	V	shrub	0					3		
Positive reference	PRI	12/20/2001	<i>Acer rubrum</i>	V	shrub	0					yes		
Positive reference	PRI	12/20/2001	<i>Liquidambar syracifolia</i>	V	shrub	0					yes		
Positive reference	PRI	12/20/2001	<i>Aster sp. I</i>	V	debris	0					yes		
Positive reference	PRI	12/20/2001	<i>Toxicodendron radicans</i>	V	debris	0					yes		
Positive reference	PRI	12/20/2001	<i>Eupatorium segetum</i>	V	debris	0					yes		
Positive reference	PRI	12/20/2001	<i>Bohemeria cyclindrica</i>	V	debris	0					yes		
Positive reference	PRI	12/20/2001	<i>Parthenocissus quinquefolia</i>	V	debris	0					yes		
Positive reference	PRI	12/20/2001	<i>Microstegium vimineum</i>	V	debris	0					yes		
Positive reference	PRI	12/20/2001	<i>Alder sp.</i>	V	debris	0					yes		
Positive reference	PRI	12/20/2001	<i>Lonicera japonica</i>	V	herb	20					yes		
Positive reference	PRI	12/20/2001	Bare ground					30					
Positive reference	PRI	12/20/2001	<i>Viola sp.</i>	V	debris	0					yes		
Positive reference	PRI	12/20/2001	<i>Wintercress sp.</i>	V	herb	15					yes		
Positive reference	PR2	12/20/2001	<i>Liriodendron tulipifera</i>	V	tree	0					no		
Positive reference	PR2	12/20/2001	<i>Alder sp.</i>	V	shrub	0					yes		
Positive reference	PR2	12/20/2001	<i>Lindernia benzoin</i>	V	shrub	0					yes		
Positive reference	PR2	12/20/2001	<i>Acer rubrum</i>	V	shrub	0					yes		
Positive reference	PR2	12/20/2001	<i>Liriodendron tulipifera</i>	V	shrub	0					yes		
Positive reference	PR2	12/20/2001	<i>Carex squarrosa?</i>	V	debris	0					yes		
Positive reference	PR2	12/20/2001	<i>Toxicodendron radicans</i>	V	debris	0					yes		
Positive reference	PR2	12/20/2001	<i>Aster sp. I</i>	V	debris	0					yes		

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Rooted?	Max hgt (in.)	Growth	dbh (in.)	Condition
Positive reference	PR2	12/20/2001	<i>Eupatorium serotinum</i>	V	debris	0							yes
Positive reference	PR2	12/20/2001	Bare ground			35							
Positive reference	PR2	12/20/2001	<i>Polystichum acrostichoides</i>	V	debris	0							yes
Positive reference	PR2	12/20/2001	<i>Partheniccus quinquefolia</i>	V	debris	0							yes
Positive reference	PR2	12/20/2001	<i>Campsis radicans</i>	V	debris	0							yes
Positive reference	PR2	12/20/2001	<i>Cephaelanthus occidentalis</i>	V	debris	0							yes
Positive reference	PR2	12/20/2001	<i>Lonicera japonica</i>	V	herb	5							yes
Positive reference	PR2	12/20/2001	<i>Trifolium sp.</i>	V	debris	0							yes
Positive reference	PR2	12/20/2001	<i>Juncus effusus</i>	V	herb	5							yes
Positive reference	PR3	12/20/2001	<i>Liriodendron tulipifera</i>	V	tree	0				2			8, 17
Positive reference	PR3	12/20/2001	<i>Liquidambar syracifolia</i>	V	tree	0							3
Positive reference	PR3	12/20/2001	<i>Fraxinus americana</i>	V	tree	0							3
Positive reference	PR3	12/20/2001	<i>Cornus ammonum</i>	V	shrub	0				3			yes
Positive reference	PR3	12/20/2001	<i>Carpinus caroliniana</i>	V	shrub	0				1			yes
Positive reference	PR3	12/20/2001	<i>Alder sp.</i>	V	shrub	0				3			yes
Positive reference	PR3	12/20/2001	<i>Juniperus effusus</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Eupatorium serotinum</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Duchesnea indica</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Viola sp.</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	Bare ground			60							
Positive reference	PR3	12/20/2001	<i>Partheniccus quinquefolia</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Toxicodendron radicans</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Lonicera japonica</i>	V	herb	5							yes
Positive reference	PR3	12/20/2001	<i>Polystichum acrostichoides</i>	V	herb	2							yes
Positive reference	PR3	12/20/2001	<i>Juniperus virginiana</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Trillium sp.</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Aster sp.</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Carex squarrosa?</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Alder sp.</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Microstegium vimineum</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Festuca pratensis</i>	V	debris	0							yes
Positive reference	PR3	12/20/2001	<i>Lycopus americanus</i>	V	debris	0							yes

**Table 1. Vegetation characteristics within each plot on multiple sampling dates within the first year of monitoring the mitigation site**

Treatment	Plot ID	Date	Plant species	Status	Stratum	Cover (%)	Indiv ID	Stems (no.)	Survival	Rooted?	Max hgt (in.)	Growth	dbh (in)	Condition
Positive reference	PR3	12/20/2001	<i>Chelone glabra</i>	V	debris	0				yes				

**Note:**

## Variable definitions

Treatment: type of planting.

Plot ID: three-digit designation of planting treatment.

Date: date plot surveyed.

Plant sp: scientific name of plant. "Bare ground" listed when no plants present.

Status: P = planted, V = volunteer.

Stratum: growth form: tree, shrub, or herb. "Debris" listed when present as dead plant material (common designation in winter surveys).

Percent cover: percentage of arable cover. Percentage of plot space covered by species. Total of all species can exceed or be below 100%. A species listed with a "0" indicates not detected on sampling date but may have been observed previously.

Individual ID: designation of individual plant within plot. Facing west from WOC:

A

B

C

D

Survival: 1 = alive, 0 = dead.

# of stems: number of live stems counted for each plant.

Rooted?: yes or no, depending on whether plant is rooted in plot. In most cases, a planted not rooted is a nearby tree that overhangs the plot. A species is designated as being rooted in plot or not regardless of the percentage of cover obtained on the sampling date.

Max height (in): maximum measured height of a live stem.

Growth: positive or negative change in the maximum measured height of live stem relative to first measured height on 12/20/00.

dbh (in): diameter of tree trunk at breast height.

Condition: evaluation of plant condition, reflecting extent of leaf coverage, disease, fungi, color. Ranked from best condition to worst: healthy, living, stressed, dead; "undetermined" reflects the uncertainty of plant condition before leaf-out.

**Table 2. Routine wetland determination data for the SNS Access Road  
Wetland Mitigation Site, as determined on June 21, 2001**

Project/Site: Wetland Delineation near SNS Access Road Applicant/Owner: SNS, ORNL  Investigator: M. J. Peterson			Date: 21 June 2001 Location: Near Bethel Valley Rd, Roane County State: TN		
Do Normal Circumstances Exist on the site?: No. Mitigation. Is the site significantly disturbed (Atypical Situation): Yes. Is the area a potential Problem Area? No			Community ID: Marsh Monitoring Point: all plots		
<b>VEGETATION</b>					
Dominant Plant Species	Stratum	Indi-cator	Dominant Plant Species	Stratum	Indi-cator
<i>Juncus effuses</i>	herb	FACW+			
<i>Juncus biflorus</i>	Herb	FACW			
<i>Cyperus esculentus</i>	herb	FAC			
<i>Scirpus atrovirens</i>	herb	OBL			
<i>Glyceria septentrionalis</i>	herb	OBL			
<i>Festuca pratensis</i>	herb	FACU			
<i>Nasturtium officinale</i>	herb	OBL			
Percent of dominant species that are OBL, FACW, or FAC (excluding FAC-): 85%.					
Remarks: Satisfies the 50/20 rule. The dominant plants are wetland species, with occasional species that are highly adaptable to a range of moisture conditions.					
<b>HYDROLOGY</b>					
Recorded Data (Describe in Remarks):	Wetland hydrology Indicators:				
Stream, Lake, or Tide Gauge	<input type="checkbox"/> Primary Indicators:				
Aerial Photographs	<input checked="" type="checkbox"/> Inundated				
Other	<input checked="" type="checkbox"/> Saturated in Upper 12 inches				
<input checked="" type="checkbox"/> No Recorded Data Available	<input checked="" type="checkbox"/> Water Marks				
	<input checked="" type="checkbox"/> Drainage Patterns in Wetlands				
Field Observations:	<input checked="" type="checkbox"/> Drift Lines				
Depth of Surface Water: At least 50% surface water, ranging from surface to 2 inches.	<input type="checkbox"/> Sediment Deposits				
Depth to Saturated Soil: saturated at surface					
Depth of Water in Soil Pit: surface	<input type="checkbox"/> Secondary Indicators				
	<input type="checkbox"/> Oxidized Root Channels in upper 12"				
	<input checked="" type="checkbox"/> Water-Stained Leaves				
	<input type="checkbox"/> Local Soil Survey Data				
	<input type="checkbox"/> FAC-Neutral Test				
	<input type="checkbox"/> Other (Explain in Remarks)				
Remarks: Grading of site downstream of spring has resulted in a relatively even distribution of water throughout the site.					

**Table 2. (Continued)**

Project/Site: Wetland Delineation near SNS Access Road Applicant/Owner: SNS, ORNL  Investigator: M. J. Peterson		Date: 18 September 2001 Location: Near Bethel Valley R., Roane County State: TN Community ID: Marsh Monitoring Point: all plots			
<b>SOILS</b>					
Map Unit Name (Series and Phase): Not available		Taxonomy: not determined			
<b>Profile Description:</b>					
Depth (in.)	Horizon	Matrix Color	Mottle Colors	Mottle Abundance/Contrast	Texture, Concretions, Structures
0-17"	A	10 YR 4/1	10YR 4/6	<10%	Organic, silt loam
Hydric Soil Indicators:					
<input type="checkbox"/> Histosol				<input type="checkbox"/> Concretions	
<input type="checkbox"/> Histic Epipedon				<input type="checkbox"/> High Organic Content in Surface Layer Sandy Soils	
<input type="checkbox"/> Sulfidic Odor				<input type="checkbox"/> Organic Streaking in Sandy Soils	
<input type="checkbox"/> Aquic Moisture Regime				<input type="checkbox"/> Listed on Local Hydric Soils List	
<input type="checkbox"/> Reducing Conditions				<input type="checkbox"/> Listed on National Hydric Soils List	
<input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors				<input type="checkbox"/> Other (Explain in Remarks)	
Remarks: Soils have yet to develop, but have low chroma due to fill used. Largely impenetrable clay-gravel underlying organic layer.					
<b>WETLAND DETERMINATION</b>					
Hydrophytic Vegetation Present?	YES				
Wetland Hydrology Present?	YES				
Hydric Soils Present?	YES			Is this sampling point within a wetland?	YES
Remarks: This mitigation site has very wet conditions with very successful herbaceous growth as a result of herb seeding and volunteer species colonization. Planted trees and shrubs have done poorly, but evidence of native trees and shrubs colonizing the site. The wetland's close proximity to an undisturbed site is advantageous.					

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