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**2006 ANNUAL RESTORATION MONITORING REPORT  
1 ½ MILE REMOVAL REACH  
GENERAL ELECTRIC (GE)/HOUSATONIC RIVER SITE,**

**Environmental Remediation Contract  
GE/Housatonic River Project  
Pittsfield, Massachusetts**



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## Executive Summary

This report presents the results of the restoration monitoring performed in 2006 within the 1½-Mile Reach Removal Action of the General Electric - Pittsfield/Housatonic River Site in Pittsfield, Massachusetts (1½-Mile Reach). This work was performed by the U.S. Army Corps of Engineers, Weston Solutions, Inc., and Weston subcontractor Woodlot Alternatives, Inc. The restoration monitoring work was performed according to the 1½-Mile Reach Restoration Monitoring Plan (Woodlot, 2004) to assess whether the specified restoration performance standards were achieved. Habitat based restoration features assessed include aquatic habitat enhancement structures, riverbank soil restoration, riverbank revegetation and the presence of invasive species. The non-habitat based restoration features include riverbed and riverbank riprap and ancillary items. This report also provides recommendations for ongoing monitoring and maintenance actions.

Areas monitored in 2006 included the Phase 1 and Transition Phase, Phase 2 and Phase 3 areas. The Phase 3 area downstream of Pomeroy Avenue Bridge (Station 561+00) was monitored for riprap and aquatic habitat structures only.

The results of the 2006 restoration monitoring results indicate that the revegetation restoration work generally achieved the applicable performance standards within the monitored areas of the 1½-Mile Reach. The installed trees and shrubs appeared healthy and were growing vigorously. In addition, substantial recruitment of “volunteer” native trees, particularly eastern cottonwood (*Populus deltoides*) and box elder (*Acer negundo*) was observed. For the spring 2006 monitoring visit observed tree survivorship did not meet the performance standard of 80% in two monitoring areas. First, monitoring area Lyman to Elm (East), the tree survivorship did not meet the standard primarily because monitoring plot 1-E-2 was coincidentally established in a shrub clump. Therefore, the planted tree density in this plot was significantly lower than the design density. The monitoring plot 1-E-2 was relocated in the summer 2006 to be more representative of the entire monitoring area. Second, monitoring area Dawes to Pomeroy (West), the tree survivorship did not meet the standard because the tree counts in all three monitoring plots (3-W-1, 3-W-2 and 3-W-3) were compared against the performance standard based on the design densities and not on actual survivorship of the number of trees planted. Since the entire monitoring area Dawes to Pomeroy (West) is located on residential properties the actual number of trees and shrubs planted varied significantly from the design densities. Therefore in this area it is appropriate to measure percent survivorship by comparing the number of live plants to the number originally planted. When this method was used, the performance standard of 80% was achieved (See Summer 2006 inspection results). For the summer 2006 monitoring visit observed tree survivorship did not meet the performance standard of 80% in one monitoring area. Monitoring area Lyman to Elm (East), the shrub survivorship did not meet the standard because monitoring plot 1-E-1 was impacted by GE’s Oxbow A and C remediation activities. Supplemental trees and shrubs were planted in the fall 2006 to replace the trees and shrubs that were affected by GE’s excavation activities.

Herbaceous vegetation cover ranged from 95 to 100 percent within the monitored areas, achieving the performance standard of 95 percent. Invasive plant cover was less than the maximum of 5 percent and met the applicable performance standard.

The riverbank soil restoration performance standard was also achieved in the monitored areas with no substantial areas of riverbank erosion, which likely benefited from the success of the revegetation work. Areas with minor erosion were repaired through out the year.

Observations of the riverbed and riverbank riprap armor in the Phase 1, Transition Phase, Phase 2 and Phase 3 areas of the 1½-Mile Reach indicate that the riverbed and riverbank riprap were in as-built condition.

Aquatic habitat structures were also found to be generally in as-built condition, and all ancillary items, including retaining walls, fences and outfalls were found to be in as-built condition, while accounting for normal wear and tear.

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## **1.0 Purpose**

This report presents the results of the restoration monitoring performed in 2006 within the 1½-Mile Reach Removal Action of the General Electric-Pittsfield/Housatonic River Site in Pittsfield, Massachusetts (1½-Mile Reach). This work was performed by the U.S. Army Corps of Engineers, Weston Solutions, Inc., and Weston subcontractor Woodlot Alternatives, Inc. (Woodlot). This work was performed in accordance with the 1½-Mile Reach Restoration Monitoring Plan (Monitoring Plan) (Woodlot, 2004) for project features including aquatic habitat enhancement structures, riverbank soil restoration, riverbank revegetation, riverbed and riverbank armor (riprap) and ancillary items.

## **2.0 Introduction**

The purpose of the annual restoration monitoring is to document the performance of the remediation and restoration work performed on the 1½-Mile Reach, including work intended to achieve both habitat and non-habitat based objectives. The restoration monitoring work was performed in accordance with the Monitoring Plan, which presents a program of maintenance and performance restoration monitoring for assessing and documenting the performance of features constructed as part of restoration activities within the 1½-Mile Reach. Specific features covered by the Monitoring Plan include bank stabilization, riprap, aquatic enhancements, riverbank soil restoration, riverbank revegetation, invasive plant species control, and ancillary features including paved areas, retaining walls, and fences.

This report describes restoration monitoring work performed in 2006 in accordance with the Monitoring Plan, including the performance results of aquatic habitat enhancement structures, riverbank soil restoration, riverbank revegetation, and riverbed and riverbank armor (riprap), and ancillary features such as fences, pavement and walls. Performance results are based on observations made during regular inspections by Weston Solutions, Inc. (Weston) and U.S. Army Corps of Engineers (USACE) on-site personnel during 2006 and during inspections performed by Woodlot during June and August of 2006.

## **3.0 Restoration Performance Standards**

Brief descriptions of applicable restoration performance standards for the assessment of habitat and non-habitat based objectives applied as part of the 2006 restoration monitoring work are presented below. The Monitoring Plan presents full descriptions of the applicable restoration performance standards and follow-up corrective actions if restoration performance standards are not achieved.

### **3.1 RESTORATION PERFORMANCE STANDARDS FOR HABITAT BASED OBJECTIVES**

#### ***3.1.1 Aquatic Habitat Enhancement Structures***

The restoration performance standard for aquatic habitat enhancement structures is defined as no significant erosion or movement of the structures or adjacent riprap. Note that while benefits to

aquatic habitat associated with the aquatic habitat enhancement structures will be documented, improved aquatic habitat itself is not a restoration performance standard.

### ***3.1.2 Riverbank Soil Restoration***

The restoration performance standard for riverbank soil restoration is defined as no significant erosion (e.g., ruts, gullies, washouts, or sloughing) of soils.

### ***3.1.3 Riverbank Revegetation***

The restoration performance standard for riverbank revegetation includes:

- Survivorship of each planted tree or shrub species (except as discussed below) shall be equal to or greater than 80 percent. The normal combined planted tree and shrub density is 1,460 per acre (730 trees and 730 shrubs). In areas where geoweb was installed as a slope-stabilization measure, the combined plant density was reduced to 1,230 per acre (500 trees and 730 shrubs).
- If shrubs are planted as a hedge, the restoration performance standard shall be 100 percent survivability or, considering additional growth of non-planted shrubs, a continuous hedge.
- Areal cover for herbaceous vegetation shall be equal to or greater than 95 percent cover outside the foliar coverage of the trees. There is no restoration performance standard for individual species within the herbaceous seed mix.
- Areal cover of invasive plant species listed in Attachment A of the Monitoring Plan shall be less than 5 percent of the restoration monitoring area. Any invasive species present in excess of 5 percent will be removed by appropriate means.

## **3.2 RESTORATION PERFORMANCE STANDARDS FOR NON-HABITAT BASED OBJECTIVES**

### ***3.2.1 Riverbank and Riverbed Riprap***

For riprap placed in the river channel, bank, or swales, the restoration performance standard is defined as no significant movement of the riprap or reduction in riprap thickness that threatens the stability of the riverbanks or river channel or results in the erosion of underlying soils or sediments. For riprap placed in swales, the restoration performance standard includes no movement of riprap that results in the exposure of the underlying geotextile fabric.

### ***3.2.2 Ancillary Items***

For ancillary items such as fencing, paved areas, and walls, the performance standard is defined as being in as-built condition, while taking into account normal wear and tear.

## **4.0 Restoration Monitoring Methods**

The Monitoring Plan describes the restoration monitoring methods used to assess and document the restoration performance standards for each constructed restoration features. Brief descriptions of the restoration monitoring methods used for the applicable features are summarized below.

### **4.1 RESTORATION MONITORING OF AQUATIC HABITAT ENHANCEMENT STRUCTURES**

Aquatic habitat enhancements structures were monitored to evaluate the structural stability and functional value of the features and to determine whether corrective actions are required. Monitoring included visual inspections to document characteristics of the structures, such as shape and location, and to document characteristics of adjacent sections of riverbed and riverbank riprap. The purpose of the restoration monitoring is to (1) determine if there was significant erosion or movement of the enhancement structures; (2) determine if the riprap is experiencing scour due to the presence of the aquatic habitat enhancement structures and (3) document apparent functional value of the structures. The functional value monitoring included observations of flow speed and depth variability, sediment deposition and scour, and the occurrence of riverine fauna in the vicinity of the structures. While the function of these structures is not a restoration performance standard, restoration monitoring provides a determination of whether the habitat-based objectives of the project are being achieved.

The Monitoring Plan specifies that restoration monitoring of the aquatic habitat enhancement structures include a minimum of two site visits per year, one visit after the high flows in the spring and one during a period of low flow (i.e., typically in July or August). Restoration monitoring is also required following flows in excess of 1,500 cubic-feet-per-second (cfs), as measured at the United States Geological Survey (USGS) Coltsville stream gaging station on the East Branch of the Housatonic River, Massachusetts (USGS Station No. 01197000).

### **4.2 RESTORATION MONITORING OF RIVERBANK SOIL RESTORATION**

Monitoring of riverbank soil restoration consisted of visual observations to determine compliance with the applicable performance standard of no significant erosion (e.g., ruts, gullies, washouts, or sloughing). The Monitoring Plan specifies that the timing of the restoration monitoring visits be similar to that for the aquatic habitat restoration structures, with visits after high flows in the spring and during low flow in late summer. In addition, site visits are required after flow events exceeding 1,500 cfs as measured at the USGS Coltsville stream gaging station or when the water level rises to the level of the riverbank soils. Monthly observations of the riverbed and banks were conducted by Weston and USACE on-site personnel as part of the project Contractor Quality Control (CQC) program.

### **4.3 RESTORATION MONITORING OF RIVERBANK REVEGETATION**

Restoration monitoring of riverbank revegetation included quantitative assessments of plant survivorship, herbaceous cover, and invasive plant cover in designated monitoring sub-areas, and qualitative assessments of riverbank vegetation using meander surveys in planted areas. This work included two restoration monitoring visits consisting of a visit in the spring prior to the beginning of the growing season and a visit in the mid- to late-summer during the peak of the

growing season. The purpose of the spring visit was to assess winter mortality and to allow for replanting in the spring. The purpose of the summer visit was to estimate plant survivorship, herbaceous cover, and invasive plant cover, and to assess compliance with the restoration performance standards.

#### **4.3.1 *Trees and Shrubs***

The restoration monitoring of trees and shrubs on the revegetated riverbank included the quantitative assessments of plant survivorship in designated sub-areas and qualitative assessments of riverbank vegetation using meander surveys in planted areas. The quantitative assessment was performed on surveyed sample plots within designated monitoring areas. These sample plots were laid out prior to the spring inspection, and are permanent monitoring sample plots. The total area of sample plots within a given monitoring area is a minimum of 10% of the monitoring area. Comparison to Performance Standards is made by averaging the data from the plots in a monitoring area. Geoweb plots are not averaged with non-Geoweb plots, but are compared separately, as the planting densities differ for Geoweb and non-Geoweb areas. To quantify plant survivorship, planted trees and shrubs were counted by walking through each monitoring area sample plot and determining the number, type, and condition of the installed plants. The results of the quantitative survey were used to determine the performance of each monitoring area relative to performance standards for survivorship of plants. For plots where the exact original plant count was not known, and where planting densities were similar to the design density referred to in section 3.1.3, live tree and shrub totals were summarized and then divided by the design number of installed live plants to calculate plant survivorship in each planting area. For plots where the original design plant count was known, and where the actual planting density may have varied from the design densities referred to in section 3.1.3, survivorship was calculated directly by comparison of the number of live plants to the number originally planted.

The qualitative assessments of riverbank revegetation were performed using meander surveys in each designated restoration monitoring area outside of the sample plots. The meander survey was also used to determine whether the restoration monitoring sample plots assessed as part of the quantitative assessments were representative of the entire planting area.

#### **4.3.2 *Herbaceous Vegetation Cover***

Restoration monitoring of herbaceous vegetation cover consisted of visual observations of planted areas and qualitative assessments of herbaceous areal coverage. This work included one restoration monitoring visit in mid- to late-summer. Herbaceous cover was determined by walking through each restoration monitoring area and visually estimating the total cover to the nearest 5 percent.

#### **4.3.3 *Invasive Plant Species Cover***

Invasive plant species were monitored to evaluate compliance with applicable restoration performance standards and to determine whether corrective actions are required. Invasive plant species for this work are those listed by Weatherbee *et al.* (1998) for the Commonwealth of Massachusetts (Appendix A).

Invasive plant areal cover estimates were performed in the summer concurrently with the summer plant survivorship and herbaceous vegetation cover assessment. Quantitative assessments of invasive plant cover were performed by walking through planting areas and visually estimating the total invasive plant cover to the nearest 5 percent in a process similar to that used to determine herbaceous coverage.

#### **4.4 RESTORATION MONITORING OF RIPRAP**

The riprap restoration monitoring consisted of visual observations to document readily apparent characteristics of the riprap, such as fairness of the slope, sloughing, erosion, and size distribution of the riprap. This work included a minimum of two restoration monitoring events each year, one visit after the high flows in the spring and one during a period of low flow (i.e., typically in July or August). As described in the Monitoring Plan, restoration monitoring is also performed after any flow event that exceeds 1,500 cfs as measured at the USGS Coltsville stream gaging station. Monthly observations of the riverbed and banks were conducted by Weston and USACE on-site personnel as part of the project CQC program.

#### **4.5 RESTORATION MONITORING OF ANCILLARY ITEMS**

The monitoring of ancillary items consisted of visual observations to document to condition of installed structures and surface, such as significant cracks, movement, or indications of deviation from as-built condition beyond that which would be expected from normal wear and tear on structures exposed to local conditions.

### **5.0 Restoration Monitoring Results**

This section presents the results of the restoration monitoring work performed in 2006 by Weston, USACE, and Woodlot, including the assessment of whether restoration features constructed as part of remediation activities within the 1½-Mile Reach met the specified restoration performance standards. Restoration features assessed include aquatic habitat enhancement structures, riverbank soil restoration, riverbank revegetation, riverbed and riverbank armor (riprap), and ancillary items. Recommendations to maintain or enhance restoration performance standards for these restoration features are also provided.

#### **5.1 WESTON AND USACE MONTHLY INSPECTIONS**

Weston and the USACE performed monthly restoration monitoring within the Phase 1, Transition Phase, Phase 2 and in Phase 3 areas (as the remediation work progressed downstream) of the ½-Mile Reach. The monitoring was done on the riverbank soil restoration and riverbed and riverbank armor (riprap). In addition, monthly visual observations were performed on the ancillary items. The Weston and USACE monthly monitoring reports can be found in Appendix B of the 2006 Annual Restoration Monitoring Report.

### ***5.1.1 Riverbank Soil Restoration***

The monitoring of the riverbank soil restoration was performed on monthly basis. Minor erosion and washouts were observed on the riverbanks in Phase 2 in spring months (March and May). The areas were immediately addressed. The overall results of this monitoring suggest that the riverbank soil restoration performance standard was achieved within the monitored areas with no substantial areas of erosion (e.g., ruts, gullies, washouts, or sloughing).

### ***5.1.2 Riverbank and Riverbed Riprap***

Monthly inspections were performed on the riverbank and riverbed riprap. The monthly inspections suggest no significant movement of the riprap or reduction in riprap thickness that threatens the stability of the riverbanks or river channel or results in the erosion of underlying soils or sediments. Therefore the performance standard for the riverbank and the riverbed riprap was achieved.

### ***5.1.3 Ancillary Items***

Visual inspections were performed on ancillary items such as fencing, paved areas, and walls on the monthly basis. The results of the observations indicate that the performance standard was archived. The ancillary items were noted to be in as-built condition, taking into account normal wear and tear.

## **5.2 WOODLOT SEMI-ANNUAL INSPECTIONS**

Woodlot performed the spring and summer riverbank restoration monitoring within the Phase 1, Transition Phase, Phase 2 and Phase 3 areas of the 1½-Mile Reach during the weeks of June 8 and August 30, 2006, respectively. Monitored areas included the Phase 1 and Transition Phase areas, Phase 2, and Phase 3 down to Station 561+00 for vegetation, and the entire 1.5 Mile Reach for soil erosion and aquatic habitat structures. The results of the 2006 monitoring work are summarized below. More detailed descriptions of each inspection event, along with associated tables, maps and field notes are included in the spring and summer inspection reports, which are attached as Appendices C and D respectively.

### ***5.2.1 Spring 2006 Inspection***

The spring 2006 monitoring of tree and shrub survivorship in the 1½-Mile Reach was performed during June of 2006. On June 8 and June 9, 2006, Woodlot Alternatives, Inc. (Woodlot) established permanent monitoring plots and conducted springtime vegetation monitoring in restored areas. Woodlot performed supplemental monitoring work to assess shrub density within individual shrub clumps of permanently established plots on July 14, 2006.

Generally, three monitoring plots were established on each side of the river in each of the three reaches being monitored: Lyman Street to Elm Street, Elm Street to Dawes Avenue, and Dawes Avenue to Pomeroy Avenue. Based on surface area calculations, the size of the plots was established so that their total area was at least 10% of the total revegetated area. A monitoring

area includes the three plots on one side of the river in a particular reach, e.g. Lyman to Elm West (LE-West). The summed and averaged results from the plots that make up a monitoring area were compared to the Performance Standards. A summary of the percent survivorship of trees and shrubs in each of the monitoring areas for the spring 2006 inspection is provided in Table 1. According to Table 1, two areas LE-East and DP-West, did not achieve the Performance Standard for survivability of 80%. However, LE-East was expected to fill in sufficiently with volunteers, and DP –West was skewed low because it was actually planted at a density lower than 80% of the standard planting density of 700 trees per acre. Comparison using this standard planting density was therefore not wholly applicable. In fact, survivability in DP-West was close to 100%, as all plants that were planted were observed to be alive. This type of discrepancy in how the DP-West area was evaluated relative to Performance Standards was slated for resolution during the summer inspection.

**Table 1 – Spring 2006 Revegetation Inspection Summary**

Monitoring Area	Performance Standard Summary – Spring 2006		
	Shrubs	Trees (non-GeoWeb)	Trees (GeoWeb)
Lyman-Elm (West)	97%	146%	NA
Lyman-Elm (East)	95%	60% (1)	119%
Elm-Dawes (West)	95%	163%	565%
Elm-Dawes (East)	91%	156%	NA
Dawes-Pomeroy (West)	134%	57% (2)	60% (2)
Dawes-Pomeroy (East)	141%	109%	188%

Notes:

- (1) The Performance Standard was not met because Plot 1-E-2 was originally established in a shrub clump. Plot 1-E-2 was relocated in the summer 2006.
- (2) The measurement method used to determine the percent survivorship was based on the design densities and not on actual survivorship of the number of trees planted. The number of trees planed varied significantly from the design densities. Actual % survivability based on actual number of trees planted will likely meet the Performance Standard. See the summer 2006 inspection results.

The meander survey indicated that the sample plots were representative of the monitoring areas and no significant issues were observed. The meander survey noted the absence of the Red Osier Dogwood band in the top of the riprap in several areas of the Lyman to Elm Street Reach. During development of the planting plan for this reach, Red Osier Dogwoods was included, but not necessarily as a hedge planted at the top of riprap in all areas. With the healthy tree and shrub community and stable banks in this reach, no additional planting of Red Osier Dogwoods band was recommended.

Gaps in the Red Osier Dogwood band were also noted in plot 2-W-1 (in the Elm to Dawes Reach), and during the meander survey in the Dawes to Pomeroy reach. It was recommended

that these areas be further assessed during the summer inspection, and potentially slated for additional Red Osier Dogwood planting in the fall of 2006. EPA concurred and additional Red Osier Dogwoods were planned in the fall 2006.

Monitoring of herbaceous coverage and invasive plants was not conducted during the spring 2006 inspection.

An inspection of the aquatic habitat enhancement structures and riprap and riverbank soil in the 1½-Mile Reach was also performed during the spring monitoring visit, and included Phase 1, the Transition Area, Phase 2, and Phase 3 areas downstream to the Pomeroy Avenue bridge (See inspection memo in Appendix E).

The results of this monitoring suggest that the aquatic enhancement structures are stable and performing as designed. Observed conditions adjacent to the aquatic habitat structures included variations in flow speed, including reversal of currents behind the structures, and adjacent sediment scour and deposition. The monitoring indicates that the performance standard was achieved. Areas of minor erosion were repaired.

The monitoring of the riverbank soil and riverbed and riverbank riprap revealed no significant displacement or damage, and in general suggested that the soil and riprap are in as-built condition.

### **5.2.2 *Summer 2006 Inspection***

The summer 2006 monitoring of tree and shrub survivorship in the 1½-Mile Reach was performed during August of 2006. The percent survivorship of installed trees and shrubs was 80% or above for the monitored areas with the exception of Lyman to Elm (East). In this monitoring area, the shrub density was impacted by GE's oxbow A and C remediation activities. A breakdown of the monitoring results by monitoring area is provided in Table 2.

The increase in measured survivorship recorded during the summer monitoring relative to Spring likely resulted from factors including 1) counting of volunteer stock, 2) recovery of plants counted as "dead" during the Spring monitoring, and 3) variations in the locations of the sample plots within the monitoring areas (e.g., Lyman to Elm (East) plot 1-E-2 was relocated because originally it was established in a shrub clump and therefore not meeting the performance standard for the tree count).

**Table 2 – Summer 2006 Revegetation Inspection Summary**

Monitoring Area	Performance Standard Summary – Summer 2006		
	Shrubs	Trees (non-GeoWeb)	Trees (GeoWeb)
Lyman-Elm (West)	85%	125%	NA
Lyman-Elm (East)	77% (1)	103%	100%*
Elm-Dawes (West)	102%	146%	287%
Elm-Dawes (East)	96%	124%	NA
Dawes-Pomeroy (West)	121%	100%*	90%
Dawes-Pomeroy (East)	145%	88%	188%

Notes:

- \* Indicates percent survivorship based on actual plant counts; all other entries based on observed densities compared to design densities.
- (1) The Performance Standard was not met because the shrub density was impacted by GE’s Oxbow A and C remediation activities. Supplemental trees and shrubs were planted in the fall 2006.

The riverbank vegetation sample plot results in both spring and summer correlated well with observations made during meander surveys, the results of which indicated 1) minimal dead planted stock, and 2) large numbers of volunteer plants, particularly eastern cottonwood (*Populus deltoides*) and box elder (*Acer negundo*). Because plant counts within the monitoring plots included volunteer species represented in the planted stock, some of the calculated plant densities exceeded the planted densities, resulting in calculated survivorships in excess of 100 percent for some areas.

Installed plants appeared healthy and growing vigorously, with fruit apparent on some of the shrubs. While many of the winterberry (*Ilex verticillata*) plants appeared stressed during the spring survey, they appeared to be in better health during the summer survey.

The meander survey did confirm some gaps in the red osier dogwood band. The gaps were addressed during fall 2006 by supplemental planting.

The 2006 monitoring of herbaceous coverage in the 1½-Mile Reach was performed during the summer monitoring visit. Table 2 in Appendix D provides a summary of the results. The herbaceous areal cover standards specified in the Monitoring Plan were achieved within all monitoring areas, with observed sample plot average coverage within each phase ranging from 95 to 100 percent. The results of meander surveys performed as part of the monitoring work indicate that the overall herbaceous vegetation coverage achieves the performance standard of 95 percent outside the foliar coverage of trees. There were some areas within individual sample plots where the observed herbaceous areal cover was below the 95 percent requirement. These included 1) along the east bank of the river in the Transition Phase area, and 2) along the west bank of the river in the Phase 2 area downstream of where the articulated concrete mat ends. The low herbaceous cover noted in portions of the Transition Phase area appears to have resulted

from soil loss or compaction within the geoweb material. No readily apparent cause was observed for the low herbaceous cover in the Phase 2 area, although the presence of sand and gravel on the slope suggests that erosion originating outside of the limit of work may have adversely effected herbaceous plant growth in limited areas. No corrective action was deemed necessary other than continued monitoring of these areas as they fill in.

The monitoring of invasive plant cover in the 1½-Mile Reach was also performed during the summer monitoring visit. The results of the monitoring work are presented in Table 2 in Appendix D. Invasive plant control updates provided by Woodlot in 2006 are included in Appendix G. Invasive plant cover within the inspected riverbank sample plots was less than 5 percent within the monitored areas. Observed invasive plants included Japanese knotweed (*Polygonum sp.*), bittersweet (*Celastrus orbiculata*), purple loosestrife (*Lythrum salicaria*), reed canary-grass (*Phalaris arundinacea*), common buckthorn (*Rhamnus cathartica*), and multiflora rose (*rosa multiflora*). As shown in Table 2 in Appendix D, the average invasive plant cover for the monitored areas is relatively low and meets the restoration performance standard of less than 5 percent coverage.

Purple loosestrife was the most apparent invasive plant in 2006 and was relatively ubiquitous in low numbers within the monitored areas. While purple loosestrife was observed growing in sediments deposited within the riverbank riprap, it is doubtful that control measures would be effective in this area due to dispersal of seed from upstream sources. Furthermore, the presence of purple loosestrife within the riprap does not directly impact planted stock success in areas above the limit of riprap. Nevertheless, EPA decided that the purple loosestrife be removed to the extent feasible in the summer 2006.

Of particular note was the presence of hedge-bindweed, or “false morning glory”, (*Calysegia sepium*). This plant was observed in large concentrations (ground coverage in excess of 50 percent) along the west side of the river in the Phase 2 area and appears to have damaged planted stock. While this plant is not listed as an invasive plant in Appendix A, it occurs in both native and introduced forms (Gleason, 1991).

Invasive plant control work within the project area was performed in 2006 by C.L. Frank & Company. Observations suggest that the herbicide applications were effective, as treated invasive plants have died back with no minimal impacts on surrounding non-target vegetation.

An inspection of the aquatic habitat enhancement structures and riprap and riverbank soil in the 1½-Mile Reach was also performed during the summer monitoring visit, and included Phase 1, the Transition Area, Phase 2, and the entire Phase 3 (See inspection memo in Appendix E).

The results of this monitoring were similar to the spring event in suggesting that the aquatic enhancement structures are stable and performing as designed. Observed conditions adjacent to the aquatic habitat structures included variations in flow speed, including reversal of currents behind the structures, and adjacent sediment scour and deposition. The monitoring indicates that the performance standard was achieved.

The monitoring of the riverbank soil and riverbed and riverbank riprap revealed no significant displacement or damage, and in general suggested that the soil and riprap are in as-built condition. Any areas with minor erosion were repaired.

### **5.3 JANUARY 25, 2006 POST 1,500 CFS EVENT INSPECTION**

Woodlot performed monitoring of riprap, aquatic habitat enhancement structures, and riverbank vegetation on the 1.5-Mile Reach on January 25, 2006, in accordance with the post-1,500-cubic-foot-per-second (cfs) monitoring requirements set forth in the May 2004 1.5-Mile Reach Restoration Monitoring Plan. The monitoring was performed in response to a hydrologic event on January 18 and 19, 2006, during which a peak flow of 2,290 cfs was recorded at 7:15 PM at the United States Geological Survey (USGS) stream gaging station on the East Branch of the Housatonic River in Coltsville, Massachusetts (Station No. 01197000), as reported on the USGS station website.

The flow during the post-event monitoring work was approximately 210-cfs, as recorded at the USGS Coltsville gage. The monitoring work was performed by walking along the riverbank and looking for observable effects on the riverbed and riverbank from the high flow event. The monitoring commenced at the upper limit of the Phase 1 Reach immediately downstream of the Lyman Street Bridge, and proceeded downstream through the Phase 2 Area to the limit of completed work in the Phase 3 Area approximately 300 feet (ft) downstream of the Pomeroy Avenue Bridge.

No areas of substantial erosion were observed during the monitoring work. Two possible indicators of minor erosion were observed during the monitoring work, including 1) a section of exposed sheet pile along the east river bank in the Transition Phase area, and a short length of exposed soil at the riprap-soil interface along the west river bank in the Phase 2 area. The extents of the aforementioned areas was less than approximately 10 feet in both cases, and no remedial action other than continued observation is recommended at this time.

The magnitude of the January 18 and 19, 2006, flood event did not likely result in overtopping of the installed riprap, and no indicators of disturbance to planted stock were observed.

The January 25, 2006 Post High Flow Inspection Memo prepared by Woodlot is included as Appendix F.

## **6.0 Conclusions**

The following conclusions are based on the 2006 restoration monitoring effort.

**Aquatic Habitat Enhancement Structures** - Observations made in June and August 2006 suggest that the installed habitat enhancement structures remain in as-built condition, are functioning as intended, that the performance standard was achieved.

**Riverbank Soil Restoration** - The riverbank soil restoration performance standard was achieved in the restoration monitoring areas. Areas that sustained minor erosion during the course of the year were evaluated and repaired prior to the end of the year.

**Riverbank Revegetation** - The results of the 2006 restoration monitoring results indicate that the revegetation restoration work achieved the applicable performance standards within the monitored area of the 1½-Mile Reach except for one monitoring area (monitoring plot 1-E-1) where the survivability did not meet the standards due to GE's remediation activities. Supplemental planting was conducted in 2006 in selected areas in response to findings and observations made during the Spring and Summer 2006 inspections. The installed trees and shrubs appeared healthy and growing vigorously. In addition, recruitment of "volunteer" native trees, particularly eastern cottonwood and box elder, was observed. Overall, tree and shrub survivorship met or exceeded the 80 percent survivorship restoration performance standard. Herbaceous vegetation cover ranged from 95 to 100 percent, and invasive plant cover was less than the maximum of 5 percent as defined by the applicable performance standard.

To enhance the performance of the revegetation program, the following maintenance items will be performed:

- **Supplemental Planting** – Supplemental planting of trees and shrubs is planned for selected areas of the Lyman to Elm reach where final restoration activities performed by EPA or GE (in former Oxbow areas) resulted in removal of trees. This planting effort is expected to be completed in the spring of 2007.
- **Tree Maintenance** – Take measures to reduce branch constraint within tree cages and minimize abrasion of tree trunks against tree cages.
- **Invasive Plant Control** - Continue invasive plant control work within the project area, as appropriate.
- **Herbaceous Cover** – The performance standard was met. No additional enhancement activities are required.
- **Sample Plot Markers** – Install additional permanent sample plot markers as necessary to allow proper identification of sample plot areas.

**Riverbed and Riverbank Riprap** - The restoration performance standard for riverbank and riverbed riprap was achieved.

**Ancillary Items** - The ancillary items performance standard was achieved, as the ancillary items were found to be in as-built condition, while accounting for normal wear and tear.

## 7.0 References

Gleason, H.A. and A. Cronquist. 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*. New York Botanical Garden. Bronx, NY.

Weatherbee, P., Somers, P., and Simmons, T. 1998. *A Guide to Invasive Plants in Massachusetts*, Prepared by The Massachusetts Biodiversity Initiative, Prepared for the Massachusetts Division of Fisheries and Wildlife.

Woodlot Alternatives, Inc. (Woodlot). 2004. *1½ Mile Reach Restoration Monitoring Plan, GE-Housatonic River Site, Pittsfield, MA*. Prepared for Weston Solutions, Inc., 1 Wall Street, Manchester, NH 03101.

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**APPENDIX A**

**INVASIVE SPECIES LIST**

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## Invasive Plant List

COMMON NAME	SCIENTIFIC NAME
Amur honeysuckle	<i>Lonicera maackii</i>
Autumn olive	<i>Elaeagnus umbellata</i>
Barnyard grass	<i>Echinochloa crusgalli</i>
Black locust	<i>Robinia pseudoacacia</i>
Black swallow-wort	<i>Cynanchum louiseae</i>
Bittersweet nightshade	<i>Solanum dulcamara</i>
Bushy Rock-cress	<i>Cardamine impatiens</i>
Canada bluegrass	<i>Poa compressa</i>
Chervil	<i>Anthriscus sylvestris</i>
Coltsfoot	<i>Tussilago farfara</i>
Common barberry	<i>Berberis vulgaris</i>
Common buckthorn	<i>Rhamnus cathartica</i>
Common / hedge privet	<i>Ligustrum vulgare</i>
Common mullein	<i>Verbascum thapsus</i>
Creeping buttercup	<i>Ranunculus repens</i>
Curly pondweed	<i>Potamogeton crispus</i>
Cypress spurge	<i>Euphorbia cyparissias</i>
Dame's rocket	<i>Hesperis matronalis</i>
Eurasian water-milfoil	<i>Myriophyllum spicatum</i>
Fanwort	<i>Cabomba caroliniana</i>
Garlic mustard	<i>Alliaria petiolata</i>
Giant waterweed	<i>Egeria densa</i>
Glossy buckthorn	<i>Rhamnus frangula</i>
Goutweed or	<i>Aegopodium podagria</i>
Hair fescue	<i>Festuca filiformis</i>
Hairy willow-herb	<i>Epilobium hirsutum</i>
Japanese barberry	<i>Berberis thunbergii</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Japanese hops	<i>Humulus japonicus</i>
Japanese knotweed	<i>Polygonum cuspidatum</i>
Japanese privet	<i>Ligustrum obtusifolium</i>
Japanese rose	<i>Rosa rugosa</i>
Kiwi vine	<i>Actinidia arguta</i>
Kudzu	<i>Pueraria montana</i>
Lesser naiad	<i>Najas minor</i>
Live-forever or Orpine	<i>Sedum telephium</i>
Money wort	<i>Lysimachia nummularia</i>
Morrow's honeysuckle	<i>Lonicera morrowii</i>
Morrow's X Tatarian	<i>Lonicera xbella</i>
Multiflora rose	<i>Rosa multiflora</i>
Norway maple	<i>Acer platanoides</i>
Oriental bittersweet	<i>Celastrus orbiculata</i>

Phragmites, Reed grass	<i>Phragmites australis</i>
Porcelain berry	<i>Ampelopsis brevipedunculata</i>
Purple loosestrife	<i>Lythrum salicaria</i>
Reed canary-grass	<i>Phalaris arundinacea</i>
Russian olive	<i>Elaeagnus angustifolia</i>
Sea- or horned poppy	<i>Glaucium flavum</i>
Sheep fescue	<i>Festuca ovina</i>
Sheep-sorrel	<i>Rumex acetosella</i>
Silver lace-vine	<i>Polygonum aubertii</i>
Silver poplar	<i>Populus alba</i>
Spotted knapweed	<i>Centaurea biebersteinii</i>
Sweet reedgrass	<i>Glyceria maxima</i>
Sycamore maple	<i>Acer pseudoplatanus</i>
Tartarian honeysuckle	<i>Lonicera tartarica</i>
Tree-of-heaven	<i>Ailanthus altissima</i>
True forget-me-not	<i>Myosotis scorpioides</i>
Water-chestnut	<i>Trapa natans</i>
Watercress	<i>Rorippa nasturtium-aquaticum</i>
Wetsern catalpa	<i>Catalpa speciosa</i>
White mulberry	<i>Morus alba</i>
Wild thyme	<i>Thymus pulegioides</i>
Winged euonymus	<i>Euonymus alata</i>
Variable water-milfoil	<i>Myriophyllum heterophyllum</i>
Yellow floating heart	<i>Nymphoides peltata</i>
Yellow iris	<i>Iris pseudacorus</i>

**Reference:**

Weatherbee, P.B., P. Somers, T. Simmons. 1998. A Guide to Invasive Plants in Massachusetts. The Massachusetts Biodiversity Initiative. MassWildlife.

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**APPENDIX B**

**WESTON MONTHLY INSPECTION REPORTS**

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Field Form for Monitoring of Rock Riprap Armor

Date:	February 17, 2006	
Location:	Housatonic River 1.5 Mile Removal Action Phases I, II and III	
Weather:	Overcast/Light Rain, Low to Mid 40's	
Observations		
Attached Map No./Site ID/GPS Coord.	Comments / Recommendations	
Phase I, Transition	<p>Comments: Conducted and initial inspection of the of the Transition Phase dam restoration area, utilizing the project drawings to determine what habitat enhancement structures were required for the restoration area.</p> <p>Recommendations: Need to install 7 boulders and 1 wing deflector</p>	
Phase I & Transition Phase	<p>Comments: Weston inspected the riverbank and riverbed riprap and the habitat enhancement structures found no movement of the movement of the riprap or structures,</p> <p>Recommendations: None required.</p>	
Phase II & III	<p>Comments: Weston inspected the riverbank and riverbed riprap and the habitat enhancement structures found no movement of the movement of the riprap or structures,</p> <p>Recommendations: None required.</p>	
Lead Monitor:	Name	Signature
Other Personnel	Richard M. Zoppel	
	_____	_____
	_____	_____

Field Form for Monitoring of Rock Riprap Armor

Date:	March 20, 2006	
Location:	Housatonic River 1.5 Mile Removal Action Phases I, II and III	
Weather:	Mid to High 20's, Mostly cloudy	
Observations		
Attached Map No./Site ID/GPS Coord.	Comments / Recommendations	
Phase II	<p>Comments: Re-inspected the interface between the riverbank riprap armor and the topsoil. There was some minor erosion of the topsoil at the interface in several locations. Most erosion location range in size from 4 to 6 inches deep and at lengths up to 2 feet.</p> <p>Recommendations: One area of slightly larger wash was filled by the inspection team using riverbank riprap.</p> <p>Recommendations: Reseed the Phase II topsoil /riprap interface</p>	
Phase I, II & III A & B	<p>Comments: Inspection found no movement or erosion of the riverbank and riverbed armor and habitat enhancement structures.</p> <p>Recommendation: None required</p>	
Lead Monitor:	Name	Signature
	Richard M. Zoppel	 _____
Other Personnel	R. Sujat	_____
	D. Tagliaferro	_____

Field Form for Monitoring of Rock Riprap Armor / Post 1500cfs Riprap Erosion Monitoring Inspection.

Date:	April 19, 2006	
Location:	Housatonic River 1.5 Mile Removal Action Phases I, II and III	
Weather:	Mid 60's, Clear, Light Wind	
Observations		
Attached Map No./Site ID/GPS Coord.	Comments / Recommendations	
Phases I / Transition, II & III	Inspection found no movement of the riverbed and riverbank riprap armor, no evidence of movement of the habitat enhancement structures and no erosion of the upper riverbank topsoil areas.	
Lead Monitor:	Name	Signature
		
Other Personnel	Richard M. Zoppel	_____
		_____

Field Form for Monitoring of Rock Riprap Armor

Date:	May 8, 2006	
Location:	Housatonic River 1.5 Mile Removal Action Phases I, II and III	
Weather:	Low 60's, Clear	
Observations		
Attached Map No./Site ID/GPS Coord.	Comments / Recommendations	
Phase I, east riverbank, Lot I8-23-6	Comments: Small washout found at the Transition Phase dam trash rack, 6" deep 8" wide and 6' long Recommendations: Install 9" riprap	
Phase I, east riverbank, Lot I8-23-6	Comments: Small washout found at the Phase I water across from the treatment entrance, 8" deep and 8" long. Recommendation: Install topsoil, seed and coconut matting in washout.	
Phase II, Cell 15, East bank at the intersection of High St. and Mass. Ave.	Comment: ACOE requested an inspection of the riprap armor for possible movement Recommendation: Weston site engineer will inspect the riverbank riprap	
Phase II C - East Bank, Rivers property	Comment: 2 topsoil washouts above the riprap, 4" to 6" deep by 5' long about 8' apart from each other.	
Phase III B, Plante property (I7-3-4) sewer right-of-way.	Comment: Observed a very small wash out of topsoil starting at the end of the sewer ROW Recommendations: Add topsoil	
Phases I, II & III	Comments: Inspected the riverbank and riverbed riprap armor and habitat enhancement structures, finding no movement. Recommendations: None required	
Lead Monitor:	Name	Signature
	Richard M. Zoppel	
Other Personnel	R. Sujat	_____



Field Form for Monitoring of Rock Riprap Armor / Post 1500cfs Riprap Erosion Monitoring Inspection.

Date:	July 27, 2006	
Location:	Housatonic River 1.5 Mile Removal Action Phases I, II and III	
Weather:	Low 80's, Clear, Calm	
Observations		
Attached Map No./Site ID/GPS Coord.	Comments / Recommendations	
Phases I / Transition, II & III	Inspection found no movement of the riverbed and riverbank riprap armor, no evidence of movement of the habitat enhancement structures and no erosion of the upper riverbank topsoil areas.	
Lead Monitor:	Name	Signature
	Richard M. Zoppel	
Other Personnel		



Field Form for Monitoring of Rock Riprap Armor

Date:	September 12, 2006	
Location:	Housatonic River 1.5 Mile Removal Action Phases I, II and III	
Weather:	Clear, Low to Mid 60's, River Flow at 19cfs	
Observations		
Attached Map No./Site ID/GPS Coord.	Comments / Recommendations	
Phases I, Cell 11A	<p>Comments: Weston found an area 18" area of sheet pile retaining wall showing along the east riverbank, approximate station 516+00. There seems to no movement of the 18" riprap bank armor causing the exposure of the sheet pile, but most likely an area of previously noted exposed sheet pile that was missed during covering of the sheet pile</p> <p>Recommendations: Sheet piling needs to be covered as directed by ACOE that no sheet pile may be showing.</p>	
Phase II, Cell 14	<p>Comments: Repairs conducted to the down stream end of the ACB Revetment in 2005, adding concrete and boulders, seems to have stopped the washing of the sand from under the revetment geotextile.</p> <p>Recommendations: None required</p>	
Phase III	<p>Comments: No evidence of riverbed, riverbank riprap and topsoil, and habitat enhancement structures to have moved.</p>	
Lead Monitor:	Name	Signature
	Richard M. Zoppel	
Other Personnel	_____	_____
	_____	_____





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**APPENDIX C**

**SPRING 2006 VEGETATION MONITORING REPORT**

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# Memorandum

To: Joel Lindsay, Weston Solutions, Inc.

From: Todd Chadwell, Woodlot Alternatives

Cc: Dean Tagliaferro, USEPA  
Darrell Moore, CENAE

Date: August 10, 2006

Re: 2006 Spring Vegetation Monitoring Report

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On June 8 and June 9, 2006, Woodlot Alternatives, Inc. (Woodlot) established permanent monitoring plots and conducted annual springtime vegetation monitoring in restored areas of the 1½-Mile Reach—GE Pittsfield/Housatonic River Site. Woodlot performed supplemental monitoring work to assess shrub density within individual shrub clumps of permanently established plots on July 14, 2006.

## 1.0 METHODS

### 1.1 Plot Establishment

Using base maps provided by Weston Solutions, Inc. (Weston), Woodlot calculated the surface area of revegetated locations within 3 reaches of the 1½-mile monitoring area. The first reach is located between the Lyman and Elm Street bridges, the second reach is located between the Elm Street and Dawes Avenue bridges, and the third reach is located between the Dawes Avenue and Pomeroy Road bridges. Within each reach, surface area estimates were acquired for 10% of the normal revegetation area (700 trees/acre density) and 10% of the Geoweb® cellular confinement area (500 trees/acre density). On the base map, Woodlot placed 3 plots on each bank of the river within each of the 3 reaches. Surface area of the combined plots in each reach was approximately equal to the desired 10% normal and 10% Geoweb® monitoring criteria. Mapped plot locations were approved by Weston and the U.S. Environmental Protection Agency prior to establishment. Plots are depicted on the attached maps.

Woodlot located the plots in the field and first verified that these areas were representative of the entire planting area. The area of each monitoring plot was measured and two wooden stakes were driven into the ground at the top of bank at each edge of the plot. The upper limit of each plot was established approximately 8 inches above the highest planting and each plot extended down to the riprap. Planting area widths were corrected for slope during data analysis using as-built mapping data provided by Weston. After establishing each plot, photos were taken to assist future location of the plots.

## 1.2 Vegetation Monitoring

Trees and shrubs within each plot were tallied by species and noted as “healthy,” “stressed,” or “dead.” “Stressed” trees and shrubs were ones that had been topped off above the protective cage, experienced general die-back of the previous year’s growth, or were affected by insect herbivory. “Dead” trees and shrubs were those that exhibited no foliage and the inner cambium was dead throughout the entire above ground portion of the plant. Volunteers of species that were planted were included in the tally if they were greater than three inches in height and appeared to be likely to survive. Volunteers of other tree and shrub species were recorded separately and not included in the tally.

Herbaceous cover and invasive plant cover were not recorded, as this is not required during spring monitoring. However, notes were made on locations of invasive species populations when occurring within or near planting areas.

A meander survey was performed along both banks of each reach of the river to collect qualitative data on plant survivorship, observe invasive plant populations, and verify that plots were representative of surrounding areas.

## 2.0 RESULTS

The results of the monitoring plot inspection and meander surveys are summarized in this section. A discussion of the results and comparison to performance standards is provided in Section 3. The attached Table 1 summarizes tree and shrub densities and red osier dogwood (ROD) status in each plot relative to performance standards. There are a total of 18 plots currently between the Lyman Street bridge and Pomeroy Avenue bridge. These 18 plots are grouped into a total of 6 distinct monitoring areas, defined by geographic location (e.g. Lyman to Elm-East). These monitoring areas are compared to the performance standards. Field data forms for all the plots are attached

### 2.1 Monitoring Area and Plot Characterization

#### Lyman Street to Elm Street Reach

##### Monitoring Area LE-West

###### **Plot 1-W-1:**

- No shrubs located in this plot (shrub clump occurs upstream of this location).
- No red osier dogwood band in this location.
- Tree density is 1,215 trees/acre.

###### **Plot 1-W-2:**

- 4 shrubs from shrub clump upstream project into plot.
- 1/3 of plot planted in 2006.
- Red osier dogwood band is incomplete.
- Tree density is 1,243 trees/acre.

###### **Plot 1-W-3:**

- Shrub clump approximately 24x14 ft. at South edge of plot.
- Shrub density within clump is 2,641 shrubs/acre.
- Red osier dogwood band complete

- Tree density is 610 trees/acre.

### **Monitoring Area LE-East**

#### **Plot 1-E-1:**

- Shrub clump approximately 77x8 ft. in center of plot.
- Red osier dogwood band is part of shrub clump and absent in 62 ft. of plot.
- Shrub density within clump is 2,881 shrubs/acre.
- Tree density is 397 trees/acre.

#### **Plot 1-E-2:**

- Shrub clump approximately 32x26 ft. in center of plot.
- Shrub density within clump is 2,266 shrubs/acre.
- Tree density is 438 trees/acre.
- Red osier dogwood band complete.

#### **Plot 1-E-3:**

- Depicted on plan as Geoweb ® site.
- Shrubs planted 7 ft. on center average (range = 4-10 ft. on center) throughout plot.
- Trees interspersed throughout planting.
- Red osier dogwood band complete.
- Shrub density within plot is 841 shrubs/acre.
- Tree density is 596 trees/acre.

### **Elm Street to Dawes Avenue Reach**

#### **Monitoring Area ED-West**

#### **Plot 2-W-1:**

- 2 shrubs from shrub clump immediately upstream occur in plot.
- Red osier dogwood band of sufficient number but 20 ft. hole in band from irregular spacing.
- Tree density is 947 trees/acre.
- *Calystegia sepium* (hedge bindweed) covering trees and shrubs in this location.

#### **Plot 2-W-2:**

- Shrub clump approximately 8x8 ft. (continuation of shrub clump upstream).
- Red osier dogwood band irregularly spaced.
- Shrub density within clump is 2,600 shrubs/acre.
- Tree density is 1,335 trees/acre.

#### **Plot 2-W-3:**

- Depicted as Geoweb ® on plan.
- Shrubs distributed evenly with trees.
- Red osier dogwood band is composed of silky dogwood.
- Shrub density within plot is 926 shrubs/acre.
- Tree density is 2,826 trees/acre.

- Large pockets of unplanted area present.
- High tree density is a result of 56 *Acer negundo* (box elder) seedlings.

### **Monitoring Area ED-East**

#### **Plot 2-E-1:**

- Shrub clump approximately half of plot area extending upstream.
- Shrub density within clump is 2,484 shrubs/acre.
- Red osier dogwood band complete.
- Tree density is 535 trees/acre.

#### **Plot 2-E-2:**

- No shrub clumps within plot (shrub clumps present approximately 200 ft. upstream and downstream).
- Red osier dogwood band complete.
- Tree density is 859 trees/acre.

#### **Plot 2-E-3:**

- No shrub clumps within plot (shrub clump present approximately 300 ft. upstream).
- Red osier dogwood band is composed of silky dogwood.
- Tree density is 1,892 trees/acre.
- High tree density results from 27 volunteer box elders.

### **Dawes Avenue to Pomeroy Avenue Reach**

#### **Monitoring Area DP-West**

#### **Plot 3-W-1:**

- Depicted as Geoweb ® on plan.
- Red osier dogwood band is composed of silky dogwood.
- Plot is planted with all shrubs and interspersed with trees.
- Some pockets of no woody growth.
- Shrub density within plot is 1499 shrubs/acre.
- Tree density is 300 trees/acre.

#### **Plot 3-W-2:**

- Shrubs distributed evenly with trees.
- GE planting adjacent to plot.
- Red osier dogwood band is complete.
- Shrub density within plot is 604 shrubs/acre.
- Tree density is 418 trees/acre.

#### **Plot 3-W-3:**

- Shrubs distributed evenly with trees.
- Some large pockets of no woody growth.
- GE planting adjacent to plot.
- Red osier dogwood band is complete.

- Shrub density within plot is 830 shrubs/acre.
- Tree density is 383 trees/acre.

### **Monitoring Area DP-East**

#### **Plot 3-E-1:**

- Shrub clump approximately 16x6 ft. with some shrubs interspersed in plot.
- Red osier dogwood band is composed of silky dogwood.
- Shrub density within clump is 3,466 shrubs/acre.
- Tree density is 792 trees/acre.

#### **Plot 3-E-2:**

- Area is depicted as Geoweb ® on plan.
- No shrub clumps within plot (shrub clump present approximately 120 ft. downstream).
- Tree density is 941 trees/acre.
- Red osier dogwood band is complete.

#### **Plot 3-E-3:**

- Shrubs distributed evenly with trees.
- GE planting adjacent to plot
- Shrub density within plot is 1,131 shrubs/acre.
- Tree density is 735 trees/acre.
- Red osier dogwood band is complete.

## **2.2 Meander Survey Results**

### **Lyman Street to Elm Street Reach**

Large sections of the red osier dogwood band are absent or incomplete in this area. This is expected due to the fact that as part of the design, RODs were not necessarily planted as a band in all areas in this reach. Rather, RODs were generally interspersed within the shrub clumps. However, shrub growth overall is very healthy, and the banks appear stable.

Trees in this reach suffered observable damage resulting from beaver herbivory, particularly in the northern section. Tree stumps left by beavers are exhibiting extensive re-sprouting from the base.

A stand of common reed (*Phragmites australis*) was observed adjacent to the road near Station 512 (see photo 1). This is the first observance of this invasive species within or near the restoration area. *Phragmites australis* is a highly invasive species that will likely expand its dominance if not controlled soon. Other invasive species encountered in this reach include Japanese knotweed (*Polygonatum cuspidatum*), Norway maple (*Acer platanoides*), and multiflora rose (*Rosa multiflora*). Purple loosestrife (*Lythrum salicaria*) was observed growing within the rip rap.

Hedge bindweed *Calystegia sepium* is growing over trees and shrubs in sections of this reach. This vine competes with planted trees and shrubs for light. It is recommended that hedge bindweed be removed by hand from planted trees and shrubs to assist the establishment of these species.

### **Elm Street to Dawes Avenue Reach**

Hedge bindweed is growing over trees and shrubs in this reach, particularly below Elm Street on the west bank. It is recommended that hedge bindweed be removed by hand from planted trees and shrubs to assist the establishment of these species.

Large sections of the red osier dogwood (*Cornus sericea*) band are comprised of silky dogwood (*Cornus amomum*) in this reach. Although silky dogwood does not exhibit stoloniferous growth like red osier dogwood, this shrub should provide adequate protection to stream bank erosion in these locations. Many sections of the red osier or silky dogwood band in this reach were irregularly spaced with some trees and shrubs of other species appear to have been planted below the band. What appeared to be a cultivar of choke cherry (*Prunus virginiana*) with red foliage was planted in sections of this reach.

Few invasive species were found within the planting area of this reach. Garlic mustard (*Alliaria petiolata*) was observed growing in the planting area. Multiflora rose (*Rosa multiflora*) and purple loosestrife (*Lythrum salicaria*) were observed growing above and below the planting areas respectively. Uprooted Japanese knotweed (*Polygonatum cuspidatum*) plants were observed to be deposited in one of the planting areas. Apparently these plant remains were removed from an adjacent property and deposited here.

### **Dawes Avenue to Pomeroy Road Reach**

It was observed that certain areas appeared to have lower tree densities. This was also reflected in the sample plots as shown in Table 1 for plots 3-W-1, 3-W-2, and 3-W-3. Further discussion on this is provided in Section 3.0 below. The red osier dogwood band was absent in a 100 ft. section of the east bank adjacent to residential properties. Also, near Station 545-25 on the west bank, red osier dogwoods were absent for 70 ft. behind a wooden fence. One section of sediment fence appears to have been buried during work and has now been exposed by erosion (see photo 2). Large sections of the red osier dogwood (*Cornus sericea*) band are comprised of silky dogwood (*Cornus amomum*) in this reach. Invasive species within the planting areas include Multiflora rose (*Rosa multiflora*) and (*Acer platanoides*).

## **3.0 DISCUSSION**

Overall, healthy growth of planted species was observed, with little die-off, and significant contribution from volunteers. There were no indications of significant problem areas. Below is a more detailed discussion of how tree and shrub densities were determined, and specific discussion of monitoring areas where tree densities were observed to be below the 80% performance standard.

Calculations of tree and shrub densities were based on the presence or absence of shrub clumps. If shrubs were evenly distributed within the monitoring area, shrub density should have been 730 shrubs/acre and tree density should be 700 trees/acre in normal plots or 500 trees/acre in areas with Geoweb®. If a defined shrub clump was observed, the area of the shrub clump was delineated and resulting shrub density within the clump should have been 2,722 shrubs/acre if shrubs were planted 4 ft. on center.

See Table 1 for the summary of tree and shrub densities. Tree densities were below the 80% density performance standard in monitoring area LE-East (non-geoweb; plots 1-E-1 and 1-E-2 only) in the Lyman Street to Elm Street reach and monitoring area DP-West in the Dawes Avenue to Pomeroy Road reach. Plots 1-E-1 and 1-E-2 have an adequate shrub cover and will likely fill in with volunteer species.

Supplemental planting is not necessary in this area. In monitoring area DP-West Geoweb area (plot 3-W-1), tree counts are somewhat lower due to the fact that trees were not planted adjacent to fences on the residential properties in order to address property owner preference. In monitoring area DP-West-Regular (plots 3-W-2 and 3-W-3) the tree counts correlate well with the number of trees that were required for a planted band of 7-8 feet in width. However, since the plantings were made in an area wider than 8 feet (14 and 13 feet respectively for 3-W-2 and 3-W-3), the resultant density is skewed somewhat lower than 700 per acre. Much of this area has 2-3 rows of GE planting behind the NRD planting, which will increase buffering capacity as well as provide a seed source for future volunteer recruitment. Supplemental tree planting is not recommended in this monitoring area, as all the planted trees are healthy and growing, and volunteer tree recruitment should fill in gaps within the next few years.

Monitoring areas that were planted with shrubs evenly distributed instead of planted with shrub clumps exceeded the 80% density performance standard (584 shrubs/acre) in all cases. Shrubs that were planted in clumps exceeded the 80% density performance standard per clump (2,178 shrubs/acre) in all cases.

The meander survey notes the absence of the ROD band in several areas of the Lyman to Elm Street Reach. During development of the planting plan for this reach, ROD was included, but not necessarily as a hedge in all areas. With the healthy tree and shrub community and stable banks in this reach, no additional planting of ROD is recommended at this time.

Gaps in the ROD band were also noted in plot 2-W-1 (in the Elm to Dawes Reach), and during the meander survey in the Dawes to Pomeroy reach. These areas should be further assessed during the summer inspection, and potentially slated for additional ROD planting in the Fall of 2006.

In general, many of the planted trees and shrubs, as well as neighboring vegetation in un-remediated areas, were experiencing some stress as a result of herbivory by the forest tent caterpillar (*Malacosoma disstria*). Forests in Berkshire County have experienced above average herbivory from the forest tent caterpillar this year. Healthy trees will produce new foliage and survive after such an attack. Trees that are already stressed may experience increased mortality. During the supplemental monitoring on July 14, 2006, it was observed that trees damaged by tent caterpillars were generating new growth. Other signs of herbivory included trees that had been topped off by beavers between Lyman Street and Elm Street. Trees damaged by beavers appear to be generating extensive regrowth from their bases.

Many of the shrubs between Dawes Avenue and Pomeroy Road have protective cages around them. Shrubs will grow through the cages and have to be pruned when cages are removed. It is recommended that these cages be removed as soon as possible. If there is a threat of property owners harming shrubs while cutting grass, smaller protective barriers constructed of corrugated drainage pipe or 10 inch wire cages are recommended.

The majority of tree cages are well maintained. However, several cages appeared to be lacking stem protectors, allowing trees to be damaged by rubbing against the wire. Tree cages should be monitored and adjusted accordingly.

Invasive species were noted within plots and during meander surveys, including Japanese knotweed (*Polygonum cuspidatum*), multiflora rose (*Rosa multiflora*), Norway maple (*Acer platanoides*), and garlic mustard (*Alliaria petiolata*). Of these species, Japanese knotweed (see photo 3) poses the most apparent threat to restoration plantings. If Japanese knotweed becomes established prior to the development of a tree canopy, it may out-compete the planted species and volunteer native plants. It is recommended that this invasive species be controlled before it gains dominance. If a spray herbicide is to be used, particular

care should be taken to avoid drift onto desired plants. A new population of common reed (*Phragmites australis*) was observed adjacent to the road near Station 512. It is recommended that this invasive species be controlled as soon as possible. Although false hedge bindweed (*Calystegia sepium*) (also referred to as false morning glory) is not an invasive species, this plant has become a problem in certain areas (between Lyman Street and Elm Street, and on the west river bank south of Dawes Avenue). This herbaceous vine climbs up tree cages and damages trees by competing for light and pulling the tree down. It is recommended that false hedge bindweed be periodically removed from tree cages.

#### 4.0 RECOMMENDATIONS

The following actions are recommended for implementation during the Summer and Fall of 2006:

- Re-assess the observed gaps in the ROD band in the Elm to Dawes and Dawes to Pomeroy Reaches during the Summer 2006 inspection, and based on findings, evaluate potential planting of additional ROD in these areas in Fall 2006.
- Continue invasive plant control work, including addressing the presence of Japanese knotweed (*Polygonum cuspidatum*), multiflora rose (*Rosa multiflora*), Norway maple (*Acer platanoides*), garlic mustard (*Alliaria petiolata*), and common reed (*Phragmites australis*). Also it is recommended that false hedge bindweed be periodically removed from tree cages.
- Remove the cages around the shrubs between Dawes and Pomeroy Avenues as soon as possible.
- Remove or trim to ground the exposed silt fence/geotextile at Station 545+25



Photo 1. *Phragmites australis* stand near Station 512.



**Photo 2. Exposed sediment fence on east bank between Dawes Avenue and Pomeroy Road.**



**Photo 3. Japanese knotweed (*Polygonum cuspidatum*) overgrowing planted species**

TABLE 1

Spring 2006 Vegetation Monitoring Plot Inspection Results - L5 Mile Reach

Monitoring Performed by Todd Chadwell, Woodlot Alternatives, Inc.

Reach	Bank	Date	Sample No.	Type	Red Osier Band Comments	Plot Characterization	Shrubs				Trees				Performance Standard Summary					
							Length	Width	Shrub No.	Area*	Shrub D (shrubs/acre)	Target D (shrubs/acre)	% Target D	Area	Tree Density (trees/acre)	Target D (trees/acre)	% Target D	Shrubs	Trees (non-GeoWeb)	Trees (GeoWeb)
Lyman-Elm	West	6/8/2006	1-W-1	Regular	Absent	no shrubs clumps or RO band, shrub clump immediately upstream							646	1215	700	174%				
Lyman-Elm	West	6/8/2006	1-W-2	Regular	Incomplete	4 shrubs projecting in from clump upstream, RO band incomplete							981	1243	700	178%				
Lyman-Elm	West	6/8/2006	1-W-3	Regular	Complete	shrub clump approx. 24x14ft at S edge of plot	24	14	16	254	2841	2723	97%	1500	610	700	87%			
<b>Monitoring Area Average</b>													<b>Monitoring Area Average</b>				97%	146%	No GeoWeb	
Lyman-Elm	East	6/8/2006	1-E-1	Regular	Incomplete	shrub clump approx. 77x8ft in center of plot, RO band 77 ft in length	77	8	32	454	2881	2723	106%	1645	397	700	57%			
Lyman-Elm	East	6/8/2006	1-E-2	Regular	Complete	shrub clump approx. 32x26ft in center of plot	32	26	34	653	2266	2723	83%	1392	438	700	63%			
Lyman-Elm	East	6/8/2006	1-E-3	Geoweb	Complete	all shrubs with interspersed trees, shrubs 4-10ft OC, avg 7 ft OC				1242	841			1242	596	500	119%			
<b>Monitoring Area Average</b>													<b>Monitoring Area Average</b>				95%	60%	119%	
Elm-Dawes	West	6/9/2006	2-W-1	Regular	Sufficient #, but 20	2 shrubs projecting in from clump upstream							1057	947	700	135%				
Elm-Dawes	West	6/9/2006	2-W-2	Regular	Irregular	shrub clump approx. 8x8ft, RO band unevenly spaced, larger shrub clump	8	8	3	50	2600	2723	95%	914	1335	700	191%			
Elm-Dawes	West	6/9/2006	2-W-3	Geoweb	SD Band	shrubs distributed evenly with trees				940	926			940	2826	500	565%			
<b>Monitoring Area Average</b>													<b>Monitoring Area Average</b>				95%	163%	565%	
Elm-Dawes	East	6/9/2006	2-E-1	Regular	Complete	shrub clump approx. 1/2 of plot extending upstream (triangle)			18	316	2464	2723	91%	895	535	700	76%			
Elm-Dawes	East	6/9/2006	2-E-2	Regular	Complete	no shrub clumps, shrub clump approx. 200 ft upstream and downstream							913	859	700	123%				
Elm-Dawes	East	6/9/2006	2-E-3	Regular	SD Band	no shrub clumps, shrub clump approx. 300 ft upstream							1382	1892	700	270%				
<b>Monitoring Area Average</b>													<b>Monitoring Area Average</b>				91%	156%	No GeoWeb	
Dawes-Pomeroy	West	6/9/2006	3-W-1	Geoweb	SD Band	all shrub clump w/ trees interspersed, some area void of plantings				581	1499	730	205%	581	300	500	60%			
Dawes-Pomeroy	West	6/9/2006	3-W-2	Regular	Complete	shrubs distributed evenly with trees, dense GE planting adjacent				938	604	730	83%	938	418	700	60%			
Dawes-Pomeroy	West	6/9/2006	3-W-3	Regular	Complete	shrubs distributed evenly, some area void, GE planting adjacent				1365	830	730	114%	1365	383	700	55%			
<b>Monitoring Area Average</b>													<b>Monitoring Area Average</b>				134%	57%	60%	
Dawes-Pomeroy	East	6/9/2006	3-E-1	Regular	SD Band	shrub clump approx. 16x6ft w/ some interspersed shrubs	16	6	6	75	3466	2723	127%	715	792	700	113%			
Dawes-Pomeroy	East	6/9/2006	3-E-2	Geoweb	Complete	no shrub clumps, shrub clump approx. 120 ft downstream							370	941	500	188%				
Dawes-Pomeroy	East	6/9/2006	3-E-3	Regular	Complete	shrubs distributed evenly with trees, sparse GE planting adjacent				770	1131	730	155%	770	735	700	105%			
<b>Monitoring Area Average</b>													<b>Monitoring Area Average</b>				141%	109%	188%	

Notes:

- 1: From As-Built CAD Drawing
- 2: 3-W-1 Height based on field observation
- 3: 3-E-1 Height based on field observation

SD = silky dogwood  
 Red-osier = red-osier dogwood  
 AW = arrowwood  
 WB = winterberry  
 CC = chokecherry

Normal Geoweb  
 Trees: 700 500 per acre  
 Shrubs: 730 730 per acre  
 Total: 1430 1230 per acre

\* area of ellipse or triangle for shrub clumps  
 shrub clump

1-W-1

# Revegetation Monitoring Field Form

Area Behind Westcott

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 1 of 1

Observer(s): TC Date: \_\_\_\_\_

Phase: Gymn - Elm Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: W Bank

Riverbank Length (ft): 61 Avg width (ft): 11 *photo*

Planting Area (sf): 671 sf 10-20% Area (sf): \_\_\_\_\_

Comments: = 0.0154 acre = 1.54 x 10<sup>-2</sup>

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

### Plant Survivorship:

III  
IIII  
IIII  
IIII

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	3	3	Red-osier Dogwood	0	
Silver Maple	4	4	Silky Dogwood	0	
Eastern Cottonwood	+	7	Winterberry Holly	0	
Box Elder	4	5	Chokecherry	0	
			Northern Arrowwood	0	

Total Live Trees: 1978 Total Live Shrubs: 0  
1,233 + 19

Herbaceous Cover (%): 100

Invasive Plant Cover (%): ✓ Little Purple loosestrife on rip rap

### Meander Survey Comments (Use Additional Sheets As Necessary):

19  
0.0154 acre

No shrubs  
shrub clump upstream

Kalotweed N of plot - Beaver damage but extensive resprout





1-W-3

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): \_\_\_\_\_ Date: 6/8

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: W side Lyman-Elm - behind Harry's

Riverbank Length (ft): 70 Avg width (ft): 22 26-21

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: 2 photos of work

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

### Plant Survivorship:

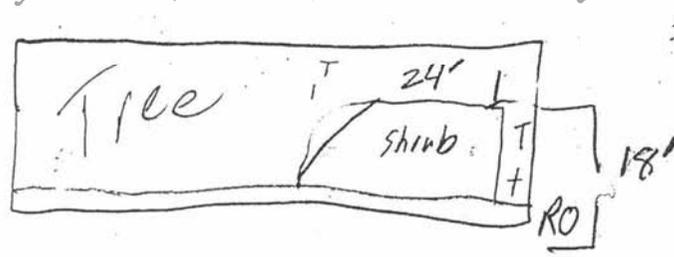
Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		5	Red-osier Dogwood		8
Silver Maple		3	Silky Dogwood		4
Eastern Cottonwood	 ✓	7	Winterberry Holly		4
Box Elder	 v v	6	Chokecherry		4
		21	Northern Arrowwood		4

Total Live Trees: 21 Total Live Shrubs: 24

Herbaceous Cover (%): lots of rvy

Invasive Plant Cover (%): 2 101way maple seedlings 1st yr plantings

### Meander Survey Comments (Use Additional Sheets As Necessary):



shrubs = 4

STA 517-25 - 51825  
No RO by road  
SP/AL to 513-00

1-E-1

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 2 of     

Observer(s): TC Date: 6/8/6  
Phase: Flow @ Coltsville (cfs) Weather:     

Planting Area Location: E side - 1st S. of Lyman - "Day St."

Riverbank Length (ft): 139 Avg width (ft): 12

Planting Area (sf): 1668 10-20% Area (sf):     

Comments: = 3.83 x 10<sup>-2</sup> acre = .038 acre Photo 2 & 3

Random Sample Location Number:      Riverbank length (ft):      Width (ft):       
Slope length (ft):      Sample Area (sf):     

### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		4	Red-osier Dogwood		13
Silver Maple		6	Silky Dogwood		12
Eastern Cottonwood		2	Winterberry Holly		7
Box Elder		3	Chokecherry		7
			Northern Arrowwood		6

Total Live Trees: 15 Total Live Shrubs: 56  
391 2/3 1,462 2/3

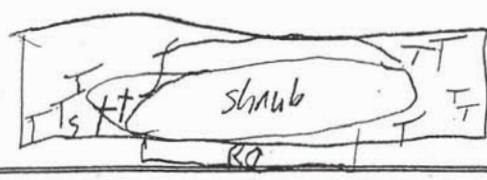
Herbaceous Cover (%):     

Invasive Plant Cover (%): 1 multiflora rose

### Meander Survey Comments (Use Additional Sheets As Necessary):

Beaver damage - minimal  
Few plastic guides on cages - Trees blanching through wire  
Volunteer shrubs

Sections of RO band  
S of here



clump ~ 7' x 12'  
RO in clump only

1 acre = 43,560 sq ft  
1,668 sq ft = 0.038 acre

1-E-2

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): TC Date: \_\_\_\_\_

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: E side, LYMAN-ELM, across from Silver Lake outflow

Riverbank Length (ft): 45 Avg width (ft): 30.31

Planting Area (sf): 1395 10-20% Area (sf): \_\_\_\_\_

Comments: = 0.032 acre

Photos 4-6 Photo 7 Jap Knot wood

12' sod fence above planting

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow			Red-osier Dogwood		10
Silver Maple			Silky Dogwood		
Eastern Cottonwood		3-3	Winterberry Holly	 vv	12
Box Elder	 <del>    </del> ✓	4/11	Chokecherry		5
Red tree		3/2 =	Northern Arrowwood		7

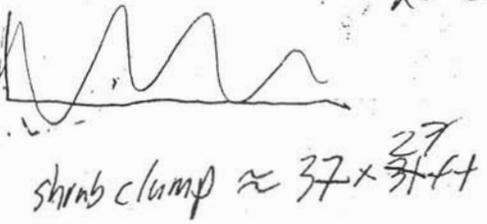
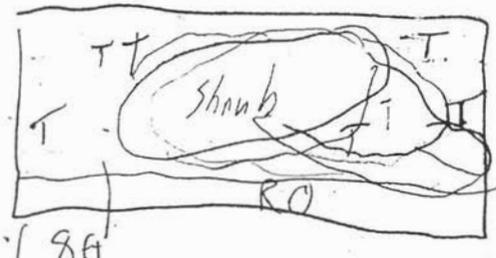
Total Live Trees: 16 = 49% Total Live Shrubs: 44 = 1,37%

Herbaceous Cover (%): ✓

Invasive Plant Cover (%): W/EW

Meander Survey Comments (Use Additional Sheets As Necessary):

Sections w/no RO Band sd here



WAI Project # 104140

\* Phrag stand approx STA 512



1-E-3

Geoweb

### Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): \_\_\_\_\_ Date: \_\_\_\_\_

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: E side of Elm - below car wash

Riverbank Length (ft): 70 Avg width (ft): 22

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: 2 photos discs 1st disc 2nd disc 6/1/11

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

#### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	1	1	Red-osier Dogwood	12	12
Silver Maple	1	1	Silky Dogwood	6	6
Eastern Cottonwood			Winterberry Holly		
Box Elder	5+5	10	Chokecherry	6	6
		17	Northern Arrowwood		

Total Live Trees: \_\_\_\_\_ Total Live Shrubs: 24

Herbaceous Cover (%): lots of ME

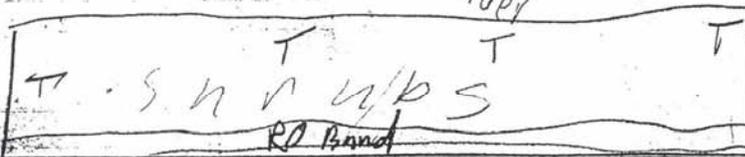
Invasive Plant Cover (%): lots Norway Maple

#### Meander Survey Comments (Use Additional Sheets As Necessary):

Lots of ME on N Meander

dist 1/2 shrubs  
Avg 6ft  
range 4-10ft

shrubs  
70+ft



Shrubs  
100+ft

2-11-1

70

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): TC & JS

Date: \_\_\_\_\_

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_

Weather: \_\_\_\_\_

Planting Area Location: S of Elm Rt Bank across from Mass Ave

Riverbank Length (ft): 63

Avg width (ft): 18

Planting Area (sf): 1022 sf

10-20% Area (sf): \_\_\_\_\_

Comments:

Jap Knot W above Pbt

Random Sample Location Number: \_\_\_\_\_

Riverbank length (ft): \_\_\_\_\_

Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_

Sample Area (sf): \_\_\_\_\_

Plant Survivorship:

20ft hole in RO band

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		5	Red-osier Dogwood	<del>    </del>	9
Silver Maple		6	Silky Dogwood		1
Eastern Cottonwood		6	Winterberry Holly		
Box Elder		6	Chokecherry		
			Northern Arrowwood		1

~~5~~

Total Live Trees: 23  
980 5/9

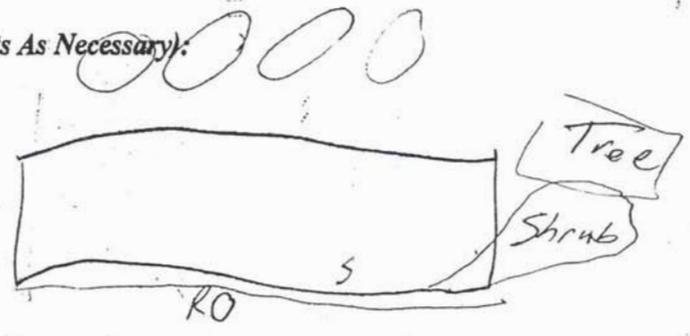
Total Live Shrubs: 11  
468 5/9

Herbaceous Cover (%): \_\_\_\_\_

Invasive Plant Cover (%): \_\_\_\_\_

Meander Survey Comments (Use Additional Sheets As Necessary):

Bad Cal Sep invasion  
can't find NA bc  
bad caly sepi. invasion



Z-W-R

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): TC & JL Date: \_\_\_\_\_

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: Rt Bank soft Elm across R. from Harold St.

Riverbank Length (ft): 17 Avg width (ft): 57

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		6	Red-osier Dogwood	1	1
Silver Maple		1	Silky Dogwood		
Eastern Cottonwood		8	Winterberry Holly	11	
Box Elder		8	Chokecherry		
			Northern Arrowwood	1	

Total Live Trees: 28 Total Live Shrubs: 4

Herbaceous Cover (%): ✓

Invasive Plant Cover (%): -

### Meander Survey Comments (Use Additional Sheets As Necessary):

Land owner across road is throwing shrub down jap KW into plot. 2 RO clump just N of plot.

SD Band to RO Band ~ 200' S of here

WAI Project # 104140

Not here irreg space RO going up hill

Shrubs & trees planted in place of RO



# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): TC & JS Date: \_\_\_\_\_

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: ft. Bank N. of Embury Rd. (next to weld shop) (back metal shed)

Riverbank Length (ft): 66 Avg width (ft): 18

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

Plant Survivorship: No RO!

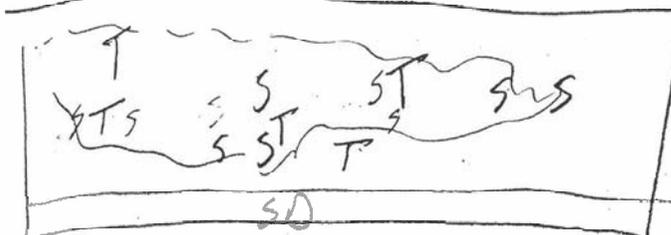
Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow			Red-osier Dogwood		
Silver Maple	1	1	Silky Dogwood (Barked)	11	11
Eastern Cottonwood	1	1	Winterberry Holly	1	1
Box Elder	3	3	Chokecherry	5	5
	<u>6, 3, 4, 10, 10</u>	<u>6</u>	Northern Arrowwood	3	3

Total Live Trees: 61 Total Live Shrubs: 20

Herbaceous Cover (%): ✓

Invasive Plant Cover (%): Ros Munt above eapl. Must. in

Meander Survey Comments (Use Additional Sheets As Necessary):



High D bc Volunteers

Avg. dist. 1/2 shrubs = 6'

Avg. Dist 1/2 planted trees = 12 ft

No observable trees 1/2 stg 538

8 535 sparse shrubs

2-F-1

9

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page      of     

Observer(s): TC OJS

Date:     

Phase:      Flow @ Coltsville (cfs)      Weather:     

Planting Area Location: S. Bank L Bank across 1/2 mile & Brown House

Riverbank Length (ft): 33 Avg width (ft): 31

Planting Area (sf): 1023 10-20% Area (sf):     

Comments: 0.235 acre

Random Sample Location Number:      Riverbank length (ft):      Width (ft):     

Slope length (ft):      Sample Area (sf):     

Plant Survivorship: small sap not used in plot

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	I		Red-osier Dogwood		6
Silver Maple			Silky Dogwood		6
Eastern Cottonwood			Winterberry Holly		6
Box Elder			Chokecherry		2
	I		Northern Arrowwood		4

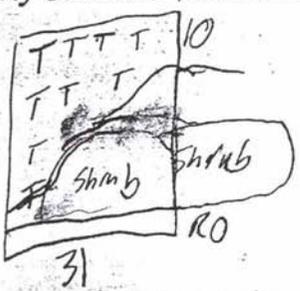
Total Live Trees: 11 Total Live Shrubs: 24  
468 t/acre 1,021 3/4

Herbaceous Cover (%):     

Invasive Plant Cover (%):     

### Meander Survey Comments (Use Additional Sheets As Necessary):

2 40% tree = 0.0054  
1 60% shrub = 0.0147



t = 1,170  
s = 1,703

South of here plantings moved + shrubs RO Band trees in RO shifted to side unevenly spaced

2-F-2

### Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): TC JS

Date: 6/19

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 1/2 mi + Dumps Lat. bank X from Harold St.

Riverbank Length (ft): 27 Avg width (ft): 35

Planting Area (sf): 945 A<sup>2</sup> 10-20% Area (sf): \_\_\_\_\_

Comments: = .0215 acre

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

#### Plant Survivorship:

RO is Robbed

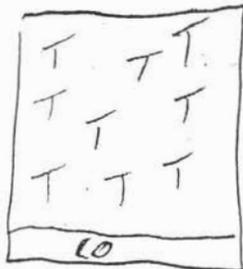
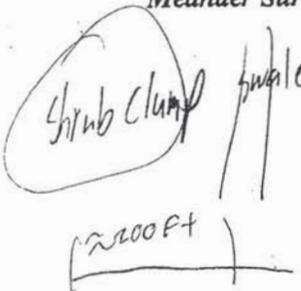
Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		3	Red-osier Dogwood		4
Silver Maple		3	Silky Dogwood		
Eastern Cottonwood		5	Winterberry Holly		
Box Elder	V. 2 	3.5	Chokecherry		
			Northern Arrowwood		

Total Live Trees: 18 Total Live Shrubs: 4  
745 + 19 186 5/9

Herbaceous Cover (%): \_\_\_\_\_

Invasive Plant Cover (%): RM Above

#### Meander Survey Comments (Use Additional Sheets As Necessary):



S. of here  
unquen RO band  
continues  
~ Sta 538  
RO band looks like  
SD, but white pith  
1A 548-00 RO band  
= SD

2-E-3

### Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): T.C. + J.S.  
Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Date: 9 June 06

Planting Area Location: Left Bank north of Dawes  
Riverbank Length (ft): 141 FT Avg width (ft): 11 FT  
Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_  
Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_  
Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

#### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	① 111	5	Red-osier Dogwood	0	0
Silver Maple	✓ 11 11111	9	Silky Dogwood	111 111 111	16
Eastern Cottonwood	1111 11111	12	Winterberry Holly		0
Box Elder	1111 111	7	Chokecherry		0
Volu Box Elder		27	Northern Arrowwood	1	1

↳ green ash volunteer = 3  
Total Live Trees: 33 Total Live Shrubs: 17  
↳ d = 477

Herbaceous Cover (%): \_\_\_\_\_  
Invasive Plant Cover (%): \_\_\_\_\_

High density because  
Volunteers + Proximity  
to existing tree line  
Bridge to S, extensive rip rap  
to N  
No shrub clumps  
until beyond rip rap  
~ 300 ft N

#### Meander Survey Comments (Use Additional Sheets As Necessary):

Heavy invasive cover above planting area  
- No red osier band and not 8ft on center

3-W-1

Geo Web

### Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): T.C. J.S.

Date: 9 June 06

Phase: Flow @ Coltsville (cfs)

Weather: \_\_\_\_\_

Planting Area Location: Right Bank Just South of Dawes Rd

Riverbank Length (ft): 65 Avg width (ft): 9

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

RO Band is SD

#### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	<u>1</u>		Red-osier Dogwood	<u>     </u>	<u>8</u>
Silver Maple	<u>2</u>		Silky Dogwood	<u>     </u>	<u>5</u>
Eastern Cottonwood	<u>1</u>		Winterberry Holly	<u>   </u>	<u>3</u>
Box Elder	<u>1</u>		Chokecherry	<u>   </u>	<u>3</u>
			Northern Arrowwood	<u> </u>	<u>1</u>

Total Live Trees: 4 Total Live Shrubs: 20

Herbaceous Cover (%): \_\_\_\_\_

Invasive Plant Cover (%): \_\_\_\_\_

#### Meander Survey Comments (Use Additional Sheets As Necessary):

Very sparse in front of green house & reversed force (4-9")  
 3 mystery shrubs - not pruning  
 Red clover dominant

All shrub clump w/ 4 trees interspersed some pockets of nothing shrubs not 4' on center  
 No signs of Geo Web  
 not very steep

3-10-2

### Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): \_\_\_\_\_ Date: \_\_\_\_\_

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: R bank 1/2 Dabest Pemaquoy - Bend in River

Riverbank Length (ft): 67 Avg width (ft): 14

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

#### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		3	Red-osier Dogwood		8
Silver Maple		3	Silky Dogwood		2
Eastern Cottonwood		1	Winterberry Holly		
Box Elder		2	Chokecherry		
* (unknown #1) collected		1	Northern Arrowwood		3

Total Live Trees: 9 Total Live Shrubs: 14  
417 650

Herbaceous Cover (%): \_\_\_\_\_

Invasive Plant Cover (%): \_\_\_\_\_

#### Meander Survey Comments (Use Additional Sheets As Necessary):

Shrubs - evenly distrib.  
 2-3 dense rows of GE plantings behind  
 typical density goes upstream - some pockets of no plantings  
 Shrub clump in 546-75 40x8' or so shrubs + PCBund

3-W-3

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): \_\_\_\_\_

Date: \_\_\_\_\_

Phase: \_\_\_\_\_

Flow @ Coltsville (cfs) \_\_\_\_\_

Weather: \_\_\_\_\_

Planting Area Location: GP Bank N of Kenoy - near wood fence

Riverbank Length (ft): 105 Avg width (ft): 17

Planting Area (sf): 1,365 = .03ac 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	1	6	Red-osier Dogwood	<del>     </del>	14
Silver Maple		4	Silky Dogwood		
Eastern Cottonwood		1	Winterberry Holly		4
Box Elder		1	Chokecherry		6
			Northern Arrowwood		2

Total Live Trees: 12

$\bar{x} = 3.83$

Total Live Shrubs: 26

$\bar{x} = 8.29$

Herbaceous Cover (%): \_\_\_\_\_

Invasive Plant Cover (%): \_\_\_\_\_

### Meander Survey Comments (Use Additional Sheets As Necessary):

RO Band ✓

shrubs evenly dist.,  $\approx 7$  ft spacing

2 rows of GE shrubs + trees behind

some large pockets of no plantings

5 x 25' pocket  
Missing trees  
below Road House  
(Sta. 518-25)

WAI Project # 104140

beneficially low density all up to  
3-W-2



# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): TC

Date: 6/9/16

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: S. Dawes - L Bank near Norway Maple

Riverbank Length (ft): 78 Avg width (ft): 10

Planting Area (sf): 780 10-20% Area (sf): \_\_\_\_\_

Comments: .0179 acres

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

*RO Band is Silky Dogwood  
Chokecherry need cultivars*

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	① 	2	Red-osier Dogwood		
Silver Maple	1 	4	Silky Dogwood	 	9
Eastern Cottonwood			Winterberry Holly		4
Box Elder	1 	7	Chokecherry		
			Northern Arrowwood		2

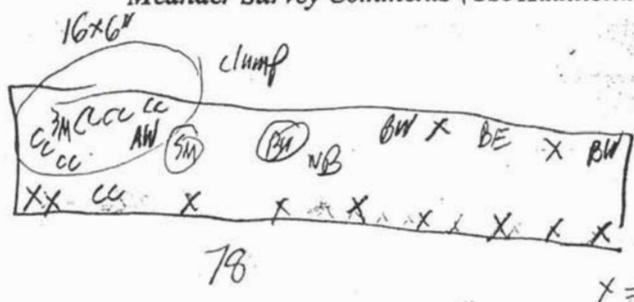
*cultivars?*

Total Live Trees: 13 Total Live Shrubs: 20  
726 t/g 1,116 t/g

Herbaceous Cover (%): \_\_\_\_\_ *Heavy shade from Norway maple*  
 Invasive Plant Cover (%): MF Rose, NW Maple

**Meander Survey Comments (Use Additional Sheets As Necessary):**

*looks sparsely planted because 9 trees are small volunteers*



*sediment fence set here exposed - photo - 100ft section on no RO band (residential)*

2 3-E-2

GEWEB

### Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): TC

Date: 6/9/16

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: L bank S. of DAWES behind brown shed; Brown House - GEWEB

Riverbank Length (ft): 38 Avg width (ft): 12

Planting Area (sf): 456 10-20% Area (sf): \_\_\_\_\_

Comments: = 0.01046 acres  
new planting, no recruits

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_  
Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

*Geoweb  
on  
map*

#### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow			Red-osier Dogwood	<u>5</u>	<u>5</u>
Silver Maple			Silky Dogwood		
Eastern Cottonwood	<u>7</u>	<u>7</u>	Winterberry Holly		
Box Elder	<u>1</u>	<u>1</u>	Chokecherry		
			Northern Arrowwood		

*yes, RO!*

Total Live Trees: 8 Total Live Shrubs: 5  
764 +/- 9 478 +/- 9

Herbaceous Cover (%): \_\_\_\_\_

Invasive Plant Cover (%): \_\_\_\_\_

*Shrub Camp approx 120' downstream*

Meander Survey Comments (Use Additional Sheets As Necessary):

3-E-3

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page \_\_\_ of \_\_\_

Observer(s): TC & JS Date: \_\_\_\_\_

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: L Bank N of Romney

Riverbank Length (ft): 77 Avg width (ft): 10

Planting Area (sf): 770 10-20% Area (sf): \_\_\_\_\_

Comments: .0176 acres NUM. BE volunteers - area to be mowed

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		5	Red-osier Dogwood		11
Silver Maple		5	Silky Dogwood		0
Eastern Cottonwood		1	Winterberry Holly		2
Box Elder		2	Chokecherry		3
		0	Northern Arrowwood		4

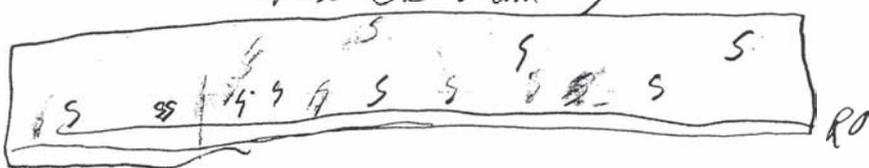
Total Live Trees: 13 Total Live Shrubs: 20  
738 1/9 1,136 5/9

Herbaceous Cover (%): \_\_\_\_\_

Invasive Plant Cover (%): \_\_\_\_\_

### Meander Survey Comments (Use Additional Sheets As Necessary):

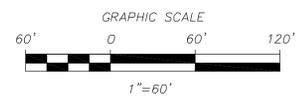
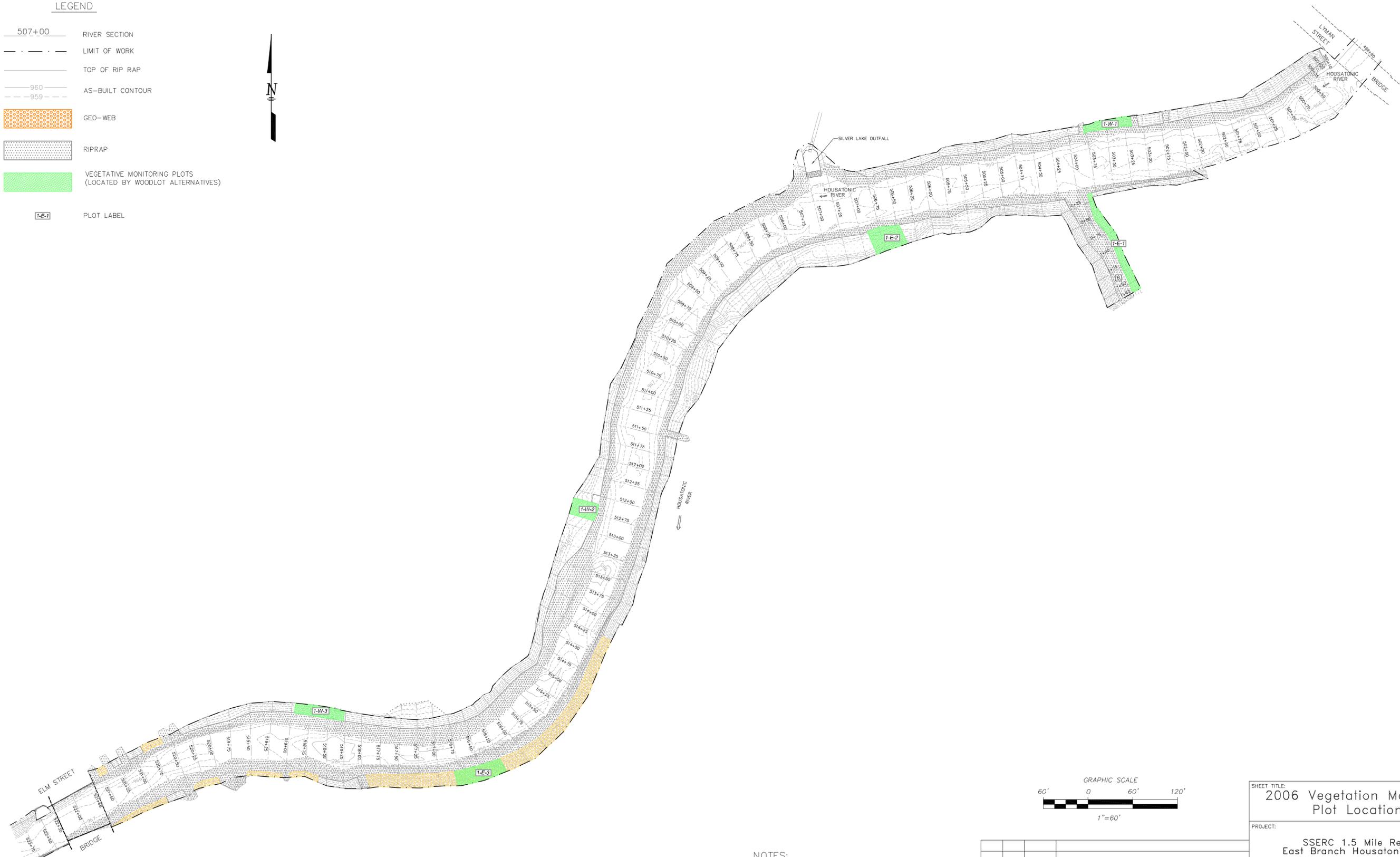
Sparse GE Planting



shrubs evenly distributed

LEGEND

- 507+00 RIVER SECTION
- LIMIT OF WORK
- TOP OF RIP RAP
- 960 AS-BUILT CONTOUR
- 959 AS-BUILT CONTOUR
- GEO-WEB
- RIPRAP
- VEGETATIVE MONITORING PLOTS (LOCATED BY WOODLOT ALTERNATIVES)
- [T-E-1] PLOT LABEL



NOTES:

1. AS-BUILT TOPOGRAPHIC SURVEY PERFORMED BY HILL ENGINEERS, ARCHITECTS, PLANNERS, INC. BETWEEN SEPTEMBER 2002 (PHASE #1) AND APRIL 2006 (END PHASE #3).
2. GEO-WEB LOCATIONS ARE BASED ON PLANS PROVIDED BY WESTON SOLUTIONS, INC. AND WERE NOT LOCATED IN THE FIELD (WITH AN INSTRUMENT) BY HILL-ENGINEERS, ARCHITECTS, PLANNERS, INC.

REV.	BY	DATE	STATUS

SHEET TITLE:  
**2006 Vegetation Monitoring Plot Locations**

PROJECT:  
**SSERC 1.5 Mile Reach  
East Branch Housatonic River  
Pittsfield, Massachusetts**

SHEET:  
**1**

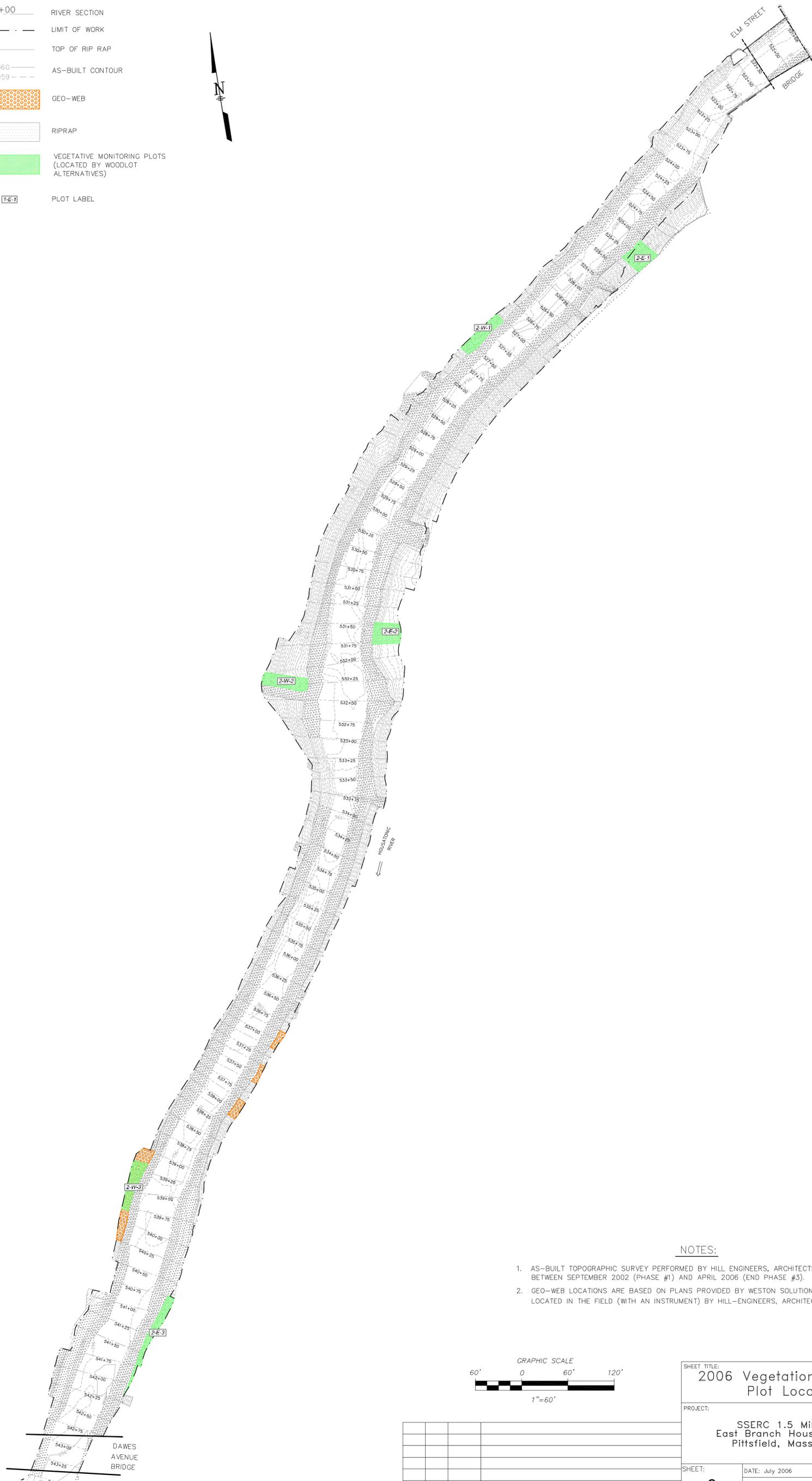
DATE: July 2006  
SCALE: 1"=60'  
PROJ. NO.: 104141.03



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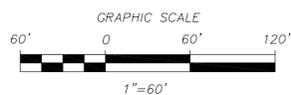
LEGEND

- 531+00 RIVER SECTION
- LIMIT OF WORK
- TOP OF RIP RAP
- 960 AS-BUILT CONTOUR
- 959 AS-BUILT CONTOUR
- GEO-WEB
- RIPRAP
- VEGETATIVE MONITORING PLOTS (LOCATED BY WOODLOT ALTERNATIVES)
- [1-E-1] PLOT LABEL



NOTES:

1. AS-BUILT TOPOGRAPHIC SURVEY PERFORMED BY HILL ENGINEERS, ARCHITECTS, PLANNERS, INC. BETWEEN SEPTEMBER 2002 (PHASE #1) AND APRIL 2006 (END PHASE #3).
2. GEO-WEB LOCATIONS ARE BASED ON PLANS PROVIDED BY WESTON SOLUTIONS, INC. AND WERE NOT LOCATED IN THE FIELD (WITH AN INSTRUMENT) BY HILL-ENGINEERS, ARCHITECTS, PLANNERS, INC.



SHEET TITLE:  
**2006 Vegetation Monitoring Plot Locations**

PROJECT:  
**SSERC 1.5 Mile Reach  
East Branch Housatonic River  
Pittsfield, Massachusetts**

SHEET:  
**2**

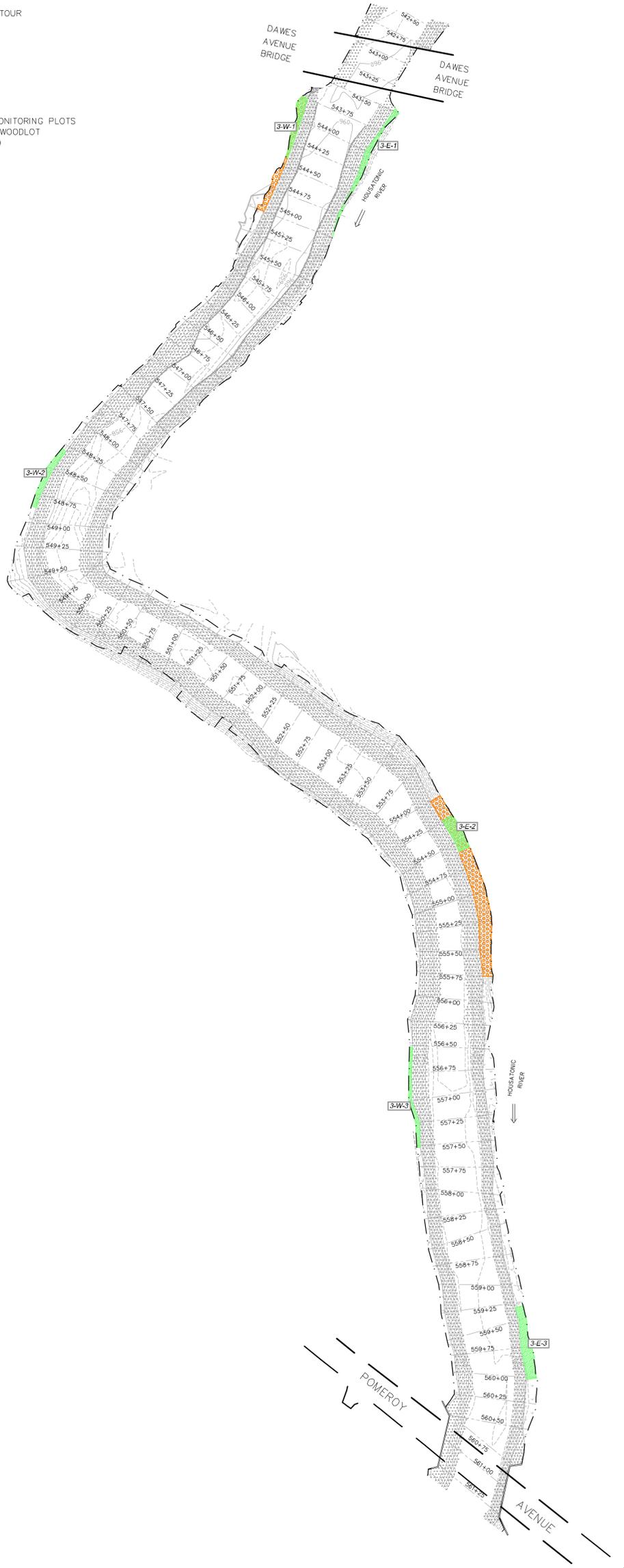
DATE: July 2006  
SCALE: 1"=60'  
PROJ. NO.: 104141.03



REV.	BY	DATE	STATUS

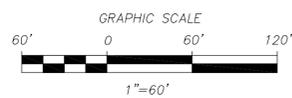
LEGEND

- 531+00 RIVER SECTION
- LIMIT OF WORK
- TOP OF RIP RAP
- 960 AS-BUILT CONTOUR
- 959 AS-BUILT CONTOUR
- GEO-WEB
- RIPRAP
- VEGETATIVE MONITORING PLOTS (LOCATED BY WOODLOT ALTERNATIVES)
- 1-E-1 PLOT LABEL



NOTES:

1. AS-BUILT TOPOGRAPHIC SURVEY PERFORMED BY HILL ENGINEERS, ARCHITECTS, PLANNERS, INC. BETWEEN SEPTEMBER 2002 (PHASE #1) AND APRIL 2006 (END PHASE #3).
2. GEO-WEB LOCATIONS ARE BASED ON PLANS PROVIDED BY WESTON SOLUTIONS, INC. AND WERE NOT LOCATED IN THE FIELD (WITH AN INSTRUMENT) BY HILL-ENGINEERS, ARCHITECTS, PLANNERS, INC.



REV.	BY	DATE	STATUS

SHEET TITLE: <b>2006 Vegetation Monitoring Plot Locations</b>	
PROJECT: SSERC 1.5 Mile Reach East Branch Housatonic River Pittsfield, Massachusetts	
SHEET: <b>3</b>	DATE: July 2006 SCALE: 1"=60' PROJ. NO.: 104141.03

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**APPENDIX D**

**SUMMER 2006 VEGETATION MONITORING REPORT**

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# Memorandum

To: Joel Lindsay (Weston Solutions, Inc.)  
From: Todd Chadwell (Woodlot Alternatives, Inc.)  
Cc: Michael Chelminski (Woodlot Alternatives, Inc.), John Lortie (Woodlot Alternatives, Inc.)  
Date: November 2, 2006  
Re: 1½-Mile Reach of the General Electric Pittsfield/Housatonic River Site, 2006 Summer Vegetation Monitoring Report

---

Woodlot Alternatives, Inc. (Woodlot) performed the 1½-Mile Reach of the General Electric Pittsfield/Housatonic River Site Summer 2006 Vegetation Monitoring on August 30 and August 31, 2006.

## 1.0 METHODS

### 1.1 Vegetation Monitoring

Vegetation monitoring work was performed by Woodlot in the three monitoring areas between the Lyman Street and Pomeroy Avenue bridges. These monitoring areas are delimited by the four bridges crossing the 1½-Mile Reach (Lyman Street, Elm Street, Dawes Avenue, and Pomeroy Avenue, respectively, from upstream to downstream). The three monitoring areas represented by these four delimiters are numbered 1-3, respectively, moving downstream from the Lyman Street Bridge. Each monitoring area is divided into sub-areas defined by the “east” (river-left) and “west” (river-right) sides of the Housatonic River, with three subplots established on each side of the river within each monitoring area. A total of 18 permanent monitoring plots were evaluated as part of this work.

Vegetation monitoring was not performed in the monitoring area between the Pomeroy Avenue Bridge and the confluence of the East and West Branches of the Housatonic River (Monitoring Area 4), as planting work was not completed at the time of the site visit.

The 18 permanent monitoring plots established in June 2006 were located and marked in the field. If the plot marker stakes could not be located, Woodlot re-established the plot based on construction plans used for plot-establishment in Spring 2006. Some variation between spring and summer tree and shrub tallies may have been a result of plots not being established in the original location. Trees and shrubs within each plot were tallied by species and noted as “healthy,” “stressed,” or “dead.” “Stressed” trees and shrubs were ones that had been topped off above the protective cage, experienced general die-back of the previous year’s growth, or were affected by insect herbivory. “Dead” trees and shrubs were those that exhibited no foliage and the inner cambium was dead throughout the entire above ground portion of the plant. Volunteers of species that were planted were included in the tally if they were greater than three inches in height and appeared to be likely to survive. Volunteers of other tree and shrub species were

recorded separately and not included in the tally. Herbaceous cover and invasive plant cover were recorded to the nearest 5 percent.

Meander surveys were performed along both banks of the river in each monitoring area to collect qualitative data on plant survivorship, observe invasive plant populations, and verify that plots were representative of surrounding areas.

## 2.0 RESULTS

The results of the monitoring plot inspection and meander surveys are summarized in this section. A discussion of the results and comparison to performance standards are provided in Section 3. Table 3 summarizes tree and shrub densities and red osier dogwood (*Cornus sericea*) status in each plot.

### 2.1 Tree and Shrub Density/Survivorship

Table 1 provides a summary of the results of the Summer 2006 monitoring event for trees and shrubs, and includes the Spring 2006 results for comparison. Details of plot characteristics may be found in Table 3. The performance standard for trees and shrubs is 80% survivorship. In most monitoring areas, exact numbers of planted trees and shrubs were not available, so survivorship was estimated by comparing the current plant density to the expected plant density based on the design. In select areas where the plant count was known, the direct comparison of the current count to the original planted count was made. In general, counted trees and shrubs within monitoring plots were compared to the original design planting density for each particular area. In two areas as noted in the table below, the percent survivorship was recorded, as the density comparison was inappropriate.

**Table 1. Comparison summary between Spring 2006 and Summer 2006 Monitoring Events**

Monitoring Area	Performance Standard Summary					
	Spring			Summer		
	Shrubs	Trees (non-GeoWeb)	Trees (Geoweb)	Shrubs	Trees (non-GeoWeb)	Trees (Geoweb)
Lyman-Elm (West)	97%	146%	NA	85%	125%	NA
Lyman-Elm (East)	95%	60%	119%	77%	103%	100%*
Elm-Dawes (West)	95%	163%	565%	102%	146%	287%
Elm-Dawes (East)	91%	156%	NA	96%	124%	NA
Dawes-Pomeroy (West)	134%	57%	60%	121%	100%*	90%
Dawes-Pomeroy (East)	141%	109%	188%	145%	88%	188%

\* Indicates percent survivorship

### 2.2 Herbaceous Cover

Herbaceous cover was at or above 95% and therefore achieved the performance standard, in all but one of the monitoring plots (Table 2). Herbaceous growth was particularly robust in the Lyman Street to Elm Street monitoring area, exceeding 6 feet in height (Photo 1) in some of this area. Monitoring plot 3-W-2 exhibited 90 percent herbaceous cover. Bare ground in this plot appeared to be the result of mowing and weed removal in close proximity to the ground surface by the property owner (Photo 2). Monitoring plot 2-W-1 exhibited 95 percent herbaceous plant cover, but some bare ground was observed. This appeared to be a result of hedge bindweed (*Calystegia sepium*) removal activities. Hedge bindweed had previously

formed a dense cover over desirable herbaceous species and some trees and shrubs. Because hedge bindweed was causing damage to trees and shrubs, some of it was removed prior to Summer 2006 Monitoring. Herbaceous growth underneath the hedge bindweed was dead by the time hedge bindweed was removed. Re-seeding this area is not recommended because it is anticipated that the existing seed/propagule bank will establish desirable herbaceous growth next year. However, efforts to control hedge bindweed should occur earlier in the growing season (June/July) in future years before hedge bindweed harms desirable plant growth and disperses its seed. Isolated areas of reduced cover (between 95 and 100% were in most cases the result of installation of an adjacent fence and/or burrowing mammal activities. No action is recommended for the mowed area (plot 3-W-2), as this area is likely to be continuously disturbed by the property owner.

### **2.3 Invasive Species Cover**

Invasive species cover was 5 percent or below in all monitoring plots (Table 2) and achieved the applicable performance standard. Invasive species encountered within monitoring plots included purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Polygonum cuspidatum*), Multiflora rose (*Rosa multiflora*), oriental bittersweet (*Celastrus orbiculata*), Morrow's honeysuckle (*Lonicera morrowii*), and Norway maple (*Acer platanoides*). Individuals and populations of these species were frequently encountered above and below the planting areas (e.g., purple loosestrife growing in riprap), but were not included in calculations. Even though the performance standard was met, it is recommended that populations of invasive species adjacent to planting areas be controlled if possible to reduce the invasion rate of restored planting areas.

### **2.4 Meander Survey Results**

#### **Lyman Street to Elm Street Reach**

This area is generally characterized by dense herbaceous growth. Original planting plans did not call for a red osier dogwood band to be installed in this area. Instead, red osier dogwoods were planted within shrub clumps with other species. Areas that were planted later may contain a red osier dogwood band. Some tree cages have been tipped over and other tree cages now contain no trees (Photo 3). Some trees are being constricted by tree protectors. Adjustment of the tree protectors is recommended. Ongoing remediation activities have impacted some plantings, resulting in tree and shrub losses. Between plots 1-E-3 and 1-E-4, three trees appear to have been killed from herbicide drift during Japanese knotweed spraying. Several stands of invasive reed canary-grass (*Phalaris arundinacea*) were encountered in this same location (Photo 4). Several red osier dogwoods are enclosed by cages near the Elm Street Bridge on the east bank. It is recommended that cages be removed as soon as possible to allow for proper growth of this species.

In addition to the reed canary-grass, invasive species observed in this reach include Japanese knotweed, purple loosestrife, multiflora rose, and oriental bittersweet. Percent cover of invasive species was similar to that recorded within monitoring plots and therefore appears to achieve the applicable performance standard.

#### **Elm Street to Dawes Avenue Reach**

Cages enclosing red osier dogwoods between plots 2-E-1 and 2-E-2 should be removed to allow proper growth of this species. Approximately 3 red osier dogwoods were absent on the east bank across from monitoring plot 2-W-2. Hedge bindweed growth was prolific in sections of this reach and should be controlled early next year (June/July) to reduce tree and shrub mortality as well as decrease the seed source.

**Table 2. Percent Herbaceous Cover and Percent Invasive Plant Species Cover Summary Information**

Monitoring Area	Bank	Date Monitored	Plot	Herbaceous Cover (%)	Invasive Plant Cover (%)	Invasive Species
Lyman-Elm	West	8/30/2006	1-W-1	>95	<5	<i>Lythrum salicaria</i>
Lyman-Elm	West	8/30/2006	1-W-2	>95	0	
Lyman-Elm	West	8/30/2006	1-W-3	100	<5	<i>Celastrus orbiculata</i>
<b>Monitoring Area Average</b>				<b>&gt;95</b>	<b>&lt;5</b>	
Lyman-Elm	East	8/30/2006	1-E-1	100	5	<i>Rosa multiflora, Lythrum salicaria</i>
Lyman-Elm	East	8/30/2006	1-E-2	100	<5	<i>Polygonum cuspidatum</i>
Lyman-Elm	East	8/30/2006	1-E-3	100	0	
<b>Monitoring Area Average</b>				<b>100</b>	<b>&lt;5</b>	
Elm-Dawes	West	8/30/2006	2-W-1	95	0	
Elm-Dawes	West	8/30/2006	2-W-2	100	0	
Elm-Dawes	West	8/30/2006	2-W-3	100	<5	<i>Celastrus orbiculata</i>
<b>Monitoring Area Average</b>				<b>&gt;95</b>	<b>&lt;5</b>	
Elm-Dawes	East	8/30/2006	2-E-1	95	0	
Elm-Dawes	East	8/30/2006	2-E-2	95	0	
Elm-Dawes	East	8/30/2006	2-E-3	100	<5	<i>Lythrum salicaria, Celastrus orbiculata, Lonicera morrowii</i>
<b>Monitoring Area Average</b>				<b>&gt;95</b>	<b>&lt;5</b>	
Dawes-Pomeroy	West	8/31/2006	3-W-1	100	<5	<i>Celastrus orbiculata</i>
Dawes-Pomeroy	West	8/31/2006	3-W-2	90 <sup>1</sup>	0	
Dawes-Pomeroy	West	8/31/2006	3-W-3	95	0	
<b>Monitoring Area Average</b>				<b>&gt;95</b>	<b>&lt;5</b>	
Dawes-Pomeroy	East	8/31/2006	3-E-1	100	5	<i>Rosa multiflora, Acer platanoides</i>
Dawes-Pomeroy	East	8/31/2006	3-E-2	95	0	
Dawes-Pomeroy	East	8/31/2006	3-E-3	100	0	
<b>Monitoring Area Average</b>				<b>&gt;95</b>	<b>&lt;5</b>	

<sup>1</sup> No action required as area is regularly mowed by residential property owner.

Invasive species encountered in this reach include Japanese knotweed, purple loosestrife, multiflora rose, and oriental bittersweet. Percent cover of invasive species was similar to that recorded within monitoring plots and therefore appears to achieve the applicable performance standard.

### **Dawes Avenue to Pomeroy Avenue Reach**

Based on the initial inspection of this area, some small areas were noted where additional planting might be necessary. As a follow-up, a more detailed walk-through was conducted by Woodlot, Weston, and EPA to confirm these areas that might require supplemental planting. The information gathered during both the initial inspection and the subsequent walk-through, and actions to be taken are summarized below by property. Weston is conducting supplemental planting during Fall 2006 to address all these areas.

#### **Dawes to Pomeroy - East**

##### **Parcel I7-3-7**

Plant 3 Red Osier Dogwoods (RODs) on riverbank along the riprap. Area located in the North West corner of the property. Measure and plant the RODs 8-feet on center.

Clean out weeds of the riverbank first and install additional topsoil on the riverbank. No trees to be planted because area too close to the apple trees.

-3 RODs total

##### **Parcel I7-3-5**

Japanese Knotweed is noted to be located in the North West corner of the parcel in the moved area and extending into the riverbank. The Japanese Knotweed is still healthy enough to be sprayed this season; Weston to coordinate with property owner for access and to ensure the lawn does not get moved after the spraying gets completed.

**Parcel I7-99-000** Japanese Knotweed present - have CL Frank inspect.

##### **Parcel I7-3-1**

Japanese Knotweed - have CL Frank inspect.

#### **Dawes to Pomeroy - West**

##### **Parcel I7-2-20**

Woodlot to calculate number of trees to be planted in a gap between GE and EPA plantings in area approximately 30' x 10', upstream from monitoring Plot 3-W-3. Area located by the large Maple tree.

Woodlot to flag out the locations (trees only). RODs already planted there.

10 Trees - BE (3), BW (2), EC (3), SM (2)

##### **Parcel I7-2-21**

Plant 1 ROD on riverbank along the riprap. Plant a row of 12 trees behind the existing tree line and stay 5-feet off the white scalloped fence.

Clean out weeds in the riverbank first and install additional topsoil on the riverbank.

-1 ROD

-12 trees (measure 8-feet on center) 3 cottonwood, 3 silver maple, 3 willows & 3 box elders.

**Parcel I7-2-22**

Plant 2 RODs on riverbank along the riprap.  
-2 RODs

**Parcel I7-2-23**

Plant 1 ROD on riverbank along the riprap.  
-1 ROD

**Parcel I7-2-25**

Plant 3 RODs on riverbank along the riprap.  
-3 RODs

**Parcel I7-2-26** Plant 4 RODs on riverbank along the riprap and 5 trees on the riverbank.

-4 RODs  
-5 trees; 2-cottonwoods, 1 silver maple, 1 black willow and 1 box elder.

**Parcel I7-2-36** Plant 2 RODs on riverbank along the riprap, corner of property with Rahilly.

-2 RODs

Invasive species encountered in this reach include Norway maple (*Acer platanoides*), purple loosestrife, multiflora rose, Japanese knotweed and oriental bittersweet. Percent cover of invasive species was similar to that recorded within monitoring plots and therefore appears to achieve the applicable performance standard.

### 3.0 DISCUSSION

The observed condition of the planted stock was good. Minimal, recent die-off was observed, and significant contribution from volunteers was apparent, suggesting that conditions are suitable for 1) continued growth of planted stock, and 2) continued recruitment and growth of volunteer stock. As stated above, the performance standard for planted stock is 80% survivorship. In most cases, because the exact number of planted trees was not known, the observed density was compared to the original design density to estimate survivorship. In select cases where the number of plants installed was known, a direct comparison of the current number to the original number was made to assess survivorship. Below is a more detailed discussion of how tree and shrub densities were determined and specific discussion of monitoring areas where tree and shrub densities or survivorship were observed to be below the 80 percent performance standard.

Calculations of tree and shrub densities were based on the presence or absence of shrub clumps. If shrubs were evenly distributed within the monitoring area, shrub density should have been 730 shrubs/acre and tree density should be 700 trees/acre in normal plots or 500 trees/acre in areas with Geoweb ®. If a defined shrub clump was observed, the area of the shrub clump was delineated and resulting shrub density within the clump should have been 2,722 shrubs/acre if shrubs were planted 4 feet on center. Table 3 summarizes tree and shrub densities.

Three trees within Plot 1-W-1 were removed during construction of a chain link fence adjacent to a parking lot in this area. The existing permanent plot width was subsequently reduced from 11 to 10 feet in Plot 1-W-1. Because tree density within the plot remains high (1,123 trees/acre), supplemental tree planting is not recommended in this location.

After conducting the Spring 2006 vegetation monitoring, it was observed that all three plots on the LE-East monitoring area (Lyman Street to Elm Street) consisted of predominantly shrub clumps. Plot 1-E-2 was therefore relocated immediately downstream to better assess tree densities within this monitoring area.

Plot 1-E-1 appears to have been impacted by ongoing remediation activities and supplemental planting has been scheduled in this area. Initial tree density within plot 1-E-3 was below 500 trees/acre because of the extreme slope in this location. Based on observed lack of mortality and the observed presence of healthy volunteer box elder seedlings during the Spring inspection (due to dense herbaceous growth in this plot, it is likely that these volunteers were present but not located during this inspection), the performance standard relative to survivorship is essentially 100% in plot 1-E-3.

Monitoring areas that were planted with shrubs evenly distributed instead of planted with shrub clumps exceeded the 80 percent performance standard (584 shrubs/acre) in all cases. Shrubs that were planted in clumps were above the 80 percent performance standard of shrub density per clump (2,178 shrubs/acre) in all plots except for plot 1-E-1 (1,170 shrubs/acre). Shrub density in plot 1-E-1 was likely impacted by ongoing remediation activities and therefore did not meet the performance standard. Supplemental planting has been scheduled in this area.

Gaps in the red osier dogwood band were noted in plot 2-W-1 (Elm Street to Dawes Avenue Reach) and during the meander survey in the Dawes Avenue to Pomeroy Avenue Reach. These areas have been slated for additional red osier dogwood planting in the Fall 2006.

In area DP-West (plots 3-W-2 and 3-W-3) in the Dawes Avenue to Pomeroy Avenue Reach the number of trees planted by GE is known; therefore the measurement method to determine compliance with the performance standard was a direct plant count comparison rather than comparison of plant density to original design density. Planting of trees and shrubs by GE in this area was conducted over a slightly larger area than originally prescribed by EPA; therefore the density of trees and shrubs is somewhat less than the standard 730 shrubs/acre and 700 trees/acre. However, survivorship is excellent (100%).

Many of the shrubs planted by GE between Dawes Avenue and Pomeroy Avenue have protective cages around them. Shrubs will grow through the cages and will need to be pruned when cages are removed. It is recommended that these cages be removed as soon as possible. If there is a threat that property owners may damage installed shrubs during lawn maintenance, smaller protective barriers constructed of corrugated drainage pipe or 10-inch diameter wire cages are recommended.

The majority of the tree cages are well maintained. However, several cages appeared to be lacking stem protectors, allowing trees to be damaged by rubbing against the wire. Some trees were observed growing through tree cages (Photo 7), which will eventually cause the limb to die and additional stress to the tree. Also, tree cages that no longer protect living trees should be removed from the site. One tree cage was observed in the river bed (Photo 8). Tree cages should be monitored regularly and appropriate adjustments made accordingly.

Invasive species were noted within plots and during meander surveys, including Japanese knotweed, multiflora rose, Norway maple, purple loosestrife, reed canary-grass, and oriental bittersweet. A program of on-going invasive species control is in place. Future monitoring will evaluate the effectiveness of this program. If a spray herbicide is being used, particular care should be taken to avoid drift onto desired plants. Although false hedge bindweed (also referred to as false morning glory) is not an invasive

species, this plant has become a problem in certain areas (i.e., between Lyman Street and Elm Street, and on the west river bank south of Dawes Avenue). This herbaceous vine climbs up tree cages and damages trees by competing for light and pulling the tree down. It is recommended that false hedge bindweed be removed from tree cages during the months of June and July.

#### 4.0 RECOMMENDATIONS

The following actions are recommended for implementation in Fall 2006:

- Locate and plant gaps in the red osier dogwood band in the Elm Street to Dawes Avenue, and Dawes Avenue to Pomeroy Avenue reaches.
- Evaluate damage caused by ongoing remediation below Lyman Street and replant trees and shrubs lost in remediation process.
- Continue invasive plant control work, including addressing the presence of Japanese knotweed, multiflora rose, Norway maple, purple loosestrife, reed canary-grass, and oriental bittersweet.
- Remove tree cages around shrubs in the monitoring area between Dawes Avenue and Pomeroy Avenues as soon as possible.
- Maintain all tree cages and remove all empty tree cages.
- Institute permanent plot markers for established monitoring plots (e.g., additional wooden stakes, tree tags affixed to trees located at the corners of the plots).
- Install supplemental plantings on properties between Dawes Avenue and Pomeroy Avenue as described in this memo.

## 5.0 PHOTOGRAPHS



**Photo 1. Dense Herbaceous Growth in Lyman Street to Elm Street Monitoring Area.**



**Photo 2. Bare Ground Apparently Resulting from Mowing Activities (Plot 3-W-2).**



**Photo 3. Tipped Over/Empty Tree Cage.**



**Photo 4. Invasive Reed Canary-Grass (*Phalaris arundinacea*) on East Bank Between Lyman Street and Elm Street.**



**Photo 5. Area Recommended for Additional Planting on West Bank Between Dawes Avenue and Pomeroy Avenue.**



**Photo 6. Area Recommended for Additional Planting on West Bank Between Dawes Avenue and Pomeroy Avenue.**

TABLE 3

Field Data, Notes, Data Analysis  
Summer 2006 Vegetation Monitoring

Monitoring Performed by Todd Chadwell, Woodlot Alternatives, Inc.

Reach	Bank	Sample No.	Type	Date	Dimensions				Trees					Shrubs					Total Plants		General Plant Observations			Red Osier Band Comments				
					L (ft)	Slope W (ft)	Height (ft) <sup>1</sup>	W (ft)	Area (ft <sup>2</sup> )	BW	SM	EC	BE	Total Trees	Tree Density (Regular)	ROD	SD	WH	CC	NA	Total Shrubs	Shrub Density	Total Plants		Stressed	Dead	Volunteers	
Lyman-Elm	West	1-W-1	Regular	8/30/2006	61	10	3	9.5	582	3	4	5	3	15	1123	0	0	0	0	0	0	15	0	1	0	Absent		
Lyman-Elm	West	1-W-2	Regular	8/30/2006	32	31	4.5	30.7	981	2	8	6	6	22	978	3	2	0	0	2	7	311	29	2	2	1	Incomplete	
Lyman-Elm	West	1-W-3	Regular	8/30/2006	67	22	5	21.4	1435	4	3	5	5	17	516	9	4	3	3	4	23	698	40	0	0	0	Complete	
Monitoring Area Average																												
Lyman-Elm	East	1-E-1	Regular	8/30/2006	139	12	2	11.8	1645	4	5	2	4	15	397	11	9	2	0	2	24	636	39	2	0	0	Incomplete	
Lyman-Elm	East	1-E-2	Regular	9/28/2006	45	34.5	2	34.4	1550	7	6	12	12	37	1040	1	0	0	0	0	1	28	38	5	1	3	Incomplete	
Lyman-Elm	East	1-E-3	Geoweb	8/30/2006	70	22	13	17.7	1242	0	0	0	9	9	N/A	12	6	0	5	0	23	806	32	1	0	3	Complete	
Monitoring Area Average																												
Elm-Dawes	West	2-W-1	Regular	8/30/2006	63	18	6.5	16.8	1057	6	6	6	4	22	906	6	3	0	0	1	10	412	32	2	0	0	20 ft gap	
Elm-Dawes	West	2-W-2	Regular	8/30/2006	17	57	19	53.7	914	6	1	9	8	24	1144	1	0	0	0	0	1	48	25	0	0	0	Irregular	
Elm-Dawes	West	2-W-3	Geoweb	8/30/2006	66	18	11	14.2	940	0	1	1	29	31	1436	0	9	0	4	3	16	741	47	0	0	26	SD Band	
Monitoring Area Average																												
Elm-Dawes	East	2-E-1	Regular	8/30/2006	33	31	15	27.1	895	1	0	7	3	11	535	6	7	5	3	4	25	1216	36	0	0	0	Complete	
Elm-Dawes	East	2-E-2	Regular	8/30/2006	27	35	9	33.8	913	3	3	8	3	17	811	5	0	0	0	0	5	238	22	1	0	0	Complete	
Elm-Dawes	East	2-E-3	Regular	8/30/2006	141	11	5	9.8	1382	5	6	11	18	40	1261	0	15	0	0	1	16	504	56	0	0	10	SD Band	
Monitoring Area Average																												
Dawes-Pomeroy	West	3-W-1	Geoweb	8/31/2006	65	9	1	8.9	581	1	2	1	2	6	N/A	0	10	2	3	1	16	1199	22	0	1	0	SD Band	
Dawes-Pomeroy	West	3-W-2	Regular	8/31/2006	67	14	0	14.0	938	4	2	1	2	9	N/A	8	1	0	0	3	12	557	21	0	0	0	Complete	
Dawes-Pomeroy	West	3-W-3	Regular	8/31/2006	105	13	0	13.0	1365	6	4	1	1	12	N/A	14	0	6	5	2	27	862	39	0	0	0	Complete	
Monitoring Area Average																												
Dawes-Pomeroy	East	3-E-1	Regular	8/31/2006	78	10	4	9.2	715	2	2	0	5	9	548	0	12	3	5	3	23	1401	32	0	2	2	SD Band	
Dawes-Pomeroy	East	3-E-2	Geoweb	8/31/2006	38	12	7	9.7	370	0	0	7	1	8	941	5	0	0	0	5	588	13	0	0	0	Complete		
Dawes-Pomeroy	East	3-E-3	Regular	8/31/2006	77	10	0	10.0	770	6	4	2	0	12	679	11	1	2	4	3	21	1188	33	1	0	0	Complete	
Monitoring Area Average																												

Notes:

- 1: From As-Built CAD Drawing
- 2: 3-W-1 Height based on field observation
- 3: 3-E-1 Height based on field observation

Species Legend  
 BW = black willow  
 SM = silver maple  
 EC = eastern cottonwood  
 BE = box elder  
 vines = river grape

SD = silky dogwood  
 ROD = red-osier dogwood  
 AW = arrowwood  
 WB = winterberry  
 CC = chokecherry

TABLE 3  
Field Data, Notes, Data Analysis  
Summer 2006 Vegetation Monitoring

Monitoring Performed by Todd Chadwell, Woodlot Alternative

Reach	Bank	Sample No.	Type	Plot Characterization	Shrub Clumps				Trees				Performance Standard Summary					
					Length	Width	Shrub No.	Area*	Shrub D (shrubs/acre)	Target D (shrubs/acre)	% Target D	Area	Tree Density (trees/acre)	Target D (trees/acre)	% Target D	Shrubs	Trees (non-GeoWeb)	Trees (GeoWeb)
Lyman-Elm	West	1-W-1	Regular	no shrubs clumps or RO band, shrub clump immediately upstream								582	1123	700	160%			
Lyman-Elm	West	1-W-2	Regular	4 shrubs projecting in from clump upstream, RO band incomplete								981	976	700	139%			
Lyman-Elm	West	1-W-3	Regular	shrub clump approx. 24x14ft at S edge of plot	24	14	14	264	2311	2723	85%	1435	516	700	74%			
Monitoring Area Average												Monitoring Area Average				85%	125%	NA
Lyman-Elm	East	1-E-1	Regular	shrub clump approx. 77x8ft in center of plot, RO band 77 ft in length	77	8	13	484	1170	2723	43%	1645	397	700	57%			
Lyman-Elm	East	1-E-2	Regular	shrub clump immediately upstream								1550	1040	700	149%			
Lyman-Elm	East	1-E-3	Geoweb	all shrubs with interspersed trees, shrubs 4-10ft OC, avg 7 ft OC				1242	806	730	110%	1242	N/A	N/A	100%			
Monitoring Area Average												Monitoring Area Average				77%	103%	100%
Elm-Dawes	West	2-W-1	Regular	2 shrubs projecting in from clump upstream								1057	906	700	129%			
Elm-Dawes	West	2-W-2	Regular	RO band unevenly spaced, shrub clump immed. upstream								914	1144	700	163%			
Elm-Dawes	West	2-W-3	Geoweb	shrubs distributed evenly with trees				940	741	730	102%	940	1436	500	287%			
Monitoring Area Average												Monitoring Area Average				102%	146%	287%
Elm-Dawes	East	2-E-1	Regular	shrub clump approx. 1/2 of plot extending upstream (triangle)			19	316	2622	2723	96%	895	535	700	76%			
Elm-Dawes	East	2-E-2	Regular	no shrub clumps, shrub clump approx. 200 ft upstream and downstream								913	811	700	116%			
Elm-Dawes	East	2-E-3	Regular	no shrub clumps, shrub clump approx. 300 ft upstream								1382	1281	700	180%			
Monitoring Area Average												Monitoring Area Average				96%	124%	NA
Dawes-Pomeroy	West	3-W-1	Geoweb	all shrub clump w/ trees interspersed, some area void of plantings				581	1199	730	164%	581	450	500	90%			
Dawes-Pomeroy	West	3-W-2	Regular	shrubs distributed evenly with trees, GE planting adjacent				938	N/A	N/A	100%	938	N/A	N/A	100%			
Dawes-Pomeroy	West	3-W-3	Regular	shrubs distributed evenly, some area void, GE planting adjacent				1365	N/A	N/A	100%	1365	N/A	N/A	100%			
Monitoring Area Average												Monitoring Area Average				121%	100%	90%
Dawes-Pomeroy	East	3-E-1	Regular	shrub clump approx. 16x6ft w/ some interspersed shrubs	16	6	6	75	3466	2723	127%	715	548	700	78%			
Dawes-Pomeroy	East	3-E-2	Geoweb	no shrub clumps, shrub clump approx. 120 ft downstream								370	941	500	188%			
Dawes-Pomeroy	East	3-E-3	Regular	shrubs distributed evenly with trees, GE planting adjacent				770	1188	730	163%	770	679	700	97%			
Monitoring Area Average												Monitoring Area Average				145%	88%	188%

Notes:

\* area of ellipse or triangle for shrub clumps  
shrub clump

denotes plots where survivorship criterion is based on actual original count rather than comparison to design density

Target Planting Densities

Normal Geoweb  
Trees: 700 500.0 per acre  
Shrubs: 730 730.0 per acre  
Total: 1430 1230.0 per acre

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 1 of 16

Observer(s): \_\_\_\_\_ Date: 8/30/06  
 Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 1-W-1  
 Riverbank Length (ft): ~65 Avg width (ft): \_\_\_\_\_  
 Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_  
 Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		3	Red-osier Dogwood	/	
Silver Maple		4	Dogwood	/	
Eastern Cottonwood		5	Winterberry Holly	/	
Box Elder	 ①	3	Chokecherry	/	
			Northern Arrowwood	/	

Total Live Trees: 15 Total Live Shrubs: 0

Herbaceous Cover (%): 98 *Special cages w/ no protectors some bare soil from tree const.*

Invasive Plant Cover (%): 190 PL, Greater PL in Rip Rap

Lyman South to 1-W-1 **Meander Survey Comments (Use Additional Sheets As Necessary):**  
~~Lyman South~~ 1 JKNW, some PL, few tree cages tipped over, few tree cages w/ no protectors, 1 tree case tipped & empty. (photos)

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

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Observer(s): TC Date: 8/30/06  
 Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 1-W-2  
 Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_  
 Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_  
 Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_  
 Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total (live)	Shrubs	Quantity (live)	Total
Black Willow	 0	2	Red-osier Dogwood		
Silver Maple	 0	8	Silky Dogwood		
Eastern Cottonwood		6	Winterberry Holly		
Box Elder	 v	5 6	Chokecherry		
			Northern Arrowwood		

Total Live Trees: ~~2~~ 22 Total Live Shrubs: 7

Herbaceous Cover (%): 99 (bare soil from fence const.)  
 Invasive Plant Cover (%): 0 (1 PL in Riprap) 1 PL in NRD Nor Plot

**Meander Survey Comments (Use Additional Sheets As Necessary):**  
1-W-1 South to 1-W-2; Construction area behind western red fence placed on trees / JKN SW of Subaru (non NRD)

Photos  
 1. N → S  
 2. from River  
 3. S → N

5  
 10  
 6  
 6

N  
 N  
 e  
 S  
 N

≈ 10:00

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 3 of 18

Observer(s): TC Date: 8/30/06  
 Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 1-W-3  
 Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_  
 Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_  
 Comments: Plot Markers Removed <sup>measured</sup> 67x18'

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_  
 Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		4	Red-osier Dogwood		9
Silver Maple		3	Silky Dogwood		4
Eastern Cottonwood		5	Winterberry Holly		3
Box Elder		5	Chokecherry		3
			Northern Arrowwood		4

Total Live Trees: 17 Total Live Shrubs: 23

Herbaceous Cover (%): 100

Invasive Plant Cover (%): 0 19% C. orb.

**Meander Survey Comments (Use Additional Sheets As Necessary):**

1-W-2 S to 1-W-3;  
 1 bit SW & RosMutt below Harry's Restoration  
 few tipped cages  
 1-W-3 → Elm - 2 tipped cages (no trees); little PL in NPPAP

10:50

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

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Observer(s): TC under B. MRC

Date: 8/30

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 1-E-1

Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

*tree + shrub removal by 8/30*

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		4	Red-osier Dogwood	<sup>###</sup>	11
Silver Maple	 <i>100% GRASS</i>	5	Silky Dogwood	 	9
Eastern Cottonwood		2	Winterberry Holly		2
Box Elder		4	Chokecherry		
			Northern Arrowwood		2

Total Live Trees: 15 Total Live Shrubs: 24

Herbaceous Cover (%): 100%

Invasive Plant Cover (%): Rosa Multi-flora (1), Purple Loosestrife ≈ 25%

**Meander Survey Comments (Use Additional Sheets As Necessary):**

1-E2 → 1-E1 *Tree protectors need adjusted super thick growth*

*r*

*2  
1.20*

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 5 of 18

Observer(s): TC Date: 8/20/06

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 1-E-2

Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow			Red-osier Dogwood		2
Silver Maple			Silky Dogwood	 	7
Eastern Cottonwood		2	Winterberry Holly		4
Box Elder	 	7	Chokecherry		6
1 quality Aspen		8' tall	Northern Arrowwood		5

Total Live Trees: 9 Total Live Shrubs: 29

Herbaceous Cover (%): 100 Thick growth

Invasive Plant Cover (%): 1% JAP. Knotweed

**Meander Survey Comments (Use Additional Sheets As Necessary):**

1-E-3 → 1-E-2 Phal Arrowed stands (6x8') across river from big white building  
Bigger stand = 100' N  
JNW spray damage to 3 trees S. of plot  
6-7 uped out trees from construction N of plot

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 6 of 14

Observer(s): TC Date: 8/30/06

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 1-E-3

Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow			Red-osier Dogwood	<del>     </del>	<del>9</del>
			<i>struck</i>		3
Silver Maple			Silky Dogwood	<del>    </del>	<del>5</del>
			<i>no found</i>		1
Eastern Cottonwood			Winterberry Holly		
Box Elder	<del>     </del>	<del>6</del>	Chokecherry	<del>    </del>	<del>5</del>
		3			
			Northern Arrowwood		

Total Live Trees: 9 Total Live Shrubs: 23

Herbaceous Cover (%): 100 (25% pwc Des can)

Invasive Plant Cover (%): 0 - 1 PL in Rip Rap

**Meander Survey Comments (Use Additional Sheets As Necessary):**

*Flm → 1-E-3 Dogwoods need removed from cages*

## Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 7 of 16

Observer(s): TC, MRC, Ken Murray USFWS Date: 8-30-06  
 Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 2-W-1  
 Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_  
 Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_  
 Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_  
 Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	~	6	Red-osier Dogwood		6
Silver Maple		6	Silky Dogwood		3
Eastern Cottonwood	-	6	Winterberry Holly		
Box Elder	~	4	Chokecherry		
			Northern Arrowwood		1

Total Live Trees: 22 Total Live Shrubs: 10

Herbaceous Cover (%): 95%

Invasive Plant Cover (%): 0%

**Meander Survey Comments (Use Additional Sheets As Necessary):**

Hedge Bindweed & GRASS IS DAMAGING  
Plant Stock Must Be Cleared  
 - Ground Cover Compromised By Dying Bindweed Removal → Potential Erosion  
4:45 pm

## Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 8 of 146

Observer(s): TC & MC

Date: 8/30/06

Phase: Flow @ Coltsville (cfs)

Weather: \_\_\_\_\_

Planting Area Location: Z-W-2

Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	<sup>1</sup>	6	Red-osier Dogwood		1
Silver Maple		1	Silky Dogwood		
Eastern Cottonwood	<sup>    </sup>	9	Winterberry Holly		
Box Elder		8	Chokecherry		
			Northern Arrowwood		

Total Live Trees: 24 Total Live Shrubs: 1

Herbaceous Cover (%): 100%

Invasive Plant Cover (%): 0 *Loosestrife in Riprap*

Meander Survey Comments (Use Additional Sheets As Necessary):

## Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 9 of 18

Observer(s): Todd C.

Date: 8-30-06

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 2-W-3

Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow			Red-osier Dogwood		
Silver Maple	1	1	Silky Dogwood		4
Eastern Cottonwood	1	1	Winterberry Holly		
Box Elder	 26 ✓	3/26	Chokecherry		4
			Northern Arrowwood		3

Total Live Trees: 31 Total Live Shrubs: 16

Herbaceous Cover (%): 100.50

Invasive Plant Cover (%): < 5% *Bittersweet*

### Meander Survey Comments (Use Additional Sheets As Necessary):

*2-W-3 ⇒ 2-W-2 : bitter sweet + PL in planting area, above & below*

Time: 4:00 PM

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 10 of 196

Observer(s): TC&MC Date: \_\_\_\_\_

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 2-E-

Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		1	Red-osier Dogwood	<del>    </del>	6
Silver Maple			Silky Dogwood	<del>    </del>	7
Eastern Cottonwood	<del>    </del>	7	Winterberry Holly	<del>    </del>	5
Box Elder		3	Chokecherry		3
			Northern Arrowwood		4

Total Live Trees: 11 Total Live Shrubs: 25

Herbaceous Cover (%): ~~100~~ 95

Invasive Plant Cover (%): 0

*stress on silky dogwood  
looks dry  
herb layer low*

*Meander Survey Comments (Use Additional Sheets As Necessary):*

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 11 of 16

Observer(s): TC & MC

Date: 8-30-06

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 2-E-2

Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		3	Red-osier Dogwood		5
Silver Maple	<sup>~</sup>	3	Silky Dogwood		
Eastern Cottonwood		8	Winterberry Holly		
Box Elder		3	Chokecherry		
			Northern Arrowwood		

Total Live Trees: 17 Total Live Shrubs: 5

Herbaceous Cover (%): 95%

Invasive Plant Cover (%): 0 *Purple loosestrife in Riprap*

**Meander Survey Comments (Use Additional Sheets As Necessary):**

*2-E-1 → 2-E-2: Red osiers in cages, evenly spaced RO  
 ~ 3- trees in RO band, Bindweed problem*

*~ 3:00 PM*

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 12 of 14

Observer(s): Tooo Date: \_\_\_\_\_

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 2-E-3

Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		5	Red-osier Dogwood		
Silver Maple	<sup>1</sup>	6	Silky Dogwood	<del>    </del>	15
Eastern Cottonwood	<sup>1</sup>	11	Winterberry Holly		
Box Elder		8	Chokecherry		
	~10 small vol Box Elder	10	Northern Arrowwood		1

Total Live Trees: 40 Total Live Shrubs: 16

Herbaceous Cover (%): 100%

Invasive Plant Cover (%): 45%

*various Honey suck  
Purple Loosestrife  
Bittersweet Regulus Control*

**Meander Survey Comments (Use Additional Sheets As Necessary):**

2-E-2 → 2-E-3  
*JWW above & between, IMFR  
 25' RO gap X 2-W-2 Big problems w/ RO spacing, + trees in RO band*



# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 13 of 18

Observer(s): TC Date: 8/31

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 3W-1

Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: could not locate pins, used prev. flags

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	1	1	Red-osier Dogwood	7	7
Silver Maple	2	2	Silky Dogwood	3	3
Eastern Cottonwood	1	1	Winterberry Holly	2	2
Box Elder	2	2	Chokecherry	3	3
			Northern Arrowwood	1	1

Total Live Trees: 6 Total Live Shrubs: 16

Herbaceous Cover (%): 100 *near "project cover"*

Invasive Plant Cover (%): ? plants, bit SW. PL below heavy weed growth

**Meander Survey Comments (Use Additional Sheets As Necessary):**

3W-2 → 3W-1: ~ 20' x 12' hole SE of blue fence ≈ 6 trees  
RO band present photo 11:22

Behind blue house - very sparse ≈ 2 RO

## Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 14 of 18

Observer(s): TC

Date: 8/3/06

Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 3-W-2

Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_

Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_

Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

### Plant Survivorship:

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		4	Red-osier Dogwood	<del>    </del>	8
Silver Maple		2	Silky Dogwood		1
Eastern Cottonwood		1	Winterberry Holly		
Box Elder		2	Chokecherry		
			Northern Arrowwood		3

Total Live Trees: 9 Total Live Shrubs: 12 <sup>12+1</sup>

Herbaceous Cover (%): 90% *mowing + weed eating*

Invasive Plant Cover (%): 0

### Meander Survey Comments (Use Additional Sheets As Necessary):

*-W-3 → 3-W-2* *37 missing behind green* *white fence*  
*1 dead because planted in hole in RR?*  
*Behind black fence some RO planted in wrong location*  
*Need ~ 5 RO behind original*

# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 15 of 18

Observer(s): TC Date: 8/31/06  
 Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 3-W-3  
 Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_  
 Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_  
 Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_  
 Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

*BW growing thr. wire*

*blight? on RO & WP*

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		6	Red-osier Dogwood		14
Silver Maple		4	Silky Dogwood		
Eastern Cottonwood		1	Winterberry Holly	1	56
Box Elder		1	Chokecherry		45
			Northern Arrowwood		2

Total Live Trees: 12 Total Live Shrubs: 25 ~~26~~ 27

Herbaceous Cover (%): 100 ~~79~~ 95 *Small patch of bare ground above RR*

Invasive Plant Cover (%): 0

**Meander Survey Comments (Use Additional Sheets As Necessary):**

*3-W-3 → 3-W-2*

*T=10.27*



# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 6 of 18

Observer(s): \_\_\_\_\_ Date: 8/31/06  
 Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 3-E-1  
 Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_  
 Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_  
 Comments: could not locate stakes - flag present

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_  
 Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

*choke cherry is cultivar*

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow	<u>1</u>	<u>1</u>	Red-osier Dogwood		
Silver Maple	<u>11</u>	<u>2</u>	Silky Dogwood <i>clump</i>	<u>11</u>	<u>9</u> <u>10</u>
Eastern Cottonwood			Winterberry Holly	<u>11</u>	<u>2</u>
Box Elder	<u>11</u>	<u>3</u>	Chokecherry	<u>11</u>	<u>5</u>
			Northern Arrowwood	<u>111</u>	<u>3</u>

Total Live Trees: 6 Total Live Shrubs: 49 20

Herbaceous Cover (%): 100 ~~MF Rose~~

Invasive Plant Cover (%): 52 MF Rose, Norway maple

Meander Survey Comments (Use Additional Sheets As Necessary):

*T- 900*

2  
1/3  
0  
1/6

0  
9  
4  
5  
2

## Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 7 of 18

Observer(s): TC Date: 8/31/16  
 Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 3-E-2  
 Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_  
 Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_  
 Comments: \_\_\_\_\_

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_  
 Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow			Red-osier Dogwood		5
Silver Maple			Silky Dogwood		
Eastern Cottonwood		7	Winterberry Holly		
Box Elder	1	1	Chokecherry		
			Northern Arrowwood		

Total Live Trees: 8 Total Live Shrubs: 5

Herbaceous Cover (%): 95

Invasive Plant Cover (%): 0 1 PL in Rip Rap

**Meander Survey Comments (Use Additional Sheets As Necessary):**

3-E-1 → 3-E-2  
seed fence still present, ~ 50' gap in RO in GE area

9:40



# Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Page 18 of 18

Observer(s): TC Date: 8/31/06  
 Phase: \_\_\_\_\_ Flow @ Coltsville (cfs) \_\_\_\_\_ Weather: \_\_\_\_\_

Planting Area Location: 3-E-3  
 Riverbank Length (ft): \_\_\_\_\_ Avg width (ft): \_\_\_\_\_  
 Planting Area (sf): \_\_\_\_\_ 10-20% Area (sf): \_\_\_\_\_

Comments: Could not locate S. pin, measured 77'

Random Sample Location Number: \_\_\_\_\_ Riverbank length (ft): \_\_\_\_\_ Width (ft): \_\_\_\_\_  
 Slope length (ft): \_\_\_\_\_ Sample Area (sf): \_\_\_\_\_

**Plant Survivorship:**

Trees	Quantity (live)	Total	Shrubs	Quantity (live)	Total
Black Willow		6	Red-osier Dogwood		11
Silver Maple <i>100% die off</i>		4	Silky Dogwood		1
Eastern Cottonwood		2	Winterberry Holly		2
Box Elder			Chokecherry		4
		<u>12</u>	Northern Arrowwood		3

Total Live Trees: 12 Total Live Shrubs: 21

Herbaceous Cover (%): 100

Invasive Plant Cover (%): 0 Pl in Rip

*Blight? on RO  
 1WB  
 in reach*

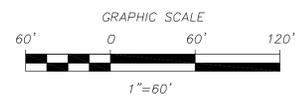
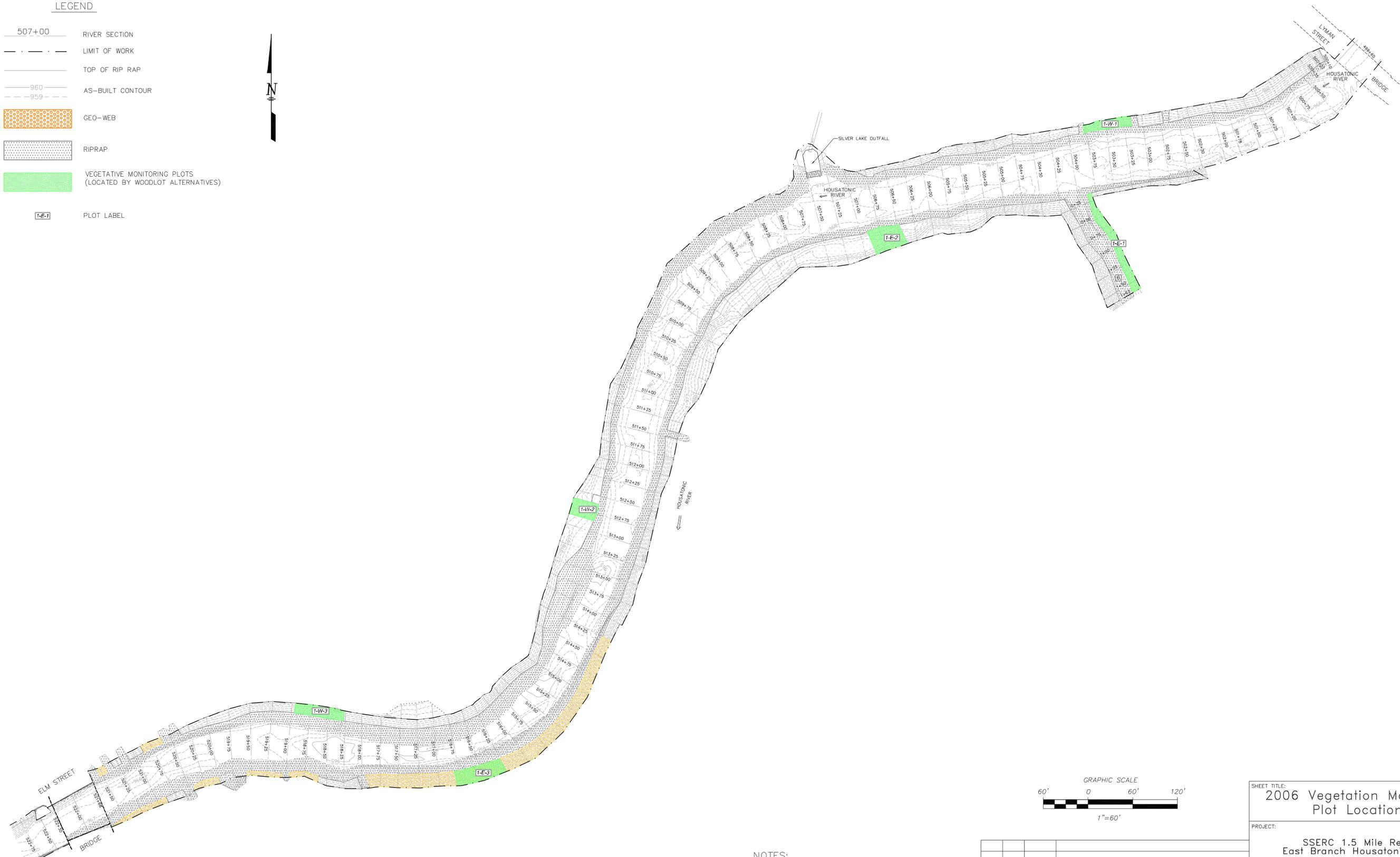
**Meander Survey Comments (Use Additional Sheets As Necessary):**

3-E-2 → 3-E-3

T=10:00

LEGEND

- 507+00 RIVER SECTION
- LIMIT OF WORK
- TOP OF RIP RAP
- 960 AS-BUILT CONTOUR
- 959 AS-BUILT CONTOUR
- GEO-WEB
- RIPRAP
- VEGETATIVE MONITORING PLOTS (LOCATED BY WOODLOT ALTERNATIVES)
- [T-E-1] PLOT LABEL



NOTES:

1. AS-BUILT TOPOGRAPHIC SURVEY PERFORMED BY HILL ENGINEERS, ARCHITECTS, PLANNERS, INC. BETWEEN SEPTEMBER 2002 (PHASE #1) AND APRIL 2006 (END PHASE #3).
2. GEO-WEB LOCATIONS ARE BASED ON PLANS PROVIDED BY WESTON SOLUTIONS, INC. AND WERE NOT LOCATED IN THE FIELD (WITH AN INSTRUMENT) BY HILL-ENGINEERS, ARCHITECTS, PLANNERS, INC.

REV.	BY	DATE	STATUS

SHEET TITLE:  
**2006 Vegetation Monitoring Plot Locations**

PROJECT:  
**SSERC 1.5 Mile Reach  
East Branch Housatonic River  
Pittsfield, Massachusetts**

SHEET:  
**1**

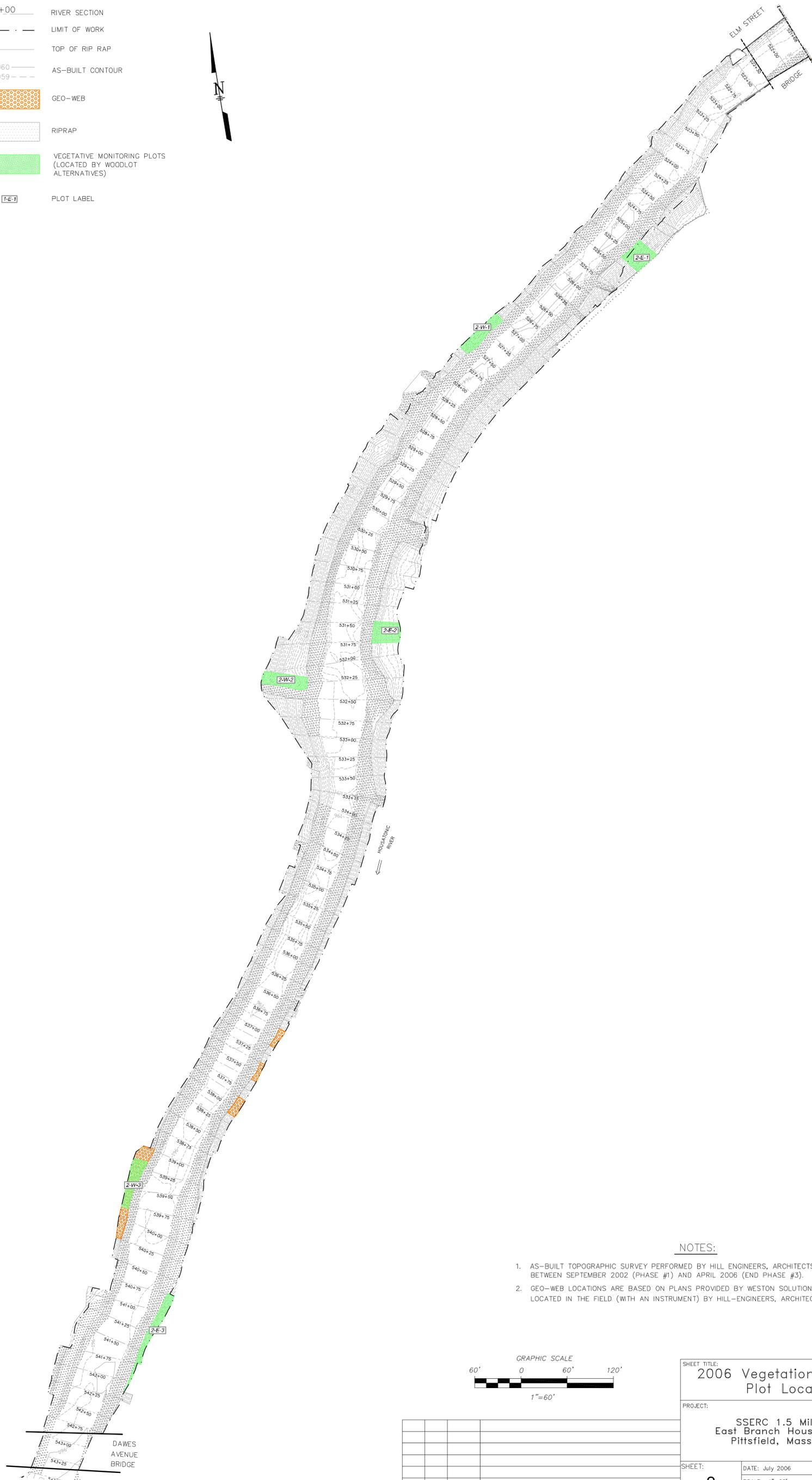
DATE: July 2006  
SCALE: 1"=60'  
PROJ. NO.: 104141.03



Y:\CAD\Projects\104141\104141.dwg 10/11/06 10:00 AM 10/11/06 10:00 AM

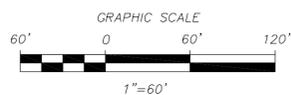
LEGEND

- 531+00 RIVER SECTION
- LIMIT OF WORK
- TOP OF RIP RAP
- 960 AS-BUILT CONTOUR
- 959 AS-BUILT CONTOUR
- GEO-WEB
- RIPRAP
- VEGETATIVE MONITORING PLOTS (LOCATED BY WOODLOT ALTERNATIVES)
- [1-E-1] PLOT LABEL



NOTES:

1. AS-BUILT TOPOGRAPHIC SURVEY PERFORMED BY HILL ENGINEERS, ARCHITECTS, PLANNERS, INC. BETWEEN SEPTEMBER 2002 (PHASE #1) AND APRIL 2006 (END PHASE #3).
2. GEO-WEB LOCATIONS ARE BASED ON PLANS PROVIDED BY WESTON SOLUTIONS, INC. AND WERE NOT LOCATED IN THE FIELD (WITH AN INSTRUMENT) BY HILL-ENGINEERS, ARCHITECTS, PLANNERS, INC.



SHEET TITLE: <b>2006 Vegetation Monitoring Plot Locations</b>	
PROJECT: SSERC 1.5 Mile Reach East Branch Housatonic River Pittsfield, Massachusetts	
SHEET: <b>2</b>	DATE: July 2006 SCALE: 1"=60' PROJ. NO.: 104141.03
<b>WOODLOT</b> ALTERNATIVES, INC. ENVIRONMENTAL CONSULTANTS	

REV.	BY	DATE	STATUS

P:\0201\Pittsfield\MA\104141\Drawings\104141-101-2006\_Monitoring\_Plots.dwg



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**APPENDIX E**

**SPRING AND SUMMER 2006 AQUATIC HABITAT STRUCTURE AND  
RIPRAP MONITORING REPORTS**

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## Memorandum

To: Joel Lindsay, Weston Solutions, Inc.

From: Michael Chelminski, Woodlot Alternatives, Inc.

Date: June 12, 2006

Re: Monitoring of Aquatic Structures, Riprap, and Riverbank Soil from June 9, 2006, Site Visit, 1½-Mile Remedial Action of the General Electric-Pittsfield/Housatonic River Site in Pittsfield, Massachusetts

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This memo presents observations made by Woodlot Alternatives, Inc. (Woodlot) following monitoring of aquatic habitat structures and riverbank riprap and soil within the 1½-Mile Remedial Action of the General Electric-Pittsfield/Housatonic River Site in Pittsfield, Massachusetts (1½-Mile Reach) on June 9, 2006. Monitored areas include the entire Phase 1 and 2 areas and the section of the Phase 3 area between the Dawes and Pomeroy Avenue bridges. The balance of the Phase 3 area downstream of the Pomeroy Avenue Bridge was not monitored as it is our understanding construction work has not been completed in this area.

**Aquatic Habitat Enhancement Structures** – Observations made by Woodlot suggest that the aquatic habitat enhancement structures are stable and in as-built condition. These structures appear to be performing as designed, as indicated by variations in current speed, turbulence, and sediment deposition adjacent to the structures. Scour of riverbed or riverbank armor was not observed adjacent to any of the observed structures. Substantial sediment deposition was observed adjacent to some of the aquatic habitat structures, further indicating that the presence of the structures is providing diversity of aquatic habitat.

This work represents the first monitoring work following the removal of the temporary dam between the Phase 1 and Transition Phase areas. Observations within the Phase 1 reach upstream of the former dam suggest that no deleterious effects resulted from the presence of the dam. Woodlot recommends that Weston and USACE on-site personnel pay particular attention to this area during their monthly monitoring work, as the removal of the temporary dam has altered the flow regime in this area.

**Riverbank Soil** – Observations made by Woodlot suggest that the riverbank soils are generally stable and providing a suitable base for herbaceous and woody vegetation. Minimal concentrated runoff and rill erosion was observed during the monitoring work.

**Riverbank Riprap** – Observations made by Woodlot suggest that the riprapped riverbanks are fair and in as-built condition.

**Riverbed Riprap** – Observations made by Woodlot revealed no indications of displacement or failure of the riverbed riprap.



## Memorandum

To: Joel Lindsay (Weston Solutions, Inc.)

From: Michael Chelminski (Woodlot Alternatives, Inc.)

Cc: John Lortie (Woodlot Alternatives, Inc.), Dean Tagliaferro (USEPA), Darrell Moore (USACE)

Date: November 2, 2006

Re: Summer 2006 Aquatic Habitat Structure and Riprap Monitoring, 1½-Mile Reach of the General Electric-Pittsfield/Housatonic River Site in Pittsfield, Massachusetts

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This memo presents observations made by Woodlot Alternatives, Inc. (Woodlot) as part of monitoring of installed aquatic habitat structures and riverbed and riverbank riprap at the 1½-Mile Reach of the General Electric-Pittsfield/Housatonic River Site in Pittsfield, Massachusetts (1½-Mile Reach). The observations presented here were made on behalf of Weston Solutions, Inc. (Weston) as part of the required performance monitoring. Woodlot's site visit was performed on August 30, 2006, and included monitoring of remediated and restored areas along the East Branch of the Housatonic River between the Lyman Street Bridge and the confluence of the east and west branches of the Housatonic River below Fred Garner Park.

Flow in the Housatonic River on August 30, 2006, in Coltsville, Massachusetts upstream of the project area was approximately 40 cubic-feet-per-second, based on preliminary data obtained at the United States Geological Survey (USGS) stream gaging station on the East Branch of the Housatonic River in Coltsville, Massachusetts (Station [Sta.] 01197000). This information was obtained from the USGS station website ([http://waterdata.usgs.gov/ma/nwis/uv?format=html&period=7&site\\_no=01197000](http://waterdata.usgs.gov/ma/nwis/uv?format=html&period=7&site_no=01197000)).

Note that terminology used to describe the monitoring reaches was changed in 2006 from the previous names reflecting construction-phase areas, to monitoring areas delimited by the four bridges crossing the 1½-Mile Reach (Lyman Street, Elm Street, Dawes Avenue, and Pomeroy Avenue, respectively, from upstream to downstream) and the confluence of the East and West Branches of the Housatonic River. The four monitoring areas represented by these five delimiters are numbered 1-4, respectively, moving downstream from the Lyman Street Bridge. Each monitoring area is divided into sub-areas defined by the "east" (river-left) and "west" (river-right) sides of the Housatonic River. The sub-areas presented here are used to describe the riverbank riprap only. In-stream features, including the installed aquatic habitat structures and the riverbed riprap, are not referenced to the east or west bank.

Referenced stationing is from as-built drawings provided by Weston. The determination of the observed condition was made based on prior observations and professional judgment. Representative photographs are presented at the end of this memo.

## **Monitoring Area 1 (Lyman Street Bridge to Elm Street Bridge)**

Monitoring in this area was performed by walking along the west bank of the river and observing the apparent condition of the installed aquatic habitat structures and riverbed and riverbank riprap along both banks of the river. Additional observations were made from the left (east) bank of 1) the section of GeoWeb ® slope between Sta. 514+25 (approximate) to Sta. 521+68 (approximate); and 2) the drainage swale that discharges to the left (east) side of the Housatonic River at Sta. 504+00.

### **East Bank**

The observed streambank riprap along the east bank of the river and in the drainage swale appears to be fair and substantially in as-built condition, with a single observed exception noted below. Deposited sediments and herbaceous vegetation cover on the riverbank between Sta. 502+30 to Sta. 514+00 (approximate) and in the adjacent drainage swale limited observations of the riverbank riprap in this area. The top of installed sheet-pile was observed within the riprap at the toe of the GeoWeb ® slope in the vicinity of Sta. 517+50 suggesting some minor movement of the riprap cover. Weston subsequently checked and repaired this small area. Woodlot understands that the as-built plan of the riverbank riprap is currently being revised in the vicinity of the former temporary dam (Sta. 513+50 [approximate]) to reflect that that riverbank is riprapped to the top of the slope in this area.

### **West Bank**

The observed streambank riprap along the west bank of the river appears to be fair and substantially in as-built condition.. Deposited sediments and herbaceous vegetation cover on the riverbank between Sta. 502+00 to Sta. 503+50 (approximate) and Sta. 517+00 (approximate) to Sta. 519+00 (approximate) limited observations of the riverbank riprap in this area.

### **Aquatic Habitat Structures**

The installed aquatic habitat structures (boulders and wing-deflectors) appear to be in as-built condition and performing as intended. The function of these structures appears good, and they appear to enhance the diversity of current speeds in this reach of river, which is dominated by shallow (i.e., less than 2-foot) and moderate-depth (i.e., 2 to 4-foot) runs. These determinations were made based on observed conditions, including the apparent condition of the observed wing-deflectors and the general boulder placement.

### **Riverbed Riprap**

The condition of the riverbed riprap in the channel of the river was not observed due to 1) turbid water, as rain had fallen in the watershed within two days prior to the monitoring work; 2) the presence of sand-dominated sediments on top of the riverbed riprap; and 3) the depth of water in most of this monitoring area. Observed conditions did not suggest any variations from as-built conditions. Riprap on the bottom of the drainage swale was observed to be in as-built condition.

Overall, the riprap and aquatic habitat structures in this reach were observed to be meeting the Performance Standards.

## **Monitoring Area 2 (Elm Street Bridge to Dawes Avenue Bridge)**

Monitoring in this area was performed by walking along the east and west banks of the river and observing the apparent condition of the installed aquatic habitat structures and riverbed and riverbank riprap along both banks of the river.

### **East Bank**

The observed streambank riprap along the east bank of the river appears to be fair and substantially in as-built condition.

### **West Bank**

The observed streambank riprap along the west bank of the river appears to be fair and substantially in as-built condition, with a single observed exception noted below. Woodlot's original observations indicated that some movement of riprap may have occurred in the vicinity of Sta. 529+25, as determined from an observed narrow "bench" of riprap within the adjacent wetted channel; and 2) observed material (gravels and pebbles) that is much smaller than the installed riprap within the riprap in this area. However, this was subsequently discussed with Weston, who indicated that they have monitored this area and determined that some minor overfilling of the riprap on the slope occurred during construction and that current conditions are consistent with the design intent.

Deposited sediments and dense herbaceous vegetation cover limited observation of the riverbank riprap between Sta. 534+00 (approximate) to Sta. 539+00 (approximate).

### **Aquatic Habitat Structures**

The installed aquatic habitat structures (boulders in this monitoring area) appear to be in as-built condition and performing as intended. The function of these structures appears good, and they appear to enhance the diversity of current speeds in this reach of river, which includes shallow (i.e., depth less than 2 feet) riffles and moderate-depth (i.e., 2 to 4 feet) runs. The variability of aquatic habitat in this monitoring area is considered very good and benefits from a diversity of in-stream habitat types, including riffles and runs with variable flow speeds and depths. These determinations were made based on observed conditions, including the apparent condition of the observed boulder placement.

### **Riverbed Riprap**

The condition of the riverbed riprap was not observed due to 1) turbid water, as rain had fallen in the watershed within two days prior to the monitoring work; 2) the presence of sand-dominated sediments on top of the riverbed riprap; and 3) the depth of water in most of this monitoring area. With one exception, observed conditions did not suggest any variations from as-built conditions. The exception was observed riprap accumulated adjacent to the upstream face of boulders installed as in-stream features in the general vicinity of Sta. 528+00. Woodlot understands that these boulders were initially installed on top of the riverbed riprap. Based on discussions with Weston, the source of the accumulated riprap is likely a combination of material that was placed in the riverbed during construction to provide a smooth grade for operation of heavy equipment, and small amounts of riprap that have moved from upstream.

Most of the articulated concrete block (ACB) at the upstream end of this monitoring area was readily observable and appears to be substantially in as-built condition. The downstream terminus of the ACB was not observed due to the depth of adjacent water and the presence of a hydraulic jump in the vicinity of the terminus.

Overall, the riprap and aquatic habitat structures in this reach were observed to be meeting the Performance Standards.

### **Monitoring Area 3 (Dawes Avenue Bridge to Pomeroy Avenue Bridge)**

Monitoring in this area was performed by walking along the west bank of the river and observing the apparent condition of the installed aquatic habitat structures and riverbed and riverbank riprap along both banks of the river.

#### **East Bank**

The observed streambank riprap along the east bank of the river appears to be fair and in substantially as-built condition. Deposited sediments and dense herbaceous vegetation cover limited observation of the riverbank riprap between Sta. 549+50 (approximate) to Sta. 541+00 (approximate).

#### **West Bank**

The observed streambank riprap along the west bank of the river appears to be fair and substantially in as-built condition. Deposited sediments and dense herbaceous vegetation cover limited observation of the riverbank riprap between Sta. 545+00 (approximate) to Sta. 547+00 (approximate) and Sta. 556+00 (approximate) to Sta. 559+00 (approximate).

### **Aquatic Habitat Structures**

The installed aquatic habitat structures (boulders and wing-deflectors) appear to be in as-built condition and performing as intended. The function of these structures appears good, and they appear to enhance the diversity of current speeds in this reach of river, which includes shallow (i.e., depth less than 2 feet) riffles and moderate-depth (i.e., 2 to 4 feet) and deep (i.e., greater than 4 feet) runs. These determinations were made based on observed conditions, including the apparent condition of the observed wing-deflectors and the general boulder placement.

### **Riverbed Riprap**

The condition of the riverbed riprap was not observed due to 1) turbid water, as rain had fallen in the watershed within two days prior to the monitoring work; 2) the presence of sand-dominated sediments on top of the riverbed riprap; and 3) the depth of water in most of this monitoring area. Observed conditions did not suggest any variations from as-built conditions.

Overall, the riprap and aquatic habitat structures in this reach were observed to be meeting the Performance Standards.

### **Monitoring Area 4 (Pomeroy Avenue Bridge to Confluence)**

Monitoring in this area was performed by walking along the west bank of the river and observing the apparent condition of the installed aquatic habitat structures and riverbed and riverbank riprap along both banks of the river.

### **East Bank**

The observed streambank riprap along the east bank of the river appears to be fair and substantially in as-built condition.

### **West Bank**

The observed streambank riprap along the west bank of the river appears to be fair and substantially in as-built condition. Deposited sediments and dense herbaceous vegetation cover limited observation of the riverbank riprap between Sta. 561+50 (approximate) to Sta. 566+00 (approximate). Riprap installed on the west bank “wraps around” the point of land between the East and West Branches of the Housatonic River and continues upstream approximately 100 feet along the east bank of the West Branch. This riprap appeared to be in as-built condition.

### **Aquatic Habitat Structures**

The installed aquatic habitat structures (boulders and wing-deflectors) appear to be in as-built condition and generally performing as intended. The top of the wing deflector in the vicinity of Sta. 574+00 adjacent to the west bank of the river was approximately 1 foot below the water surface, while the tops of the two wing deflectors immediately upstream were set at the water surface. This apparent variation from the design intent may limit the functionality of the “submerged” wing deflector. However, observations made by Woodlot during the pre-design phase suggest that substantial sedimentation may occur in this area, resulting in increased water surface elevations and thereby improving the function of this wing deflector. The function of these structures appears good, and they appear to enhance the diversity of current speeds in this reach of river, which is dominated by moderate-depth (i.e., 2 to 4 feet) and deep (i.e., greater than 4 feet) runs. These determinations were made based on observed conditions, including the apparent condition of the observed wing-deflectors and the general boulder placement.

### **Riverbed Riprap**

The condition of the riverbed riprap was not observed due to 1) turbid water, as rain had fallen in the watershed within two days prior to the monitoring work; 2) the presence of sand-dominated sediments on top of the riverbed riprap; and 3) the depth of water throughout this monitoring area. Observed conditions did not suggest any variations from as-built conditions.

Overall, the riprap and aquatic habitat structures in this reach were observed to be meeting the Performance Standards.

### **Summary**

Observations made during the Summer Inspection of riprap and aquatic habitat enhancement structures indicate that these components of the 1.5 Mile Reach Removal Action restoration are in substantially as-built condition and are meeting the project Performance Standards. Woodlot will continue to coordinate with Weston and USACE to monitor the on-going condition of these features.

## Photographs

Following are representative and specific photographs of items discussed in the memo.

**Photo 1: Monitoring Area 1, View Downstream from Sta. 503+50 (Approx.)**



**Photo 2: Monitoring Area 1, View Downstream from Sta. 516+50 (Approx.)**



**Photo 3: Monitoring Area 2, View Downstream from Sta. 527+50 (Approx.)**



**Photo 4: Monitoring Area 2, View Upstream of Area of Potential Riprap Movement, West Bank, Sta. 525+25 (Approx.)**



**Photo 5: Monitoring Area 2, View Upstream of Riprap Adjacent to Installed Boulder, from Sta. 528+00 (Approx.)**



**Photo 6: Monitoring Area 2, View Upstream from Sta. 540+00 (Approx.)**



**Photo 7: Monitoring Area 3, View Upstream from Sta. 548+00 (Approx.)**



**Photo 8: Monitoring Area 3, View Upstream from Sta. 557+50 (Approx.)**



**Photo 9: Monitoring Area 4, View Downstream from Sta. 562+00 (Approx.)**



**Photo 10: Monitoring Area 4, View Downstream from Sta. 573+00 (Approx.)**



**Photo 11: Monitoring Area 4, Submerged Wing Deflector from West Bank, Sta. 574+00 (Approx.)**



**Photo 12: Monitoring Area 4, View Upstream of Riprap Installed on East Bank of the West Branch of the Housatonic River Immediately Upstream of the Confluence**



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**APPENDIX F**

**JANUARY 25, 2006 POST HIGH-FLOW INSPECTION REPORT**

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## Memorandum

To: Joel Lindsay, Weston Solutions, Inc.

From: Michael Chelminski, Woodlot Alternatives, Inc.

Date: January 27, 2006

Re: Post 1,500-CFS Inspection, January 25, 2006

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Woodlot Alternatives, Inc. (Woodlot) performed monitoring of riprap, aquatic habitat enhancement structures, and streambank vegetation on the 1.5-Mile Reach of the Housatonic River on January 25, 2006, in accordance with the post-1,500-cubic-feet-per-second (cfs) monitoring requirements set forth in the May 2004 1.5-Mile Reach Restoration Monitoring Plan. The monitoring was performed in response to a hydrologic event on January 18 and 19, 2006, during which a peak flow of 2,290 cfs was recorded at 7:15 PM at the United States Geological Survey (USGS) stream gaging station on the East Branch of the Housatonic River in Coltsville, Massachusetts (Station No. 01197000), as reported on the USGS station website ([http://waterdata.usgs.gov/ma/nwis/uv?format=html&period=7&site\\_no=01197000](http://waterdata.usgs.gov/ma/nwis/uv?format=html&period=7&site_no=01197000)).

The flow during the post-event monitoring work was approximately 210-cfs, as recorded at the USGS Coltsville gage. The monitoring work was performed by walking along the riverbank and looking for observable effects on the riverbed and riverbank from the high flow event. The monitoring commenced at the upper limit of the Phase 1 Reach immediately downstream of the Lyman Street Bridge, and proceeded downstream through the Phase 2 Area to the limit of completed work in the Phase 3 Area approximately 300 feet (ft) downstream of the Pomeroy Avenue bridge. Approximately 4 inches of snow was on the ground during the monitoring work. The snow fell after the peak flow event and limited visibility of the streambank riprap and soil.

No areas of substantial erosion were observed during the monitoring work. Two possible indicators of minor erosion were observed during the monitoring work, including 1) a section of exposed sheet pile along the east streambank in the Transition Phase area (Photo 1) and 2) a short length of exposed soil at the riprap-soil interface along the west streambank in the Phase 2 area (Photos 2 and 3). The extents of the aforementioned areas was less than approximately 10 feet in both cases, and no remedial action other than continued observation is recommended at this time.

The magnitude of the January 18 and 19, 2006, flood event did not likely result in overtopping of the installed riprap, and no indicators of disturbance to planted stock were observed. The streambed armor was not readily observable during the monitoring work and is therefore not discussed here.

**Photo 1: Exposed Sheet Pile, Transition Phase Area**



**Photo 2: Exposed Soil at the Riprap-Soil Interface, Phase 2 Area**



**Photo 3: Exposed Soil at the Riprap-Soil Interface, Phase 2 Area**



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**APPENDIX G**

**2006 INVASIVE PLANT CONTROL MEMO UPDATES**

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## Memorandum

To: Joel Lindsay, Weston Solutions, Inc.

From: Todd Chadwell, Woodlot Alternatives, Inc.

Cc: Susan Svirsky, United States Environmental Protection Agency  
Dean Tagliaferro, United States Environmental Protection Agency  
John Lortie, Woodlot Alternatives, Inc.

Date: August 25, 2006

Re: Purple Loosestrife Growing in 1½-Mile Remedial Action area of the General Electric -  
Pittsfield/Housatonic River Site.

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During the August 21, 2006, 1½ Mile Reach site visit with EPA and Woodlot Alternatives, Inc., it was observed that there is an abundance of purple loosestrife (*Lythrum salicaria*) growing within the riprap of the project area. Following discussion between EPA and Woodlot it was decided that purple loosestrife growing within and adjacent to the riprap should be removed, and that hand-pulling would be an appropriate means to achieve this goal. After removing purple loosestrife, plant material should be bagged and removed for offsite disposal. This action should be performed as soon as possible, and preferably before seed has set, which would exacerbate the existing problem.