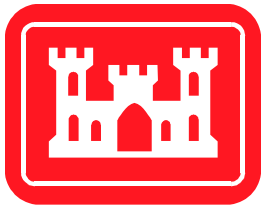

U.S. Army Corps of Engineers

New England District
Concord, Massachusetts

2004 Restoration Monitoring Report
1.5 Mile Reach Removal Action

DCN: GE-033105-ACQO

March 2005

Environmental Remediation Contract
General Electric (GE)/Housatonic River Project
Pittsfield, Massachusetts

Contract No. DACW33-00-D-0006

Task Order No. 0005

02M-0140

WESTON SOLUTIONS

March 31 2005

Mr. Darrell Moore
U.S. Army Corps of Engineers
New England District
10 Lyman Street
Pittsfield, MA 01201

Re: Contract No. DACW33-00-D-0006
1.5 Mile Reach Removal Action
2004 Restoration Monitoring Report
DCN: GE-033105-ACQO

Dear Mr. Moore:

Please find attached the 2004 Restoration Monitoring Report for the 1.5 Mile Reach Removal Action.on the GE/Housatonic River site in Pittsfield, Massachusetts. Additional copies of this submittal are being sent simultaneously to the following:

- Peter Hugh, USACE Concord
- Dean Tagliaferro, EPA Pittsfield

This submittal has undergone WESTON's technical and quality control review and coordination procedures to ensure: (1) completeness for each discipline commensurate with the level of effort required for the submittal; (2) elimination of conflicts, errors, and omissions; (3) compliance with project criteria; and (4) overall professional and technical accuracy of the submittal.

Please feel free to contact me at (978) 779-8904 if you should have any questions.

Very truly yours,

Weston Solutions, Inc.

Joel S. Lindsay, P.E.
Task Manager

Enclosures

cc: D. Tagliaferro, USEPA
P. Hugh, CENAE
A. Silfer, GE
S. Steenstrup, MDEP (2 copies)

H. Inglis, EPA
S. Peterson, CTDEP
D. Young, MA EOEA
K. Munney, USFWS
Berkshire Athenaeum, Madeline Kelly
Simon's Rock College of the Bard Library, Joan Goodkind
Kent Memorial Library, Sue Hunt
Cornwall Public Library, Amy Cady
Housatonic Valley Association, Liba Furhman
J. Lindsay, WESTON
R. Jendrasiak, WESTON
A. Harpur, WESTON
M. Chelminski, Woodlot
J. Kilborn, EPA (cover letter only)
R. Howell, EPA (plus CD)
R. Nasman, The Berkshire Gas Company (cover letter only)
DCN Files—PMA, WC, and MNH

Executive Summary

This report presents the results of the restoration monitoring performed in 2004 by USACE, Weston Solutions, Inc. (WESTON), and WESTON's subcontractor,Woodlot Alternatives, Inc. (Woodlot) within the 1½-Mile Remedial Action of the General Electric - Pittsfield/Housatonic River Site in Pittsfield, Massachusetts (1½-Mile Reach). Restoration monitoring work was performed according to the 1½-Mile Reach Restoration Monitoring Plan (Monitoring Plan) (Woodlot, 2004) to assess whether the specified restoration performance standards were achieved. Restoration features assessed include aquatic habitat enhancement structures, riverbank soil restoration, riverbank revegetation, presence of invasive species, riverbed and riverbank riprap, and ancillary items such as fence, pavement, and walls. This report also provides recommendations for restoration efforts in 2005.

Restoration monitoring results indicate that the revegetation restoration work within the monitored areas has been successful. The installed trees and shrubs appeared healthy and growing vigorously. The plant survivorship ranged from 95 to 100 percent, exceeding the 80 percent survivorship restoration performance standard. Herbaceous vegetation cover ranged from 92 to 95 percent, which is slightly less than the herbaceous cover minimum restoration performance standard of 95 percent. Invasive plant cover was less than the maximum cover restoration performance standard of 5 percent, meeting the specified performance standard. Ongoing invasive plant control treatments appear to be successful. 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.

In 2004, the hydraulic backwater propagating upstream from the temporary dam on Phase 1 of the 1½-Mile Reach precluded effective restoration monitoring of the aquatic habitat enhancement structures and much of the riverbank and riverbed riprap armor in the Phase 1 area. Monitoring in Phase 1 for aquatic habitat enhancements will be postponed until the temporary dam is removed.

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

Observations made during regular inspection of ancillary items by WESTON and USACE personnel since their installation indicates that they remained in as-built condition other than normal wear and tear as of the end of 2004.

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Appendices

1.0 Purpose

This report presents the results of the restoration monitoring performed in 2004 by Woodlot Alternatives, Inc. (Woodlot) within the 1½-Mile Remedial Action of the General Electric - Pittsfield/Housatonic River Site in Pittsfield, Massachusetts (1½-Mile Reach). 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, and riverbed and riverbank riprap.

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 (Woodlot, 2004). The Monitoring Plan 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 2004 in accordance with the Monitoring Plan, including the performance results of aquatic habitat enhancement structures, riverbank soil restoration, riverbank revegetation, riverbed and riverbank armor (riprap), and ancillary items such as fence, pavement and walls, based on observations made during regular inspections by WESTON and USACE on-site personnel between June 2004 and December 2004, and during Woodlot's semi-annual inspection in September 2004.

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 2004 restoration monitoring work are presented below. The Monitoring Plan presents full descriptions of the applicable restoration performance standards and follow-up corrective actions if the 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.
- 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 of the 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 was 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 provided a determination of whether the habitat based objectives of the project were 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 document characteristics including fairness of slopes, sloughing, apparent erosion, and woody and herbaceous plant cover. 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. Regular bi-weekly to monthly observations of the riverbed and banks are also conducted by on-site USACE and Weston personnel as part of the Contractor Quality Control (CQC) program for the project.

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 fall. 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 randomly selected sub-areas representing between 10 and 20 percent of the total sub-area within each restoration monitoring area. To quantify plant survivorship, planted trees and shrubs were counted by walking through each monitoring sub-area and determining the number, type, and condition of the installed plants. The results of the quantitative survey were used to determine the number of live and dead plants in each restoration monitoring area. Live tree and shrub totals were summarized and then divided by the number of installed live plants to calculate plant survivorship in each planting area.

The qualitative assessments of riverbank revegetation were performed using meander surveys in each designated restoration monitoring area. The meander survey was also used to determine whether the restoration monitoring sub-areas 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 includes a minimum of two formal 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. Regular bi-weekly to monthly inspections of the riverbed and banks are also conducted by on-site Weston and USACE personnel as part of the CQC program for the project.

4.5 Restoration Monitoring of Ancillary Items

The monitoring of ancillary items consists of visual observations to document the condition of installed structures and surfaces, such as significant cracks, movement or other signs 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 2004 by USACE, WESTON, and Woodlot, including an 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 riprap and ancillary items. Recommendations to maintain or enhance restoration performance standards for these restoration features are also noted.

5.1 WESTON and USACE Inspections

WESTON conducted inspections of the restored areas of the river, including ancillary items, on an on-going bi-weekly to monthly basis as part of its overall CQC program. Minor issues that were noted during these inspections were addressed by WESTON or its subcontractors also on an on-going basis and documented in daily reports as appropriate. In addition to these activities, WESTON, along with USACE, conducted and documented formal walk-through inspections of the restored areas in October and November 2004. The detailed findings of these walk-throughs are documented in Appendix B.

The regular riprap inspections by WESTON indicated that the installed riprap in the 1.5 Mile Reach was meeting the performance standards through 2004. Some minor issues were identified with erosion or potential for erosion on some upper bank areas. In addition, observations of ancillary items such as installed pavement, fence and walls indicated that they remained in as-built condition other than normal wear and tear as of the end of 2004.

5.2 Woodlot Semi-Annual Inspection – September 2004

Because monitoring began in June 2004, the spring restoration monitoring visit was not conducted. The formal summer restoration monitoring visits (low flow period) were performed by Woodlot on September 15 and September 23, 2004. Appendix C provides representative photographs of the restoration monitoring features during these site visits. Completed field forms and data analyses for the Woodlot inspection are shown in Appendix D and E, respectively.

5.2.1 Aquatic Habitat Enhancement Structures

Restoration monitoring of aquatic enhancement structures was not performed in 2004 due to inundation of the Phase 1 area resulting from the temporary dam at the downstream end of Phase 1. The resulting backwater water increased water depths that reduced the visibility to assess both structural stability and habitat functional values of the installed aquatic habitat enhancement structures within the Phase 1 area. Aquatic habitat enhancement structures were not installed downstream of Phase 1 at the time of the inspection.

Restoration monitoring of the aquatic habitat enhancement structures in Phase 1 will resume when the temporary dam is removed so that aquatic habitat structures can be more accurately evaluated.

5.2.2 Riverbank Soil Restoration

Woodlot performed the riverbank soil restoration monitoring inspection within the Phase 1, Transition Phase, and Phase 2 (STA 522+00 to 538+00) portions of the 1½-Mile Reach[1] on September 23, 2004. The flow in the Housatonic River during this inspection was approximately 85 cfs, as measured at the USGS Coltsville stream gaging station. As noted in the Monitoring Plan, formal inspections of these constructed restoration features are also to be performed after any flow event that exceeds 1,500 cfs. Prior to the September 23, 2004, inspection, a flow of 1570 cfs occurred on September 18, 2004. Thus, the September 23, 2004, inspection fulfilled the restoration monitoring requirement for both the formal summer low flow inspection and for inspections after flow events that exceed 1,500 cfs. There were no other flows above 1500 cfs between June and December 2004.

[1] The inspection within the Phase 2 area was performed from STA 522+00 to the downstream extent of completed remedial work (restored riverbank) during the site visit, which was approximately STA 538+00.

Based on the September 23, 2004, site visit, the riverbank soil restoration performance standard was met within the Phase 1, Transition Phase and Phase 2 areas, as no significant areas of erosion (e.g., ruts, gullies, washouts, or sloughing) were observed. The riverbank soil restoration performance standard was met within the inspected portion of Phase 2 area (Elm Street to Dawes Avenue).

5.2.3 Riverbank Revegetation

Woodlot performed the summer riverbank revegetation monitoring work within the 1½ -Mile Reach, including Phase 1 (STA 500+00 to STA 513+75) and a portion of the Transition Phase (STA 514+25 to STA 518+35 of the East Riverbank) on September 15, 2004. This work included the assessment of plant survivorship, herbaceous vegetation cover, and invasive plant cover to evaluate whether the specified restoration performance standards were achieved.

Tree and Shrub Survivorship

Table 1 summarizes the 2004 riverbank revegetation restoration monitoring results. The percent survivorship of installed trees and shrubs was very good and ranged from approximately 95 percent to 100 percent for both Phase 1 and the Transition Phase within the inspected riverbank vegetation sample plots, which met the plant survivorship restoration performance standard (i.e., 80% survivorship). The riverbank vegetation sample plot results correlated well with meander surveys, which estimated 90-95 percent survivorship. Meander surveys were performed on other planting areas outside the sample plots during revegetation restoration monitoring.

Installed plants appeared healthy and growing vigorously. Most noteworthy were eastern cottonwood (*Populus deltoides*) plants, which increased in height by approximately 5 feet in 2004. Red osier dogwood (*Cornus sericea*), arrowwood (*Viburnum dentatum*), and winterberry (*Ilex verticillata*) had produced a good seed crop, as these shrubs had many berries present during the inspection. Choke cherry (*Prunus virginiana*) and box elder (*Acer negundo*) appeared to have a lower survivorship percentage, and some of these plants were observed to be stressed (i.e., 10-25% leaf wilt). These plant species are particularly hardy, however, and may recover in 2005.

In regards to plant health and maintenance, approximately 15 installed trees in Phase 1 had been set back by stem failures, particularly eastern cottonwood. These failures were the result of the stems rubbing on the welded-wire tree protector during windy weather conditions, subsequently snapping the stem. These plants will typically re-sprout new leaders during next year's growing season, although their height and vigor will be temporarily stunted. Additionally, branch development of some trees such as black willow (*Salix nigra*) is being constrained within the welded-wire tree protector and needs to be adjusted to support healthy and vigorous growth. In total, approximately 10-20 percent of

the planted trees are in need of maintenance work. Woodlot recommends that maintenance work be performed in 2005 to maintain revegetation restoration success.

Herbaceous Cover

Herbaceous areal cover ranged from 80 to 100 percent within the inspected riverbank sample plots. The typical height of the herbaceous community was between 2 and 6 feet. As shown in Table 1, the average areal cover for both Phase 1 and the Transition Phase was 94 percent and 92 percent , respectively, which is slightly less than the 95 percent restoration performance standard. A few localized areas where herbaceous areal cover was relatively low (i.e., 80%), such as where herbicide applications were used to control invasive plant and where herbaceous cover has been temporarily reduced, are likely to have skewed the average herbaceous cover percentage in Phase 1. Nonetheless, herbaceous cover in these localized areas is expected to revegetate quickly, as the areas seed in from adjacent sites with dense herbaceous cover. Overall, herbaceous cover is on track to meet the restoration performance standard. No follow-up action items are recommended at this time.

Invasive Plant Cover

Invasive plant cover within the inspected riverbank sample plots ranged from zero to 10 percent for the Phase 1 and Transition Phase areas. Observed invasive plants included Japanese knotweed (*Polygonum cuspidatum*), oriental bittersweet (*Celastrus orbiculata*), purple loosestrife (*Lythrum salicaria*), and Morrow's honeysuckle (*Lonicera morrowii*). As shown in Table 1, the average invasive plant cover for the Phase 1 and Transition Phase areas inspected was relatively low (i.e., 3% and 0%, respectively), which meets the restoration performance standard of less than 5 percent cover.

Purple loosestrife, which was a relatively minor invasive plant component in 2003, was observed in higher densities in 2004, particularly in the Phase 1 area within the riverbank rock armor. Here, estimated areal coverage was 5-10 percent in late August 2004. Recent colonization by this species is likely the result of seeds being transported by the river from upstream sources and deposited onto the fine sediments within the armor.

Invasive plant control work began in the Phase 1 area during June 2003 and has continued through 2004 to facilitate meeting the invasive plant cover restoration performance standard. Invasive plant control work in Phase 1 and Transition Phase areas was performed four times during 2004, and has included both physical removal (e.g., hand pulling and cutting) and chemical removal (e.g., herbicide applications). Observed results suggest that the herbicide applications have been effective, as treated invasive plants have died back with no drift impacts on surrounding non-target vegetation. The estimated kill rate for all treated invasive plants was approximately 90 percent with the density and areal cover of invasive plants reduced following the initiation of the invasive plant control work. Appendix F includes two invasive plant control update memos that provide additional details of the invasive plant control work performed.

Table 1

Revegetation Restoration Monitoring Results; Phase 1 And Transition Phase (East Riverbank At Sta 514+25 To Sta 518+35) Of The 1½-Mile Reach

Planting Area	Riverbank Revegetation Feature	Sample Plot Average (%)	Restoration Performance Standard (%)	Meets Restoration Performance Standard? Y or N
Phase 1	Plant Survivorship (Trees)	94%	80%	**Y**
	Plant Survivorship (Shrubs)	99%	80%	**Y**
	Herbaceous Cover	94%	95%	**N**
	Invasive Plant Cover	3%	<5%	**Y**
Transition Phase	Plant Survivorship (Trees)	100%	80%	**Y**
	Plant Survivorship (Shrubs)	100%	80%	**Y**
	Herbaceous Cover	92%	95%	**N**
	Invasive Plant Cover	0%	<5%	**Y**

Note: Sample plot average is based on average for all vegetation sample plots inspected on September 15, 2004. Total plot area represents approximately 20% of the total riverbank planting area (See Appendix E).

5.2.4 Riverbank and Riverbed Riprap

On September 23, 2004, Woodlot performed the "low-flow" riverbank soil restoration monitoring work within the Phase 1, Transition Phase, and Phase 2 (STA 522+00 to 538+00) portions of the 1½-Mile Reach. The flow in the Housatonic River during at this time was 85 cfs. Because the flow at the USGS Coltsville stream gaging station was recorded at 1,570 cfs on September 18, 2004, the September 23, 2004, site visit also fulfilled the requirement in the Monitoring Plan that restoration monitoring of the riverbank and riverbed riprap be performed following flow events exceeding 1,500 cfs. The field data forms and field and reports for the riverbank and riverbed riprap monitoring are included in Appendix G.

The water level in the Phase 1 area at the time of the site visit was at the top of the riverbank armor, except for the west riverbank immediately downstream of the Silver Lake Outfall where riverbank riprap extents upslope to the top of bank (approximately STA 507+50 to 510+10). No significant movement of the riverbank riprap was observed in this localized riverbank area. With the exception of the top of the riverbank armor downstream of the Silver Lake outfall, the Phase 1 area riverbed riprap and the riverbank riprap could not be inspected during the site visit due to high water levels and limited visibility.

During the monitoring work in the Transition Phase area and downstream through the end of work in Phase 2 area (approximately STA 538+00), the flow within the channel of the river was relatively low (i.e., less than 10 cfs). This condition allowed for a thorough evaluation of the riverbank riprap and most of the riverbed riprap during the monitoring visit. The

performance standard for riverbank and riverbed riprap was met in all locations where the riprap was visible..

Some downstream displacement of the streambed riprap was observed in the riverbed at approximately STA 524+25. The riverbed grade and substrate transitions at this location from a relatively steep riverbed grade comprised of articulated concrete blocks (ACB) to a relatively flatter grade with riprap rock armor (see photographs in Appendix C). At this transition point, the movement of the riprap has exposed a portion of the downstream end of the ACB and the bedrock immediately downstream. The displacement of the riverbed riprap at this location is not unexpected, as a hydraulic jump has been observed at this location on a number of occasions during intermediate flow events (during high flow events the hydraulic jump appears to be "drowned"). While the ACB is anchored to the underlying bedrock and the presence of the bedrock immediately downstream of the ACB should preclude the mobilization of any adjacent underlying soils , this location should continue to be evaluated as part of the ongoing monitoring work.

6.0 Conclusions

As a result of the 2004 restoration monitoring effort, the following conclusions are presented for each of the constructed restoration features.

Aquatic Habitat Enhancement Structures. Restoration monitoring of the aquatic habitat enhancement structures was not performed in 2004 as a result of the backwater effects of the temporary dam in Phase 1. The current flow regime in Phase 1 is altered by the presence of the temporary dam, which has likely reduced flows speeds and potential erosive conditions in the vicinity of these structures. Restoration monitoring of these structures will occur once the temporary dam is removed.

Riverbank Soil Restoration. The riverbank soil restoration performance standard was achieved in the restoration monitoring areas.

Riverbank Revegetation. Revegetation restoration work within the restoration monitoring areas has been successful, and restoration performance standards for plant survivorship and invasive plant cover are being achieved. To enhance the performance of the revegetation program, the following items will be performed in 2005:

- **Tree maintenance (Phase 1 and Transition Phase).** Adjust tree cages and stem protectors, install taller tree cages, and reduce branch constraint within tree cages during spring 2005.
- **Continue to control invasive plants.** Continue invasive plant control efforts in Phase 1, Transition Phase, and Phase 2A and begin control efforts in Phase 2B and Phase 3. Control treatments should be performed in mid June, mid August, and late September 2005.

- The herbaceous cover performance standard is expected to be met in 2005 without any corrective actions.

Riverbed and Riverbank Riprap. The restoration performance standard for riverbank and riverbed riprap was achieved. Some movement of riprap was observed at a location on the riverbed in Phase 2 (STA 524+25). The riprap in this area should be monitored on an ongoing basis and after periods of high flow.

Ancillary Items. The restoration performance standards for ancillary items were achieved for 2004. All items were observed to be in as-built condition, accounting for normal wear and tear.

7.0 References

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

Gleason H. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada, Second Edition. The New York Botanical Garden, Bronx, New York, USA.

Sorrie, B.A. and P. Somers. 1999. The Vascular Plants of Massachusetts: A County Checklist. Massachusetts Division of Fisheries and Wildlife Natural Heritage & Endangered Species Program, Westborough, Massachusetts, USA.

Appendix A

Massachusetts Invasive Plant List (Weatherbee et al., 1998)

Attachment A – Invasive Plant List

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

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

Appendix B

Weston Report – October and November 2004 Site Inspections

WESTON and USACE Restored Area Inspections
October and November 2004

October 1, 2004 Inspection

This inspection covered the following phases of work: Phase I, Transition Phase, and Phase II A & B. The riverbed and riverbanks were inspected along with ancillary items, and the following was noted:

- The ACB Revetment tie in with downstream riprap has some minor movement. To be monitored going forward.
- Cell 13 east riverbank requires repairs of 2 upper riverbank washouts, caused by the Mobil Station remediation project. (station 519+00)
- Re-seed the riverbank above the riprap from the Silver Lake Outfall to the 55 Root Place property (station 507 +60 to station 511+50)
- Repair the silt fence along the top of the restored area where a build up of access road run off sediment is collecting (station 503+50 to station 504 +25)
- Cell 14 ACB Revetment requires repairs, approximately 150 blocks have been broken
- Cell 16 upper riverbank requires reseeding from station 531+50 to 532+25
- Cell 18 requires repairs to the silt fence failing and the sloughing of the coconut matting, caused by heavy rain runoff (approximate station 534+35).
- Need to correct the Caledonia Ave storm water run off to prevent erosion along cell 18.

November 23,2004 Inspection

This was a Pre-Winter inspection of Phase II and III A, which included riverbed and riverbank inspection along with ancillary items. One in-river item was found:

- Additional topsoil is required between stations 545+00 to 545+50 due to minor washouts from Appleton Ave. property run off. (east bank)

Appendix C

Selected Photographs
(All Photographs by Woodlot Alternatives, Inc.)

Photo 1. Typical riverbank herbaceous cover in Phase 1 is approximately 95% (looking downstream, east riverbank-STA 508+00) 9/15/04 Woodlot Alternatives, Inc.

Photo 2. Typical riverbank herbaceous cover in Transition Phase with Geocell is approximately 90%. Vigor of planted stock is fair. (east riverbank, looking downstream- STA 515+00). 9/15/04 Woodlot Alternatives, Inc.

Photo 3. Shrub clumps appear healthy and vigorous in Phase 1 (looking upstream, east riverbank- STA 511+50) 9/15/04 Woodlot Alternatives, Inc.

Photo 4. Planted trees had approximately 90-95% survivorship depending on species (looking upstream, east riverbank-STA 506+50) 9/15/04 Woodlot Alternatives, Inc.

Photo 5a - 5b. Purple loosestrife (*Lythrum salicaria*) within the rock armor and Japanese knotweed (*Polygonum cuspidatum*) within some planting areas are the dominant invasive plant species in Phase 1. 9/15/04 Woodlot Alternatives, Inc.

Photo 6. Invasive plant control treatments with herbicide applications have kept invasive plants from spreading and reduced areal cover to less than 5%. 8/24/04 Woodlot Alternatives, Inc.

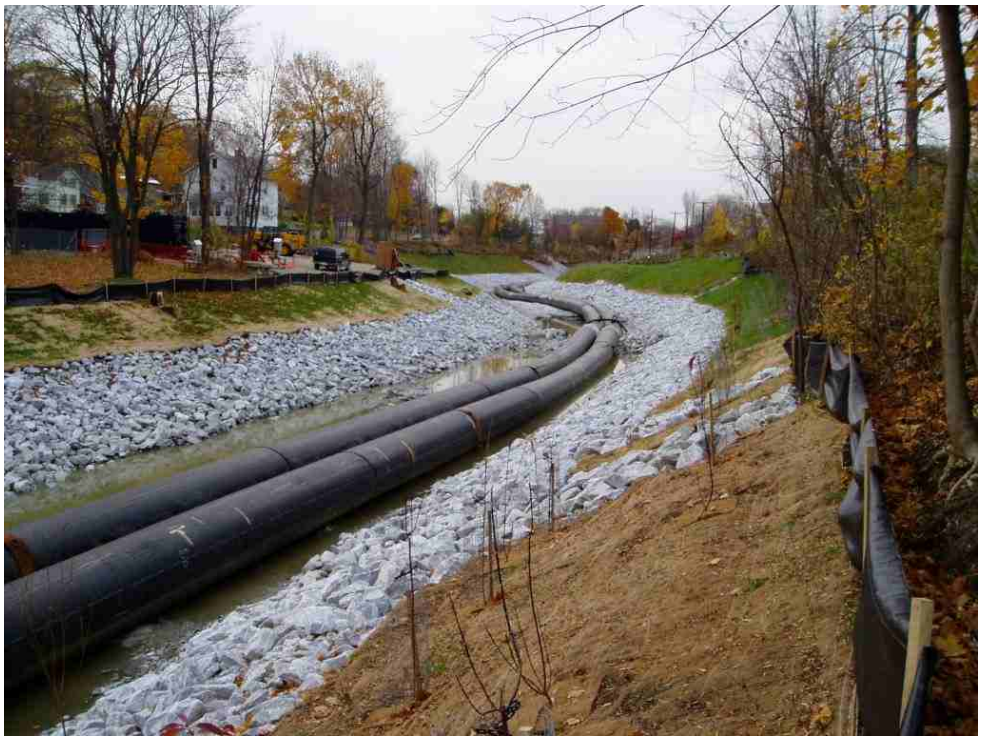

Photo 7. Planted red osier dogwood (*Cornus sericea*) in Phase 2 Area.
September 15, 2004. Woodlot Alternatives, Inc.

Photo 8a - 8b. Hydraulic jump at downstream termination of ACM and associated riverbed scour.
July 7, 2004 / September 11 2004. Woodlot Alternatives, Inc.

Photo 9. Existing slope above restored area, Phase 2 Area.
September 15, 2004. Woodlot Alternatives, Inc.

Photo 10. Planted yellow water lily (*Nuphar luteum*)
September 15, 2004. Woodlot Alternatives, Inc.

Appendix D

Completed Field Data Forms and Field Maps – Revegetation Monitoring

104141-01

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 1 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: PARTLY SUNNY, 70's

Planting Area Location: WEST BANK, AREA 1
Riverbank Length (ft): 0-100 Avg width (ft): 18
Planting Area (sf): 1800 10-20% Area (sf): 180-360
Comments:

Random Sample Location Number: #1 Riverbank length (ft): 40 Width (ft): 20
Slope length (ft): 18 Sample Area (sf): 360
plot is 20ft inside the shrub clump.

Plant Survivorship:

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow	11	2	Red-osier Dogwood	11	2
Silver Maple	1	1	Silky Dogwood	11	2
Eastern Cottonwood	1	1	Winterberry Holly	1	1
Box Elder	1111	4	Chokecherry (cc)		0
			Northern Arrowwood		0

Total Live Trees: 8 **Total Live Shrubs:** 5
1 Dead cc observed in plot

Herbaceous Cover (%): 95

Invasive Plant Cover (%): 0% (about 5% cover - P. loosestrife on mound)

Meander Survey Comments (Use Additional Sheets As Necessary):

Survivorship 90-95%. BE & cc appear stressed, others looks very good
Maintenance - stake (wooden) needed adjacent to trees as trees are rubbing against cages. Herbaceous growth dense around some shrubs and may need some trimming weeding to reduce competition.

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Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 2 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: Partly Sunny
Planting Area Location: WEST BANK, AREA 1
Riverbank Length (ft): 100 Avg width (ft): 15
Planting Area (sf): 1500 10-20% Area (sf): 150-300
Comments:

Random Sample Location Number: #2 Riverbank length @ (ft): 88 Width (ft): 20
Slope length (ft): 11 Sample Area (sf): 220

Plant Survivorship: plot is ~ 90% in shrub clump.

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

Total Live Trees: 1 **Total Live Shrubs:** 14
1 stressed cc, 1 dead cc

Herbaceous Cover (%): 100

Invasive Plant Cover (%): 0 (same note as #1)

Meander Survey Comments (Use Additional Sheets As Necessary):
Maintenance - some trees growing out the side of cages, others being constrained within - need work.
Chokecherry is struggling, some shrubs being engulfed by herbaceous growth, others 4-5' tall.

Revegetation Monitoring Field Form

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

Observer(s): B. Stack Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather:

Planting Area Location: WEST BANK AREA 1
Riverbank Length (ft): 100 Avg width (ft): 11
Planting Area (sf): 1100 (940) 10-20% Area (sf): 110 - 220
Comments: 2 ROCK SWALES PRESENT. AVG 8FT IN WIDTH (TOTAL AREA = 160ft²)

Random Sample Location Number: #3 Riverbank length (ft): 36 Width (ft): 20
Slope length (ft): 10 Sample Area (sf): 200

Plant Survivorship: plot only in trees

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow	111	3	Red-osier Dogwood		ϕ
Silver Maple	1	1	Silky Dogwood		ϕ
Eastern Cottonwood	11	2	Winterberry Holly		ϕ
Box Elder	1	1	Chokecherry		ϕ
			Northern Arrowwood		ϕ

1 Dead cottonwood

Total Live Trees: 7 **Total Live Shrubs:** ϕ

Herbaceous Cover (%): 95 %

Invasive Plant Cover (%): 5 % Knotweed, P. loosestrife
Cyperus sponge near swales (small area 5x5)

Meander Survey Comments (Use Additional Sheets As Necessary):
2nd Sew Maintenance - Need stem protectors moved up on some trees. Knotweed & P. loosestrife in planting areas.

WOODLOT ALTERNATIVES, INC. ENVIRONMENTAL CONSULTANTS

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 4 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: Partly sunny
Planting Area Location: WEST BANK ~~AREA~~ 1
Riverbank Length (ft): 100 Avg width (ft): 13
Planting Area (sf): 1300 10-20% Area (sf): 130 - 260
Comments: 1 drainage swale rock (W = 6') Area ~ 80 ft²

Random Sample Location Number: #4 Riverbank length (ft): @ 90 Width (ft): 20
Slope length (ft): 13 Sample Area (sf): 260

Plant Survivorship: plots is entirely in a shrub clump

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow		ϕ	Red-osier Dogwood	1111	4
Silver Maple		ϕ	Silky Dogwood	1111	4
Eastern Cottonwood	1	1	Winterberry Holly	1111	6
Box Elder		ϕ	Chokecherry		ϕ
			Northern Arrowwood	111	3

cottonwood stressed

Total Live Trees: 1 **Total Live Shrubs:** 17

Herbaceous Cover (%): 100

Invasive Plant Cover (%): 0 % (~ 5% loosestrife on corner)

Meander Survey Comments (Use Additional Sheets As Necessary):
P. loosestrife previously controlled 3 weeks ago. Seed heads removed. No flower heads observed.

Revegetation Monitoring Field Form

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

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: PARTLY SUNNY - 70's

Planting Area Location: WEST BANK, AREA 1
Riverbank Length (ft): 100 Avg width (ft): 15
Planting Area (sf): 1500 10-20% Area (sf): 150-300
Comments:

Random Sample Location Number: # 5 Riverbank length (ft) @: 43 Width (ft): 20
Slope length (ft): 15 Sample Area (sf): 300

Plant Survivorship: Plot in tree area only

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow		ϕ	Red-osier Dogwood		ϕ
Silver Maple	1111	4	Silky Dogwood		
Eastern Cottonwood	111	3	Winterberry Holly		
Box Elder	1	1	Chokecherry		
			Northern Arrowwood		

Total Live Trees: 8 **Total Live Shrubs:** ϕ

Herbaceous Cover (%): 95

Invasive Plant Cover (%): < 5 %
Cyprus spurge in planting area. Likely to be out competed

Meander Survey Comments (Use Additional Sheets As Necessary):

Silver maples have tar spot (5-10% coverage).
Cottonwoods have put on 5' of new growth.
1 wood chuck hole observed

WOODLOT ALTERNATIVES, INC.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 6 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: PARTLY SUNNY

Planting Area Location: WEST BANK, AREA 1
Riverbank Length (ft): 100 Avg width (ft): 18
Planting Area (sf): 1800 10-20% Area (sf): 180-360
Comments:

Random Sample Location Number: #6 Riverbank length (ft) @: 60 Width (ft): 20
Slope length (ft): 20 Sample Area (sf): 400

Plant Survivorship: Plot in a tree meadow

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

Total Live Trees: 7 **Total Live Shrubs:**

Herbaceous Cover (%): 90
Bare patches result of herbicide application from previous invasive plant control work.

Invasive Plant Cover (%): < 5%
Cypress spurge, Japanese knotweed

Meander Survey Comments (Use Additional Sheets As Necessary):
1 woodchuck hole. Silver maple growing where tree tube is observed @ B
Herbaceous growth dominated by solidago species (30% cover)
Tree + shrub survivorship appears to be around 90%

WOODLOT ALTERNATIVES, INC.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 7 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: P. SUNNY 70's

Planting Area Location: WEST BANK - AREA 2
Riverbank Length (ft): 100 Avg width (ft): 17
Planting Area (sf): 1200 10-20% Area (sf): 120-240
Comments: Sample ~~size~~ location begins at upstream end of area 2 1 swale within this section (8'x12') ~ 100 FT²

Random Sample Location Number: #7 Riverbank length (ft): @ 25 Width (ft): 30
Slope length (ft): 7 Sample Area (sf): 210

Plant Survivorship: Plot is in shrub clump.

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow		ϕ	Red-osier Dogwood	1	1
Silver Maple			Silky Dogwood	1111	4
Eastern Cottonwood			Winterberry Holly	1	1
Box Elder			Chokecherry		ϕ
		↓	Northern Arrowwood	1111	6

Total Live Trees: ϕ **Total Live Shrubs:** 12

Herbaceous Cover (%): 80 (cover affected by herbicide spray)

Invasive Plant Cover (%): < 5 % (J. knotweed)

~~Some cypress spurge outside of planting area near TOB~~

Meander Survey Comments (Use Additional Sheets As Necessary):
added 10 extra ft to plot as it was too small a plot orig

Revegetation Monitoring Field Form

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

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: P. SUNNY - 70's

Planting Area Location: WEST BANK, AREA 2
Riverbank Length (ft): 100 Avg width (ft): 12
Planting Area (sf): 1200 10-20% Area (sf): 120-240
Comments:

Random Sample Location Number: #8 Riverbank length (@ 10 ft): _____ Width (ft): 20
Slope length (ft): 10 Sample Area (sf): 200

Plant Survivorship: Plot in tree planted area.

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

Total Live Trees: 7 **Total Live Shrubs:** ϕ

Herbaceous Cover (%): 100

Invasive Plant Cover (%): 0 None observed in planting area. 1 J. Knotweed on TOB, also some knotweed (<5%) in bank around.

Meander Survey Comments (Use Additional Sheets As Necessary):
Silver maple put on 3' of new growth.
Survivorship 95%.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 9 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: PARTLY SUNNY - 70's

Planting Area Location: WEST BANK, AREA 2
Riverbank Length (ft): 100 Avg width (ft): 22
Planting Area (sf): 2200 10-20% Area (sf): 220 - 440
Comments: END OF THIS 100 FT SECTION IS APPROX 10' DOWNSTREAM OF TRASH RACK AT DAM. BOAT RAMP (access point)

Random Sample Location Number: #9 Riverbank length (ft): @ 60 Width (ft): 20
Slope length (ft): 25 Sample Area (sf): 300

Plant Survivorship: tree planted area only.

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow	1111	5	Red-osier Dogwood		ϕ
Silver Maple	1111 111	8	Silky Dogwood		
Eastern Cottonwood	111	3	Winterberry Holly		
Box Elder	111	3	Chokecherry		
			Northern Arrowwood		

Total Live Trees: 19 **Total Live Shrubs:** ϕ
1 - SM+1 BE stressed.

Herbaceous Cover (%): 90 (no herbicide impacts here. Poison Ivy) herbaceous cover

Invasive Plant Cover (%): 0

Meander Survey Comments (Use Additional Sheets As Necessary):
5-6 dead piled trees - removed as result of boat ramp
Surrounding ~~opened~~ opened to be around 90%
Trees look good especially silver maple, cottonwood, and black willow.
Eastern waste here as result of dam back water effects.
10-15 trees have been damaged due to access around the dam, these trees generally appear healthy but will need maintenance - cage adjustments

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 10 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: PARTLY SUNNY - 70's

Planting Area Location: EAST BANK, AREA 3
Riverbank Length (ft): 100 Avg width (ft): 5
Planting Area (sf): 500 10-20% Area (sf): 50-100
Comments: Very narrow planting area.

Random Sample Location Number: #10 Riverbank length (ft): @ 20 Width (ft): 20
Slope length (ft): 5 Sample Area (sf): 100

Plant Survivorship: all shrubs clumps

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

Total Live Trees: ϕ **Total Live Shrubs:** 6

Herbaceous Cover (%): 95%

Invasive Plant Cover (%): 0 Purple Loosestrife in marsh downstream (5% cover)

Meander Survey Comments (Use Additional Sheets As Necessary):

Survivorship ~ 90%.
Some cypress spruce (<5%) near TOB.
Numerous grape vines on TOB moving into planting area.

WOODLOT ALTERNATIVES, INC.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 11 of 25

Observer(s): B STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: P. SUNNY 70's

Planting Area Location: EAST BANK AREA 3
Riverbank Length (ft): 100 Avg width (ft): 6
Planting Area (sf): 600 10-20% Area (sf): 60-120
Comments:

Random Sample Location Number: 11 Riverbank length (ft): @ 50 Width (ft): 5 20
Slope length (ft): 5 Sample Area (sf): 100

Plant Survivorship: Part of plot (30%) is in shrub clump.

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow	1	1	Red-osier Dogwood	111	3
Silver Maple		ϕ	Silky Dogwood	1	1
Eastern Cottonwood	11	2	Winterberry Holly		ϕ
Box Elder		ϕ	Chokecherry		ϕ
			Northern Arrowwood	11	2

Total Live Trees: 3 **Total Live Shrubs:** 6

Herbaceous Cover (%): 95 %

Invasive Plant Cover (%): 5 %
Multiflora Rose, P. loosestrife

Meander Survey Comments (Use Additional Sheets As Necessary):
clust of purple loosestrife in flower (seed stage) in corner.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 12 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: P. SUNNY · 70's

Planting Area Location: EAST BANK, AREA 3
Riverbank Length (ft): 100 Avg width (ft): 8
Planting Area (sf): 800 10-20% Area (sf): 80-160
Comments:

Random Sample Location Number: 12 Riverbank length (ft): @ 40 Width (ft): 20
Slope length (ft): 8 Sample Area (sf): 160

Plant Survivorship: Plot 100% in shrub change

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow		ϕ	Red-osier Dogwood	1/11	4
Silver Maple			Silky Dogwood	111	3
Eastern Cottonwood			Winterberry Holly	1/11 1	6
Box Elder			Chokecherry		ϕ
			Northern Arrowwood		ϕ

Total Live Trees: ϕ **Total Live Shrubs:** 13

Herbaceous Cover (%): 100

Invasive Plant Cover (%): < 5% (Purple loosestrife)

Meander Survey Comments (Use Additional Sheets As Necessary):
Control efforts needed immediately in this area.
Survivorship appears to be 95-100%. Most of mortality in stressed plants are cuttle change. Arrowwood looks very good.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 13 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: P. SUNNY 70's

Planting Area Location: East Bank, AREA 3
Riverbank Length (ft): 100 Avg width (ft): 15
Planting Area (sf): 1500 10-20% Area (sf): 150-300
Comments:

Random Sample Location Number: #13 Riverbank length (ft): @ 90 Width (ft): 20
Slope length (ft): 15 Sample Area (sf): 300

Plant Survivorship: Plot is all in tree planted area

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow	1	1	Red-osier Dogwood		Ø
Silver Maple	1111	4	Silky Dogwood		
Eastern Cottonwood	1	1	Winterberry Holly		
Box Elder	1	1	Chokecherry		
			Northern Arrowwood		

Total Live Trees: 7 **Total Live Shrubs:** Ø
1 - BE stressed

Herbaceous Cover (%): 100

Invasive Plant Cover (%): 0

Meander Survey Comments (Use Additional Sheets As Necessary):
New England aster
Purple loosestrife in area (<5%). Japanese Knotweed at TOB.

Revegetation Monitoring Field Form

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

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: P. SUNNY / ~70's

Planting Area Location: East Bank, AREA 3 (50') + Area 4 (50')
Riverbank Length (ft): 100 Avg width (ft): 15
Planting Area (sf): 1500 10-20% Area (sf): 150-300
Comments:

Random Sample Location Number: #14 Riverbank length (ft): 33 Width (ft): 25
Slope length (ft): 15 Sample Area (sf): 375

Plant Survivorship:

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow	11	2	Red-osier Dogwood	𝍸 11	7
Silver Maple	1	1	Silky Dogwood	1	1
Eastern Cottonwood	11	2	Winterberry Holly		
Box Elder			Chokecherry		
			Northern Arrowwood	𝍸 1	6

Total Live Trees: 5 **Total Live Shrubs:** 14

Herbaceous Cover (%): 95

Invasive Plant Cover (%): 0

Meander Survey Comments (Use Additional Sheets As Necessary):
alder / Birch volunteers
1 wood duck hole
Bend - plot may be longer.

WOODLOT ALTERNATIVES, INC.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 15 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: Partly sunny - 70's

Planting Area Location: East bank, Area 4
Riverbank Length (ft): 100 Avg width (ft): 18
Planting Area (sf): 1800 10-20% Area (sf): 120-360
Comments: 80-90% in shrub canopy

Random Sample Location Number: 15 Riverbank length (ft): @ 50 Width (ft): 20
Slope length (ft): 20 Sample Area (sf): 400

Plant Survivorship:

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

Total Live Trees: 2 **Total Live Shrubs:** ≥17

Herbaceous Cover (%): 95%

Invasive Plant Cover (%): 5-10%
P. lanceolata, multiflora rosa. Need control work immediately

Meander Survey Comments (Use Additional Sheets As Necessary):
Volunteer black willows

Revegetation Monitoring Field Form

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

Observer(s): B. STACK Date: 9/15/04

Phase: 1 Flow @ Coltsville (cfs) 55 Weather: PARTLY SUNNY - 70's

Planting Area Location: East Bank, AREA 4

Riverbank Length (ft): 100 Avg width (ft): 25

Planting Area (sf): 2500 10-20% Area (sf): 250 - 500

Comments:

Random Sample Location Number: #16 Riverbank length (ft): @ 70 Width (ft): 20

Slope length (ft): 30 Sample Area (sf): 600

Plant Survivorship: plot 80% in shrub clump

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow		0	Red-osier Dogwood	1111	5
Silver Maple		0	Silky Dogwood	111	4
Eastern Cottonwood		0	Winterberry Holly	111	4
Box Elder	11	2	Chokecherry	1	1
			Northern Arrowwood	111	3

Total Live Trees: 2 **Total Live Shrubs:** 17

Herbaceous Cover (%): 95

Invasive Plant Cover (%): 5% (Lysimachia in planting area as well as J. frutwerd)

Meander Survey Comments (Use Additional Sheets As Necessary):

Rock armor has 10% over with purple loosestrife in seed. In some places it is in planting area

WOODLOT ALTERNATIVES, INC.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 17 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: PARTLY SUNNY ~70's

Planting Area Location: East Bank, Area 4
Riverbank Length (ft): 100 Avg width (ft): 27
Planting Area (sf): 2700 10-20% Area (sf): 270 - 540
Comments:

Random Sample Location Number: #17 Riverbank length (ft): @ 40 Width (ft): 20
Slope length (ft): ~~20~~ 35 Sample Area (sf): 700

Plant Survivorship: Plot 100% in tree planted zone only.

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow	5	6	Red-osier Dogwood		0
Silver Maple	3	3	Silky Dogwood		
Eastern Cottonwood	4	4	Winterberry Holly		
Box Elder	5	5	Chokecherry		
			Northern Arrowwood		

Total Live Trees: 18 **Total Live Shrubs:** 0
1 Dead BE, 1 stressed BE

Herbaceous Cover (%): 95

Invasive Plant Cover (%): 5% (purple loosestrife in planting area)

Meander Survey Comments (Use Additional Sheets As Necessary):

tube caps off of willows?
purple loosestrife observed in middle of planting area.
Survivorship ~ 95%.

WOODLOT ALTERNATIVES, INC.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 18 of 25

Observer(s): B STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: PARTLY SUNNY - 70's

Planting Area Location: East BANK AREA 4
Riverbank Length (ft): 100 Avg width (ft): 23
Planting Area (sf): 2300 10-20% Area (sf): 230 - 460
Comments:

Random Sample Location Number: #18 Riverbank length (ft): @ 70 Width (ft): 20
Slope length (ft): 15 Sample Area (sf): 300

Plant Survivorship: plot in 100% tree planted area only

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

Total Live Trees: 11 **Total Live Shrubs:** ϕ
1 Dead BE, 1 stressed BE

Herbaceous Cover (%): 95

Invasive Plant Cover (%): 10 (purple loosestrife)

Meander Survey Comments (Use Additional Sheets As Necessary):

Bar-like feature (point bar) starting to form. Two elevation sections, purple loosestrife concentrated in this area. Needs treatment soon.

WOODLOT ALTERNATIVES, INC.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 19 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: Mostly sunny - 70's

Planting Area Location: East Bank - Area 4
Riverbank Length (ft): 100 Avg width (ft): 25
Planting Area (sf): 2500 10-20% Area (sf): 250-500
Comments:

Random Sample Location Number: 19 Riverbank length (ft): 10 Width (ft): 20
Slope length (ft): 25 Sample Area (sf): 500

Plant Survivorship: prob 80% in shrub clump

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow		0	Red-osier Dogwood	HHT I	6
Silver Maple	I	1	Silky Dogwood	HHT I	6
Eastern Cottonwood	II	2	Winterberry Holly	III	3
Box Elder		0	Chokecherry	I	1
			Northern Arrowwood	III	3

Total Live Trees: 3 **Total Live Shrubs:** 19

Herbaceous Cover (%): 90

Invasive Plant Cover (%): <5% (P. loosestrife in lower bank)

Meander Survey Comments (Use Additional Sheets As Necessary):

New tree cages (trailer) need to be added to approx 15-20 trees.
Beaver has cut 2-3 planted trees. Possible bank beaver hole in this area.
survivorship ~ 90-95%
Herbaceous cover decreases in downstream section of this area (Herbaceous veg 2-3' tall), shorter + not as dense as upstream.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 21 of 25

Observer(s): B. Stack Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: ~~Partly~~ Cloudy

Planting Area Location: East Bank - Area 4 (50%) ; Area 5 (50%)
Riverbank Length (ft): 100 Avg width (ft): 20
Planting Area (sf): 2000 10-20% Area (sf): 200-400
Comments: One 7' wide with swale. (~140 ft²)

Random Sample Location Number: 20 Riverbank length (@ ~~ft~~): 50 Width (ft): 20
Slope length (ft): 20 Sample Area (sf): 400

Plant Survivorship: plot 100% in tree planted zone

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow		ϕ	Red-osier Dogwood		ϕ
Silver Maple	HHT III	8	Silky Dogwood		↓
Eastern Cottonwood	II	2	Winterberry Holly		↓
Box Elder	III	3	Chokecherry		↓
			Northern Arrowwood		↓

Total Live Trees: 13 **Total Live Shrubs:** ϕ

Herbaceous Cover (%): 80

Invasive Plant Cover (%): 0

Meander Survey Comments (Use Additional Sheets As Necessary):

Silver maples 6-8' tall (1-1.5" caliper)
Poor herbaceous cover of invasives in this area.

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 21 of 25

Observer(s): B. STACK Date: 7/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: OVERCAST - CLOUDY

Planting Area Location: East Bank - Area 5
Riverbank Length (ft): 100 Avg width (ft): 8
Planting Area (sf): 8000 10-20% Area (sf): 80 - 160
Comments:

Random Sample Location Number: 21 Riverbank length ~~(ft)~~: 70 Width (ft): 30
Slope length (ft): 8 Sample Area (sf): 240

Plant Survivorship: plot 100% in tree planted area

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

Total Live Trees: 9 **Total Live Shrubs:** ϕ
2 Dead BE

Herbaceous Cover (%): 90

Invasive Plant Cover (%): 0

Meander Survey Comments (Use Additional Sheets As Necessary):

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 22 of 25

Observer(s): B. Stacl Date: 9/15/04
Phase: 1 Flow @ Coltsville (cfs) 55 Weather: overcast & 70's

Planting Area Location: East bank-Area 5
Riverbank Length (ft): 100 Avg width (ft): 10
Planting Area (sf): 1000 10-20% Area (sf): 100-200
Comments:

Random Sample Location Number: 22 Riverbank length (ft): ~~50~~ ~~100~~ Width (ft): 20
Slope length (ft): 10 Sample Area (sf): 200

Plant Survivorship: Plot 100% in tree planted only zone

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow	—	0	Red-osier Dogwood		0
Silver Maple	1111	4	Silky Dogwood		
Eastern Cottonwood	—	0	Winterberry Holly		
Box Elder	1111	5	Chokecherry		
			Northern Arrowwood		

Total Live Trees: 9 **Total Live Shrubs:** 0

Herbaceous Cover (%): 90

Invasive Plant Cover (%): 0 (b. sweet on TOB)

Meander Survey Comments (Use Additional Sheets As Necessary):

Survivorship is about 90%

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 23 of 25

Observer(s): B. STACK Date: 9/15/04
Phase: 1/2 TRANS Flow @ Coltsville (cfs) 55 Weather: OVERCAST

Planting Area Location: East Bank - 514+25 to 518+35
Riverbank Length (ft): 100 Avg width (ft): 17
Planting Area (sf): 1700 10-20% Area (sf): 170-340
Comments:

Random Sample Location Number: 23 Riverbank length (ft): @ 90 Width (ft): 20
Slope length (ft): 17 Sample Area (sf): 340

Plant Survivorship:

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow		Ø	Red-osier Dogwood	III	3
Silver Maple		I	Silky Dogwood	II	2
Eastern Cottonwood		√	Winterberry Holly		Ø
Box Elder	III		Chokecherry		Ø
			Northern Arrowwood		

Total Live Trees: 3 **Total Live Shrubs:** 5

Herbaceous Cover (%): 90

Invasive Plant Cover (%): 0

Meander Survey Comments (Use Additional Sheets As Necessary):

Herbaceous cover fair; low diversity
Survivorship of planted stock good 95%

Revegetation Monitoring Field Form

1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA Page 24 of 25

Observer(s): B. Stark Date: 9/15/04
Phase: 1/2 Trans Flow @ Coltsville (cfs) 55 Weather: overcast ~70's

Planting Area Location: East Riverbank - 2+25 to 5+35
Riverbank Length (ft): 100 Avg width (ft): 18
Planting Area (sf): 1800 10-20% Area (sf): 180-360
Comments:

Random Sample Location Number: 24 Riverbank length (ft): @ 25 Width (ft): 20
Slope length (ft): 16 Sample Area (sf): 320

Plant Survivorship:

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow		ϕ	Red-osier Dogwood	1111	4
Silver Maple		ϕ	Silky Dogwood	111	3
Eastern Cottonwood		ϕ	Winterberry Holly		ϕ
Box Elder	111	3	Chokecherry		ϕ
			Northern Arrowwood		ϕ

Total Live Trees: 3 **Total Live Shrubs:** 7

Herbaceous Cover (%): 90

Invasive Plant Cover (%): 0

Meander Survey Comments (Use Additional Sheets As Necessary):

Survivorship @ 95-100%

Revegetation Monitoring Field Form

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

Observer(s): B. Stack Date: 9/15/04

Phase: 1/2 TRANS Flow @ Coltsville (cfs) 55 Weather: OVERCAST - 70's

Planting Area Location: East River Bank - STA 514+25 to 519+35

Riverbank Length (ft): 100 Avg width (ft): 20

Planting Area (sf): 2000 10-20% Area (sf): 200-400

Comments:

Random Sample Location Number: 25 Riverbank length (ft): @ 50 Width (ft): 30

Slope length (ft): 20 Sample Area (sf): 600

Plant Survivorship:

Trees	*Quantity (live)*	*Total*	*Shrubs*	*Quantity (live)*	*Total*
Black Willow		ϕ	Red-osier Dogwood	HH	5
Silver Maple		|	Silky Dogwood	III	3
Eastern Cottonwood		↓	Winterberry Holly	I	1
Box Elder	HHI	6	Chokecherry		
			Northern Arrowwood		

Total Live Trees: 6 **Total Live Shrubs:** 9

B.E all stressed

Herbaceous Cover (%): 95

Invasive Plant Cover (%): 0

Meander Survey Comments (Use Additional Sheets As Necessary):

Red & Silky dogwoods looks healthy & vigorious.
Box Elder stressed.
Most of red-osier had fruit. Didn't observe on silky dogwood w/ fruit.

WOODLOT ALTERNATIVES, INC.

VEG PLOT LOCATIONS
1.5 MILE REACH
PITTSFIELD, MA
VEG MONITORING
SHEET 1 OF 4

WAI # 10414.01

PHASE 1

B. STACK
9/15/04

WEST BANK

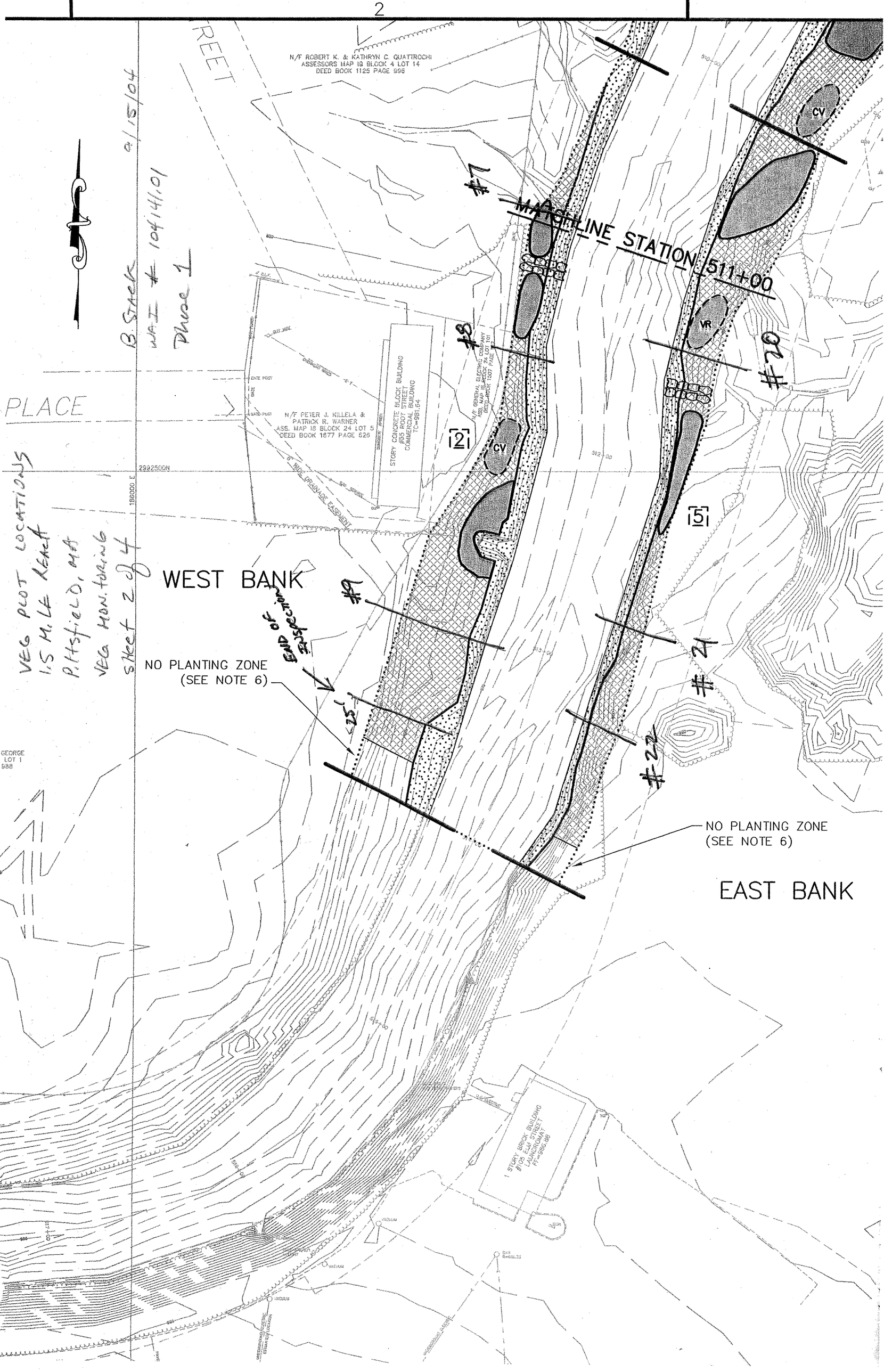
EAST BANK

#1
#2
#3
#4
#5
#6
#10
#11
#12
#13
#14
#15
#16

VR
VR
CV

[1]
[3]
[3]
[4]

NOT SAMPLED (too short)


N/F ROBERT K. & KATHRYN C. QUATTROCHI
ASSESSORS MAP 18 BLOCK 4 LOT 14
DEED BOOK 1125 PAGE 996
REET
PLACE
B. Stack
WAI # 104141.01
Phase 1
4/15/04
#7
#8
#9
#20
#21
#22
MAINLINE STATION 511+00
CV
VR
N/F PETER J. KILLELA &
PATRICK R. WARNER
ASS. MAP 18 BLOCK 24 LOT 5
DEED BOOK 1677 PAGE 526
STORY CONCRETE BLOCK BUILDING
#30 FOOT STREET
COMMERCIAL BUILDING
TC=981.64
N/F GENERAL ELECTRIC CO.
ASS. MAP 18 BLOCK 24 LOT 101
DEED BOOK 1307 PAGE 101
8" WIDE DRAINAGE EASEMENT
29325000N
192000 E
WEST BANK
EAST BANK
NO PLANTING ZONE
(SEE NOTE 6)
NO PLANTING ZONE
(SEE NOTE 6)
END OF INSPECTION
~325'
VEG PLOT LOCATIONS
1.5 M. LE Reach
Pittsfield, MA
Veg Monitoring
Sheet 2 of 4
GEORGE
LOT 1
988
1 STORY BRICK BUILDING
#106 ELM STREET
LAUNDROMAT
FF=966.88

N/F JOHNSON FAMILY REAL ESTATE, LLC
ASSESSORS MAP 18 BLOCK 4 LOTS 203
DEED BOOK 1894 PAGE 812

N/F JOHNSON FAMILY REAL ESTATE, LLC
ASSESSORS MAP 18 BLOCK 4 LOTS 25
DEED BOOK 1581 PAGE 241

REAR RELOCATION EASEMENT (APPROX. LOCATION)

VR

CV

EAST BANK

14

#17

#18

#19

CV

VR

LINE STATION 511+00

13

13

VEG. PLOT LOCATIONS
1.5 M.LF REACH
PITTSFIELD, MA
VEG. MONITORING
SHEET 3 OF 4

B. STACK
WAI # 10141.01
PHASE 1

LEGEND

EXISTING CONTOURS

ROCK SWALE (WIDTH 5' TYP.)

LIMIT OF REMEDIATION

PLANTING K

1 MON

TREE

BANK

SHR

VINE

VEG PLOT LOCATIONS
1.5 MILE REACH
PITTSFIELD, MA
VEG. MONITORING
sheet 4 of 4

B. STACK
WAI # 104141.01
PHASE 1

FLOW

START PHASE 2
514+00

LIMIT OF REMEDIATION

1 BOULDER CLUSTER
2101 2101

WEST BANK

EAST BANK

#23

#24

#25

LIMIT OF REMEDIATION

Appendix E

Revegetation Restoration Monitoring Data Analyses

WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

September 17, 2004

SURVEY DATE: September 15, 2004
SURVEY PERFORMED BY: Bill Stack (Woodlot Alternatives, Inc)

Revegetation Monitoring

(SSERC 1.5 Mile Reach; GE/Housatonic River Project, Pittsfield, Massachusetts)

Woodlot Alternatives, Inc. Project No.: 104141.01

Monitoring Area: Phase 1 (Sta 500+00 to 513+75)

Table 1. Revegetation Monitoring Data

Monitoring Location	Planting Area (sq. ft)	Plot Number	Sample Area (sq. ft)	Number of Live Trees	Number of Live Shrubs	Percent Herbaceous Cover	Percent Invasive Plant
1	1800	1	360	8	5	95%	0%
1	1500	2	220	1	14	100%	0%
1	940	3	200	7	0	95%	5%
1	1220	4	260	1	17	100%	0%
1	1500	5	300	8	0	95%	5%
1	1800	6	400	7	0	90%	5%
1	420	small area - no plot data collected					
2	1100	7	210	0	12	80%	5%
2	1200	8	200	7	0	100%	0%
2	2200	9	300	19	0	90%	0%
2	500	small area - no plot data collected					
3	500	10	100	0	6	95%	0%
3	600	11	100	3	6	95%	5%
3	800	12	160	0	13	100%	5%
3	1500	13	300	7	0	100%	0%
3 & 4	1500	14	375	5	14	95%	0%
4	1800	15	400	2	17	95%	10%
4	2500	16	600	2	17	95%	5%
4	2700	17	700	18	0	95%	5%
4	2300	18	300	11	0	95%	10%
4	2500	19	500	3	19	90%	5%
4 & 5	1860	20	400	13	0	80%	0%
5	800	21	240	9	0	90%	0%
5	1000	22	200	9	0	90%	0%

Total Planting Area (sq. ft)	34540
Total Planting Area (ac)	0.79
Number of Inspection Plots	22
Total Plot Area (sq. ft)	6825
Total Plot Area (ac)	0.16
Percent of Plot Area in Total (%)	20

Table 2. Evaluation of Performance Standards

Performance Standard	Plot Average	Performance Standard	Meets Performance Standard? Y or N
Percent Plant Survivorship			
Quantity of Trees	140	88	**Y**
Quantity of Shrubs	140	92	**Y**
Percent Herbaceous Cover	94%	95%	**N**
Percent Invasive Plant Cover	3%	<5%	**Y**

Notes:

(1) Revegetation monitoring was conducted on September 15, 2004.
(2) *Monitoring Location* refers to areas delineated on as-built map (June 2003; Woodlot Alternatives Inc.)
(3) Revegetation monitoring was conducted according to the *1.5 Mile Reach Restoration Monitoring Plan* (May 2004; Woodlot Alternatives, Inc.)
(4) Performance standards include: 80% Plant Survivorship; 95% Herbaceous Cover, and <5% Invasive Plant Cover.
(5) Trees and shrubs were installed at plant densities of 700 and 730 plants per acre, respectively.

WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

September 17, 2004

SURVEY DATE: September 15, 2004
SURVEY PERFORMED BY: Bill Stack (Woodlot Alternatives, Inc)

Revegetation Monitoring

(SSERC 1.5 Mile Reach; GE/Housatonic River Project, Pittsfield, Massachusetts)

Woodlot Alternatives, Inc. Project No.: 104141.01

Monitoring Area: Phase 1 and 2 Transition (East Riverbank Sta 514+25 to 518+35)

Table 1. Revegetation Monitoring Data

Monitoring Location	Planting Area (sq. ft)	Plot Number	Sample Area (sq. ft)	Number of Live Trees	Number of Live Shrubs	Percent Herbaceous Cover	Percent Invasive Plant Cover
6	1700	1	340	3	5	90%	0%
6	1800	2	320	3	7	90%	0%
6	2000	3	600	6	9	95%	0%
6	800	small area - no plot data collected					

Total Planting Area (sq. ft)	6300
Total Planting Area (ac)	0.14
Number of Inspection Plots	3
Total Plot Area (sq. ft)	1260
Total Plot Area (ac)	0.03
Percent of Plot Area in Total (%)	20

Table 2. Evaluation of Performance Standards

Performance Standard	Plot Average	Performance Standard	Meets Performance Standard? Y or N
Percent Plant Survivorship			
Quantity of Trees	12	12	**Y**
Quantity of Shrubs	21	17	**Y**
Percent Herbaceous Cover	92%	95%	**N**
Percent Invasive Plant Cover	0%	<5%	**Y**

Notes:

(1) Revegetation monitoring was conducted on September 15, 2004.
(2) *Monitoring Location* refers to areas delineated on as-built map (June 2003; Woodlot Alternatives Inc.)
(3) Revegetation monitoring was conducted according to the *1.5 Mile Reach Restoration Monitoring Plan* (May 2004; Woodlot Alternatives, Inc.)
(4) Performance standards include: 80% Plant Survivorship; 95% Herbaceous Cover, and <5% Invasive Plant Cover.
(5) Trees and shrubs were installed at plant densities of 500 and 730 plants per acre, respectively.
(6) Geocell installed within the entire riverbank monitoring area.

Appendix F

Invasive Plant Control Memo Updates
(Two memos- June 29 and December 7, 2004)

WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

Memorandum

To: Miles Gelatt and Joel Lindsay (Weston Solutions, Inc.)

From: Bill Stack (Woodlot Alternatives, Inc.) and Mike Penko (U.S. Army Corps of Engineers)

Cc: Michael Chelminski (Woodlot Alternatives, Inc.), and Peter Hugh and Darrell Moore (U.S. Army Corps of Engineers)

Date: June 29, 2004

Re: Invasive Plant Control Work - Phase 1, Phase 1/2 Transition, and Phase 2 – 600 ft; 1.5 Mile Reach, GE/Housatonic Site, Pittsfield, MA

The spring 2004 invasive plant control task work in the Phase 1, Transition Phase, and Phase 2 (600 ft) area of the 1.5 Mile Reach on the Housatonic River in Pittsfield, MA was completed on June 23, 2004. The goal of the invasive plant control work was to reduce or eliminate invasive plant populations within the riverbank planting areas and immediately adjacent to the planting areas so that planted native stock can become established and meet the habitat restoration objectives (i.e., establish a native riparian vegetation community).

Mike Penko of the U.S. Army Corps of Engineers and Bill Stack of Woodlot Alternatives, Inc. performed the invasive plant control work on June 11 and June 23, 2004. The control work included both physical (e.g., hand pulling and cutting) and chemical (e.g., herbicide applications) treatments. Mike Penko is a pesticide applicator certified by the Commonwealth of Massachusetts and conducted the chemical control treatments. Chemical treatments included foliar, topical (cut stumps), or injection (cut stem) applications of herbicides.

Invasive plants treated as part of this work included those listed by the Commonwealth of Massachusetts as such. Primary species that were identified and treated as part of this work included Japanese knotweed (*Polygonum cuspidatum*), oriental bittersweet (*Celastrus orbiculata*), and Morrow's honeysuckle (*Lonicera morrowii*). Secondary species treated included common barberry (*Berberis vulgaris*), common buckthorn (*Rhamnus cathartica*), black swallow-wort (*Cynanchum louiseae*), multiflora rose (*Rosa multiflora*), and winged euonymus (*Euonymus alata*). Norway Maple (Acer platanoides) saplings were selectively treated. A foliar application of 5% triclopyr (Brush-B-Gone®) was used for all invasive plants treated except for knotweed, on which 5% glyphosate (Rodeo®) was applied. No surfactant was used with Rodeo®. A topical application of 100% (Brush-B-Gone®) was applied to cut stems of woody

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E-mail: mail@woodlot.com Web Site: http://www.woodlotalt.com

species. Cut knotweed stems were injected with 25% Rodeo®. As a test, one stand of knotweed was treated with foliar application of 5 % Rodeo® and 5 % Brush-B-Gone®.

Results from the June 11, 2004, control treatments indicated that invasive plants had died back with no drift impacts on surrounding non-target vegetation. Estimated kill rate for the treated knotweed was approximately 75%, with the remaining plants showing some slight evidence of regrowth. New growth of knotweed seedlings was also observed. Three small patches of knotweed were observed and treated within the riverbank planting areas. These areas were located in Phase 1 (Cell 5 and 8) and Phase 2 –600 ft (Planting Area 17). The majority of the treated knotweed was located outside the planting areas. This knotweed carries a high risk of spreading seeds into the adjacent planting areas or onto the access roads and being transported to other portions of the 1.5 Mile project area.

RECOMMENDATIONS:

(1) Continue to control invasive plants. Left untreated, invasive plants will continue to spread into bare soil areas within the riverbank planting or adjacent areas. Continuing to control or reduce the spread of these species presents opportunities for native plants to colonize these areas. This is evident in some areas adjacent to the riverbank planting areas where native tree seedlings are becoming more established. It is recommended that follow-up invasive plant control treatments be performed between early August and mid-September.

(2) Revegetate bare soil areas. Where invasive species are present and groundcover is limited (e.g., the large knotweed patch behind Pete's Subaru), we recommend installation of some type of ground cover as soon as possible. Depending on the remedial actions planned for these areas, this may consist of an application of herbaceous seed mix or the installation of woody trees and shrubs. Establishing a vegetation community will help reduce the need for continual invasive plant control treatments in many of these areas.

WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

DRAFT CONFIDENTIAL – FOIA EXEMPT

Memorandum

To: Miles Gelatt (Weston Solutions, Inc.)

From: Bill Stack (Woodlot Alternatives, Inc.) and Mike Penko (U.S. Army Corps of Engineers)

Cc: Joel Lindsay (Weston Solutions, Inc.) and Michael Chelminski (Woodlot Alternatives, Inc.)

Date: December 7, 2004

Re: Invasive Plant Control Work Update - Phase 1, Transition Phase, and Phase 2A 600-ft; 1.5 Mile Reach, GE/Housatonic River Site, Pittsfield, MA

Invasive plant control work within Phase 1, Transition Phase, and Phase 2A (600 ft) areas of the 1.5 Mile Reach on the GE/Housatonic River site in Pittsfield, MA was performed on August 24 and October 4, 2004. The goal of the invasive plant control work was to reduce or eliminate invasive plant populations within and adjacent to the riverbank planting areas to foster the establishment of a native riparian vegetation community so as to achieve the specified habitat restoration objective for the 1.5 Mile Reach. This memo summarizes the work performed during the referenced site visits and recommends invasive plant control work for 2005.

Mike Penko of the U.S. Army Corps of Engineers (ACOE) and Bill Stack of Woodlot Alternatives, Inc. (Woodlot) performed the invasive plant control work. This work included both physical removal (e.g., hand pulling and cutting) and chemical (e.g., herbicide applications) treatments. Mike Penko, who is a Commonwealth of Massachusetts-certified pesticide applicator, performed the chemical control treatments. Chemical treatments included foliar, topical (cut stumps), or injection (cut stem) applications of herbicides. Weston Solutions, Inc. (Weston) staff assisted in hand pulling invasive plants during the August 24 site visit. Invasive plant control treatments were also performed by ACOE and Woodlot on June 11 and June 23, 2004, and were previously summarized in a Woodlot memo dated June 29, 2004.

Invasive plants treated as part of this work included those listed by the Commonwealth of Massachusetts. Primary species that were identified and treated included Japanese knotweed (*Polygonum cuspidatum*), oriental bittersweet (*Celastrus orbiculata*), purple loosestrife (*Lythrum salicaria*), and Morrow's honeysuckle (*Lonicera morrowii*). Other treated species included common barberry (*Berberis vulgaris*), common buckthorn (*Rhamnus cathartica*), black swallow-wort (*Cynanchum louiseae*), multiflora rose (*Rosa multiflora*), and winged euonymus (*Euonymus alata*). Norway Maple (Acer platanoides) saplings were selectively treated. A foliar application

30 Park Drive Topsham, Maine 04086 Phone 207-729-1199 Fax 207-729-2715
E-mail: mail@woodlot.com Web Site: http://www.woodlotalt.com

of 5% triclopyr (Brush-B-Gone®) was used for all invasive plants treated except for Japanese knotweed. Japanese knotweed was treated with a foliar application using a mixture of 5 % glyphosate (Rodeo®) and 1.5% Brush-B-Gone® during the August control treatment, and 2 % Rodeo® plus a non-ionic surfactant during the October control treatment. In some cases Japanese knotweed stems were cut and injected with 25% Rodeo®. A topical application of 100% Brush-B-Gone® was applied to cut stems of woody invasive plant species.

Observed results suggest that the control treatments have been effective, as invasive plants have died back with no drift impacts on surrounding non-target vegetation. The estimated kill rate for all treated invasive plants was approximately 90% with the density and areal cover of invasive plants having been reduced following the initiation of the invasive plant control work. The areal cover of invasive plants within planting areas is currently much less than 5%, which meets the restoration monitoring performance standard for invasive plant areal cover.

To date, Japanese knotweed has been the most challenging plant to control within the project area. Although kill rates have been high (approximately 90%), new growth of knotweed seedlings has been observed adjacent to the treated plants, which suggests that sufficient seed and rhizome reserves persist. Repeated treatments will eventually deplete rhizome reserves but recolonization by seed remains a long-term concern. In some areas, native seedlings such as eastern cottonwood (*Populus deltoides*) are colonizing the treated area and should out-compete Japanese knotweed once they become well established.

Four small knotweed patches ranging in size from approximately 20 to 200 square feet have been observed in the referenced project areas. The patches are located within riverbank Planting Areas 5 and 8 and adjacent to the riverbank Planting Areas 6 and 17. In addition, there is one large patch (approximately 1000 square feet) adjacent to the access road and planting area 5 and 8 in Phase 1 (behind Pete's Subaru). Monitoring and control of Japanese knotweed should continue in 2005 as Japanese knotweed typically produces a prolific seed source that carries a high risk of spreading seeds into the adjacent planting areas or onto the access roads and being transported to other portions of the 1.5 Mile Reach project area.

Purple loosestrife, which was a relatively minor invasive plant component in 2003, was observed in higher densities in 2004, particularly in the Phase 1 area within the riverbank rock armor. Here, estimated areal coverage was 5-10% in late August 2004. Further colonization by this species likely results from seeds being transported by the river from upstream sources and deposited onto the fine sediments within the armor. The fine sediments within the armor provide a suitable substrate for plant growth as other native plants are becoming established.

Because purple loosestrife was in the process of going to seed during the invasive plant control work, the most effective control method was to cut flower stalks and uproot the plant. Woodlot and Weston performed physical control efforts for purple loosestrife on August 24 and removed approximately 20 large garbage bags from the Phase 1 area. Two additional garbage bags of purple loosestrife were removed from the Transition Phase area.

The upstream invasive seed source for purple loosestrife is not likely to be eliminated; therefore, an annual effort may be required to reduce the spread of this species within the 1.5 Mile Reach. In an effort to minimize future invasive plant control work, Woodlot and ACOE recommend that live stakes or tubelings[1] such as red osier dogwood (*Cornus sericea*) be installed within the rock armor. These plants can deter the colonization of invasive species by quickly establishing dense root systems and by providing dense vegetation cover. They can also enhance ecological value to the riparian area (e.g., shading or hiding cover).

Installing live stakes or tubelings within the armor is a common bioengineering technique (i.e., joint planting) that is effective and relatively inexpensive ($2.00 per stake or plant plus installation costs). Woodlot suggests that a pilot project be initiated in the spring of 2005, consisting of the installation of approximately 200 live stakes or tubelings in an area in Phase 1. If successful, similar efforts could be used on other riverbank armor areas within the 1.5 Mile Reach that may be subject to colonization by purple loosestrife.

RECOMMENDATIONS:

(1) Continue to control invasive plants. Left untreated, invasive plants will continue to spread into bare soil areas within the riverbank planting or adjacent areas. Continuing to control or reduce the spread of these species presents opportunities for native plants to colonize these areas. This is evident in some areas adjacent to the riverbank planting areas where native plants are becoming more established. Invasive plant control treatments should continue to be performed in Phase 1, Transition Phase, and Phase 2A, and should begin in Phase 2B. Control treatments should be conducted during mid June, mid August, and late September (if needed) in 2005.

(2) Revegetate bare soil areas. Where invasive species are present and groundcover is limited (e.g., the large knotweed adjacent to access road near Pete's Subaru located at approximately STA 512+00), we recommend installation of some type of ground cover in spring 2005. Depending on the remedial actions planned for these areas, this may consist of an application of herbaceous seed mix or the installation of woody trees and shrubs. Establishing a vegetation community will help reduce the need for continual invasive plant control treatments in many of these areas.

(3) Install Live Stakes or Tubelings. Install 200 red osier dogwood stakes or tubelings within the riverbank armor in Phase 1, near the Silver Lake outfall. Work should be completed in spring 2005.

[1] Live stakes are branch cuttings for dormant plants. Tubelings are small containerized plants with established root systems.

Appendix G

Completed Field Data Forms and Reports

Riverbank and Riverbed Riprap Monitoring

Attachment B – Sample Field Form for Maintenance Monitoring of Rock Riprap Armor

Field Form for Monitoring of Rock Riprap Armor

Date:	8-23-04
Location:	WEST + EAST BANK PHASE I (TO DIVERSION DAM)
Weather:	CLEAR ~ 70°F
Observations	

Attached Map No./Site ID/GPS Coord.	*Comments/Recommendations*
	- WATER LEVEL 1' BELOW TOP OF RIPRAP
	RIPRAP BETWEEN BRIDGE & SWALE LOOKS GOOD
	SWALE LOOKS GOOD
Synopsis	WHERE VISIBLE, THE RIPRAP APPEARED TO BE IN AS-BUILT CONDITION. THE IMPOUNDMENT CREATED BY THE DAM LIMITS VISIBILITY, HOWEVER. THE BACKWATER WILL ALSO LIKELY REDUCE FLOW SPEEDS AND MUNCK STRESS ON THE RIPRAP. ALL OF THE OBSERVED SWALES APPEARED TO BE IN GOOD CONDITION. SCOUR TILE OR NATIVE SOIL WAS NOT OBSERVED UNDER THE RIPRAP

Lead Monitor:	MICHAEL CHELMINSKI	
	Name	**Signature**
Other Personnel:		

Attachment B – Sample Field Form for Maintenance Monitoring of Rock Riprap Armor

Field Form for Monitoring of Rock Riprap Armor

Date: 9-23-04

Location: PHASE 2 REACH - EAST (LEFT) SIDE

Weather: Partly Cloudy / ~ 70°F

Observations

Attached Map No./Site ID/GPS Coord.	*Comments/Recommendations*
–	MOVING UPSTREAM FROM DS LIMIT OF COMPLETED WORK. STA 538+75 AS MARKED ON HDPE PIPE
–	HDPE IS AGAINST TOE OF SLOPE TO STA 538 +00
–	HDPE PIPE IS AGAINST TOE OF SLOPE FROM 537+75 to 530+00
–	SWALE AT 530+00 LOOKS GOOD
–	ALL OF SLOPE LOOK OK!
–	PIPE IS AGAINST TOE OF SLOPE FROM 528+75 TO 524+00 (END OF RIPRAP) EXCEPT FOR OUTFALL SWALE AT 526+25
–	SWALE AT 525 +75 LOOKS OK
–	SWALE AT 524+75 LOOKS OK

Lead Monitor: MICHAEL CHELMINSKI

Name	Signature

Other Personnel:

Attachment B – Sample Field Form for Maintenance Monitoring of Rock Riprap Armor

Field Form for Monitoring of Rock Riprap Armor

Date: 9-23-04

Location: PHASE 2 – WEST SIDE (RIGHT)

Weather: CLOUDY / SUNNY ~ 70°F

Observations

Attached Map No./Site ID/GPS Coord.	*Comments/Recommendations*
	- NOTED UNRAVELING OF ARTICULATED CONCRETE MAT AT DS END.
	- KING FISHER & CRAYFISH OBSERVED
	- STEP PORTION OF RIPRAP ~ 40-FT DS OF RIPRAP TO TOP OF SLOPE. STEP SECTION APPROXIMATELY 20-FT LONG
NOTE TO WESTON	- NOTED MINOR (SMALL) "BLOW-OUT" OF ECB AT BASE OF SLOPE ON EAST (LEFT) BANK APPROXIMATELY DS OF INTERMEDIATE ACCESS ROAD
↓	- BLOW-OUT OF 35-FT OF SILT FENCE AND ECB APPROXIMATELY

Lead Monitor: MICHAEL CHOLMINSKI

Name	Signature

Other Personnel:

Attachment B – Sample Field Form for Maintenance Monitoring of Rock Riprap Armor

Field Form for Monitoring of Rock Riprap Armor

Date:	9-23-04
Location:	TRANSITION PHASE - RIGHT (WEST) SIDE
Weather:	CLEAR/SUNNY/70°F
Observations	
Attached Map No./Site ID/GPS Coord.	***Comments/Recommendations***
	NOTES TAKEN GOING UPSTREAM
-	RIPRAP UNDER BRIDGE AGAINST ABUTMENT APPEARS UNEVEN AND POTENTIALLY UNSTABLE. THIS MAY BE DUE TO OUTFALL AT DOWNSTREAM SIDE OF BRIDGE
-	WHERE IF VISIBLE, CHANNEL ARMOR APPEARS TO BE WELL CONSOLIDATED.
-	REACH ALONG WEST BANK LOOKS GOOD SAND MIGHT DEPOSITING ON INSIDE OF BEND AS ANTICIPATED
-	RACK LINE IS HIGH
Lead Monitor:	MICHAEL CHELMINSKI
	Name / **Signature**
Other Personnel:	

Attachment B – Sample Field Form for Maintenance Monitoring of Rock Riprap Armor

Field Form for Monitoring of Rock Riprap Armor

Date: 9-23-04

Location: TRANSITION PHASE - LEFT (EAST) SIDE

Weather: CLOUDY/SUNNY/ ~70°F

Observations

Attached Map No./Site ID/GPS Coord.	*Comments/Recommendations*
–	RIPRAP ON EAST (LEFT) BANK BETWEEN SHEET
	PILE AND RIVER APPEARS TO BE TOO STEEP
	(~1:1 CH:VT) ALONG A SECTION OF BANK
	APPROXIMATELY 30-FT LONG BEGINNING
	APPROXIMATELY 60-FT DOWNSTREAM OF THE DAM.
–	JUNCTION OF RIPRAP AND GEO-CELL-STABILIZED
	SLOPE APPEARS UNIFORM/CONSISTANT AND
	AS-BUILT. THIS SUGGESTS MINIMAL MOVEMENT
	OF SLOPE
–	LEFT BANK ~20-FT UPSTREAM OF RIPRAP +
	SHOTCRETE SWALE BETWEEN SHEET PILE
	AND RIVER. APPEARS TO BE TOO STEEP (~1:1).
	EVIDENCE OF RECENT MOVEMENT INCLUDES
	A SCARED ROCK AT BASE OF SLOPE. ROCKS
	WERE LOOSE IN THIS SECTION. LENGTH ~60-FT.
–	SMALL SWALE ENTERING BANK BEHIND FRIENDY'S
	APPEARS OVERLY STEEP AND POTENTIALLY UNSTABLE.

Lead Monitor: MICHAEL CHELMINSKI

Name	**Signature**

Other Personnel: