

**Spring 2008 Re-Vegetation Monitoring Report**

**1½ Mile Reach of Housatonic River**  
**General Electric (GE) – Pittsfield/Housatonic River Site**  
**Pittsfield, MA**

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## 1.0 INTRODUCTION

This Spring 2008 Re-vegetation Monitoring Report presents the results of the 2008 qualitative monitoring assessment of riverbank and non-riverbank re-vegetation within the 1½ Mile Reach of the Housatonic River, which is part of the General Electric (GE)–Pittsfield/Housatonic River Site (the Site). This monitoring assessment was conducted on June 3, 2008 and represents the spring portion of the first year of riverbank re-vegetation monitoring of the five-year monitoring period for the riverbanks in this reach of the Site, as well as the spring portion of the 2008 monitoring required for certain non-riverbank plantings. The requirements for this monitoring assessment and associated deliverables are presented in the Interim Post-Removal Site Control (PRSC) Plan for the 1½ Mile Reach (Weston, 2008).

### 1.1 Project Background

The United States Environmental Protection Agency (EPA) conducted a Removal Action for the 1½ Mile Reach of the Housatonic River under the terms of the Consent Decree (CD) for the Site. This reach extends from the Lyman Street Bridge downstream to the confluence of the East and West Branches of the river (the Confluence). The 1½ Mile Reach Removal Action included the excavation and disposal of approximately 91,700 cubic yards (cy) of contaminated sediments and riverbank soil from this reach of the river, followed by the performance of restoration activities. Excavation activities were completed in March of 2006, and restoration activities, including restoration of support areas, were substantially completed by the end of 2006. In 2007, EPA completed restoration and maintenance activities

In May 2008, EPA developed an Interim PRSC Plan to provide for the monitoring and maintenance of certain aspects of the remediation and restoration activities that were part of the 1½ Mile Reach Removal Action. These activities include monitoring and maintenance of riverbank soils (to prevent erosion), riprap, aquatic habitat enhancement structures, ancillary items constructed as part of remediation (e.g., retaining walls, fences, gates, etc.), and re-vegetation in riverbank and non-riverbank areas, including control of invasive species. Pursuant to the CD, GE is required to carry out these activities under the cost-sharing arrangement with EPA.

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## 1.2 Re-vegetation Monitoring Background and Maintenance Standards

This report addresses monitoring of the vegetation planted as part of restoration activities. This re-vegetation monitoring effort assesses riverbank and non-riverbank plantings, tree cages, and invasive plant species

This work involves two monitoring visits per year, one in May (spring monitoring visit) and the other in July (summer monitoring visit). The spring monitoring visit is to be qualitative in nature with the purpose of assessing plant conditions and plant survivorship and identifying segments of the planting areas where potential corrective actions or maintenance may be required. The summer monitoring visit is to be quantitative in nature with the purpose of assessing plant conditions, measuring plant survivorship and areal herbaceous vegetative cover, and assessing compliance with the Maintenance Standards in the PRSC Plan.

The Maintenance Standards for the re-vegetation of riverbank and non-riverbank planting areas are as follows:

- **Riverbank Planting Areas** – Survivability of planted trees and shrubs shall be equal to or greater than 80% of the number of trees and shrubs originally planted.
- **Non-Riverbank Areas, Excluding Fred Garner Park** – Survivability of planted trees and shrubs shall be 100% of the number of trees and shrubs originally planted.
- **Non-Riverbank Fred Garner Park Plantings** – Survivability of planted trees and shrubs in Fred Garner Park shall be equal to or greater than 80% of the number of trees and shrubs originally planted, except that the Maintenance Standard for the following trees in Fred Garner Park shall be 100% survivability: the eight (8) red maples and the six (6) river birches adjacent to the soccer field at Fred Garner Park, and the sixteen (16) hemlocks along the walking path.
- **Herbaceous Cover** – The Maintenance Standard for herbaceous cover shall be 95% cover outside the foliar coverage of trees. There is no Maintenance Standard for individual species of the herbaceous seed mix.



The Maintenance Standard for invasive species control is defined as areal coverage of species listed in Appendix A of the PRSC Plan that is less than 5% of any monitoring area; any invasive species present in excess of 5% must be removed by appropriate means.

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## 2.0 METHODS

This spring re-vegetation monitoring was conducted on June 3, 2008 and was qualitative in nature with the purpose of assessing plant conditions and plant survivorship and identifying segments of the planting areas where potential corrective actions or maintenance may be required. For purposes of the re-vegetation monitoring, the 1½ Mile Reach has been divided into four sub-reaches, commencing at the upstream end and delimited by the four bridge crossings in the 1½ Mile Reach, as shown on Figure 1:

- Phase 1 - Lyman Street Bridge to Elm Street Bridge
- Phase 2 - Elm Street Bridge to Dawes Avenue Bridge
- Phase 3 - Dawes Avenue Bridge to Pomeroy Avenue Bridge
- Phase 4 - Pomeroy Avenue Bridge to the Confluence

For the riverbanks, the PRSC Plan designates each side of the river within each of these sub-reaches as an overall monitoring area, and it designates specific representative monitoring plots within each such area for more intensive, quantitative monitoring (Table 3-1 of PRSC Plan). The designated monitoring plots within the monitoring areas are shown, by sub-reach, on Figures 2 through 5. These figures also show the overall area of planting within the monitoring areas; specific planting areas, which are designated by number, are shown on maps provided in the PRSC Plan. During the June 3, 2008 monitoring visit, the assessment of the riverbank re-vegetation was conducted using meander surveys in each overall monitoring area, with special attention to the specific monitoring plots. A meander survey involves traversing a study area on foot in a deliberate and sinuous manner to observe overall site conditions.

The assessment also qualitatively assessed the non-riverbank plantings at certain properties. Table 3-2 of the PRSC Plan lists the properties where non-riverbank plantings are subject to monitoring as part of the 1½ Mile Reach. At many of these properties, only limited monitoring was required and has already been completed by EPA. The listed properties where continued monitoring is required are Parcels I8-24-1 and I9-5-13 (in Phase 1) and Parcels I7-1-101, I6-1-67, and I6-1-66 (in Phase 4); these properties are shown on Figures 2 and 5. The June 2008 inspection included observations of the plantings on these properties, except that, based on discussions with EPA, Parcel I6-1-67 was not specifically inspected, since EPA reported that the

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plantings on this property are doing well. In addition, based on discussions between GE and EPA, the June 2008 assessment also qualitatively evaluated the plantings along the top of the riverbank at Parcels I9-4-14 and I9-4-19 in Phase 1 (see Figure 2).

During these surveys, the general characteristics of each riverbank monitoring area and non-riverbank planting area and any exceptional characteristics, such as concentrations of dead or stressed plants, were noted. The surveys also (1) assessed whether the monitoring plots within each overall monitoring area are representative of the entire monitoring area, (2) included photo-documentation of the monitoring areas, (3) assessed the red-osier dogwood (*Cornus sericea*) band at the bottom of the re-vegetated slope along the entire length of the areas from Elm Street Bridge to the Confluence, (4) identified significant areas of bare soil, and (5) noted the need for any tree cage maintenance, or performed tree cage maintenance as needed.

In accordance with the PRSC Plan, quantitative and qualitative inspections for invasive plant species are scheduled to be conducted during the summer monitoring visit; however, a qualitative assessment of invasive plant species was nevertheless conducted during the spring monitoring visit as part of the meander survey. This qualitative assessment noted whether any additional invasive plant species should be added to the list presented in Appendix A of the PRSC Plan, and whether any obvious problem areas require immediate attention.

The monitoring effort was conducted using the As-Built Drawings provided in Appendix H of the PRSC Plan as a guide to note the boundaries of property lines, planting areas, and monitoring areas.

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### 3.0 RESULTS

Charles Harman and Phil Perhamus, both of AMEC Earth & Environmental, Inc., conducted the qualitative assessment for the spring 2008 monitoring visit. Also present during this visit were the following personnel:

- Dean Tagliaferro, US Environmental Protection Agency
- Ken Munney, U.S. Fish and Wildlife Service (USFWS)
- Kevin Mooney, General Electric Company
- Izabela Zapisek, Weston Solutions
- Chris Frank, C.L. Frank & Company

The weather during the monitoring visit was clear, sunny and warm with an air temperature of around 80°F. The observations made during this monitoring visit are presented below. They are grouped according to the four above-listed phases of the project area:

- Phase 1 - Lyman Street to Elm Street
- Phase 2 - Elm Street to Dawes Avenue
- Phase 3 - Dawes Avenue to Pomeroy Avenue
- Phase 4 - Pomeroy Avenue to the Confluence

Photographs of these areas are presented in **Appendix A** of this report.

#### 3.1 Phase 1 – Lyman Street to Elm Street

1. With one small exception, the planted riverbank and non-riverbank vegetation in this sub-reach appears to be in very good condition. The exception is a small pocket of dead trees situated north of Monitoring Plot 1-E-2. The cause of this mortality may be related to the local hydrology of the area, which may provide too much available water for the plantings, although this could not be verified in the field.
2. Numerous volunteer species and individuals above, below, and within the rip-rap were observed throughout this sub-reach. Most of these individuals were box elders.

3. Some damage to the base of a few woody plant specimens was noted in Planting Area #1 and was attributed to either beaver or woodchuck activity.
4. Several trees in Planting Areas #1 and #2 will require adjustments to their tethering to minimize their movement in the wind and thereby minimize abrasion against the tree cages. Planting Areas #1 and #2 are located along the west side of the river and extend from the Lyman Street Bridge to approximately half the length of Phase 1.
5. For some of the black willows throughout this sub-reach, removal of approximately 50% of the side suckers may be necessary in order to focus their growth towards the main stems. Black willows exhibiting a large number of side suckers appear to be of a particular nursery stock designed to have a shrubby growth form, although this could not be verified in the field. Allowing approximately half of the side suckers to remain on the plant may also provide a food source for herbivores that would otherwise attack the main stem.
6. A few of the box elders in Planting Area #2 appear to be chlorotic although no distinct pattern with regard to their spatial distribution within the planted area was apparent. Planting Area #2 is located along the west side of the river and occupies the middle segment of Phase 1.
7. Canada thistle (*Cirsium arvense*) was observed in some locations throughout the sub-reach and thus was added to the invasive plant species control list.
8. An erosional swale was noted on the east side of the channel in Planting Area #5 (south of Monitoring Plot 1-E-2), which appears to have originated from, or be exacerbated by, woodchuck activity. This erosional swale will be more formally addressed as part of the structural inspection in July 2008.
9. A large tangle of grape vines (*Vitis* sp.) was observed near the downstream end of Planting Area #4. Planting Area #4 is located along the west side of the river at the downstream portion of Phase 1.

### **3.2 Phase 2 – Elm Street to Dawes Avenue**

1. With the exception of Monitoring Plot 2-W-1, the planted vegetation in this sub-reach appears to be in very good condition. The plants in Monitoring Plot 2-W-1 were shorter than specimens observed outside of the plot.

2. Numerous volunteer species and individuals above, below, and within the rip-rap were observed throughout the sub-reach. For example, volunteer specimens of branching bur-reed (*Sparganium angrocladum*), eastern Joe-pye-weed (*Eupatorium dubium*), and various sedges, all desirable species, were observed growing below and within the rip-rap.
3. Several tree cages were knocked down and were impacting the saplings. These cages were removed from around the trees to improve survivorship and will be replaced.

### **3.3 Phase 3 – Dawes Avenue to Pomeroy Avenue**

1. With the exception of Planting Area #27, the planted vegetation in this sub-reach appears to be in very good condition. The plants in Planting Area #27 (north of Pomeroy Avenue) were relatively smaller in size than the other planting areas. This appears to be due to frequent and short-height mowing performed by the landowner, which may be removing important humid micro-climate for the planted specimens.
2. Numerous volunteer species and individuals above, below, and within the rip-rap were observed throughout the sub-reach.

### **3.4 Phase 4 – Pomeroy Avenue to the Confluence**

1. The planted riverbank and non-riverbank vegetation in this sub-reach appears to be in very good condition.
2. Numerous volunteer species and individuals above, below, and within the rip-rap were observed throughout the sub-reach.

#### **4.0 CONCLUSION**

The results of the spring 2008 monitoring visit for the 1½ Mile Reach revealed that the riverbank plantings in all the sub-reaches, as well as the non-riverbank plantings in Phases 1 and 4, are exhibiting very good initial growth. This survey also indicated that the designated monitoring plots are representative of the overall monitoring areas that they were designed to represent. There were no obvious gaps in the red-osier dogwood band at the bottom of the re-vegetated slope, and there were no significant areas of bare soil observed. The need for some tree cage maintenance and invasive plant species control was noted. To address these issues, GE began implementing an ongoing program of invasive species control and tree cage maintenance in May 2008 and will continue this program until the end of the growing season in October. However, the overall conclusion drawn from this qualitative assessment of the re-vegetation is that this effort is successful to date. The next monitoring visit (i.e., summer monitoring visit) is scheduled for July 2008 and will examine the monitoring plots quantitatively.

## 5.0 REFERENCES

Weston. 2008. Interim Post-Removal Site Control Plan, 1½-Mile Removal Reach, General Electric (GE)–Pittsfield/Housatonic River Site. Prepared by Weston Solutions for the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency. DCN: GE-051908-ADWJ. May 2008.



## FIGURES



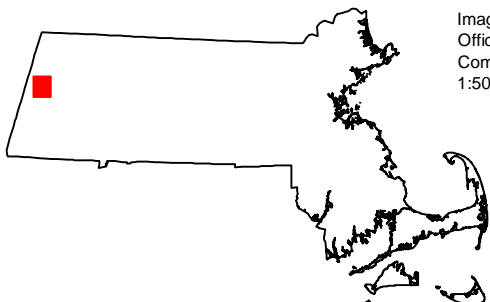
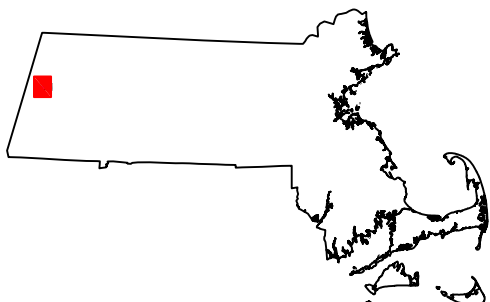


Image Source:  
 Office of Geographic and Environmental Information (MassGIS)  
 Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs  
 1:5000 Color Ortho Imagery, 2005

**amec** Earth & Environmental

Figure 1  
 Study Area Location Map  
 1 1/2 - Mile Reach of the Housatonic River  
 Revegetation Monitoring Report  
 Pittsfield, MA







- LEGEND**
- 1-W-2 VEGETATIVE MONITORING PLOT ID
  -  VEGETATIVE MONITORING PLOT
  -  PLANTING AREA

Image Source:  
Office of Geographic and Environmental Information (MassGIS)  
Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs  
1:5000 Color Ortho Imagery, 2005

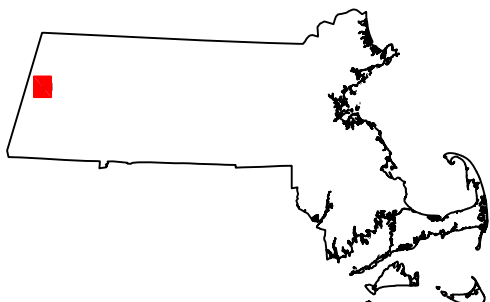
**amec** Earth & Environmental

Figure 2  
Phase 1 Study Area Location Map  
1 1/2 - Mile Reach of the Housatonic River  
Revegetation Monitoring Report  
Pittsfield, MA





**Housatonic River**



**LEGEND**



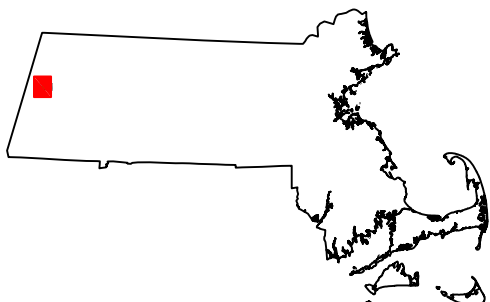
- 1-W-2 VEGETATIVE MONITORING PLOT ID
-  VEGETATIVE MONITORING PLOT
-  PLANTING AREA

Image Source:  
Office of Geographic and Environmental Information (MassGIS)  
Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs  
1:5000 Color Ortho Imagery, 2005



**Figure 3**  
Phase 2 Study Area Location Map  
1 1/2 - Mile Reach of the Housatonic River  
Revegetation Monitoring Report  
Pittsfield, MA







- LEGEND**
- 1-W-2 VEGETATIVE MONITORING PLOT ID
  -  VEGETATIVE MONITORING PLOT
  -  PLANTING AREA

Image Source:  
Office of Geographic and Environmental Information (MassGIS)  
Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs  
1:5000 Color Ortho Imagery, 2005

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**Figure 4**  
Phase 3 Study Area Location Map  
1 1/2 - Mile Reach of the Housatonic River  
Revegetation Monitoring Report  
Pittsfield, MA







- LEGEND**
- 1-W-2 VEGETATIVE MONITORING PLOT ID
  -  VEGETATIVE MONITORING PLOT
  -  PLANTING AREA

Image Source:  
Office of Geographic and Environmental Information (MassGIS)  
Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs  
1:5000 Color Ortho Imagery, 2005



**Figure 5**  
Phase 4 Study Area Location Map  
1 1/2 - Mile Reach of the Housatonic River  
Revegetation Monitoring Report  
Pittsfield, MA



**APPENDIX A**  
**PHOTO-DOCUMENTATION**

## **Phase 1**

### **Lyman Street to Dawes Avenue**





Photo 1: General view of Planting Area #1, upstream of Monitoring Plot 1-W-1, facing downstream (to the west/southwest).



Photo 2: General view of the Housatonic River from the western side of Planting Area #1, upstream of Monitoring Plot 1-W-1, facing downstream (to the west/southwest).





Photo 3: Monitoring Plot 1-W-1, facing downstream (to the southwest).



Photo 4: Alternate view of Monitoring Plot 1-W-1, facing downstream (to the southwest).





Photo 5: Mouth of a tributary to the Housatonic, associated with Monitoring Plot 1-E-1, viewed from the opposite bank, facing downstream (to the southwest).



Photo 6: General view of Planting Area #1, downstream of Monitoring Plot 1-W-1, facing downstream (to the west/southwest).



Photo 7: Alternate view of Planting Area #1, downstream of Monitoring Plot 1-W-1, facing downstream (to the west/southwest).



Photo 8: View of the twin box culverts that compose the New Silver Lake outfall, facing downstream (to the west).





Photo 9: View of the opposite shoreline from the New Silver Lake outfall, facing south.



Photo 10: View of the upstream end of Planting Area #2, facing downstream (to the southwest).





Photo 11: Alternate view of Planting Area #2, facing downstream (to the south/southwest).



Photo 12: View of Monitoring Area 1-W-2, facing downstream (to the south).





Photo 13: Planting area #5, viewed from Planting Areas #2 and #3, facing east.



Photo 14: Upstream end of Planting Area #4, facing downstream (to the south/southwest).





Photo 15: Monitoring Plot 1-W-3, facing downstream (to the west). Elm Street Bridge is in the background.



Photo 16: View of the Housatonic River from the Elm Street Bridge, facing upstream (to the northeast). Planting Area #4 is on the left side of the photo; Planting Area #8 is on the right.





Photo 17: Head of erosional swale within Planting Area #5.



Photo 18: Alternate view of erosional swale within Planting Area #5, facing down-slope towards the river.





Photo 19: Monitoring Plot 1-E-1 on the eastern shoreline of the Day Street drainage ditch (i.e. right side of the photo), facing downstream towards the river (to the northwest).



Photo 20: Upstream end of Planting Area #5, viewed from the Lyman Street Bridge, facing downstream (to the south/southwest).

## **Phase 2**

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





Photo 21: Upstream end of Phase 2 area, facing downstream (to the southwest). Planting Area #9 is on the right side of the photo; Planting Area #12 is on the left.



Photo 22: Upstream end of Planting Area #9, facing downstream (to the southwest).





Photo 23: Planting Area #12, viewed from across the stream, facing downstream (to the south/southwest).



Photo 24: Alternate views of Planting Area #9 (right side of photo) and Planting Area #12 (left side of photo), facing downstream (to the southwest).





Photo 25: Toe-of-slope for Planting Area #9, facing downstream (to the southwest).



Photo 26: View of volunteer plants below the rip-rap line in the Phase 2 area.





Photo 27: View of the downstream portion of the Planting Area #10A, facing downstream (to the southwest).



Photo 28: Monitoring Area 2-W-3, facing downstream (to the south).



Photo 29: View of the Housatonic River from the Dawes Avenue Bridge, facing upstream (to the north/northeast). Planting Area #10A is in the background on the left side of the photo; Planting Area #14 and Monitoring Area 2-E-3 is in the foreground on the right side of the photo.



### **Phase 3**

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



Photo 30: View of Planting Area #16 and Monitoring Plot 3-W-1 from the Dawes Avenue Bridge, facing downstream (to the southwest).



Photo 31: View of Planting Area #28 and Monitoring Plot 3-E-1 from the Dawes Avenue Bridge, facing downstream (to the south).





Photo 32: View of in-stream stone from the Dawes Avenue Bridge, facing downstream (to the south/southwest).



Photo 33: View of Planting Area #27 on the left side of the photo and Planting Area #38 and Monitoring Plot 3-E-3 on the right side of the photo, facing upstream (to the north/northeast).





Photo 34: View of Planting Area #37, facing northeast.



Photo 35: View of Planting Area #32 in the foreground and Planting Areas 20 to 23 on the left side of the photo (across the river), facing upstream (to the northwest).





Photo 36: View of Planting Area #30, facing upstream (to the northeast).



Photo 37: Planting Area #30 in the foreground, Planting Area #29 and #28 with Monitoring Plot 3-E-1 in the background on the right side of the photo, and Planting Areas #15 and 16 on the left side of the photo.

## **Phase 4**

### **Pomeroy Avenue to the Confluence**





Photo 38: View of Planting Area #45 and Monitoring Plot 4-E-1 from across the river, facing downstream (to the south/southwest). A portion of Planting Area #40 is in the foreground.



Photo 39: View of Planting Area #43, facing upstream (to the north/northeast). Planting Area #48 is in the background, across the river.





Photo 40: View of Planting Area #48 from across the river, facing downstream (to the south).



Photo 41: View of the Housatonic River downstream of the confluence, facing downstream (to the southwest).