



Restoration of Riparian Buffer at the Former Smelt Hill Dam Site, Falmouth, Maine



Final Report

June 30, 2006



**Gulf of Maine
Council on the
Marine Environment**



I. Project Title – Restoration of Riparian Buffer at the Former Smelt Hill Dam Site, Falmouth, Maine

II. Reporting Period: 06/01/05 – 6/01/06

III. Project Narrative

Problems Addressed:

This project addressed several problems at the Smelt Hill Dam removal site, including a lack of forested riparian buffer, erosion and sediment deposition into the Presumpscot River caused in part by the flow of stormwater through the site, and the presence of invasive species.

Lack of forested buffer: Large angular riprap and crushed stone were deposited in the riparian buffer as part of the Smelt Hill Dam removal project completed by the US Army Corps of Engineers in 2002, presumably in order to ensure bank stability and to cover deposited coarse debris from the dam and appurtenant structures. Fine textured soils were completely absent from the mid and lower sections of the buffer except for some thin deposits near the normal high water mark, where fines had recently been deposited in the interstices of riprap and along the shoreline. Prior to project implementation, the upper portion of the riparian buffer consisted of a small area of herbaceous vegetation over sandy soil that graded smoothly into upland forest about 200 feet from the normal high water line of the river.

Presence of invasive species: Those areas that did have small deposits of fine-textured alluvium near the shoreline had an early-successional emergent plant community. This shoreline community consisted of several native riparian and wetland species typical in southern Maine. Two exotic/invasive species of concern were also observed: purple loosestrife (*Lythrum salicaria*) and white sweet clover (*Melilotus alba*). Away from the shoreline, in the middle and upper portions of the buffer, additional species were observed including Japanese knotweed (*Falopia japonica*), which is another exotic/invasive species of concern. Native vegetation was needed to compete with invasives, protect and stabilize healthy riparian buffers upstream and downstream of the site, and provide a contiguous vegetated buffer to function as a wildlife corridor along the river shoreline.

Address stormwater runoff & erosion: There was also a need to improve stormwater runoff at the site. Prior to project implementation, stormwater runoff had created a deepening and widening gully during significant rain events. A significant headcut had formed and was migrating up the slope. Most of the stormwater appeared to be coming from an existing catch basin and culvert outlet, rather than the road itself. A small, crushed rock trail leading down from one house lot may have exacerbated the erosion by channelizing the stormflow and not allowing it to spread out through the woods. The gully downstream of the culvert outlet but upstream of the project site showed signs of recent erosion, with the channel widening and eroding down to boulder or bedrock material and resulting in sediment deposition into the Presumpscot River. The storm flow exited the woods at the access road and then ran in the eroded gully down across the riprap slope. The upper riprap (crushed rock) had slumped in a few areas due to the runoff over the slope.

The site is the property of the Maine Department of Marine Resources (DMR).

Project objectives and goals: The overall project objective was to restore a native vegetated riparian buffer at the highly visible site of the 2002 Smelt Hill Dam removal, where the natural shoreline was covered with riprap and gravel. Another objective of the project was to reduce erosion due to stormwater runoff at the site. Given that much of the Presumpscot River is dammed, and that head of tide areas are

important habitat in coastal rivers, a contiguous vegetated buffer and associated detrital inputs provide high value habitat in even in this short stretch of unimpounded river. Specific project objectives were to:

1. Create a stable runoff drainage channel and repair and stabilize slumping areas.
2. Create a simple pond/wetland area to slow runoff, distribute a sheet flow of water, allow some settling of sediment, and absorb pollutants.
3. Increase vegetative cover along the unimpounded section of the river and increase the structural and floristic diversity of the entire site.
4. Eradicate invasive plants at the site and establish native vegetative cover.
5. Create a more visually appealing riparian strip.

Project description: The Casco Bay Estuary Partnership (CBEP) was awarded a grant from the Gulf of Maine Council to restore approximately 250 feet of riparian buffer habitat at the site of the former Smelt Hill dam in Falmouth, Maine. CBEP selected Northern Ecological Associates, Inc. (NEA) a consulting firm with expertise in riparian restoration, to design and oversee implementation of the project. Presumpscot River Watch, a local nonprofit organization whose volunteers sample water quality throughout the watershed, coordinated with abutting landowners and volunteers.

Initial site designs were prepared in June 2005. Plans called for regrading bank slope, spreading a clay/soil base and a five inch loam surface, and planting native grasses, shrubs, and trees across the entire site. Initial designs also envisioned the combination of a vegetated swale and a small vegetated wetland/pool to transport stormwater runoff across the site. Landowners abutting the property were invited to review the designs and provide feedback. Landowners expressed concern that standing water could increase mosquito populations in the area and requested that site designs remove any standing water. Additional questions were raised about the likelihood of establishing wetland vegetation on the site. Designs were modified so that stormwater runoff would be transported entirely via a winding vegetated swale.

Significant delays were encountered in attempts to locate, schedule, and hire a contractor to implement the site plan. As a result, the decision was made to delay project implementation until the end of the 2005 growing season. Regrading, creation of a swale, and loam/soil spreading occurred during the first week of October, 2005. Native trees, shrubs, and grasses were planted throughout the site according to a planting plan. A conservation seed mix was broadcast on top of the entire site, and a wetland seed mix was broadcast within the swale.

During the period between October 8 and October 15 2005, the closest climate monitoring station recorded rainfall totals of 10.68 inches, more than 6 inches of which occurred over a two-day period on October 8th and 9th. For the month, the area received over 10 inches above normal precipitation totals. The record rain fall revealed complexities in the hydrology of the site which were not evident prior to project implementation, and three additional drainage channels emerged on site during the storms. Rapid response and dedicated repair and erosion control efforts by NEA personnel prevented large scale erosion at the site, but significant erosion did occur, particularly in the swale and in newly formed drainage channels outside the swale. Consequent sediment movement presented an immediate need for adaptive management. At this time, CBEP consulted with representatives from the Maine Coastal Program, Maine State Planning Office, and Maine Department of Environmental Protection, as well as several consultants to identify adaptive management alternatives to achieve long-term site stability.

In the fall 2005, CBEP developed a proposal with Hillier Associates, Inc. to stabilize high energy eroded areas within the swale, channelize newly formed drainages, and continue promoting revegetation and naturalization of the entire site. The CBEP Habitat Restoration Committee allocated approximately \$8,000 in National Estuary Program funding to implement 'Phase II' adaptive management

recommendations. In late April 2006, live stakes were planted adjacent to drainage channels and the entire site was reseeded. Between June 20 and June 27, 6-12 inch rip-rap, 1-2 foot boulders, and erosion control mulch were delivered and used to prevent further erosion, create a series of settling basins and checks dams, strengthen the swale, build up berms adjacent to drainage channels, and stabilize other areas around the site as needed. Additional work is scheduled for the site in July 2006, including additional revegetation work, planting, swale stabilization and erosion repair by the newly formed Presumpscot River Youth Conservation Corps (PRYCC). The PRYCC will also be working with abutting landowners to reduce on-site flow of sediment from erosion occurring above the site on private property by creating additional settling basins and stabilizing eroding channel banks. Once all implementation activities on site have been concluded, the original silt fencing will be removed.

Representatives of the Casco Bay Habitat Restoration Committee (which includes representatives of US Fish and Wildlife Service, US Environmental Protection Agency, Maine Department of Environmental Protection, Maine Department of Marine Fisheries, Maine State Planning Office, Presumpscot River Watch and Friends of Casco Bay) provided guidance throughout the project. Abutting landowners provided access to the site using the former right of way access road to the former Smelt Hill dam.

IV. Methodology

Phase I project design involved creating a stable drainage channel and repairing and stabilizing slumping areas, creating a winding drainage swale to minimize discharge into the river, increasing the cover and diversity of vegetation on the site, eradicating invasive plants, and creating a more visually appealing riparian strip at a dam removal site. An initial site visit was conducted to assess various aspects of the area to be mitigated and to collect baseline information. Information collected during the initial site visit included: photo documentation of existing conditions, determination of depth and condition of the current substrate under the gravel, topographic survey, information on existing vegetation, and locations of current drainage swales and erosion.

After collection and mapping of the baseline data, a design plan was developed. The plan identified areas where grading was required and where the existing gravel needed to be removed and suitable planting material imported. The plan also addressed the stormwater runoff that was eroding a portion of the site. NEA then developed a detailed Planting Plan, which identified areas to be planted, species, and quantity. Research was conducted to identify the appropriate species to be planted based upon the existing vegetative cover in the surrounding area and the growing conditions in the area.

After installation of erosion control devices (silt fence) NEA worked with an excavation contractor to carry out the plan. This included partial excavation and reshaping of the existing gravel area, importation of select fill and topsoil, construction of a winding drainage swale, and minor grading. Upon completion of the earthwork, NEA executed the Planting Plan. This included the placement and planting of trees, shrubs, herbaceous plants, and wattles, seeding, and mulching. NEA has been monitoring the area since completion of the grading and planting activities and will prepare a Post-Construction Report and a Monitoring Report after the first growing season.

Designs for Phase II adaptive management were developed primarily to stabilize eroded areas and secondarily to further promote a transition toward natural channel conditions present upstream of the site. Designs for stabilizing eroded areas in the swale were developed and implemented based on standard engineered guidelines for armoring using rip-rap in one high energy section of the swale. In more stable areas of the swale and other channels, large boulders and woody debris were keyed into berms. A landscape architect assisted with selecting and utilizing existing native plant species adjacent to the site. Erosion control mulch and hay were applied throughout the site to stabilize the site post-construction.

V. Results/Progress to Date

All Phase I grading activities and most of the planting was completed on the approximately 1 acre site in the first week of October 2005. As discussed previously, the steepest areas of the site were graded to obtain a stable slope throughout the site. A wide drainage swale (approximately 10 to 12 feet wide) was created from the top of the site down to the river, which incorporated the areas of most runoff identified during initial site visits. Trees, shrubs, and herbaceous plants were planted throughout the site. Seed mixes (Conservation mix and detention basin mix) were spread over the site including in the drainage swale. Due to a large rain event the week after grading and planting were completed, additional work was required to stabilize the site. Since the vegetation had not had sufficient time to establish prior to heavy rains, some erosion occurred on the site. Additional Phase I work was completed by hand and included: movement of topsoil, placement of rocks and gravel to stabilize the channel, and additional planting of seeds.

Following Phase II adaptive management implementation, the swale and recently formed drainages are now stabilizing. Additional work by the Presumpscot River Youth Conservation Corps will ensure that remaining steep sections of channel which were beyond the reach of excavating equipment will be armored in early to mid July.

Overall, vegetation establishment has been largely successful as of June 2006:

- Phase I:
 - 100% of the willow waddles planted in the fall of 2005 show extensive leafing and appear to be establishing a solid vegetated strip along the length of the riverbank.
 - Red maple, red oak, willow, white pine, dogwood, and other fall 2005 plantings generally show robust growth.
 - In some well drained areas, dry conditions have stressed individual trees. Erosion control mulch berms were placed around these in the summer 2006 to help retain moisture.
 - No signs of purple loosestrife or other invasive plant species are evident on the site.
 - Deer browse killed a few (3) individuals.
 - Initial seeding with conservation mix was partially successful in part due to heavy rains immediately following seed dispersal.
 - Initial seeding in the swale was largely unsuccessful due to water flows.
- Phase II:
 - Hundreds of red osier dogwood live stakes planted in the spring of 2006 in and adjacent to drainage channels show extensive leafing.
 - Additional seeding with conservation mix in the spring of 2006 has been successful throughout the site and particularly robust along swale berms.
 - Ferns, sedges, and other plants transplanted from adjacent forested areas have established atop of berms and along drainage channels.

Note: Additional seeding, plug planting, and transplanting of local native plants will take place with the assistance of the PRYCC.

VI. Monitoring and Maintenance Activities

Following completion of the Phase I grading and planting and implementation of Phase II adaptive management, the site has been monitored regularly to make sure that plants are establishing and any additional erosion is under control.

The PRYCC will be available during the summer of 2006 and 2007 to address any additional maintenance needs that may arise.

VII. Community Involvement

Abutting landowners participated in the site design planning process. Project team members regularly consulted with abutters regarding access, maintenance needs, source run-on, etc. Abutters were specifically consulted about site design and various options were discussed. Feedback was integrated into site plans. Abutters also provided access to the DMR property, which is surrounded by private land, via the former access road to the Smelt Hill dam.

Members of the Yarmouth High School environmental club visited the site numerous times to assist with maintenance and materials transfer following heavy rains. Americorps staff assisted with planting trees, willows, and seeding.

VIII. Outreach Activities

The site was visited in a July tour of restoration sites within the Presumpscot River watershed as part of the University Council on Water Resources conference held in Portland. The site was also discussed as part of a September Presumpscot River Watershed Coalition tour targeting local, state, and regional decision-makers to raise awareness of issues and opportunities in the watershed. CBEP has assisted Gulf of Maine Council staff in developing an article on the project for the *Gulf of Maine Times*.

IX. Supporting Materials

A CD of pre, during, and post implementation photographs was included with the six month progress report. Additional supporting materials are attached as appendices, including copies of permits obtained, selected pre- and post- project implementation photos, the Phase II adaptive management plan, and match documentation.

X. Funding Information (Cash and In-kind)

**UNIVERSITY OF SOUTHERN MAINE
SIX MONTH REPORT OF EXPENDITURES**

**Smelt Hill Dam Site
6/1/2005 – 5/30/2006**

BUDGET CATEGORIES	GOMC/ NOAA	Actual Matching	Other Fed	Total
Personnel				
Fringe				
Total Personnel				
Contractual	24,992	10,000*		34,992
Volunteers				
Total Other	24,992	10,000		34,992
Total Direct Costs	24,992	10,000		34,992
Indirect Costs @ 32%		7,997		7,997
Totals	\$ 24,992	\$ 17,997		\$ 42,989

* Match source is estimated in-kind services provided by NEA staff, primarily additional hours spent at the site.

Report Prepared By: _____
Signature

Date

Appendix A: Permits Obtained

Appendix B: Selected Pre- & Post- Implementation Photos



May 2005. Presumpscot River southern shore facing downstream at site of Smelt Hill dam removal.



June 2006. Presumpscot River southern shore facing downstream at site of Smelt Hill dam removal. Note willow waddles planted during fall 2005 flourishing in front of silt fence along the length of the site.



Fall 2005. Smelt Hill swale, lower run, after over 10 inches of rain falls in the area in one week.



June 29, 2006. Smelt Hill swale, lower run, post Phase II adaptive management implementation.



April 2005. Original stormwater runoff channel pre project implementation.



Fall 2005. Grassed swale following October rain events.



June 2006. Swale after Phase II adaptive management. Hayed area will be reseeded by Presumpscot Youth Conservation Corps the second week of July.

June 29, 2006. This drainage channel emerged during heavy rains in October 2005. Phase II adaptive management installed large boulders and some of the plants seen in the background. The Presumpscot River Youth Conservation Corps will continue this naturalization process at other low flow drainages on the site in July 2006.





April 2005. The site pre-project implementation.



June 29, 2006. Site post- Phase II implementation. Note granite wall to the left, which was unearthed during Phase I regrading activities.



June 29, 2006. Site post- Phase II implementation. Note granite wall to the left, which was unearthed during Phase I regrading activities.



June 29, 2006. Site post- Phase II implementation. Note granite wall to the left, which was unearthed during Phase I regrading activities.

Appendix C: Phase II Adaptive Management Plan

Appendix D: Match Documentation