

Sherman Marsh Phragmites Control

On-Going Treatment Plan

In October 2007, USM researchers reported finding the invasive species common reed (*Phragmites australis* – hereafter *Phragmites*) in small patches within the upper reaches of the marsh. At that time, some plants in several of the patches had formed tassels. The source of *Phragmites* (it was not known to occur in or around the shoreline of Sherman Lake and none has been identified within the immediate vicinity of the marsh or along Route 1) and the timing of the first appearance are uncertain. The *Phragmites* present in Sherman Marsh has been identified by USM students as the introduced genotype.

The salinity levels and the plant assemblages identified in Sherman Marsh to date show that brackish to salt marsh conditions are developing through succession in response to the disturbance caused by the breach of the dam. This suggests that Sherman Marsh is at an increased risk of colonization by *Phragmites* which often occurs in marshes with salinities less than 22 ppt.

During the summer of 2008 research staff from USM, and interns and staff from the MaineDOT Environmental Office continued to map the locations of *Phragmites* patches. Patch location was recorded using a Trimble GeoXT handheld GPS unit with submeter accuracy. As of September 2008, approximately 270 patches of *Phragmites* covering a total area of approximately 1 acre have been identified within the marsh (see attached map). The patches range in size from point locations (< 25 ft²) up to approximately 1700 ft². Most of the patches are located in the uppermost (southern) section of the marsh with fewer known patches occurring in the middle and lower sections closer to the Route 1 bridge. *Phragmites* was found near the upland edge and near the banks of the secondary and main tidal channels with no clear pattern to its distribution within the marsh. In most of the patches, *Phragmites* was growing up through an understory of native salt marsh vegetation, or in association with cattails, however in some areas bare soil was present in all or a portion of the patch.

In 2008 an Interim Treatment Plan was implemented to determine application methods on a group of *Phragmites* patches and how a marsh wide control plan would be carried out in the future. This Plan is summaries below:

Treatment Plan Herbicide will be applied to *Phragmites* plants growing in selected representative patches within areas of vegetated marsh. Approximately 13 patches will be treated as shown on the attached map. Each treatment patch will be paired with an untreated control patch at a similar elevation.

- The purpose of this trial is to begin to evaluate different application techniques and to determine the relative effectiveness of the treatments. Nearby untreated patches will provide experimental controls. The trial will allow for comparisons between herbicides, application methods and of treated versus non-treated areas.
- Herbicide application will be made in accordance with label directions regarding mix concentrations and appropriate application rates as shown in Table 1.

- Two different application methods will be used: Foliar wick/wipe-on and cut stem treatment. For the foliar wick/wipe-on technique, the herbicide will be applied by hand using commercially available wick applicators, sponges and/or with cotton gloves (worn over rubber or nitrile gloves) sprayed with herbicide and rubbed over the stems and leaves. For the cut stem technique, individual *Phragmites* stems will be cut 2 to 3 feet above the ground (or below the first leaf on the plant), and a small quantity (approx. 3 ml) of herbicide will be dripped into the hollow, cut stem. Cut stems will be bagged and removed from the site to prevent them from being dispersed during a high tide and potentially taking root in a new location. These techniques will significantly reduce or eliminate the potential for herbicide to drift onto other non-target vegetation or into surface water. MaineDOT anticipates that each technique will be tested with each herbicide.
- Herbicide will only be applied using the wick/wipe technique during low wind conditions to minimize the potential for *Phragmites* stems to come into contact with non-target species or the applicator.
- Herbicide will not be applied during periods when spring high tides flood the marsh surface (i.e. tides higher than approximately 10.5 feet as listed on the NOAA tide chart for Portland) or during rain events that lead to runoff from the plants.
- The proposed herbicide application will be conducted in a manner that will not impair water quality within the upper Marsh River.

Table 1. Herbicide Concentration (percent solution)/Treatment Method Matrix

HERBICIDE	BACK PACK APPLICATION
Habitat™ (imazapyr)	1.5 %
Rodeo™ (glyphosate)	33%

Timing of Application

- The initial herbicide treatment took place during the last week of September and/or the first week of October 2008 weather depending. Rodeo™ is most effective when applied to green foliage after the tasseling stage when the plant is supplying nutrients to the rhizomes. Application of Habitat™ toward the end of the growing season will limit the potential for damage to adjacent non-target plants via root grafts or by exudates or through movement of soil particles.
- MaineDOT reported the application took no more than two working days.

Applicator/Agent

- Interim treatment herbicide was applied by MaineDOT personnel under the supervision of MaineDOT staff with Masters and Commercial Level Pesticide Applicators licenses in the Aquatics Category issued by the Maine Board of Pesticide Control (BPC). All spray operations were conducted in accordance with the Plan, as approved by MaineDEP, and all applicable BPC requirements.

Future Control Plan

This Phragmites Control Plan (hereafter the “Plan”) describes the herbicide treatments proposed by MaineDOT to control the spread of *Phragmites* within Sherman Marsh from the fall of 2008 into the future. The Plan has been developed in response to the conditions described in the Maine DEP Fact Sheet, Use of Herbicides in Wetlands in Maine, dated April 2006; and in accordance with the terms of a MaineDOT consultation letter, dated July 11, 2008, with NOAA NMFS pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, regarding the proposed Marsh River bridge rehabilitation project.

The Plan addresses the conditions listed in the Maine DEP Fact Sheet that must be met in order to apply aquatic pesticides within wetlands in Maine. It is MaineDOT’s understanding that if the Plan satisfactorily addresses the conditions stated in the Fact Sheet and is implemented accordingly, then the proposed treatments will be exempt from Maine DEP Waste Discharge Licensing.

DEP Conditions

The following sections address the conditions listed in the DEP Fact Sheet and include a description of the need for *Phragmites* control at Sherman Marsh, the materials proposed for use, and the herbicide treatment plan.

Demonstration of Need

- The breach of the Route 1 dam resulted in an unprecedented opportunity to restore tidal hydrology to over 200 acres of former salt marsh. Restoration of salt marsh at this site is supported by the state and federal resource and regulatory agencies.
- MaineDOT’s involvement stems from its initial decision to allow restoration to proceed rather than replace the roadbed/dam. MaineDOT’s decision to take on monitoring and management responsibility at Sherman Marsh is in anticipation that, at a later date, the marsh could be proposed for addition to a statewide MaineDOT wetland mitigation bank.
- Vegetative monitoring of the marsh by research staff from USM identified the presence of numerous patches of non-native *Phragmites* scattered throughout the marsh by the end of the 2007 growing season.
- Hydrologic and salinity data collected in the marsh to date by MaineDOT and USM show that salinity levels within the marsh are often below the 22 ppt *Phragmites* tolerance threshold commonly used as a target in salt marsh restoration projects.

- The increasing prevalence of *Phragmites* in New England salt marshes is well documented. *Phragmites* is known to have invaded numerous salt marshes in Maine, notably Scarborough Marsh, and fringing marshes along the Presumpscot and Royal Rivers. Marshes with a dominant cover of *Phragmites* are functionally impaired and provide fewer ecosystem services.
- There are a limited number of effective *Phragmites* control measures. Treatment with herbicide is a commonly used approach that has successfully reduced *Phragmites* cover and restored important wetland functions in many environmental restoration and wildlife management areas in the United States.

Materials Used

- MaineDOT is planning to control *Phragmites* in Sherman Marsh through the targeted application of herbicide. Two chemicals will be used: 1) Rodeo TM (active ingredient glyphosate), and 2) Habitat TM (active ingredient imazapyr). Both Rodeo and Habitat are registered for the control of invasive emergent vegetation in aquatic settings by the USEPA (Rodeo EPA Reg. No. 62719-324; Habitat EPA Reg. No. 241-426) and the Maine Dept. of Agriculture.
- Rodeo TM is a non-selective systemic herbicide used to control undesirable herbaceous and woody vegetation growing in or near bodies of fresh and brackish water, including estuaries. It is a water-soluble liquid which mixes readily with water and requires the addition of a non-ionic surfactant. Rodeo TM does not control plants which are completely submerged or have a majority of their foliage under water. After application, it moves through the plant from the foliage to the root system where it inhibits enzyme synthesis at points of growth. The effects include gradual wilting and yellowing of the plant and deterioration of underground plant parts.
- Toxicological evaluations reported by the USEPA and others have shown that glyphosate, the active ingredient in Rodeo, has very low potential to accumulate in aquatic food chains; is no more than slightly toxic to wild birds (primarily through ingestion of recently treated plant material); and is practically non-toxic to fish, aquatic invertebrates, and honeybees. Glyphosate binds strongly to soil particles, and suspended organic matter and clay particles in water. Once bound to soil particles it becomes relatively immobile which limits the potential for uptake by aquatic organisms and prevents uptake by the roots of non-target plants. It is broken down by microbial degradation. Application to extensive areas of aquatic plants can result in fish kills due to oxygen depletion from decomposition of dead plant material, especially in shallow water (< 6 inches). The *Phragmites* patches in Sherman Marsh are small and localized; making it unlikely that plant decomposition would pose a significant risk to fish.
- Rodeo surfactant will be applied. Some surfactants are often highly toxic to fish and wildlife, much more than glyphosate alone. Selection of surfactant should favor materials with little to no toxicity to aquatic organisms.
- Habitat TM is a non-selective herbicide used for the control of a broad range of weeds including emergent aquatic species. It is labeled for use in and around standing and flowing water, including estuarine areas. Habitat TM is an aqueous solution that is mixed with water and a surfactant and applied as a spray solution

to control vegetation. It is applied to the emergent foliage of the target vegetation and has little to no effect on submerged aquatic vegetation. Habitat is absorbed through the leaves and stems and is translocated rapidly throughout the plant, with accumulation in the meristematic tissues. It is also translocated into and kills underground tissues preventing regrowth. Habitat TM inhibits a plant-specific enzyme, causing the plant to stop growing and die as its food and energy reserves are exhausted. This enzyme is not found in animals or humans.

- The environmental fate of imazapyr, the active ingredient in Habitat TM, varies with pH. At pH greater than 5 (i.e. field conditions likely to occur in Sherman Marsh) it does not bind strongly to soil particles and can remain available for plant uptake (soil active), increasing the potential for damage to non-target species. It has also been reported that surrounding vegetation may also be affected by movement of imazapyr via root grafts or exudates. Imazapyr is slowly degraded by microbial degradation in soils, but rapidly by sunlight in aquatic solutions. Given these properties Habitat TM must be applied carefully to avoid unintended damage to non-target plant species.

Treatment Plan

- Rodeo TM and Habitat TM will be applied to *Phragmites* plants growing in selected patches within areas of vegetated marsh according to a random stratified experimental design (See previous section on Treatment Goals for treatment thresholds).
- Application of Habitat TM and Rodeo TM will be made in accordance with label directions regarding mix concentrations and appropriate application rates. A 1 to 2% solution of Habitat TM mixed with an aquatic surfactant will be used for foliar spray treatment. A 1.5 to 2% solution of Rodeo TM mixed with an aquatic surfactant will be used for foliar spray treatment.
- Application method(s) – Low volume foliar spray application technique will be used. To maximize effectiveness Habitat TM must be applied in a manner that ensures 100% coverage. The best results are achieved when the herbicide covers the crown. Rodeo TM must be applied in a manner that wets at least 80% of the foliage and covers all of the plant growing tips.
- Herbicide will only be applied during low wind conditions (winds < 10 mph at ground level).
- Applications of Habitat TM are rainfast one hour after treatment. The effectiveness of Rodeo TM may be reduced by rainfall up to 6 (one source said 12) hours after application.
- Protection for non-target species will be maintained through the use of low pressure backpack sprayer with a micro-jet applicator.
- Address tidal conditions – e.g. treatment only during mid-tide or below; or treatment discontinued within 2 hours of high tides.
- Violation of State Water Quality Laws – all estuarine and marine waters lying within the boundaries of the State and which are not otherwise classified are Class SB waters (MRS Title 38, Chap 3, Subchapter 1, Article 4-A, subsection 469, Classification of estuarine and marine waters.)

Timing of Application

- The initial interim herbicide treatment will take place in mid-September to October 2008. Habitat TM is applied to actively growing, green foliage after full leaf elongation. Habitat TM can be applied early in the growing season, but adjacent non-target plants may be more susceptible to damage by earlier treatments. Rodeo TM is most effective when applied to green foliage after the tasseling stage when the plant is supplying nutrients to the rhizomes.
- Follow up treatments in future years will be applied in the late summer early fall after the initial treatment depending on the effectiveness as determined by post-treatment monitoring.

Applicator/Agent

- The herbicide will be applied by a landscape contractor certified and licensed in Aquatic Pesticide Control by the Maine Board of Pesticide Control (BPC) under contract to the MaineDOT Environmental Office. MaineDOT anticipates contracting with Municipal Pest Management Services, Inc. of Kittery, Maine to conduct all spray work at Sherman Marsh. The contract will require that the contractor conduct all spray operations in accordance with the Plan, as approved by MaineDEP, and all applicable BPC requirements. Only applicators who are licensed or certified as aquatic pest control applicators and are authorized by a government agency can apply Habitat TM
- MaineDOT staff with a Commercial Pesticide Applicator's license – Master Level - in the Aquatics category will also be applying herbicide as needed and will oversee the implementation of the herbicide treatment and will inspect the Contractor's work for conformance with the contract requirements.

Duration of Application

- MaineDOT anticipates conducting spot treatments in late summer/early fall of 2009 and beyond. The results of yearly post-treatment monitoring will be used to determine whether or not additional follow-up treatments are warranted to control existing or new patches.



Photo 1. Typical small patch of *Phragmites* in Sherman Marsh mapped as a point location. August 2008.



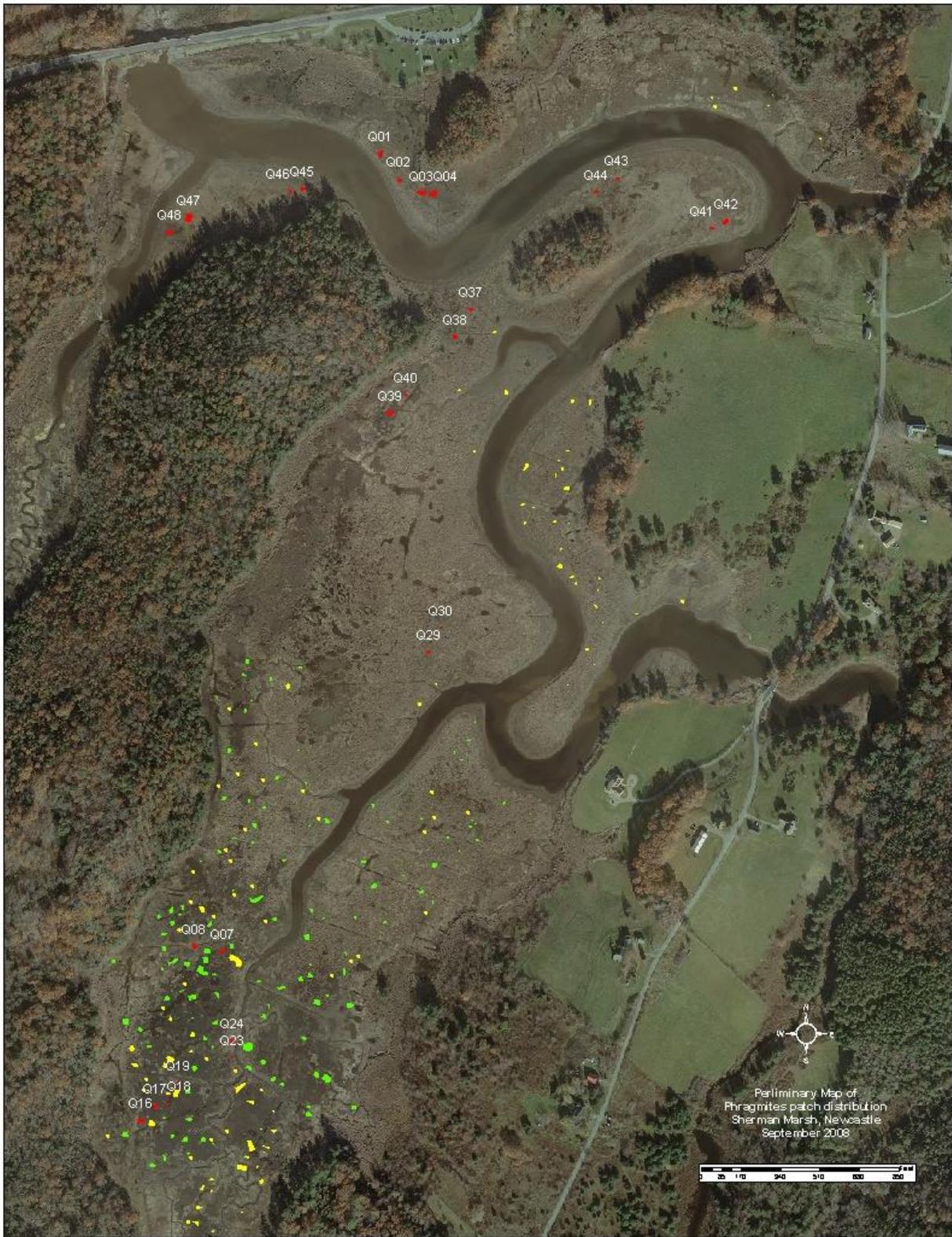
Photo 2. Small *Phragmites* patch adjacent to a tidal ditch. August 2008.



Photo 3. Typical small *Phragmites* patch with low stem density in vegetated marsh zone. August 2008.



Photo 4. *Phragmites* stems showing development of tassels (seed heads) on old dead stems and current years growth. August 2008.



Map showing location of Phragmites patches mapped in 2007 and 2008.