Response of Freshwater Wetland Flora to Removal of *Phragmites australis*

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Highstead

Introduction

Common reed (*Phragmites australis*) was introduced to eastern North America in the nineteenth century and colonized many fresh water, brackish, and salt marsh environments. In the past 100 years, common reed has largely outcompeted the native, and less dominant, American reed (*Phragmites americanus*), often forming near-monocultures that reduce the growth and diversity of native plant species (Farnsworth and Meyerson 1999)[1].

In the late 1980s, common reed invaded the perimeter of a 1-hectare man-made pond in Redding, CT, eventually dominating the pond-side flora and reducing the aquatic viewshed.

Objectives

1. Remove *Phragmites* from the pond
2. Promote a more expansive aquatic viewshed
3. Increase native plant diversity
4. Understand the cost-benefit of different herbicide application techniques

Methods

Management Approach

A. All *Phragmites* stems mowed

B. *Phragmites* population divided into four herbicide (Glyphosate) treatment areas

1-2) Hand-wipe with glove: 2.3% solution & 25% solution

3) Wipe-on wand applicator: 25% solution

4) Backpack sprayer: 2.3% solution

Treatment Schedule

Spring 2012
32-1m² plots established prior to herbicide treatment

January 2013
All *Phragmites* stems mowed

June & September 2013
Phragmites treated with herbicide

January 2014
All *Phragmites* stems mowed

June & September 2014
Phragmites treated with herbicide

2015 to Present
Spot-treated regenerating *Phragmites* stems as needed with Hand-wipe 25% solution

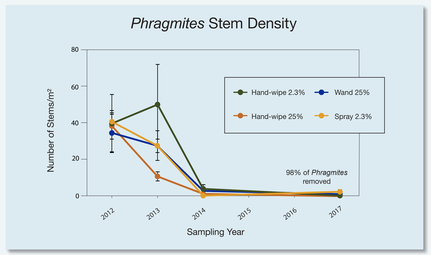
Vegetation Monitoring

July/August 2012, 2013, 2014, and 2017

- Identified and recorded all plant species in plots
- Counted all live stems of *Phragmites* and other species

Results

Phragmites Removal



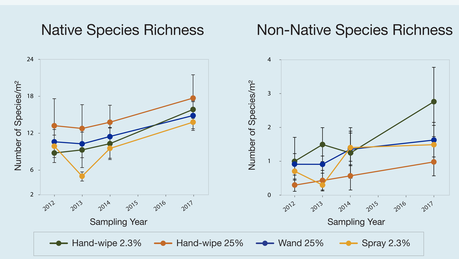
Removal of *Phragmites* varied initially by herbicide treatment in 2013, but was similar across all treatments by 2014. By 2017, almost all stems had been removed.

One of the monitoring plots dominated by *Phragmites* prior to treatment (left) and replaced by a diversity of sedges and forbs after treatment (right).

Viewshed

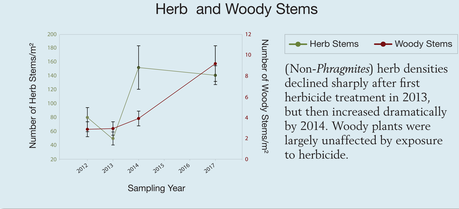
The Highstead pondscape in 2012 (top) with two prominent patches of *Phragmites* restricting the view and in 2017 (bottom) with a more expansive view following *Phragmites* removal.

Plant Diversity and Density



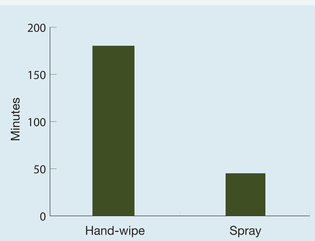
Number of native species declined sharply in the Spray 2.3% treatment in 2013, but recovered quickly in 2014 and increased in all treatments by 2017.

Number of non-native species (other than *Phragmites*) declined initially in the Spray 2.3% Treatment, but recovered quickly and generally increased across all treatments by 2017.



(Non-*Phragmites*) herb densities declined sharply after first herbicide treatment in 2013, but then increased dramatically by 2014. Woody plants were largely unaffected by exposure to herbicide.

Herbicide Treatment Cost-Benefit



Spray 2.3% treatment took 1/4 the time as the Hand-wipe treatments, but caused the most collateral damage to other vegetation (see Native Species Richness graph to the upper left).

Conclusions

1. *Phragmites* removal successful, but repeat herbicide treatment critical
2. Aquatic viewshed more expansive after *Phragmites* removal
3. Both native and non-native species richness increased after *Phragmites* removal
4. After initial differences, herbicide treatments converged over time in effectiveness against *Phragmites* and impact on other flora
5. Non-*Phragmites* herbs generally recovered quickly and woody vegetation was resistant to herbicide treatments
6. Impact of *Phragmites* removal on wildlife habitat and populations unknown (Anecdotally, nesting red-winged blackbirds appear to have declined)

Highstead

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[1]Farnsworth, E.J. and Meyerson, L.A., 1999. Species composition and inter-annual dynamics of a freshwater tidal plant community following removal of the invasive grass, *Phragmites australis*. Biological Invasions, 1(2), pp.115-127.