89

Combination of Treatments Influence Survival of Woody Species Planted to Suppress Reed Canarygrass (Wisconsin)

Stephen M. Hovick and James A. Reinartz, University of Wisconsin-Milwaukee Field Station, 3095 Blue Goose Road, Saukville, Wisconsin 53080, 262/675-6844, Fax: 262/675-0337, smhovick@uwm.edu, jimr@uwm.edu

Reed canarygrass (*Phalaris arundinacea*) is an aggressive pest plant that has established in formerly forested wetlands of southeastern Wisconsin. Although reed canarygrass tolerates a wide range of nutrient and moisture levels (Lavergne and Molofsky 2004), several investigators have found that heavy shade reduces its ability to grow and germinate (Kephart and others 1992, Thompson 1995, Lindig-Cisneros and Zedler 2001). To test this finding, we conducted a high-density (one stem/m^2) planting of mostly bareroot trees and shrubs in a reed canarygrass monoculture as a potential long-term replacement of the invasive grass. Here, we discuss initial survival of planted woody species and understory diversity in five pre-planting treatments during two growing seasons.

Our study site is part of the Huiras Lake Natural Area in northern Ozaukee County, Wisconsin, north of Milwaukee. The site is a 3-acre (1.2-hectare) field of reed canarygrass planted more than 35 years ago on a hydric silt loam and surrounded on three sides by swamp forest.

Following a hard freeze in late fall 2002, we sprayed mowed and unmowed stands of reed canarygrass with a 1-percent solution of glyphosate. We intended that this treatment would suppress the grass for at least two growing seasons so that the planted trees and shrubs would have sufficient time to grow without competition. In the spring following herbicide application, we established five treatments: 1) control (no herbicide in two 941-m^2 plots), 2) herbicided and burned (four 9,830-m^2 plots), 3) herbicided and plowed (one 360-m^2 plot), 4) mowed and herbicided (121,165-m^2 plots), and 5) herbicided only (six 1,992-m^2 plots). We predicted that the herbicide-only plots would have the highest survival because the treatment would enable the dead reed canarygrass to mulch the newly planted trees, protecting them from desiccation and weeds.

In spring 2003, we planted 16 species of native trees and shrubs in numbers sufficient to test for significant differences in survival (Table 1). In fall 2003 and fall 2004, we counted surviving trees and found significant differences among species. Survival of the planted species was significantly higher in the plowed treatment than all other treatments, followed by burned plots. Herbicide-only and mowed treatments did not differ significantly but had higher survival than the controls. Survival varied greatly by species. For example, more than 80 percent of green ash (*Fraxinus pennsylvanica*) survived in plowed, burned and herbicide-only plots compared to 56 percent in mowed plots and 16 percent in controls. Survival was also relatively high for redosier dogwood (*Cornus sericea*), silky dogwood (*C. amomum*) and elderberry (*Sambucus canadensis*), but notably poor for paper birch (*Betula papyrifera*), yellow birch (*B. alleghaniensis*), and pussy willow (*Salix discolor*). Contrary to our prediction, a mulch-effect in herbicide-only plots did not result in high rates of survival, despite drought conditions in 2003.

We also surveyed herbaceous vegetation in ten 1-m^2 quadrats in each treatment and found that the Shannon-Wiener diversity of herbaceous species established after removal of reed canarygrass varied by treatment. Control plots had the least diverse herbaceous community, followed by herbicide-only plots. Herbaceous diversity in the plowed and burned treatments was the highest ($p < 0.05$). Herbaceous species found within the plots included both exotic weedy species, such as Canada thistle (*Cirsium arvense*) and Queen AnneÕ lace (*Daucus carota*), and native species, such as swamp vervain (*Verbena hastata*) and boneset (*Eupatorium perfoliatum*). We found all of these species throughout the four experimental treatments, although the herbicide-only plots were more frequently dominated by reed canarygrass.

At this point in our study, we have found that treatments resulting in the highest herbaceous diversity also have the highest woody species survival. Plowing and burning following a successful herbicide treatment both gave good results in that respect. The ability to plow a wet meadow may be limited in the spring, so chemical treatment followed by burning may be the most effective and feasible of all the pre-planting treatments.

Since these results may be site-specific, we expanded the study in 2004 to include a nearby site that has soil, vegetation, and hydrology similar to our primary site and to a considerably wetter site in neighboring Washington County. Given our current results, we recommend a late-fall application of glyphosate followed by a spring burn for high survival of woody species planted in a reed canarygrass monoculture. Burning also makes it easier to plant and subsequently locate the trees and shrubs.

ACKNOWLEDGMENTS

This study was funded by the Zoological Society of Milwaukee and the Society of Wetland Scientists.

REFERENCES

Kephart, K.D., D. R. Buxton and S. E. Taylor. 1992. Growth of C_3 and C_4 perennial grasses under reduced irradiance. Crop Science 32(4):1033-1038.

Lavergne, S. and J. Molofsky. 2004. Reed canary grass (*Phalaris arundinacea*) as a biological model in the study of plant invasions. Critical Reviews In Plant Sciences 23(5):415-429.

Lindig-Cisneros, R. and J. Zedler. 2001. Effect of light on seed germination in *Phalaris arundinacea* L. (reed canary grass). Plant Ecology 155(1):75-78.

Thompson, A.L. 1995. Factors affecting the distribution and abundance of reed canary grass (*Phalaris arundinacea* L.). M.S. thesis, University of Wisconsin-Milwaukee.