Did natives establish?

Yes: Two-thirds of the sown species were encountered, and 8 were common (Asclepias incarnata, Aster paniculatus, Eupatorium coloratum, Leersia oryzaeoides, Leobelia siphilitica, Lycoctonum americanus, Mentha arvensis, and Verbena hastata). The aquatic plants, Alisma subcordatum and Leersia oryzaeoides, were abundant in the wetter year (2004) in the wettest plot, where RCG was dominant but unable to form a monotype. Other species volunteered: Polygonum hydropiper, a weedy annual became the most common forb. Other non-sown native species were Carex tribuloides, Helianthus grosseserratus, Iris sp., Lycoctonum flum fossor, Poa palustris, Ranunculus penicilliformis, and Scutellaria galericulata, but these volunteers were uncommon.

Annuals (P. hydropiper and Bidens cernuus) produced high cover in year one but decreased in year two, as did Verbena hastata. The restoration treatment produced an average of 1.6 + 0.2 native species / 0.1-m² quadrat, while control plots averaged (0.1 + 0.1 native species/ 0.1-m² quadrat). In other words, RCG was the only species in 9 out of 10 quadrats. All the species we sowed but never found at LGP were

- Poa palustris, Ranunculus pensylvanicus, and Scutellaria galericulata, but these volunteers were uncommon.
- Carex tribuloides, Helianthus grosseserratus, Iris sp., Lycoctonum flum fossor, Poa palustris, Ranunculus penicilliformis, and Scutellaria galericulata, but these volunteers were uncommon.

In just two years, RCG regained dominance, forming monotypes in all but the wettest plot, which was closest to stormwater inflows.

In control plots, RCG remained the monotypic dominant, producing an average of 820 g m⁻² above-ground biomass in 2003. In restored plots, importance values of native species dropped as RCG reinvaded the seeded macroplots.

In a seeding experiment, RCG reestablished 52% cover in year one but decreased in year two, as did Verbena hastata. The restoration treatment produced an average of 1.6 + 0.2 native species / 0.1-m² quadrat, while control plots averaged (0.1 + 0.1 native species/ 0.1-m² quadrat). In other words, RCG was the only species in 9 out of 10 quadrats.

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Acknowledgments

Julia Wilcox received a Cottam/Loucks Scholarship in 2003. We thank an anonymous donor to the Arboretum for supporting her field work during the summers of 2003 and 2004. Applied Ecological Services donated personnel and equipment to herbicide the site. Many people helped with the baseline studies. Special thanks to Suzanne Kercher and Andrea Herr-Turoff for devising the seed mix and establishing the field plots.

The Restoration Research Program at UW–Madison Arboretum has focused on reed canary grass because of this species’ unusual invasibility. Dr. Sue Galatowitsch and her students at U. Minnesota are also working on factors that enhance its growth and that potentially might aid in its control.

References


Why control invaders?

Altered hydrologic conditions and invasive species severely limit restoration of wetland biodiversity in wetlands (Galatowitsch et al. 1999, Bernthal and Willis 2004). Reed canary grass (Phalaris arundinacea L. = RCG) is a model invasive species (Lavergne and Molofsky 2004). It expands its distribution rapidly (by vegetative growth), and it displaces most native species (Kercher and Zedler 2004). If we can figure out how to replace this model invader with native vegetation, we can solve similar problems with other aggressive plants.

Here we report knowledge gained while attempting to restore RCG to species-rich vegetation at Lower Greene Prairie in the UW–Madison Arboretum (43°1’40"N 89°26’15"E), Dane County, Wisconsin.

Why did RCG invade?

1. The site was farmed in dry years before being restored to prairie from 1942 to 1952 (Anderson 1968).

2. Although the vegetation was weedy in the 1970s, RCG was uncommon and water inundation was restricted to seasonal ponds (Allsup 1977).

3. Then, stormwater inflows increased, >60 cm of sediments accumulated on site, and RCG spread to form a monotype measuring 3 ha by 2000 (Zedler 2000, Werner and Zedler 2002). The seed bank was dominated by RCG in 1999 (data of S. Kercher in Zedler 2000).

Is this site restorable?

When we began work at Lower Greene Prairie, it was not clear whether the site was restorable. We had demonstrated that, in mesocosms, stormwater accelerates RCG invasion (Kercher and Zedler 2004); we then used the same mesocosms to test whether RCG can be replaced where flooding and nutrient inflows (simulating “stormwater”) are allowed to continue vs. when they are curtailed. It was difficult to reverse the invasion with stormwater treatment than without, but a field test was needed.

Lower Greene Prairie is being considered for controls on stormwater inflows (UW Arboretum 2004). However, reducing or eliminating inflows will require costly construction measures over several years. Hence, we asked if the site is restorable without having to remove stormwater.

We attempted to restore wet meadow vegetation by

• herbiciding monotypic RCG twice with glyphosate,
• burning the site to expose the soil, and
• sowing seeds of 33 native species (Wilcox 2004).

These actions were completed in mid-December 2002. Our seed mix had even proportions of graminoids (grass and grass-like species) and forbs, and we favored species commonly available, affordable, and capable of germinating under water (Middelton 1999). We then examined the response of RCG and native species and sought explanations of the outcome through three associated experiments: (1) germination of the 33 native species in the laboratory, (2) RCG control (early-season removal) in field plots, and (3) seeding at different times in field plots.

This fact sheet was prepared by Joy Zedler (UW–Arboretum) and Julia Wilcox (now at Wisconsin DNR). The material will soon be available on the Arboretum web site www.wisc.edu/arboretum