Invasion to Restoration: Managing Reed Canarygrass (*Phalaris Arundinacea*) in Wetland Ecosystems

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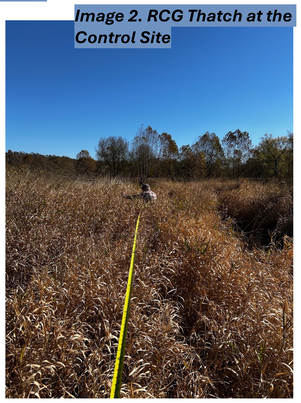
Introduction:

Reed Canarygrass (RCG) is a cool-season, perennial plant native to Europe that was brought over to the Americas for agricultural use. Since then, RCG has become a highly invasive wetland species that threatens the natural biological productivity of those ecosystems. RCG is so destructive because it drowns out native vegetation by establishing a dense monoculture and outcompeting native vegetation. As a result, RCG disrupts wetland waterflow patterns and nutrient cycling, hindering the ability of wetlands to support native wildlife and sequester carbon. Wetlands are incredible efficient at nutrient cycling, so the loss of these functions is detrimental to the health of our climate. As we begin tackling the issue of climate change and restoring wetlands to their natural functions, RCG management strategies are needed. Because RCG is so invasive and unpredictable, the outcomes of different management techniques often yield varying results. This study (in collaboration with the Killbuck Watershed Land Trust) examined the different impacts of five RCG management techniques.

Image 1. Life Cycle of RCG (Source: Wisconsin Reed Canarygrass Management Working Group)

Image 2. RCG Thatch at the Control Site



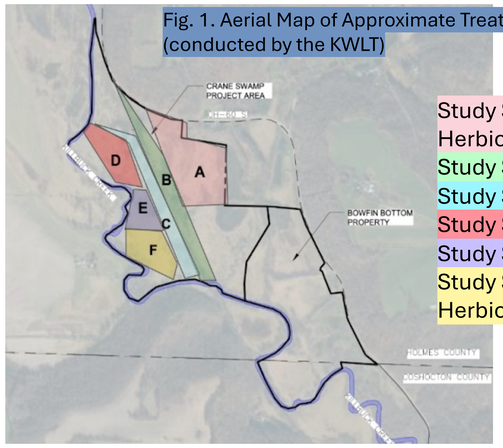
Research Question: What are the comparative effects of shade, mowing, burning, and herbicide application on Reed canary grass (*Phalaris arundinacea*) and their subsequent impacts on native plant diversity?

Methodology:

Study Site: Crane Swamp, Killbuck, OH

Beginning in 2023, the KWLT was approved for wetland restoration at Crane Swamp. Plans included controlling RCG, reestablishing native species, and building new drainage pools. This study examined the effectiveness of the five RCG management techniques implemented by the KWLT.

Fig. 1. Aerial Map of Approximate Treatment Locations (conducted by the KWLT)



Data Collection: Quadrat Analysis

- Observational Study
- Four, 2ft X 2ft quadrats per study site (quadrats were randomly generated, study sites predetermined by the KWLT)
- Counted RCG and non-RCG Stems in each quadrat(1,093 total stems - 858 RCG, 235 non-RCG)
- 15 total plant species documented
- Recorded topographical features of each site

Fig 2. Burn Treatment Quadrat 1.

- 14 RCG Stems
- 0 Non-RCG
- Clumps of RCG rather than evenly dispersed stems
- Charred soil texture
- Initial burn decimated all life, but RCG was able to recover quickly

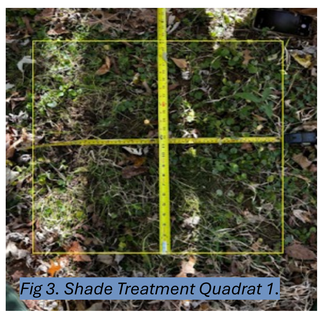


Fig 3. Shade Treatment Quadrat 1.

- 0 RCG Stems
- 106 native grass stems (species unable to be identified)
- 37 Penny Royal stems
- RCG needs 6+ hours of sunlight to grow so heavy shade inhibits growth

Results:

- **Shade treatment was most effective**: significantly lowering RCG proportion ($p \approx 0.049$) and supporting the highest native species diversity.
- **Mowing was least effective**: no significant differences from the control
- **Site 6: Burn, Herbicide experienced site contamination**
- **Burning reduced RCG short-term** (≈300 fewer stems than control; $p \approx 0.059$), but rapid regrowth limited long-term effectiveness.
- **Herbicide reduced RCG stems and proportion** ($p \approx 0.059$ for stem count; 0.49 for proportion), 10 native stems
- **Control plots had the highest RCG dominance**
- **Most stem count and density results were not statistically significant** ($p \approx 0.059$), but trends suggest biologically meaningful treatment effects.

Table 1. Total Number of Stems Across Treatments

Plant group	Site 1: Control	Site 2: Burn	Site 3: Herbicide	Site 4: Shade	Site 5: Mow	Site 6: Burn, Herbicide
RCG	428	141	43	9	237	N/A
Non-RCG	2	3	10	220	0	N/A

Table 2. Results from the pairwise Wilcoxon rank-sum test comparing the number of RCG stems. *Biologically meaningful but not statistically significant differences are highlighted in blue.*

	B (Burn)	C (Control)	H (Herbicide)	M (Mow)
C (Control)	0.059	-	-	-
H (Herbicide)	0.116	0.059	-	-
M (Mow)	1.000	0.381	0.381	-
S (Shade)	0.059	0.059	0.098	0.059

Table 3. Results from the pairwise Wilcoxon rank-sum test comparing the proportion of RCG. Significant differences are highlighted in blue

	B (Burn)	C (Control)	H (Herbicide)	M (Mow)
C (Control)	0.869	-	-	-
H (Herbicide)	0.148	0.049	-	-
M (Mow)	0.504	0.232	0.049	-
S (Shade)	0.049	0.049	0.049	0.049

Literature Cited: haw, D. (n.d.). *Invasive Species Control - Reed Canary Grass Control | MN Board of Water, Soil Resources*. Bwsr.state.mn.us. https://bwsr.state.mn.us/invasive-species-control-reed-canary-grass-control