Stomatal Conductance and Reed Canary Grass Suppression Traits of Native Michigan Trees

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Introduction

Reed canary grass (*Phalaris arundinacea*), a prominent invasive understory species, threatens native Michigan biodiversity statewide. A notable affected area includes a stretch of agricultural land along Schooley Drain in Caledonia, MI, located in the headwaters of the Plaster Creek watershed. Our study pursues the following questions: "Do native trees provide enough shade to reduce the growth of Reed canary grass?" and "Which native trees best transpire water from a floodplain?": To answer these questions, we continued the evaluation of seven different species of native Michigan trees to investigate which species best inhibits the growth of reed canary grass and transpires the most water. Information generated from this research will help to support the utility of trees in riparian restoration projects.

Study Area

Schooley Drain (Figure 1) resides in the headwaters of Plaster Creek in Caledonia, MI near 84th St. SE and East Paris Ave. SE. The surrounding area consists of an agricultural landscape. Reed canary grass has enveloped both banks, smothering native growth, biodiversity, and limiting drainage capability. As shown in the top right image, the grass encroaches into the drain, blocking water flow, which can lead to localized flooding after heavy rain events

Figure 1. A map of Schooley Drain in Caledonia, MI. The area designated for planting is outlined in red.

Methods

Overview

In Fall 2020, 192 trees were planted along the west bank in single-species clusters of 4 such that the interior area forms a square [1]. 7 to 8 clusters for each species were planted, with 48 clusters total (Figure 2).

Species in our project include:

- Bur oak (*Quercus macrocarpa*)
- Hackberry (*Celtis occidentalis*)
- Red maple (*Acer rubrum*)
- Sugar maple (*Acer saccharum*)
- Swamp white oak (*Quercus bicolor*)
- Sycamore (*Platanus occidentalis*)
- Tulip tree (*Liriodendron tulipifera*)

Reed Canary Grass Data

On July 15 , randomized 0.5 m x 0.5 m cell samples of vegetation biomass were collected from the interior area of each cluster to determine the extent of reed canary grass viability. To obtain these measurements we used quadrats to sample each cluster and separated the collected biomass into reed canary grass and other species, which were then dried and weighed.

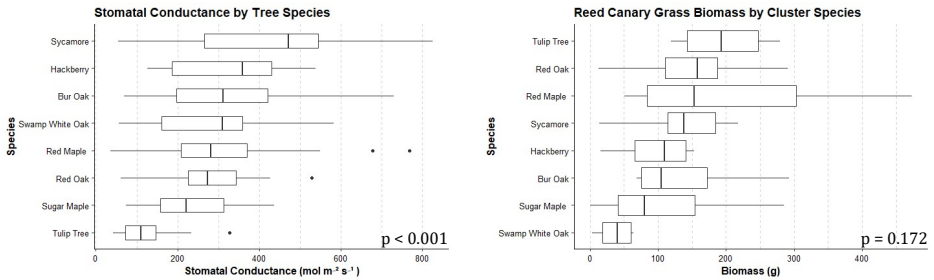
Stomatal Conductance Data

Stomatal conductance data were collected from 2 randomly chosen trees per cluster during two sampling dates: June 17 and July 22. An SC-1 Leaf Porometer was used to take a 30 second sample from one leaf per tree selected (Figure 3).

Figure 2. A single-species cluster of four trees

Figure 3. Measuring the stomatal conductance of a hackberry leaf

Results



Significant differences exist in terms of stomatal conductance for TT-BO, TT-HB, SYC-RM, TT-RM, SYC-SM, and TT-SYC ($p < 0.05$). No significant differences exist in terms of reed canary biomass ($p > 0.05$).

Conclusions

From stomatal conductance data collection, we found that the leaves of sycamores, hackberries, and bur oaks respectively respired the greatest volumes of water. Based on our vegetation collection, swamp white oak, sugar maple, and bur oak clusters respectively had the lowest median value of reed canary grass biomass. However, we found no significant differences between clusters ($p > 0.05$). Notably, the trees in the clusters have not matured. The development of more pronounced canopies in the future may provide more insight to the study.

Acknowledgements

I would like to thank Dr. David Warners and Deanna Geelhoed for their guidance throughout the summer. I would also like to thank the USDA Forest Service, the Great Lakes Restoration Initiative, and the Calvin University Science Division for making the research financially possible. Lastly, I would like to thank Josie Aardema, Naomi Dykstra, Jia Luchs, Noah Millen, Caedmon Morgret, and Ethan Tulp for their assistance during the data collection process.

References

[1] Miller, T., Martin, L., & MacConnell, C. (2008). Managing Reed Canarygrass (Phalaris arundinacea) to Aid in Revegetation of Riparian Buffers. *Weed Technology, 22*(3), 507-513.