

Winter, water, and herbicide: A retrospective analysis of factors driving curlyleaf pondweed dynamics in sixty Minnesota lakes

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Environmental drivers of curlyleaf abundance

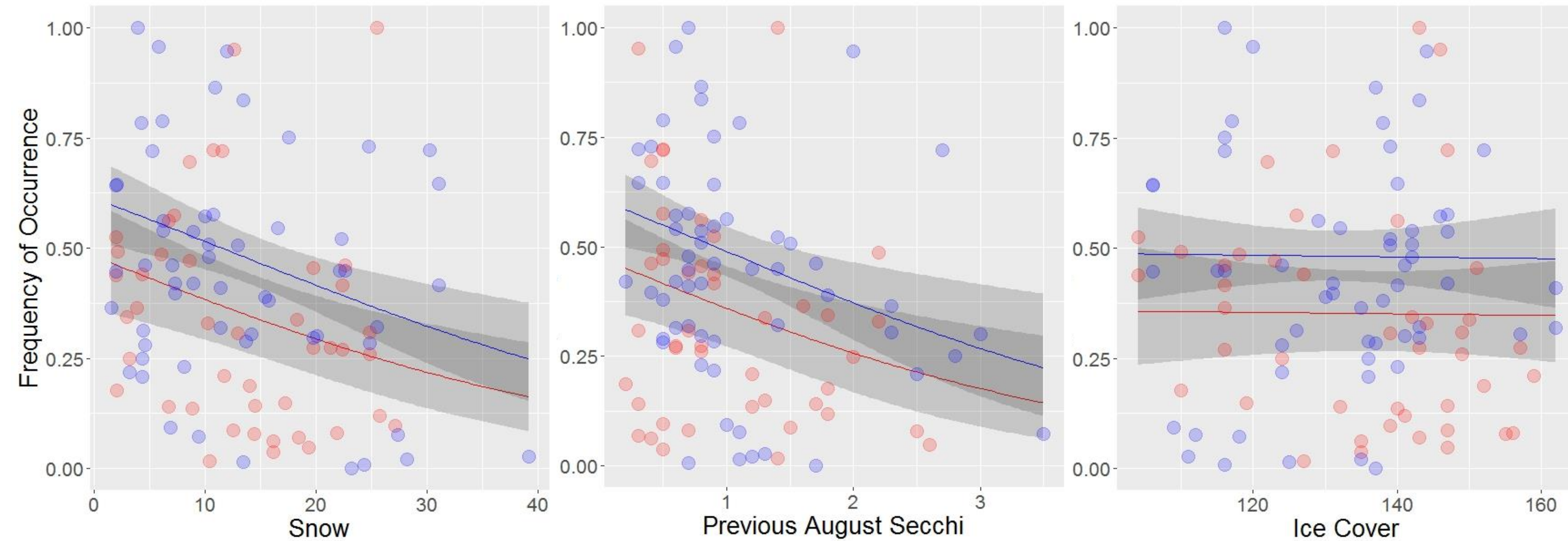


Figure 1: Mean daily snow cover (left; inches), and water clarity (center; meters of secchi depth) have negative effects on curlyleaf pondweed ($p < .001$), while ice cover (right; days) has no significant effect. No significant interactions with treatment were identified for environmental variables. Red and blue represent treated and untreated lake-years, respectively, shaded regions represent 95% confidence intervals for the means

Herbicide: immediate, carryover, cumulative

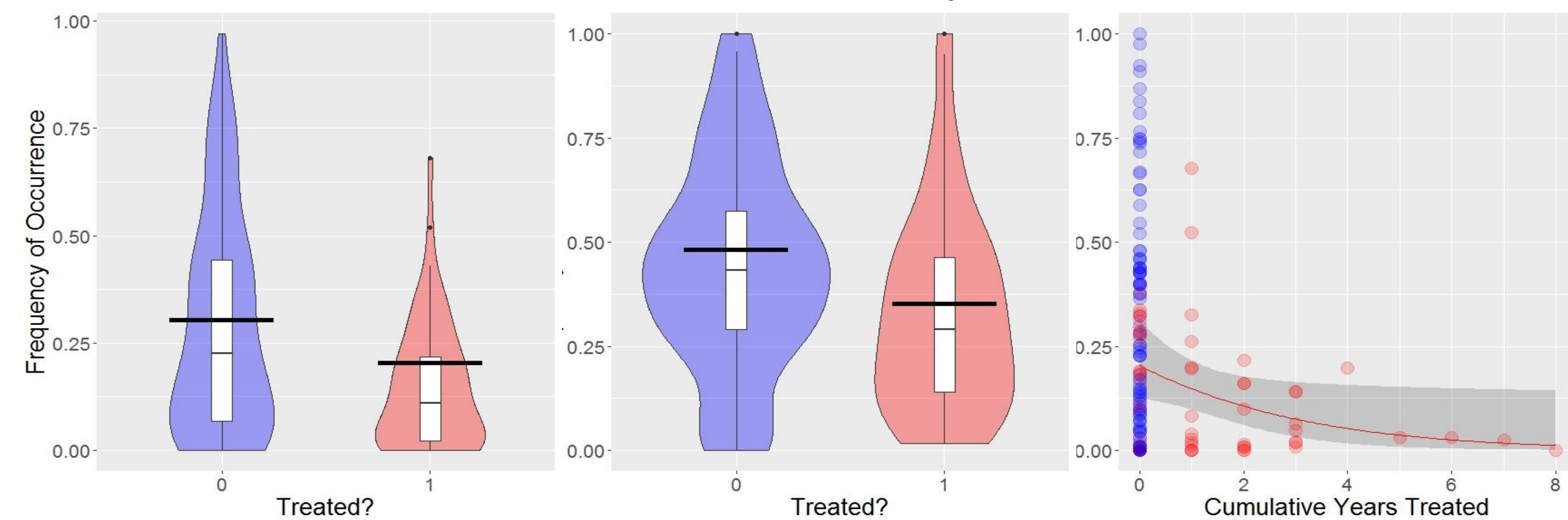


Figure 2: Herbicide treatment drove declines in curlyleaf abundance in three ways—as a within year effect measured from post-treatment surveys (left), as a carryover effect measured from following-year surveys in the spring following a treatment (center), and as a cumulative effect of additional consecutive years of treatment (right). Width of violin plots depict data density at a given y-axis value, and mean values are represented by black bars, red and blue represent treated and untreated lake-years, respectively

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References: 1.Valley, R. D. & Heiskary, S. *Lake and Reservoir Management* 28, 338–345 (2012). 2.McComas, S. R., Christianson, Y. E. & Singh, U. *Lake and Reservoir Management* 31, 109–114 (2015). 3.Madsen, J. D. & Wersal, R. M. *Journal of Aquatic Plant Management* 55, 1–12 (2017).

Managers need to know more to do more

Problem: Recent work has shown that curlyleaf pondweed may be influenced by winter snow cover¹ and interacts with water clarity². The generality of these relationships and how they influence management of the plant remains unclear

Goal: Determine if the effect of snow and water clarity on curlyleaf pondweed are driving curlyleaf dynamics on a broad scale and if the effects of these differs between treated and untreated lakes

Plan: Compile point-intercept³ data collected on Minnesota lakes between 2006 and 2015. Pair with environmental data from MN Pollution Control Agency, MN State Climatology Office, and MN Department of Natural Resources. Estimate effects of environmental variables, management, and their interactions on curlyleaf frequency of occurrence from these data using generalized linear modeling

The power of collaborative data and research

- 575 point-intercept surveys
- 67 lakes representing 236 lake-years of plant data
- 65 treated lake-years for curlyleaf & 116 untreated lake-years
- Adaptive management can happen at state-wide scales
- Collective learning through experimentation (e.g., 8 years of continuous treatments)
- Ability to tease apart climate, physical lake attributes and management effects
- Contact maisrc@umn.edu to contribute your plant surveys to our next project!

