Impact of Lawn Maintenance on Insect and Plant Biodiversity

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Introduction

There are about 40 million acres of maintained lawn in the US. Grass lawns require constant maintenance and use of excessive amounts of water, fossil fuels (to power lawn equipment), and pesticides. Additionally, maintained lawns are areas void of biodiversity that are uninhabitable to most wildlife. Reduced lawn maintenance has been shown to increase arthropod abundance and taxa richness (Proske et all 2022).

Communities nationwide have joined initiatives to reduce the amount of maintained lawn, such as No Mow May (Del Toro et al, 2020). At the State University of New York at Potsdam (SUNY Potsdam), two locations were selected to be only mowed once a year (low-mow). This protocol has been in place at SUNY Potsdam since 2018, but research is lacking on the tangible effects of these initiatives on insect and plant biodiversity. We began the current study in August 2022 to address this question and figure out whether the low-mow protocol is benefiting campus biodiversity.

Left to right: individuals from the order Hemiptera and one individual from the order Diptera.

Materials and Methods

We measured differences in plant and insect biodiversity in two locations on SUNY Potsdam's campus: one location was mowed weekly, and one was only mowed once throughout the season (low-mow). We hypothesized that both plant and insect species richness and insect individual abundance would be higher in low-mow plots than in mow plots. Two mow and two low-mow plots were established in each location. We sampled each plant species present in each plot and both locations were sampled once using sweep nets for insects. To sample plants, a one-meter square of PVC piping was used to designate the plots. Low-mow plots were chosen by randomly selecting a location on the edge of the area and measuring 60 meters in. Each plot was 60 meters apart from any other plot. Plants were identified using previous knowledge and Seek, a photo identification app. Samples that could not be identified were brought back to the lab and photographed. All plants were identified to the species level.

Insects were sampled using sweep nets. A line of 60 meters was set using a tape measure for each plot. Using the standard of one sweep with the net per step, the 60-meter line was sampled along both sides. Insects were gathered into plastic bags and frozen for preservation. Using small plastic jars, the insects were sorted first into families and then into orders. Individuals of each order were counted. Identification was done with expertise from Dr. Snyder as well as several guides provided by the school.

Results

Plant species richness was higher across the board in mow plots with more invasive species in low-mow plots (Table 1) contrary to our hypothesis. Only two non-invasive plant species were observed; *Taraxum officinale* (common dandelion) and *Amblystegium varium* (tangled thread moss), the latter only being observed in low mow plots. The lack of species in low-mow plots is likely due to the prevalence of *Lotus corniculatus* (birdsfoot trefoil), an invasive species that creates a thick, dense mat of vegetation that prevents other plants from growing. A t-test (p=0.089) was calculated to determine that there is a weakly significant difference between the family richness of the mow plots and the low-mow plots.

Plant Species Richness and % Invasives

	Lehman	Maxcy	Total Species	Invasive Species (%)
Mow	17	16	33	36%
Low Mow	15	5	20	50%
Total	32	21	53	42%

Table 1. Plant species richness by site and % of total species that are invasive.

Results (cont'd)

Insect individual abundance was significantly higher in low mow plots (Figure 3). Exceptionally high numbers can be seen in the Hemipterans (true bugs) because of an aphid nest that was found in a low-mow plot (Figure 1). The aphids account for approximately 52% of low mow Hemipterans (approx 400 aphids), but even with this acknowledged, there are still 100 times more low-mow hemipterans than those in the mow plot. Less Hymenoptera individuals (bees and wasps) were observed than expected. Diptera (flies) are most prevalent in mow plots (Figure 2).

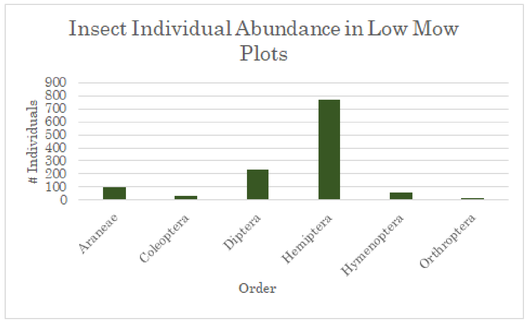


Figure 1. Abundance of insects by order in Low Mow plots.

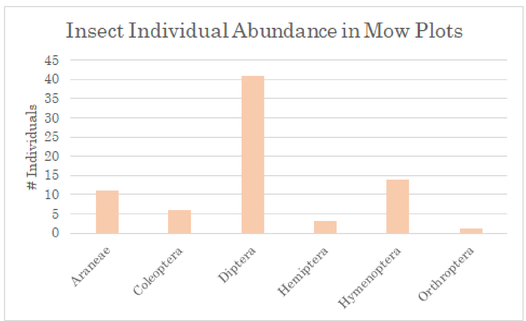


Figure 2. Abundance of insects by order in Mow Plots.

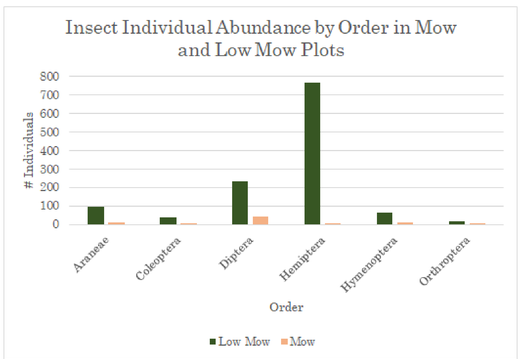
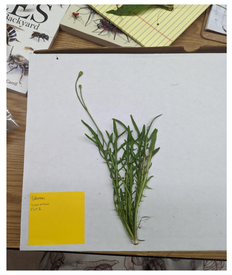


Figure 3. Abundance of insects by order compared between Low Mow and Mow plots.

Conclusions

It is recommended that the next steps in this research focus specifically on plant individual abundance or percentage of cover to clarify further the effects of low-mow protocols on plant biodiversity. This is a long-term project on SUNY Potsdam's campus that will be continued in coming years. This research provides a foundation of data to present to SUNY Potsdam in hopes of motivating further changes to their landscaping protocols by reducing the area of mowed lawn on campus.



Left to right: *Scorzoneroides autumnalis (*autumn hawkbit) and *Symphyotrichum novae-angliae (*New England aster)

References

Del Toro, Israel, and Relena R. Ribbons. "No Mow May lawns have higher pollinator richness and abundances: An engaged community provides floral resources for pollinators." *PeerJ* 8 (2020): e10021.

Proske, Anja, Sophie Lokatis, and Jens Rolff. "Impact of mowing frequency on arthropod abundance and diversity in urban habitats: A meta-analysis." *Urban Forestry & Urban Greening* 76 (2022): 127714.

Acknowledgements

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