Sustainable RIVER   Sustainability & Environment

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Time of Plant Establishment Affects Prairie Composition

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By: Aleisa LaBelle

Sustainability, a cross-disciplinary field, focuses on maintaining the earth's ecosystems for future generations while improving human well-being. For years, humans have been using the land in a way that satisfies economic stakeholders, and aren't always focused on allowing ecosystems to flourish into the future. In the United States, native prairies are decreasing, which is primarily due to past and current conversion to agricultural land. Several scientific studies have been performed or are in progress to evaluate potential benefits of managed prairie systems, including haying grasses for animal feed or biofuels, or to increase pollinator levels near agricultural fields (Jarchow & Liebman 2011). The results of these studies aim to encourage land managers to restore and maintain diverse prairie systems. By incorporating sustainability practices into prairie research and agricultural practices, we can hope to preserve today's beauty and biodiversity for future generations.

I helped conduct research on prairie systems in the 2017 Sustainable RIVER REU program. For my research, I assisted with the Comparing Managed Prairie Systems (CoMPS) experiment near Vermillion, SD. I used data from the treatments that contained different prairie functional groups, including warm-season grasses, cool-season grasses, early-flowering forbs, and late-flowering forbs, grown alone and grown in pairs (for a total of 10 treatments). The research hoped to quantify whether each functional group overyielded or underyielded when grown with the other functional groups. A functional group overyielded when the amount of aboveground biomass that the group produced when paired with another functional group was higher than the yield it produced when grown alone (Hector & Loreau 2001). Conversely, a functional group underyielded when the amount of aboveground biomass that the group produced when paired with another functional group was lower than the yield it produced when grown alone (Hector & Loreau 2001). Measuring overyielding and underyielding helps to evaluate the relationship between increasing diversity and productivity.

To gather data for my research project, I conducted fieldwork, which included harvesting plants and identifying plant species. To further inform my research question, I also incorporated data previously collected in July of 2015 and 2016 by a graduate student. My main finding was the cool-season grasses tended to

dominate all other functional groups (i.e. overyield), but the abundance of the warm-season grasses was increasing over time (Figure 1). The forbs were not well established in the experiment yet. Because the cool-season grasses started growing earlier (in the experiment and in the year), they were able to get established and exclude other functional groups.

Overall, this project helped enhance my research skills and provided me the opportunity to learn more about the complexities of prairie ecology.

Example vegetation plot with necessary materials for harvesting and identification

Aleisa in action harvesting grasses and forbs from the vegetation from the test plot
Pictures by Eva Soluk Allison Bowers and Shelly Kosola

		Partner Plant			
		C3	C4	Early Flowering Forb	Late Flowering Forb
Yielding Focal Plant	C3	N/A	0.48	0.5	0.5
	C4	-0.48	N/A	0.31	0.27
	Early Flowering Forb	-0.50	-0.31	N/A	0.13
	Late Flowering Forb	-0.50	-0.26	-0.13	N/A

When C3 plants were paired with C4 plants, early-flowering forbs, and late-flowering forbs, the C3 plants overyielded. However, when later-flowering forbs were paired with the other groups, they underyielded.

Click on the following links to learn more about prairie ecosystems and the research that is ongoing!

- https://www.jarchowlab.org/
- http://www.spiritmound.com/prairie.htm
- https://prairienebraska.org/restoration/

Aleisa is from Sioux City, IA and is currently studying general sciences at the Nebraska Indian Community College. She was part of the 11-week 2017 Sustainable RIVER REU, and researched prairie conservation with a sustainability focus with her research mentor Dr. Meghann Jarchow.

Literature Cited

Jarchow, M. E., & M. Liebman. 2011. Incorporating prairies into multifunctional landscapes. Extension and Outreach Publications. 48 <>.

Loreau, M., & A. Hector. 2001. Partitioning selection and complementarity in biodiversity experiments. Nature, 412(6842): 72-76.