

For my proposal, I outlined the methodology of how to perform an experiment in viewing how bison wallows impact the surrounding prairie communities. Prairie communities are an important part of a diverse environment and can aid the surrounding biodiversity within an ecosystem. Tallgrass prairies were once prevalent across the large expanse of North America, and now 99% has been destroyed. (Zylka et al., 2016). Restoration and management strategies are used to restore these native areas to their historic state. Studies have shown ungulates, specifically bison; may alter the environment through means of disturbance such as grazing, trampling and wallowing. The focus of this proposal relates to prairie restoration ecology, and how wallowing affects plant diversity and impacts vegetation.

My plans for conducting this project, with the help of the Nachusa stewards and NIU biology professors, include surveying abandoned and active wallows in collecting data on the vegetative distributions compared to the surrounding prairie. Nachusa Grasslands is an example of a local preserve, owned by The Nature Conservancy that contains one the most highly rated quality prairie (Taft, Hauser & Robertson 2006). Currently Nachusa covers 4,000-sq acres consisting of tallgrass prairie, native oak savanna, and wetland ecosystems (Goldblum et al. 2013). By demonstrating the importance of maintaining this natural biome, more public incentive and awareness can be spread to the public in carrying out their mission.

Historically in North America, bison were an important factor in maintaining prairie plant communities. Bison may play an active role in prairie restoration by causing natural disturbances (Knapp et al. 1999). Bison are commonly referred to as a keystone species, due to their role of aiding prairie communities. A keystone species can be defined as having a greater influence, and play an essential role in maintaining the ecological distribution and biodiversity of an ecosystem (Mills, Soule & Doak 1993). Natural smaller-scale disturbances, such as

wallowing, may play a role in maintaining the distribution of the mosaic grassland community, and help maintain biodiversity.

Wallowing is an example of how bison may have an indirect influence on prairie communities. The reason bison wallow is not well known or documented, although, studies have suggested that bison may wallow to seek relief from insect bites or parasites, or for social interactions (MacMillian et al. 2000). Despite their behavioral inferences for why bison wallow, both active and abandoned wallows may aid in establishing a mosaic of vegetative communities.

During my research, I found two key characteristics of how bison may aid prairies in wallowing. When bison wallow, they compact the soil, and they act as seed dispersal agents. Further studies are needed to determine how seed dispersal affects plant distribution of introduced species (Palmer et. al, 2008). I reviewed how the environmental conditions occur within wallows, such as increased bulk soil density and compaction, which may result in lower diversity of vegetation (McMillian et. al, 2011). However, long-term effects of wallowing on richness and diversity, may not be comparable to other small-scale disturbances by animals. Studies have shown, that these long-term effects can correspond to the ability of wallows to become frequently abandoned, and may result in vegetation regrowth by advancing to the mosaic prairie. Studies have shown correlations within edges of wallows to demonstrate vegetative abundance, richness and have a lower richness than the surrounding prairie (Trager et al, 2004).

Within wallows, temperature varies seasonally, but drought dependent species can have a greater abundance in wallows. Many of these species including invasive species, and non-noxious weeds to thrive within a wallowed area, or along wallow edges. Based on my findings

in the literature, wallows are frequently abandoned, which can promote plant diversity when plants regrow and may have an influence on the mosaic of overall prairie composition. In further researching this topic, I outlined the methodology for the proposal.

My methods include investigating the environmental processes, by determining if wallows return to their native state after being abandoned. Both active and abandoned wallows will be selected, based on previous GPS locations by another NIU student. Two 1m² quadrats will be placed within the wallow, along the edge, and in the surrounding prairie. In each plot plant species present and their percent cover will be recorded to calculate species richness, Shannon diversity, total percent cover, and percent cover of non-native species will be assessed. Abiotic environment conditions will also be surveyed, by using these plots to take samples to determine soil compaction, moisture retention, temperature and pH. Each variable will be compared between active wallows, abandoned wallows and surrounding prairie using ANOVA.

My predictions for this experiment correspond with previous studies conducted on wallows, (Augustine & Frank 2001, Knapp et. al, 1999), the hypothesis includes: increase in bare ground cover, lower species richness and diversity within the wallows compared to surrounding prairie, due to increased forbs and; graminoids and increases in noxious non-native weeds. The prevalence of forbs may be attributed to vegetation response to herbivory, as bison may frequently graze around wallows (Coopedge et. al, 1998).

In comparing natural disturbance to that of human derived initiatives, such as fire, bison have played an ecological role throughout history. Prairies have developed around bison presence, and bison disturbances may provide ecological service, by maintaining heterogeneity in a prairie ecosystem. My results may further conservation strategies by better informing hand

managers of grazer effects. While further research is needed to determine how bison impact the ecological structure and diversity of communities, it is still a measure that has captured my interest, and that I plan to continue to investigate by partnering with Nachusa stewards, and professors here at NIU.

Throughout this period of finding and reviewing the literature I created an annotated bibliography for each article, and highlighting specific areas to incorporate in my proposal. By creating and following an action plan, I became invested in further reviewing relevant material, and created a database containing articles related to my project. While effectively creating a proposal, conducting the background research, and connecting with other students at URAD and in my department working in other labs, I found it easier to stay motivated and focused. While framing my methodology, and during weekly meeting with my mentor, he helped provide me with the necessary tools to advance my learning process. Some examples include, suggesting other resources I could include, helping me in structuring my methods, and aiding with designing a poster for the Undergrad Research and Artistry Day Symposium at NIU. My mentor Professor Barber, was an instrumental component to my success in helping to prepare my “pitch” for the judges, and others who were interested in my poster. During this opportunity, I found it easier to convey my proposal, methods and discuss my predicted outcomes.

Including the above areas outlined in this report, I found this experience to be helpful in framing my critical thinking skills, and portraying what I plan to continue into my future career. Overall this opportunity has helped provide more incentive to move forward with this project. I am very grateful for what I have learned, and continue to learn as well as my future plans for collecting data.

Works Cited

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