

**The Friends of Nachusa Grasslands
2021 Scientific Research Project Grant Report
Due June 30, 2022**

1. Please save this form to your desktop with a unique file name that includes “Friends 2021 Science Grant Report” and your last name.
2. Complete the form using the headings in bold as your guide.
3. Save the file as a Word document or a PDF.
4. Attach the file to an e-mail, and send it to: nachusafriendsscience@gmail.com no later than June 30, 2022.
5. The subject of the e-mail should be “2021 Scientific Research Grant Report” and your last name.
6. After your research project is complete, please contact Friends so that we may learn from and publicize the outcomes as appropriate.

Name: Pallavi Singh

Address: 359 Montgomery Hall, Northern Illinois University, DeKalb, IL-60115

Phone: 815-753-7839

Current E-mail: psingh1@niu.edu

2021 grant amount: \$2,000

Please answer the following questions with 1- to 2- sentence summaries:

Research Project Topic: Longitudinal Characterizing of Intestinal Microbial Ecology of Bison

Research Project Purpose: The purpose of this study is to characterize the composition and role of intestinal microbial population of the bison. This will further elucidate the ways these microbes shape health of the animal. We further aim at identifying factors that affect this microbial composition both internal, for instance; host (age, weight, gender), and external (diet, temperature, and vegetation variation), longitudinally. We thus, aimed at understanding ecological dynamics and decipher these impacts on both the animal and its environment.

Research Project Outcomes to date: We have collected fecal and water samples year-round from various sites in Nachusa and during the annual round up, as a result banked close to 800 samples thus far.

For assessing, the intestinal microbial ecology and pathogen status we have isolated community DNA from all the fecal samples above. We assessed pathogen status from a set of samples collected during winter and summer season from last year and found samples negative for various bacterial pathogens.

For Community DNA analysis based on 16S rRNA gene sequencing we found that the microbial communities are different within each animal and are influenced by season (Fig.1) as well as from year to year (Fig.2). These annual changes support our hypotheses and work that changes in access to prairie composition affects the animal microbiome and consequently animal health.

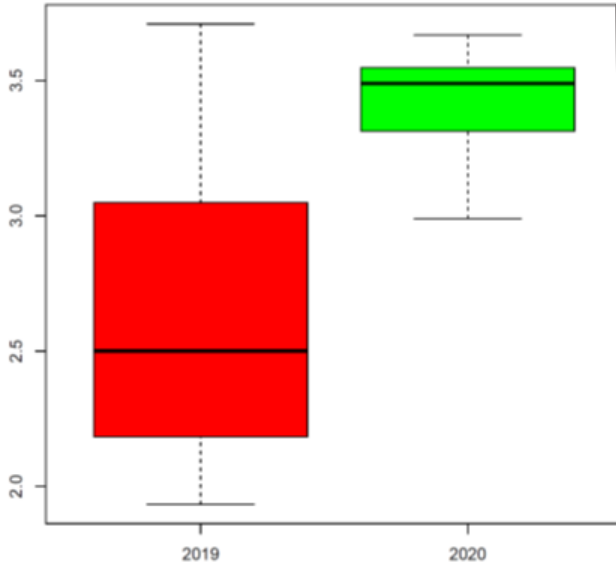


Fig.1: Higher Diversity was observed in intestinal microbial communities of animals in 2020 as compared to 2019. Higher diversity may indicate better health status in animals during 2020.

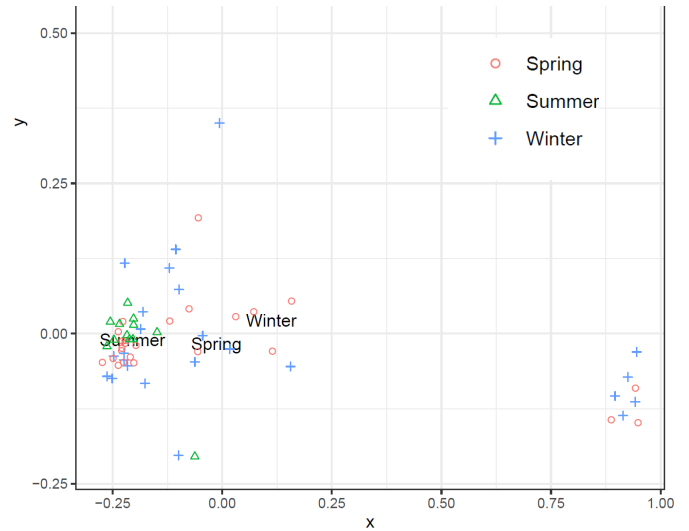


Fig.2: Intestinal microbial communities clustered separately from each Winter, Spring, and Summer. Summer communities were found to be more stable and closely clustered as opposed to other seasons.

Describe how the grant funds you have received from the Friends of Nachusa Grasslands have been used in regard to the above topic, purpose, and/or outcomes: Funds from the 2021 grants allowed us to collect samples, perform DNA isolations, and PCR. More importantly, funds from Nachusa supported travel of several students for sample collection as well as provide research and training opportunity to these students, listed table below. These students gained experience in field, and lab (microbial and molecular) techniques.

Students	
<i>Undergraduates</i>	<i>Graduates/Personnel</i>
Chloe` Harvey	Pallavi Singh
Paula Luengo	Laurie Spencer
Carretero	Ritesh Ray
Halee Tyszka	Jeanine Sitz

Describe how your project has benefited the work and goals of Nachusa Grasslands: The results of the study will reflect upon Bison herd management as our goal is to holistically study animal, water microbiome to decipher microbial community interplay in the ecosystem. Our year round fecal and water sample collection has reflected on microbial community variation in Bison host by 16S sequencing. Augmenting Bison growth performance and health is the long-term goal of the project.

Describe how your findings can be applied to challenges in management practices for restoration effectiveness and species of concern: Various factors affect health and growth of Bison in the wild. A well-established and important factor my group is focused on is the intestinal microbial community of the Bison. These communities have important function of food digestion and protecting the host from various pathogens. Therefore, are important in supporting the health of the animal, however they can be easily disturbed by multitude of factors. The goal of our research is to study these factors and provide information on the significantly influential factors identified for instance water or diet. These will enhance our understanding of Bison herd management, which in turn will support prairie restoration efforts.

Please list presentations/posters you have given on your research:

1. L. Spencer[#], E. Bach, and **P. Singh**. Seasonal Variation of Enteric Parasites in Wild Bison. Talk at Nachusa Science Symposium. Virtual, Apr. 2022
2. **P. Singh**, L. Spencer[#], R. Ray[#], J. Seitz[#], C. Harvey^{*}, P. L. Carretero^{*}, and E. Bach^{*}. Longitudinal study to identify factors important for Bison health. Talk at Nachusa Science Symposium. Virtual, Apr. 2022
3. L. Spencer[#], E. Bach, and **P. Singh**. Seasonal Variation of Enteric Parasites in Wild Bison. ASM Microbe, Virtual, June 2022.
4. R. Ray[#], L. Spencer[#], C. Harvey^{*}, and **P. Singh**. Surveillance of foodborne pathogen, Shiga-toxin producing *E. coli* in wild Bison. Nachusa Science Symposium. Virtual, Apr. 2022

Have you submitted manuscripts to scientific journals? If so, which ones? If not, do you anticipate doing so? (Please send digital copies of published articles to the Friends so that we can learn from your work.)

We haven't submitted any research articles, yet. Yes, we anticipate submitting journal articles within the next year.

What follow-up research work related to this project do you anticipate (if any)?

Optional: Suggestions for improving the application and award process for future Friends of Nachusa Grasslands Scientific Research Grants: