

**The Friends of Nachusa Grasslands
2019 Scientific Research Project Grant Report
Due April 30, 2020**

1. Please save this form to your desktop with a unique file name that includes “Friends 2019 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 April 30, 2020.
5. The subject of the e-mail should be “2019 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

2019 grant amount: \$7,700

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

Research Project Topic: Characterizing Intestinal Microbial Ecology of Bison introduced to Restored Tallgrass Prairie

Research Project Purpose: This study aimed at elucidating intestinal microbial population of the bison and the ways it shapes health of the animal. We aimed at identifying host (age, weight, gender) and external factors (diet, seasonal variation, and water microbial composition) that may be affecting the gut of bison. 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 600 samples thus far, as described in Table 1.

Table 1: Samples collected till date

Sample Type	No. of Samples
Recto-anal junction Swabs	351
Fecal Samples	145
Water	12

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 one winter season and thus far have found sample presumptive positive for *Salmonella* (18.75%) and shiga-toxin (12.5%) and negative for *Shigella*, and *Campylobacter*. These numbers may change when assessing samples

collected from summer. Based on the pathogen status we are gearing up to ship of samples for 16S rRNA gene sequencing on both positive and negative animals. Further, we have been working on standardizing metabolite analysis on the fecal samples. Metabolites provide information on action of the microbes in the gut and how they affect the animal's growth and performance.

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 2019 grants allowed us to collect samples as, perform DNA isolations, PCR and soon sequencing. 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 in Table 2.

Table 2: Student Research Training

Students	
<i>Undergraduates</i>	<i>Graduates/Personnel</i>
Tina Sison	Pallavi Singh
Alex Hoover	Laurie Spencer
Anthony Acevedo	Babatunde Olawuni
Bhumi Shah	Neetika Khurana
Kyi Zay Min	

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 pathogen colonization status which will be supported by 16S sequencing data soon. 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. One important factor my group and I are studying are the bacterial community of the Bison intestine. These bacteria 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**. Molecular Detection of Foodborne pathogens in wild Bison in Illinois. ASM Microbe, Chicago IL, June 2020 (Accepted abstract, Conference cancelled due to COVID-19).
2. A. Hoover and **P. Singh**. Metablomics of Bison Intestinal Microbial Ecology. MAC-NIU, DeKalb IL. Nov. 2019

3. **P. Singh.** Assessing intestinal Microbial Ecology of Bison and linking microbial community dynamics to environmental factors. Nachusa Science Symposium. Dixon, IL Oct. 2019

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

What follow-up research work related to this project do you anticipate (if any)? This is an ongoing research effort which I initiated in 2018 after starting at NIU. The goal is to analyze the variations in Bison gut microbial population over a period of (at least) five years. This will provide information on dynamic pathogen status, effect of temperature and diet as depicting by changes in maturing prairie.

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