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

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2021 grant amount: $2435

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

Research Project Topic:

Quantification of Microplastics in Soils and Sediments at Nachusa Grasslands, and Impact on Microbiota

Research Project Purpose:

The purpose of this project is to determine whether Nachusa Grassland soils and stream sediments are contaminated by anthropogenically sourced microplastics and any impacts microplastics may have on the soil and sediment microbial communities.

Research Project Outcomes to date:

We processed the soil and sediment samples through sediment separation methods. The results revealed two pieces of microplastics, suggesting that there is not much contamination at the chosen sites.

We have sampled and extracted DNA from microplastics in a simulated wetland environment using sediment from various Nachusa locations. The samples are currently awaiting sequencing.

We have removed pieces of each type of MP at various timepoints to view differences in degradation (if any) under the microscope (1 month and 4 months).

We have conducted wet chemistry analysis on the liquid in the simulated microcosms at 1 month and 4 months.

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:

The bulk of our budget request is for the analytical expenses of DNA sequencing. These are as follows through the Research Resources Center sequencing facility at UIC, with estimates given based on recent jobs completed for the Meyer-Dombard lab.

1] The 16S rRNA amplicon sequencing service is approximately $20 per sample. We anticipate ~45 samples to be collected from Nachusa soils/sediment (~15 sites, with triplicate sampling at each). This brings a total of $900 for this service, which will provide the analysis of the diversity of microorganisms in the samples.

2] The ‘shotgun metagenomics’ sequencing service is approximately $200 per sample. We will choose four of our experimental microcosms/controls for this analytical technique which will facilitate understanding the ecosystem functions of the communities. This totals $800.

The remainder of our budget is for the DNA extraction kit, ($586.00), supplies for PCR for the preparation of the DNA for sequencing (“Dreamtaq” is listed at $98.49), and supplies to build two additional ‘SMI’ units for microplastic separation to accelerate our sample processing ($50.00).

Other expenses such as routine laboratory consumables, chemicals for the density separation, and gasoline for travel to the field site will be paid for from available student funds.

Totals:

$900

$800

$586.00

$98.49

$50.00

Describe how your project has benefited the work and goals of Nachusa Grasslands:

It is important to monitor any microplastics entering environments such as the grassland as plastic pollution continues to become a growing problem. This helps better understand microplastic movement in environments where this topic is not heavily studied.

Describe how your findings can be applied to challenges in management practices for restoration effectiveness and species of concern:

In addition to understanding microplastic movement in the grassland, continuous monitoring of microplastics can help with future mitigation plans to keep plastics from entering the grasslands and keep any animals from ingesting them. While MPs are not a huge issue in the grasslands at the moment, I think this is an important issue to monitor to avoid microplastics from entering this relatively MP-free ecosystem.

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

Midwest Geobiology Symposium 2021: Microplastics: Abundance and Effect on Microbial Life in Landfills, Wetlands, and Grassland.

Nachusa Symposium 2022: Quantification of Microplastics in Soils and Sediments at Nachusa Grasslands, and Impact on Soil Microbiota.

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 have not yet submitted to scientific journals, but plan to do so after I am done with my thesis this coming December 2022.

What follow-up research work related to this project do you anticipate (if any)?
<u>Optional</u>: Suggestions for improving the application and award process for future Friends of Nachusa Grasslands Scientific Research Grants:

Currently, I do not anticipate doing follow-up work because of time limitations with my master's program. Though, I'll be leaving behind some bright undergraduates that have helped me with the project and may want to continue doing this work with Nachusa Grasslands and EDGE lab. This may consist of expanding the locations of soil and sediment samples to get a more representative area when looking for MPs.