Nachusa Autumn Medley
(Photo credit: Mary Vieregg)

Nachusa Grasslands

Virtual

Science Symposium

April 23, 2022

Welcome!

Science at Nachusa! A few hours spent together at this symposium will only begin to scratch the surface of all the fascinating and insightful scientific study being carried out on the preserve. We hope it will enlighten you…and inspire you to learn more, do more, explore more, and appreciate more of what is happening. Thank you to all of the symposium presenters for sharing their work with us, and a special thank you to Dr. Elizabeth Bach, Nachusa's Research Scientist, who coordinates all of the scientific efforts at the preserve.

During 2021, 40 scientists conducted research at Nachusa. At the same time, Nachusa staff members and volunteer community scientists continued to support local, regional, and national efforts to monitor, protect, and conserve threatened and endangered species and habitats. Nachusa scientists published 14 peer-reviewed scientific publications including one in the highly-regarded *Proceedings of the National Academy of Sciences.* You can read more about these publications in the December blogpost written by Dr. Bach: (https://www.nachusagrasslands.org/nachusa-blog/nachusa-science -in-review-2021)

In the most recent issue of the Friends of Nachusa Grasslands' annual report, *Connected to the Land*, you will find summaries of the research goals of thirteen scientists awarded 2021 Friends Science Grants (https://www.nachusagrasslands.org/science-grants-2021.html). You will hear about some of the work done under the auspices of those grants at the symposium today.

This year, Friends of Nachusa Grasslands has awarded $66,000 in grants for scientific work at the preserve. Visit the science section of the Friends website to read the project summaries: (https://www.nachusagrasslands.org/science-at-nachusa-grasslands.html). Click on the "Science Grants 2022" link in the right-hand column. These thirteen projects are excitingly diverse and should add significantly to our knowledge about how Nachusa…and other sites…function. *To receive information about the 2023 grant guidelines and application process, send an email to:* nachusafriendsscience@gmail.com, or visit the Friends website in late August.

In 2021, Friends of Nachusa Grasslands used a substantial gift honoring Robert and Patricia Anderson to establish the Friends Endowment for Nachusa Science. The goal of the endowment is to permanently fund science research at Nachusa Grasslands. To honor this gift, Friends annually recognizes the work of a researcher at Nachusa who has demonstrated a commitment to scientific excellence at the preserve. This year, the non-monetary *Robert and Patricia Anderson Outstanding Contribution to Science at Nachusa Grasslands Award* is being presented to Dr. Bethanne Bruninga-Socolar.

Nine years ago, Dr. Bruninga-Socolar began studying bees at Nachusa. She was awarded her first of several Friends of Nachusa Grasslands science grants in 2015 to support her ongoing work with Dr. Sean Griffin. Beginning with a baseline survey of the bee populations on remnants, restored land, and alternative land use areas at the preserve, the work grew into an exploration of the impact of management actions including bison introduction on the diversity and abundance of bee species and their interactions with plants.

Exciting discoveries of rare and endangered bee species have been dramatic highlights of Dr. Bruninga-Socolar's work. Her numerous publications and presentations about the bees of Nachusa have drawn other researchers to the preserve and made it one of the Midwest's preeminent sites for learning more about these important pollinators. Dr. Bruninga-Socolar is now an Assistant Professor at Albright College in Reading, PA and plans to continue her long-term monitoring of bee populations at Nachusa.

The first *Robert and Patricia Anderson Award* presented in 2021 recognized the long-term and continuing work of Dr. Richard King, Tom Anton, and Dave Mauger who study, manage, and promote the populations of endangered Blanding's Turtles at Nachusa and other sites in northern Illinois.

Friends of Nachusa Grasslands' volunteers will continue to work hard to raise larger amounts of money to support scientific endeavors at Nachusa. We appreciate the many donors who have helped us increase the amount available for grants every year since the program began. Will you help us, too? Please visit: https://www.nachusagrasslands.org/donate.html

Enjoy the Nachusa Grasslands 2022 Science Symposium!

Cream baptisia (*Baptisia leucophaea*), Nachusa Grasslands
(Photo credit: Mary Vieregg)

Symposium Program

Session 1: Revisiting Historical Data

9-9:45: Watch Session 1 pre-recorded talks and review posters online

9:45-10:30: **LIVE** Session 1 panel discussion followed by networking time

Moderator: Holly Jones, PhD, Associate Professor of Biology, Northern Illinois University

Talk: "Wetland restoration efforts result in increasing phylogenetic diversity" –Nicholas Foster, MS Botany/Plant Biology (Duvall Lab), Northern Illinois University

Talk: "Twenty years of tallgrass prairie restoration at Nachusa Grasslands" – Elizabeth Bach, PhD, Ecosystem Restoration Scientist, Nachusa Grasslands – The Nature Conservancy

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Poster: "Predicting Ornate Box Turtle (*Terrapene ornata*) spring emergence at Nachusa Grasslands" – Andrea Colton, Field Technician; Devin Edmonds, PhD candidate; Michael Dreslik, PhD, Professor, Illinois Natural History Survey, University of Illinois at Urbana-Champaign.

Poster: "Effects of fire frequency on shaping multiple ecosystem outcomes in tallgrass prairie: A Meta-Analysis Approach" – Kathryn Bloodworth, PhD candidate (Koerner Lab); University of North Carolina at Greensboro

Session 2: Microbes on the Prairie

10:45-11:30: Watch Session 2 pre-recorded talks and review posters online

11:30-12:15: **LIVE** Session 2 panel discussion followed by networking time

Moderator: Wes Swingley, PhD, Associate Professor of Biology, Northern Illinois University

Talk: "Longitudinal study to identify factors important for bison health" – Pallavi Singh, PhD, Assistant Professor of Biology, Northern Illinois University

Talk: "Seasonal variation of enteric parasites in wild bison" – Laurie Spencer, PhD candidate (Singh Lab), Northern Illinois University.

Talk: "Microbial community and soil geochemical responses to land management practices" – Desirae Klimek, MS candidate (Swingley Lab), Northern Illinois University.

Poster: "**Surveillance of foodborne pathogen, Shiga-toxin producing *E. coli* in wild bison"** – Ritesh Ray, PhD candidate (Singh Lab), Northern Illinois University.

Poster: **"Testing the effect of native arbuscular mycorrhizal fungi on prairie restoration success at Nachusa Grasslands"** – Reb Bryant, PhD candidate (Bever/Schultz Lab); The University of Kansas.
Poster: **"Quantification of microplastics in soils and sediments at Nachusa Grasslands, and impact on soil microbiota" -** Sarah Khoury, MS candidate, Mariah Morales, D'Arcy Meyer-Dombard, PhD, Associate Professor of Earth and Environmental Sciences, University of Illinois at Chicago.

12:15-1:15: Lunch (on your own)

Session 3: Ecosystem Responses to Management

12:30-1:15: Watch Session 3 pre-recorded talks and review posters online

1:15-2:00: LIVE Session 3 panel discussion followed by networking time

Moderator: Dr. Maria Lemke, Director of Science, The Nature Conservancy in Illinois
Talk: **"Landscape and habitat associations of prairie small mammals: a preliminary investigation"** – Erin Rowland-Schaefer, PhD candidate (Jones Lab), Northern Illinois University.
Talk: **"Bird responses to bison and prescribed fire at Nachusa Grasslands and Kankakee Sands"** – Tony Del Valle, MS candidate (Jones Lab), Northern Illinois University.

Poster: **"Post-management AM fungal community composition is associated with selection for spore traits and altered plant-AM fungal interactions"** – Jacob R. Hopkins, PhD, USDA NIFA Postdoctoral Fellow, The Ohio State University.
Poster: **"Well, dam: Is water storage potential influenced by beaver dam structure and density?"** – Jesse Sikora, MS candidate; Holly Jones, PhD, Associate Professor of Biology, Northern Illinois University.
Poster: **"A look into the diversity of ground-nesting bees and wasps (Aculeata) found in the bison wallows of Nachusa**" – Josh Klostermann, PhD candidate (Sullivan Lab), University of Missouri.

Presentation Abstracts

Session 1: Revisiting Historical Data---

Talk: "Wetland restoration efforts result in increasing phylogenetic diversity" – Nicholas Foster, MS, Botany/Plant Biology (DuVall Lab), Northern Illinois University.

Over the course of ecological restoration efforts, it has been observed that, despite restoration activities, species richness sometimes declines in a given habitat. While this response can be interpreted to mean that restoration activities are ineffective, other measures known as Phylogenetic Diversity Metrics can show that the community is actually becoming more diverse. Utilizing plant inventories collected as transect data from 1992-2021 of five wetland sites under various types of restoration in northern Illinois, a regional wetland community phylogeny was assembled. The community phylogeny was then analyzed for phylogenetic diversity measures through this 30-year period across the five sites. Additionally, water sampling was performed on the five properties for analyses of water chemistry. Linearized regression analyses were performed on the phylogenetic diversity metrics. Two of the three metrics showed significant increases in spite of no change in species richness through time. Additionally, species lists showed a decrease in percent non-native species over time. One of the active measures of restoration across the five wetland sites was the removal of non-native species, consistent with the finding that the proportion of native to non-native plant species was generally increasing through time. This correlation with increasing phylogenetic diversity metrics suggests that restoration activities have some degree of targeted effectiveness on wetland plant communities.

Talk: "Twenty years of tallgrass prairie restoration at Nachusa Grasslands" – Elizabeth Bach, PhD, Ecosystem Restoration Scientist, Nachusa Grasslands – The Nature Conservancy. (elizabeth.bach@tnc.org)

This study examines longitudinal plant community data collected from permanent transects at the Nachusa Grasslands preserve in northern Illinois, USA. Managers established permanent transects for repeated plant community monitoring beginning in the mid-1990s. Native plant communities, including rare species, have persisted, or improved with management over two decades. Planted prairies have lower proportions of native species than native prairies but have generally maintained native-dominated communities and in some cases, increased presence of native species. Savannas have shown a distinct transition from shrub-dense communities to herbaceous understories dominated with native species. Restoration efforts at Nachusa Grasslands have been successful at sustaining unique native plant communities through management practices like prescribed fire, brush removal and aggressive invasive species control. As a disturbance- dependent ecosystem that has developed with human management over millennia, tallgrass prairie and savanna can thrive through restoration and active management.

Poster: "Predicting Ornate Box Turtle (*Terrapene ornata*) spring emergence at Nachusa Grasslands" – Andrea Colton, Field Technician; Devin Edmonds, PhD candidate; Michael Dreslik, PhD, Professor, Illinois Natural History Survey, University of Illinois at Urbana-Champaign. (Contact Devin Edmonds at: dae2@illinois.edu)

The Ornate Box Turtle (*Terrapene ornata*) is declining throughout its range and is listed as threatened in Illinois. Habitat loss, road mortality, increased predation from inflated mesopredator populations, and collection for the pet trade have contributed to declines. Ornate Box Turtle habitat in Illinois requires frequent burns to maintain ecosystem health. However, prescribed burns can inadvertently cause turtle mortality when conducted after spring emergence. Considering populations are already small and isolated, the additional loss of even a few adult turtles each year can have drastic consequences for population persistence. We used radiotelemetry to monitor overwintering Ornate Box Turtles at Nachusa Grasslands and recorded shell and soil temperatures with data loggers to determine when and under what conditions turtles are at risk from fire. We then used logistic regression to predict aboveground activity based on environmental variables land managers can easily monitor, such as air temperature and precipitation. Our study helps guide decisions of land managers working in Ornate Box Turtle habitat, with direct conservation implications for the timing of prescribed burns.

Poster: "Effects of fire frequency on shaping multiple ecosystem outcomes in tallgrass prairie: A Meta-Analysis Approach" – Kathryn Bloodworth, PhD candidate; University of North Carolina at Greensboro. (kjbloodw@uncg.edu)

Grasslands have highly flammable plant matter, which coupled with climatic conditions leads to the occurrence of periodic fires. In tallgrass prairie fire plays an important role in ecosystem health. However, the effect of fire frequency has mainly been studied in the context of just one ecosystem outcome at a time (e.g., either effects of fire on plants, birds, or small mammals). To fully understand the effects of fire frequency and the ideal fire return interval for land-managers, we must assess how fire frequency impacts multiple outcomes of importance, as land managers must consider multiple conservation priorities (e.g., forage quantity, biodiversity, and carbon sequestration). To address this research gap, we are synthesizing data across 232 published papers using a meta-analysis approach. Our data are spread across the tallgrass prairie region with most studies assessing plants (132), birds (43), and arthropods (36), and few studies looking at small mammals (12), soil nitrogen (9), microbial biomass (5), and soil carbon (4). Upon completing this study, we will inform land managers about the most effective fire frequency for their conservation outcomes of interest.

Session 2: Microbes on the Prairie

Talk: "Longitudinal study to identify factors important for bison health" - Pallavi Singh, PhD, Assistant Professor of Biology, Northern Illinois University

Bison have important ecological impact on the ecosystem which in turn effects the health of bison. This study is aimed at identifying factors that affect host, its surrounding environment and pathogen transmission dynamics. To assess these factors in Bison, we analyzed the intestinal microbial population of the bison and the ways it shapes health of the animal. For this, we performed microbial community analyses on all variable regions of 16S rRNA gene sequencing. Amplicon sequencing allows identification of microbial markers in the animal gut that aid in growth and development of the host. Other factors including diet, seasonal variation, and pathogen (bacterial and parasites) colonization may be affecting the health of the animal. For assessing seasonal variation, fecal samples were collected three times a year from 2019-2020 for intestinal microbial community analysis. Bacterial pathogens including *Salmonella*, *Shiga-toxin* producing *E. coil* (STEC) and parasitic pathogens, were also detected molecularly and microscopically, during these years. These pathogens not only affect Bison but are also important foodborne pathogens, which can be transmitted within environment including humans. This is an important concern in the US and around the world. As a result, we will identify factors that affect bison health, including pathogen colonization. Therefore, this study is an important step under One Health initiative, focused towards ecosystem as well as both bison and Human health.

Talk: "Seasonal variation of enteric parasites in wild bison" – Laurie Spencer, PhD candidate (Singh Lab), Northern Illinois University (**Z1676857@students.niu.edu**)

Bison and other large herbivores are keystone species that shape the structure, functioning and species diversity in their native ecosystems. Wild American bison (*Bison bison*) were reintroduced in 2014 at the Nachusa Grasslands preserve in Illinois as part of the Nature Conservancy's mission to restore tallgrass prairie. In-turn, ensuring the health of these bison is paramount to the sustainability of these ecosystem restoration efforts. Many species of gastrointestinal parasites have been reported in European bison – with evidence of cross- species transmission to bison by invasive species of deer inhabiting the same landscape. However, limited information is available on parasite infections in American bison. Parasite infections are major threats to bison, particularly in herds contained within smaller, more concentrated environments. Intestinal parasite infections have the potential to cause weight-loss, anemia, diarrhea; some species have high fatality rates in calves. The aim of our study is to evaluate intestinal parasitic load, and factors influencing their colonization. For this, we will determine dynamics of parasitic species infection and influence of seasonality, longitudinally across four years. Visibly fresh fecal samples were collected – during winter, spring, summer and fall seasons (2018-2021). Duplicate samples were aliquoted and fixed in 10% formalin and Zinc PVA solutions and concentrated for wet mount microscopy. To date, several parasites have been

identified and average eggs per gram calculated (epg) [**nematodes:** *Strongyloides* spp – 10 epg, *Cooperia* spp – 1 epg, *Enterobius* spp – 1 epg; **cestodes:** *Monezia* spp – 9 epg, *Taenia* spp – 2 epg; **trematodes:** *Schistosoma* spp – 8 epg; **protozoa:** *Eimeria* spp – 34 epg, *Isospora* spp – 11 epg]. To evaluate seasonal variation, further fecal samples are currently being analyzed for quantification and characterization. Further, parasitic load will be evaluated via polymerase chain reaction (PCR) with pathogen-specific primers based on species identified via microscopy on DNA isolated from the fecal samples. Pathogenicity of helminths and protozoa varies depending on the parasite species, severity of infection and host-related factors. Further analysis into the species identification, quantification and potential infection risk factors is an important component of bison health assessment. Therefore, results from this study can be utilized towards veterinary health interventions (e.g., anti-parasitic medication administration) and management strategies (e.g., preferential access to certain grazing sites).

Talk: "Microbial community and soil geochemical responses to land management practices" – Desirae Klimek, MS candidate (Swingley Lab), Northern Illinois University. (dklimek2@niu.edu)

Critical ecosystem functions such as decomposition and nutrient cycling are driven by microbial communities within soil. As such, it is important to examine the effect of restoration practices, such as the presence of native grazers and prescribed burning, on these microbes and the soil they inhabit. The Nachusa Grasslands provides a chronosequence of restored tallgrass prairies ranging in restoration age from 5 to 33 years, as well as remnant prairies, and agricultural fields. We have sampled and sequenced soil microbial communities at these locations for the last 9 years to assess how common restoration practices affect microbial communities. Geochemical analyses were performed to quantify soil carbon and nitrogen content, pH, and moisture. These data have been compared to microbial community compositions between and within plots to assess the impact of burn regime, bison introduction, season/year/age, and soil geochemistry. Site age since restoration is seen to have the greatest impact on microbial community fluctuations and C:N ratio, with bison access also affecting C:N ratio. Changes in pH are significant between some sites, sites with bison access, and site types (remnant, restoration, and agriculture).

Poster: "**Surveillance of foodborne pathogen, Shiga-toxin producing *E. coli* in wild bison"** – Ritesh Ray, PhD candidate, Laurie Spencer, Phd candidate, Chloe`Harvey, Research Assistant, and Pallavi Singh, PhD, Professor of Biology, Northern Illinois University. (Z1933514@students.niu.edu)

Nachusa grasslands are home to Bison, small mammals, birds, and other species that interface constantly. They also rely on the same water source which flows to the surrounding farmlands, as well. Shiga-toxin-producing *E. coli* (STEC) shedding through colonized Bison, can

transmit in the environment. Together, these can serve as potential factors for zoonosis of STEC. STEC transmission and colonization in Bison may also be affected by diet and seasonal variations. Commercial Bison have been reported to harbor STEC responsible for human infection outbreaks. STEC infection leading to toxin production leads to bloody diarrhea and kidney failure. Our research aims to evaluate the prevalence of STEC in wild Bison through longitudinal non-invasive fecal sampling over different seasons. We will molecularly detect STEC by PCR to detect 16S rRNA, *stx1*, *stx2*, and *eae* genes. We collected 220 fecal samples from Winter, Spring, and Summer (2019-to 2021) and 474 rectal swabs during the annual round-up in fall (2018-to 2021). Based on results, thus far, 75 samples collected in 2020, STEC were not detected. Overall, our study will elucidate whether Bison are STEC reservoirs, and contribute to better management practices for limiting the transmission of pathogenic bacteria in the animals and environment.

Poster: "Testing the effect of native arbuscular mycorrhizal fungi on prairie restoration success at Nachusa Grasslands" – Reb Bryant, PhD candidate (Bever/Schultz Lab); The University of Kansas. (Reb.L.Bryant@gmail.com)

While restoration efforts of historic tallgrass prairies have intensified and improved over the past decades, restored prairies consistently struggle to match the rich plant biodiversity of remnant prairies. Many of the rare or missing plants in restorations (termed late successional species) respond to symbiotic arbuscular mycorrhizal (AM) fungi in soils more than plants that readily establish in these same restorations (termed early successional species). AM fungi are found in nearly all terrestrial soils, but practices like agriculture have shifted the community of these fungi in ways that are generally not beneficial to native prairie plants. In this project, we will be establishing two restoration experiments looking at the effects of inoculating late successional plants with whole soil containing AM fungi cultured from both remnant prairies and a brome-dominated field at Nachusa Grasslands. We expect that plants inoculated with remnant prairie whole soil will show increased survival and growth than those inoculated with sterile or non-native whole soil. Additionally, the same pattern may be observed in the overall plant biodiversity surrounding these inoculated plants. Furthermore, to understand if restoration age impacts the benefits from inoculation with AM fungi, we are performing this experiment in an older and a more recently established restoration. This experiment will help us further determine if native AM fungi are key components of successful restoration projects.

Poster: "Quantification of microplastics in soils and sediments at Nachusa Grasslands, and impact on soil microbiota" - Sarah Khoury, MS candidate, Mariah Morales, D'Arcy Meyer-Dombard, PhD, Associate Professor of Earth and Environmental Sciences, University of Illinois at Chicago. (skhour5@uic.edu)

Microplastics (MPs) and microfibers (MFs) have been an increasing problem in many environments due to a global surge in anthropogenic activity and waste. While the impact of MPs is largely studied in marine environments and larger marine organisms, little is known abouthow MPs affect microbial communities in grassland/wetland sediments and their

abundance in these environments. While the Nachusa Grasslands are a protected location, aeolian and fluvial transport of microplastics from surrounding anthropogenic sources into Nachusa soils and fluvial sediments may be occurring. Specifically, we are interested in potential contamination from neighboring communities and agricultural areas. Our study first aims to calculate MPs' abundance in the grassland and wetlands using a density-based separation unit known as the sediment-microplastic separation (SMI) unit. Secondly, we aim to better understand the biofilm diversity on the surface of MPs by simulating the conditions of the Nachusa wetland sediments in a controlled environment with the addition of MPs (Polystyrene (PS), Polypropylene (PP), Polyethylene (PE), and MFs).The initial results from the SMI unit of several soil and sediment samples suggest that the grasslands and wetlands have little to no MPs from the neighboring agricultural land. The design of the experimental approach and plans for analysis will be discussed.

Session 3: Ecosystem Responses to Management

Talk: "Landscape and habitat associations of prairie small mammals: a preliminary investigation" – Erin Rowland-Schaefer, PhD candidate (Jones Lab), Northern Illinois University. (erin.rowland@cune.org)

Landscape ecology examines the interactions between spatial patterns and ecological processes across different scales. This relatively young field is increasingly important in restoration ecology, where restored lands are frequently fragmented and often share borders with a large variety of these habitat types. Understanding the impacts of this fragmentation and variation in land cover are critically important in informing management decisions and predicting patterns in local species.

Our study examines the relationship between three prairie small mammals and differences in land cover at Nachusa Grasslands. We visually plotted captures of each species by their location on our trapping grid and examined patterns of association with different habitat types. Deer mice (*Peromyscus maniculatus*) were found throughout the majority of the preserve and were most dominant in areas dominated by continuous tallgrass prairie. White-footed mice (*Peromyscus leucopus*) were observed only in sites close to wooded areas and captures within those sites clustered close to the woodlands. Prairie vole (*Microtus ochrogaster*) patterns were less clear but may be associated with avoiding roads. The patterns were also confounded by prairie voles' avoidance of recently burned areas. Future work will include developing a model to predict which local and landscape factors are the most significant in predicting small mammal populations.

Talk: "Bird responses to bison and prescribed fire at Nachusa Grasslands and Kankakee Sands" – Tony Del Valle, MS candidate (Jones Lab), Northern Illinois University. (adelvalle@wisc.edu)

Reintroduction of native herbivores such as bison, in combination with prescribed fire, are applied to tallgrass prairies by managers to recreate important disturbance patterns in this ecosystem. Bird communities may be indirectly impacted by these disturbances through their direct impact on plants that provides critical breeding habitat for grassland birds. The objectives of this research are to determine the impacts that bison and prescribed fire have on grassland breeding birds in two tallgrass prairie preserves, Nachusa Grasslands and Kankakee Sands. Birds, vegetation structure, and bison activity were surveyed systematically at these two preserves in 2020 and 2021. Preliminary results from 2020 showed species-specific responses to different management practices. For example, Grasshopper Sparrows exhibited higher abundances in bison units, while the opposite was observed for Sedge Wrens. The addition of data from 2021 will help to clarify these relationships, while allowing for additional analyses of the bird community. Moreover, prescribed fire application differed drastically between 2020 and 2021 (due to the Covid-19 pandemic), offering a chance to observe the impact of yearly changes in prescribed fire practices on grassland birds. By quantifying the potential impacts of these disturbances on grassland birds, we will provide information to help conservation efforts of these declining species.

Poster: "Post-management AM fungal community composition is associated with selection for spore traits and altered plant-AM fungal interactions" – Jacob R. Hopkins, PhD, USDA NIFA Postdoctoral Fellow, The Ohio State University. (hopkins.982@osu.edu)

Management methods like fire and grazing maintain tallgrass prairie remnants and restorations, however, it is unclear how management influences belowground biota like AM fungi. Since AM fungi are associated with healthy plant communities, it is important to understand how management influences AM fungal communities and mutualisms. To assess management effects on AM fungi, I collected soil from bison exclosure plots (graze vs. no graze) that received different fire management (burn vs. no burn). This soil was used to assess AM fungal spore community composition, spore traits, and as inoculum for a plant growth assay. This allowed me to answer 1) how AM fungal communities are associated with land management and spore traits, and 2) how management effects on AM fungal communities influence AM fungal mutualisms. Management effects on AM fungal community composition differed between burned and grazed plots due to selection for different spore traits. Grazing favored smaller volumed and lighter colored spores, while fire favored darker spores. Additionally, the presence of AM fungi in burned soils was associated with lower plant root:shoot ratios. This suggests that AM fungal responses to management differ due to selection for different spore traits, and that AM fungi may aid plant growth following disturbance.

<u>Poster:</u> "Well, dam: is water storage potential influenced by beaver dam structure and density?" – Jesse Sikora, MS candidate; Holly Jones, PhD, Associate Professor of Biology, Northern Illinois University. (sikoraj8@gmail.com)

Within forested landscapes, American beaver (*Castor canadensis*) behavioral impacts on river morphology lead to increased ecosystem function; however, the ecological impacts of beaver dams within grasslands are virtually unstudied. The hydrological dynamics and water storage rates impacted by beavers in grasslands could have significant implications for mitigating climate change impacts and restoring clean water resources. Our goal was to compare dam density of grasslands to forests and investigate hard edge (preserve boundary) as a limiting factor to relative water storage of dams.

We located beaver dams by wading through all streams within Nachusa Grassland during the summer of 2021. We ranked water retention above a selection of beaver dams according to level of stream flow and assessed the relationship of distance to the hard edge and the extent of water retention per dam using ordered logistic regression. We located 148 dams distributed across the three major streams that run laterally through the property. Dams were largely absent in most of the branching streams within isolated property allotments. Within the 1200 ha of Nachusa, dams occupy 1.4% of the 10.4-km accumulated length of stream reaches, a dam density approximately one-tenth as dense as beaver dams in forests. Our analysis revealed that distance to hard edge was not a strong indicator of dam water retention. Increases in water storage potential could create drought resilience and boost carbon sink loads within grasslands. In future work, we will examine how hard edge and forest patches shape beaver dam density and water storage in a restored tallgrass prairie. This work will be a unique contribution to our understanding of grassland beaver behavior and a resource to restoration managers navigating beaver facilitated restoration in grasslands.

<u>Poster:</u> "A look into the diversity of ground-nesting bees and wasps (Aculeata) found in the bison wallows of Nachusa" – Josh Klostermann, PhD candidate (Sullivan Lab), University of Missouri. (jpkhr9@missouri.edu)

The plains bison (*Bison bison*) historically played a major role in shaping the landscape structure and biodiversity found in tallgrass prairies. These large grazing mammals have been extirpated from most of their former range in North America and have largely been replaced by cattle. Bison are known to differ from cattle in their grazing preferences and behaviors. Our research is focused on the ecology surrounding the landscape disturbance caused by the wallowing behavior that is unique to bison. Wallows are landscape features characterized by small to relatively large patches of exposed soils surrounded by vegetation. Many insect groups use exposed soil in tallgrass prairies for nesting, but whether bison wallows provide nesting habitat for diverse insects remains unknown. Current restoration efforts for insect pollinators often focus on re-establishing floral diversity without consideration for nesting habitat; therefore, it is important to understand whether open, bare, spaces like bison wallows are

important drivers of bee and wasp diversity in prairie habitats. As bison reintroduction becomes a more common practice across their former range, it is also important to investigate how their wallowing behavior interacts with soil properties to influence the nesting habitat of these economically important ground-nesting insect taxa. Our research examines how the wallow features in the sandy soils of Nachusa grasslands support ground-nesting bee and wasp species.