



FRIENDS OF
NACHUSA
GRASSLANDS

June 2023

Dear Friend,

Hidden life at Nachusa Grasslands? That's what "cryptobiotic" means, and it is communities of such hidden life that scientists and students are studying here at Nachusa. Lichens are fungi forming symbiotic relationships with photosynthetic algae. Bryophytes comprise three different plant lineages, namely mosses, liverworts, and hornworts. Both lichens and bryophytes occur on soils, bark, and rock and may be largely unnoticed.

As its subject is fascinating, but little-known, I am pleased to present this A Prairie Calling to you.

Working out of the Field Museum in Chicago, Matt von Konrat, Todd Widhelm, and their students are very knowledgeable and enthusiastic about this special topic. They are attempting to compile an exhaustive record of these species at Nachusa and are among many such scientists studying a variety of subjects here. You may find details of these studies on the Friends of Nachusa Grasslands website: nachusagrasslands.org.

Please consider helping us grow scientific research at Nachusa. Although we provided \$73,000 in grants this year, much valuable research is going unfunded. Your gift to either our permanent science endowment or to immediate grant funding will help Nachusa remain a leader in grassland research.

With warm regards from Nachusa Grasslands,

Charles Larry

A Prairie Calling

ISSUE 11 - June 2023



FRIENDS OF
NACHUSA
GRASSLANDS



Photo: Dee Hudson

Uncovering Hidden Diversity of Nachusa Grasslands:

Insights into the microscopic world of bryophytes and lichens

By Matt von Konrat, Todd Widhelm

Cryptobiotic Communities

At Nachusa Grasslands scientists investigate and explore a group of enigmatic organisms that are hiding in plain sight! Crypto means “hidden,” while Biota refers to “life.” Prime examples of hidden life around us are lichens and bryophytes. Lichens are fungi that form a symbiotic relationship with photosynthetic algae. The majority of algae in lichen symbioses belong to green algae (Chlorophyte), while heterokont (Stramenopiles) algae, such as brown or yellow-green algae, are known to form associations with fungi.

There are about 20,000 described lichen species worldwide. Bryophytes are the second largest group of green land plants after flowering plants, with an estimated 25,000 species and three independent plant lineages: mosses, liverworts, and hornworts. While bryophytes and lichens are not evolutionarily related, they represent two major kingdoms of life and are functionally related as the main hosts for cryptobiotic communities. Although some of these communities can form large colonies, the organisms themselves



Candelariella vitellina lichen. Photo: Todd Widhelm



Photo: Charles Larry

are microscopic in size. Cryptobiotic communities occur on soil, bark, and rock around the world in forests, deserts, and savannas at elevations from sea level to alpine. Scientists from the Field Museum, DePaul University, and Northeastern Illinois University (NEIU) are investigating these communities, focusing on bryophytes and lichens from the Nachusa Grasslands. Their primary goal is to provide a complete inventory of the bryophyte and lichen biota of Nachusa Grasslands representing the first-ever of its kind.



Photo: Zoe Ryan

Ecological Significance of Lichens and Bryophytes

These cryptobiotic communities occupy the threshold between the macroscopic and microscopic realms and are of major ecological importance. Lichens and bryophytes form minute “forests” and provide a home for many microscopic forms of life, such as tardigrades, mites, and microfungi. Bryophytes and lichens also play a broader role in our environment. For example, they are important in the global carbon budget and plant succession. Mosses also are nature’s natural sponges, soaking up water and preventing soil erosion.



Moss growing across rock. Photo: Charles Larry

From the Field to the Field

The primary challenge for the team of scientists, led by the Field Museum, is to document the diversity of lichen and bryophyte species. On several field trips throughout 2022, the team explored the broad range of habitats that Nachusa Grasslands harbors, from wetlands, woodlands, savannah, and prairie to rocky outcrops. These initial collections during five visits have led to preliminary checklists of species that occur at Nachusa Grasslands. The team of scientists from the Field Museum was joined by Dr. Tom Campbell and his students from Northeastern Illinois University, as well as students from the University of Illinois and DePaul University, as well as high school student Stephanie Maari from Crystal Lake South.

For some students it was their first experience being in the field collecting plants and lichens. Immediately after collecting, the team dried the specimens so they would remain preserved well into the future, and deposited the specimens into the Field Museum herbarium - one of the largest dried plant facilities in the world. Soon they will all be added to the database and photographed to be available to researchers, educators, and the general public on an online, web-accessible database.

Left: Bryophytes collected at Nachusa. Photo: Todd Crawford

Indicators of environmental changes

Bryophytes and lichens are unusually sensitive to pollutants and are widely used as air pollution monitors. Because of their sensitivity to the immediate microhabitat, they are dependable indicators of environmental changes of many other kinds, both physical and chemical, and have been featured in studies of acid rain, climate warming or drying, grazing pressure, and water quality.

Unveiling a microscopic world at Nachusa Grasslands

Because lichens and bryophytes have tiny features, it is necessary to painstakingly examine them under the microscope. It is under the microscope that the stunning diversity and morphology of these organisms is revealed. Mosses look especially stunning under the compound microscope, where they reveal their cellular detail. There are important microscopic features that help scientists distinguish between different species.



Photo: Dee Hudson

Lichens as Chemical Factories

Lichens produce a vast number of unique chemical compounds while manufacturing their own antibiotics. Some recent studies have shown that extracts from certain lichen species expressed strong anticancer activity against certain cell lines.



Photo: Charles Larry

For example, some leaves may have an entire margin, others may have a toothed margin — just like we would see in flowering plants — but a microscope is required to examine these leaves that might only be millimeters long!

Microscope images Photos: Matt von Konrat

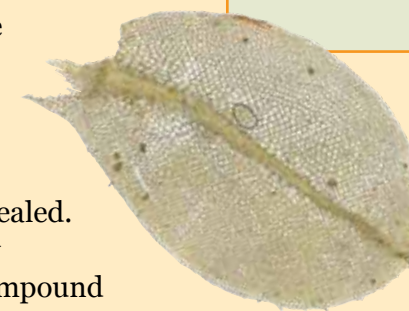




Photo: Zoe Ryan

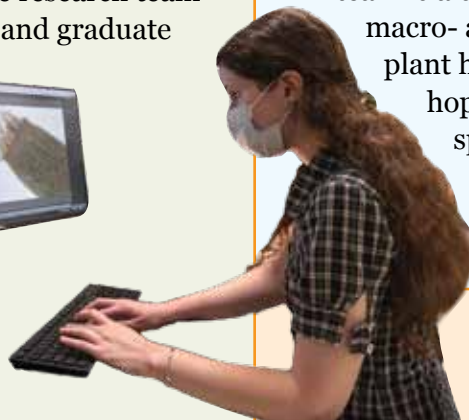
their posters at a symposium at NEIU. Amanda Zinke continues to be funded by the Nachusa award allowing her to capture macro- and microscopic images to provide an exhaustive digital catalogue. One study also provided a preliminary comparison of bryophyte composition between two large rock outcrops to investigate the impact of ecological factors such as light and vegetation cover.

Educational tools

The research team is also utilizing the online platform ThingLink to create educational tools to understand bryophytes and lichens. ThingLink is an interactive platform that connects objects in our physical environment to digital information about them. The team is also generating species profiles with macro- and microscopic images to indicate plant habit and cellular detail. Investigators hope that these resources will allow non-specialists to enjoy the stunning beauty and diversity, as well as to realize the significance of these no longer “hidden” communities.

Training of undergraduates

Equally important is providing an opportunity to train the next generation of scientists. The research team brought a total of 15 undergraduate and graduate students to learn how to identify and collect bryophytes and lichens in the field. For some students, this was their first experience doing fieldwork and their first experience getting to know Nachusa’s bugs and mosquitoes! Two interns, funded by Northeastern Illinois University, began investigating bryophytes from Nachusa Grasslands as part of their research experience. They presented



Amanda Zinke
Photo: Thomas Campbell

Preliminary checklist of lichenized fungi and bryophytes

So far there are approximately 75 species of lichens and bryophytes from Nachusa Grasslands that have been recorded. Next time you are visiting Nachusa, perhaps the next lichen or moss you see has not yet been discovered by the team!

Rough speckled shield lichen
(*Punctelia rudecta*)
Photo: Todd Widhelm



Matt von Konrat

Originally from Aotearoa-New Zealand, Matt relocated to Chicago in 2001. His field of interest has focused on the systematics of pteridophytes and bryophytes, particularly liverworts.

Todd Widhelm

Todd grew up in rural Nebraska where he developed an early interest in science and nature. He became a Collections Manager at the Field Museum and manages the Fungal Herbarium.

Contributors:

Amanda Zinke, Kimberly Rice, Thomas Campbell, Chrissy Christian, Zoe Ryan, Stephanie Maari, Nkosi Evans, Danny Kreider, and Christopher Maves

This newsletter was produced by Friends of Nachusa Grasslands volunteers:

Editor-in-Chief: Charles Larry

Editor: James Higby

Illustrations: Betty Higby

Design: Dee Hudson

Website: www.nachusagrasslands.org



100%
Recycled