



# Minnesota Plant Press

*The Minnesota Native Plant Society Newsletter*

*The Minnesota Native Plant Society – A non-profit organization dedicated to the conservation and appreciation of Minnesota's native plants and plant communities through education and public awareness.*

Volume 41 Number 4

October 2026

## Introducing the Ecological Monitoring Network

by *Holly Bernardo & Nathan Dahlberg, MN DNR*

Do you know what makes an ecosystem 'healthy'? Look it up, you'll find all sorts of definitions. Some definitions say a healthy ecosystem (ecosystem defined as a group of living organisms interacting with their non-living environment in a shared space) is one in which all its components (physical, biological, etc.) are intact. What does intact mean? Many definitions emphasize that biological components, things like food webs, need to be sustainable. Sustainable for how long? Other definitions get a little more technical, specifically stating that healthy ecosystems need to be resilient. Thankfully, ecosystem resilience has an accepted scientific definition: a system's ability to withstand or recover from disturbances, while maintaining its structure and function.

Putting all those ideas together, in a healthy ecosystem:

- a) all the parts and pieces that are supposed to be there are there and they work (*they are intact*);
- b) the parts and pieces are expected to continue to work into the future (*they are sustainable*); and
- c) they are expected to continue to work even when something happens that could break them (*they are resilient*).

Wow, that's a lot! How do we know whether a single ecosystem meets the benchmarks to be considered healthy? How do we know whether Minnesota's native ecosystems are healthy overall? Or to be more scientific about it, how do we quantifiably measure those benchmarks such that we can assess ecosystem function at small and large scales? Wow, that's even more! Those are hard questions. I'll give you minute to think.

## What is a Native Plant Community?

A native plant community is a group of plant species that live in a shared space and form a recognizable unit that has not been significantly altered by human activity. Understanding native plant communities helps us understand ecosystems because plants respond to and interact with all the components of an ecosystem. Think of a prairie, a wetland and a forest. Clearly, they aren't just random collections of species. They have unique parts and pieces, and those parts and pieces work in specific ways. That is because native plant community structure and function are

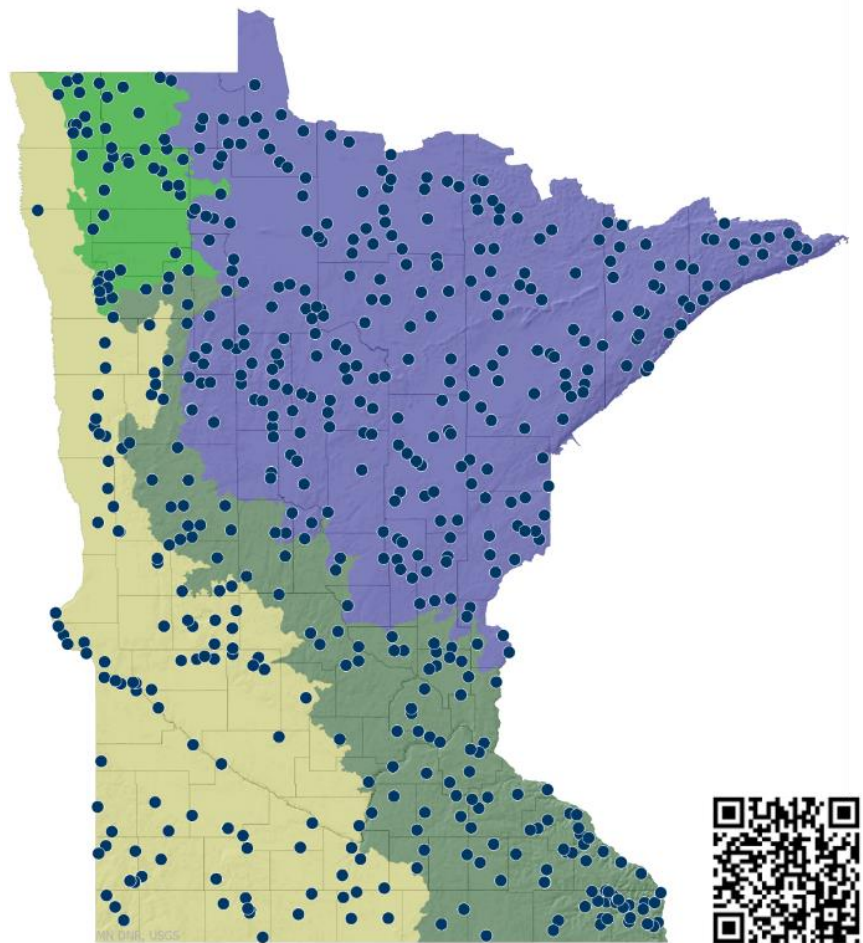


**Figure 1.** Each blue dot is one of the 544 EMN plots installed across Minnesota. [mndnr.gov/mbs/ecologicalmonitoring](http://mndnr.gov/mbs/ecologicalmonitoring). Image courtesy H Bernardo & N Dahlberg.

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The *Minnesota Plant Press* is the newsletter of the Minnesota Native Plant Society. The newsletter is published quarterly, in January, April, July, and October. The deadline for contributions, which are welcome, is the first day of the publication month. Scientific names follow [MNTaxa](#). Send articles, photos, suggestions, etc. via email to the co-editors, Brian Johnson & Steve Saupe at [editors@mnnps.org](mailto:editors@mnnps.org). The Society officers are listed below:

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Minnesota Native Plant Society  
 P.O. Box 16257  
 St. Paul, MN 55116  
 Website: [www.mnnps.org](http://www.mnnps.org)  
 eMail: [contact@mnnps.org](mailto:contact@mnnps.org)

governed by environmental filters, such as soil type, day length, fire return interval and flooding. While some filters (soil type, day length) are relatively constant, others (fire return interval, flooding) naturally vary. It is when these filters change, particularly when they are pushed beyond their natural variation due to human activity, that many communities become vulnerable to breaking.

So, how do we know whether Minnesota's native plant communities (as a proxy for ecosystems) are healthy? Turns out, the same way you know whether you are healthy. You go to the doctor. Except plant communities can't move. So instead, the Ecological Monitoring Network makes a house-call.

## What is the Ecological Monitoring Network?

The Ecological Monitoring Network (EMN) is Minnesota's first, and only, statewide monitoring system that collects comprehensive, statistically rigorous data on native plant communities. The idea for the EMN was conceived over a decade ago, through a collaboration between four divisions within the MN Department of Natural Resources (DNR), as well representatives from The Nature Conservancy, the University of Minnesota, and the U.S. Fish and Wildlife Service. The EMN program is housed within the DNR's Minnesota Biological Survey (MBS) unit.

In 2025, after eight field seasons, MBS completed the installation of the EMN. The network contains 544 monitoring plots (**Figure 1**), 13,056 sampling locations (subplots), and measured 152,317 individual plants in the ground layer alone (as well as other environmental and site characteristics). Financial support was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative Citizen Commission on Minnesota Resources (LCCMR) through three grants totaling over two-million dollars.

## How Does the EMN Assess Native Plant Community Health?

The EMN was designed to detect ecological changes through time. Minnesota's native ecosystems provide a wide variety of services, recreation, timber, water filtration, wildlife habitat, and more. These services are threatened by multiple environmental stressors including climate change, invasive species, and habitat fragmentation. In order to know how well ecosystems perform those services, we need to know how they are being impacted by those stressors over time.

The EMN measures a variety of things that tell us how a native plant community is responding to stressors that can change the environmental filters governing its structure and function. Just like your primary care doctor is going to look at a lot of different things about you to assess your health.

In you, overall indicators of health are things like blood pressure and cholesterol. In native plant communities, overall health measures are things like species richness, diversity and coefficients of conservatism (see **Box 1**). For example, we record all ground-layer plant species present in each subplot and the amount of area they cover. We record all the tree species present in each plot, as well as information about the degree of decay on dead trees and any unusual characteristics such as pathogens. These data are then analyzed to calculate those measures of overall health.

The EMN also collects information on things that have a direct impact on native plant community health. In you, that would be like a test to see if you have the Flu when you're feeling sick. For native plant communities, direct measures of stressors are things like non-native species cover and we use the Invasive Earthworm Rapid Assessment Tool to evaluate depletion of the leaf litter in forested plots (see **Box 1**).

Lastly, the EMN doesn't just assess the health of individual native plant communities. The EMN can assess native plant community health across all of Minnesota. Compare this one to larger-scale public health, not just you going to your doctor. In essence, we do this by putting the data from all 544 plots together. But, there are two critical reasons why that works.

First, the same standardized methods and plot design, three transects with five subplots per transect (**Figure 2**), were used in all community types across Minnesota (**Figure 3**). Having standardized methods means that when we look at **Figure 4** (*on p. 5*), we can make comparisons among communities, and say prairies have higher non-native species cover than forests in Minnesota. Then, since that is a direct measure of health, we can then say prairies have lost more of their parts and pieces and are less intact overall than forests.

Second, the placement of the plots was such that the EMN network has a statewide statistical inference. Statistical inference means that a subsample, our 544 EMN plots, can reliably represent the larger thing from which the subsample was taken, the entire state of Minnesota. We did this by randomly selecting where to put EMN plots across the state, with a few modifications made to ensure enough plots were placed in some of the less common native plant community types. Having a statewide statistical inference means that when we look at **Figure 5**, (*on p. 5*) we can say there is a statewide trend of higher floristic quality in northern native plant communities in Minnesota. Then, since floristic quality is an overall measure of health, we can say northern native plant communities in Minnesota are, on average, more intact than southern native plant communities.

## Doctor's EMN's Orders

I have one more hard question for you. Do you always do everything your doctor tells you to do? Whether the health is assessment is of you or of Minnesota's native ecosystems, all an assessment does is provide information with which to make a decision. The information the EMN provides is meant to support all types of natural resource decision-makers (land managers, private landowners, legislators, local units of government) to improve conservation, management, policy and land-use decisions.

### Box 1. Examples of the types of data collected by the

**EMN.** (Each measure gathered by the EMN helps describe the components of a native plant community in relation to one of EMN's six core objectives – *Vegetation, Landscape Context, Soils, Hydrology, Pollinators and Other Wildlife, and Pests and Pathogens*).

- **Species Richness and Diversity** – measures the number of different plant species present in a community and how evenly they are distributed, respectively. Richness and diversity indicate how many species can persist in a plant community given the environmental filters.
- **Coefficients of Conservatism (C-values)** – are a score given to each species that reflects how tolerant that species is to degraded conditions, from 0 being most tolerant or 'weedy' species, to 10 being least tolerant species. A high average C-value often indicates a more intact plant community.
- **Non-Native Species** – especially those that have become problematic, degrade the quality of Minnesota's native ecosystems. Typically, they reduce native species cover, sometimes displacing them altogether. Tracking the ratio of non-native species cover compared to all species is a measure that tells us whether all the parts and pieces that are supposed to be there are there.
- **Invasive Earthworms** – disrupt natural conditions in forests. Without earthworms, leaf litter decomposes slowly, leaving the forest floor layered with organic matter, called duff and humus. Some native forest species need those layers to survive. Invasive earthworms can remove duff and humus layers very rapidly, breaking how the natural process of decomposition works in many forests across Minnesota.
- **Deer Browsing** – can negatively impact forest vegetation. Deer eat tree seedlings and saplings and can suppress regeneration of species that would otherwise form the future tree canopy. This can lead to shifts in forest composition and structure. Over-browsing of forests can also lead to reduced deer populations long-term and reduce other ecosystem benefits provided by healthy forests.

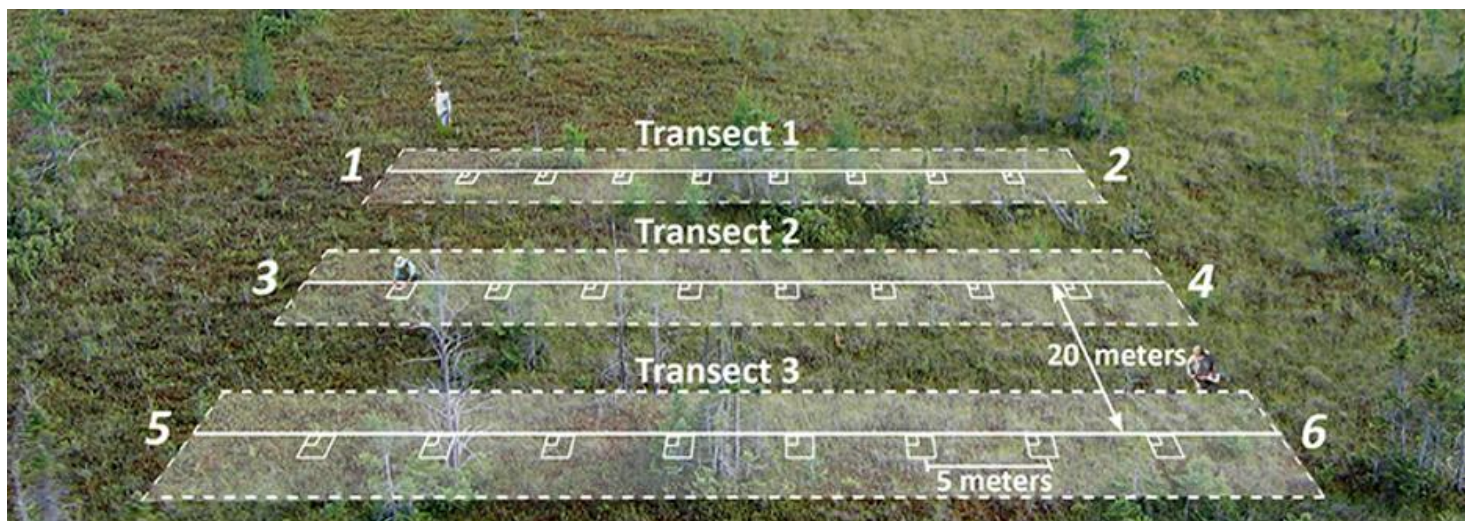


**Figure 2.** One EMN sampling plot showing the transect and subplot structure. Image courtesy H Bernardo & N Dahlberg.



If we know that an ecosystem's parts and pieces are all there and they work, that information should influence the decisions we make around protecting that intact system from development or other forms of degradation.

If we can track overtime an ecosystem continuing to work, providing all the services we rely on from our natural systems in Minnesota, that information should influence the decisions we make about land-uses that could impact the long-term sustainability of those services.

And, if we see an ecosystem about to break, that information calls on us to act, through land management, conservation, protection, through all the tools that we have available, to make the ecosystem healthy again.

### Related Resources:

- **Ecological Monitoring Network**  
<https://www.dnr.state.mn.us/eco/mbs/ecologicalmonitoring/index.html>
- **Minnesota's Native Plant Communities**  
<https://www.dnr.state.mn.us npc/index.html>
- **Minnesota's Vascular Plant List (MNTaxa)**  
<https://www.dnr.state.mn.us/eco/mbs/plant-lists.html>
- **Invasive Earthworm Rapid Assessment Tool**  
<https://wormwatch.d.umn.edu/ierat>

**Figure 3.** Photos taken from an EMN transect-endpoint in varying types of native plant communities. Images courtesy H Bernardo & N Dahlberg.

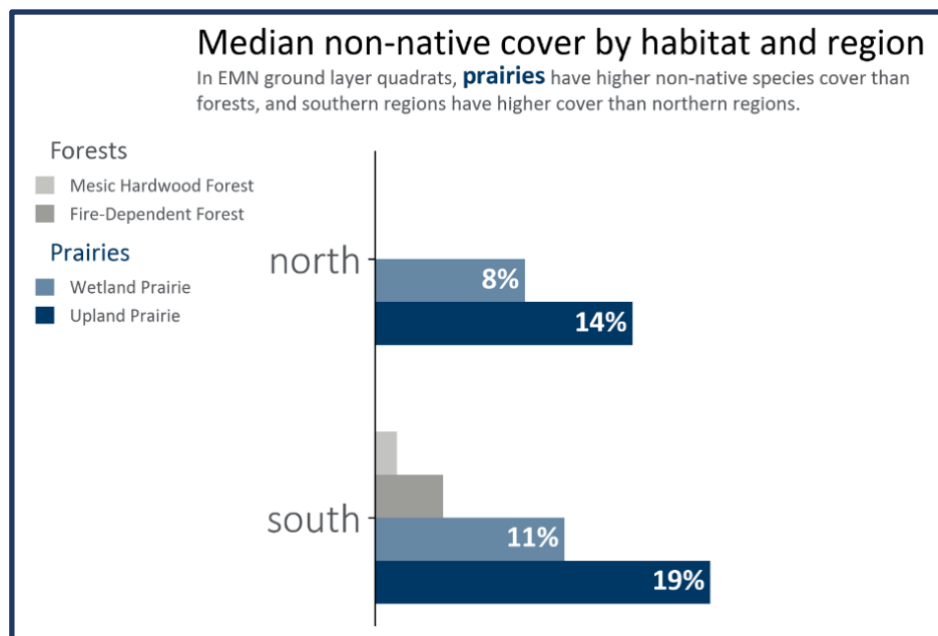


*Figure 4. Median ground layer cover reflects the total abundance of non-native species relative to native species in EMN sampling quadrats. Plots are summarized by floristic region (north vs. south) and the type of native plant community (forests vs. prairies). The ground layer cover shows two patterns: (1) southern communities are higher than northern communities and (2) prairies are higher than forests. These patterns could be explained by the fragmented landscape in southern Minnesota, and the presence of non-native grasses like smooth brome and Kentucky bluegrass that threaten prairie ecosystems. Courtesy H Bernardo & N Dahlberg.*

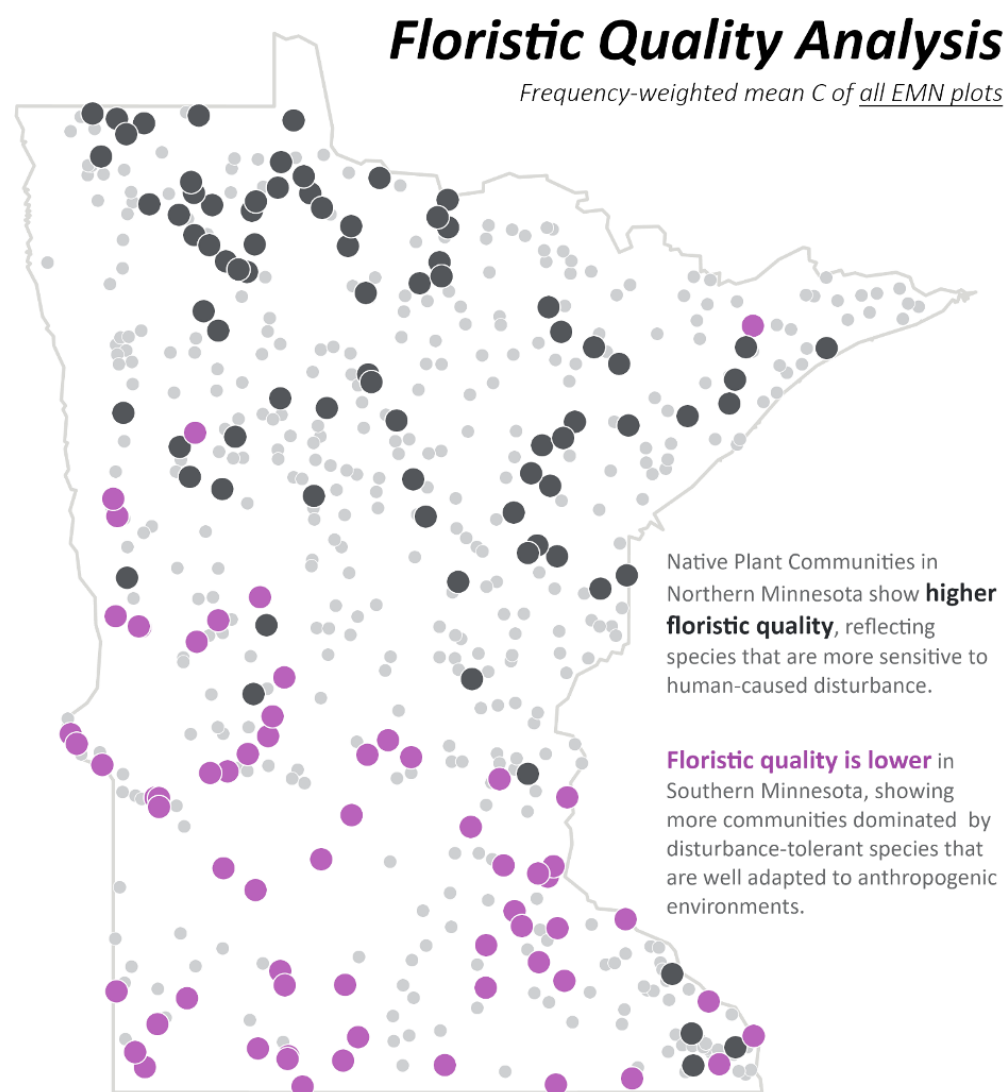


*Figure 5. Coefficients of Conservatism (C-values) are a score given to each species that reflects how tolerant that species is to degraded conditions, from 0 being most tolerant or 'weedy' species, to 10 being least tolerant species. A high average C-value in a native plant community often indicates a more intact ecosystem. We highlight unusually high (dark grey) and low (pink) values to show where observations differ most from the typical value. Images courtesy H Bernardo & N Dahlberg.*

## Minnesota Wildflowers Plant of the Month: *Azolla microphylla*

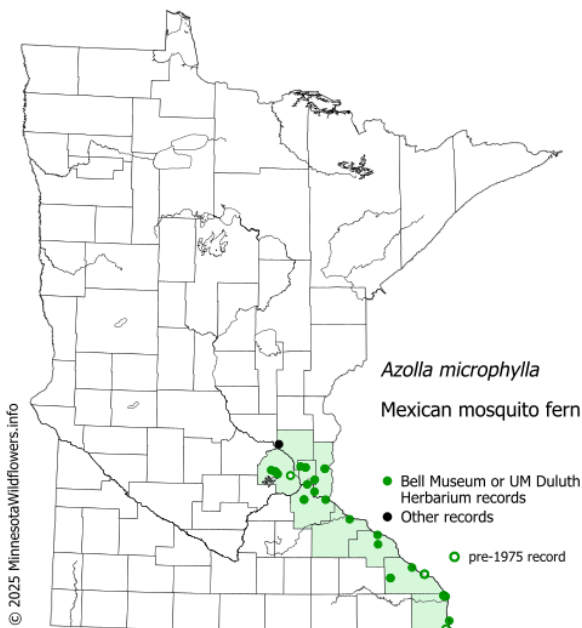
by Katy Chayka, Minnesota Wildflowers ([www.minnesotawildflowers.info](http://www.minnesotawildflowers.info))

|                      |                                                                |
|----------------------|----------------------------------------------------------------|
| <b>Family:</b>       | Azollaceae (Mosquito Fern)                                     |
| <b>Common name:</b>  | Mexican mosquito fern,<br>Mexican water-fern, floating<br>fern |
| <b>Life cycle:</b>   | Annual, short-lived perennial                                  |
| <b>Plant height:</b> | Usually less than 1 inch                                       |
| <b>Bloom season:</b> | July – October                                                 |
| <b>Habitat:</b>      | Part shade, sun; still water,<br>ponds, marshes, sloughs       |

### Plant Description

**Leaves & Stems:** Plants are prostrate, floating on the water's surface. Leaves are up to 1 mm long, stalkless, alternate and often overlapping, like shingles, along branching stems. A leaf is divided into 2 lobes and folded so the upper lobe is above the water's surface and the lower lobe is submersed. The upper lobe is blunt to pointed at the tip, somewhat succulent and covered in short, glass-like hairs, while the lower lobe is more membranous and rounded at the tip.

Stems are up to about 1 inch (3 cm) long, usually branched, with well-developed plants typically fan-shaped in outline. New growth is bright green to blue-green, often turning dark red later in the season, or having at least some red-tinged leaves. Plants can form sizable colonies, sometimes covering an entire pond, and may form multi-layer mats up to 1½ inches thick.



**Reproduction** – Two types of spores are produced in sacs called sporocarps: a male microsporocarp and a female megasporocarp. These develop in pairs on the lower leaf lobe, the pair being a single sex or one of each sex. Male microsporocarps are globular and much larger than the egg-shaped female megasporocarp. Microsporocarps contain many tiny spores (microspores).

**Megasporocarps** – each contain a single large spore (megaspore), much larger than the microspores. The base of a megaspore is rounded, sparsely covered in long hairs, and is pitted on the surface.

## Notes

What a cool little fern! If you ever pass by a pond that appears red on the surface, it may well be due to Mexican mosquito fern, formerly known as *Azolla mexicana*.

In Minnesota, this species is primarily restricted to quiet backwaters of the Mississippi River, though it periodically pops up in other water bodies, and likely spreads there by waterfowl. It does not seem especially hardy and may not persist following winter freeze-up so don't expect it to be in the same pond year after year.

There are 3 native mosquito ferns in North America and they can be especially difficult to distinguish when spores are not present; a microscope is generally required to see the identifying characteristics in either case.



In Minnesota, the only similar species is Carolina mosquito fern (*Azolla caroliniana*, a.k.a. *A. cristata*), which has megaspores with a smooth surface, not pitted, and is more densely covered in long, matted hairs. It is also said to rarely produce spores where *A. microphylla* frequently does. The general consensus is the real distribution of these two species, in Minnesota as well as nation-wide, is not precisely known since many collected specimens lack the sporocarps that are needed for a positive ID. It is possible the more cold-hardy *A. caroliniana* is actually more common in Minnesota than *A. microphylla*, though there is just a single Bell herbarium record for it, collected in 1946. Time will tell.

**Fun fact:** the common name “mosquito fern” is said to come from the notion that this plant makes such a dense covering on the water's surface that

mosquitoes can't breed. Nice idea, but unfortunately false. Mosquito ferns also have a symbiotic relationship with nitrogen-fixing blue-green algae, which may be found in cavities of the upper leaf lobes. It's an especially important green manure (fertilizer) crop in rice paddies, used heavily in southeast Asia and introduced elsewhere for agricultural and horticultural purposes. Mosquito ferns are also considered invasive species in Japan and Great Britain, and another species (*A. pinnata*) is listed as invasive in Wisconsin. Such is the price we pay for moving stuff around the planet.

## Image credits

- All photos by Katy Chayka, taken in Hennepin County.
- Whole plant on my thumbnail, close-up of sporocarps, *Azolla* with *Lemna*, a pond covered in *Azolla*
- Minnesota county distribution map ©Minnesota Wildflowers Information.
- More images available at <https://www.minnesotawildflowers.info/fern/mexican-mosquito-fern>

## News from the Herbarium: Minnesota Flora

by *Tim Whitfeld (Collections Manager, Bell Museum Herbarium at the University of Minnesota)*

We're fortunate in Minnesota to be at the meeting point of three major biomes (plus one minor one) along with three continental-scale watersheds. Because of our location, Minnesota is something of a botanical crossroads where plant species that have ranges from all points of the compass come together in our prairies, forests, and wetlands.

Accompanying the rich plant diversity, we also have a deep history of botanical study in the State. However, something we lacked was a comprehensive treatment of Minnesota plants. That is, until Catherine (Katy) Chayka founded *Minnesota Wildflowers* (MWI) in 2006 to fill the gap of publicly accessible and comprehensive resources on Minnesotan plants.

Katy is a self-proclaimed "born-again nature lover" who fell in love with wildflowers when a spot of color caught her eye as she walked in a park near her home in New Brighton. Her curiosity was piqued, and she took digital images of all the flowers in the park and searched numerous sources to try to identify them. Disappointed with both the quality and quantity of information about Minnesota plants, she set out to make a better resource for anyone interested in our local botanical diversity. Thus, *Minnesota Wildflowers Information* was born and launched in March of 2007.

Wanting to know more about the world these plants live in, Katy enrolled in the Minnesota Master Naturalist program and connected with other volunteers as well as people in various environmental agencies and organizations. She is a self-taught botanist who learned a great deal about plant species along the way and is on something of a mission to spread the word. With this in mind, in 2011, MWI, a non-profit corporation, was incorporated to provide long-term stability and security for *Minnesota Wildflowers* as a public resource.

passion, dedication, and indefatigable curiosity about the world around her have grown this immensely valuable public resource from 15 to over 1,800 plant species.

Katy's continued dedication to supporting and growing *Minnesota Wildflowers* as a public resource seeded a collaboration with the Bell Museum, connecting MWI with herbarium specimens and expert observations. The grants she received from the ENRTF included plans for the long-term sustainability of MWI as a public resource. To ensure perpetuity of this valuable website, the plan was that MWI would eventually be entrusted to the Bell Museum, the state's official natural history museum.

With this in mind, in 2023 Katy collaborated with the Bell Museum team, including George Weiblen and Ya Yang (Professors in the Department of Plant and Microbiology and Curators in the Bell Museum Herbarium), Anna Fowler (Bell Museum Data Manager), and

Matthew Meshulam (Software Engineer at the University of Minnesota's Supercomputing Institute) (see **Figure 6**). We received a third ENRTF grant to provide time and funding to develop a prototype of what the long-term support at the Bell Museum might look like.



**Figure 6.** The Minnesota Flora team (from left to right: Tim Whitfeld, Anna Fowler, Ya Yang, Matthew Meshulam, George Weiblen). Images courtesy Tim Whitfeld.

Following approval of its 501(c)(3) status in 2012, MWI applied for grants and received six years of funding from the Environment and Natural Resources Trust Fund (ENRTF) as approved by the Legislative-Citizen Commission on Minnesota Resources. From the early beginnings of the project, Katy's

This resulted in a new look and a new name (*Minnesota Flora*) to align MWI with similar resources in other states and more accurately reflect the encyclopedic representation of both flowering and non-flowering Minnesota plants. *Minnesota Flora* (<https://mnflora.umn.edu/>; **Figure 7**) introduces new features to enhance access to the plant records and continue to support the needs of MWI's roughly 1.5 million users.

Some examples include: an improved advanced search with additional search criteria and a redesigned interface; integration with the

*Minnesota Biodiversity Atlas*, including photos of specimens from herbarium collections across the state and expert observation data; and integration with iNaturalist to host research-grade observations submitted by the public (**Figure 8**).

The *Minnesota Flora* project will continue the mission of the MWI, to engage and educate people about plants growing in Minnesota, raise awareness of invasive species, and inspire people to get involved in exploring and preserving our great state and its irreplaceable natural heritage. With many thanks and great

appreciation for decades of expertise, passion, and tireless community-oriented engagement on the part of the original MWI team, we hope to uphold their vision as we preserve and protect public access to this invaluable resource on a new platform. Visitors accustomed to the previous *Wildflowers* site should find the new website familiar with a similar ease of navigation. (*continued on p. 10*)

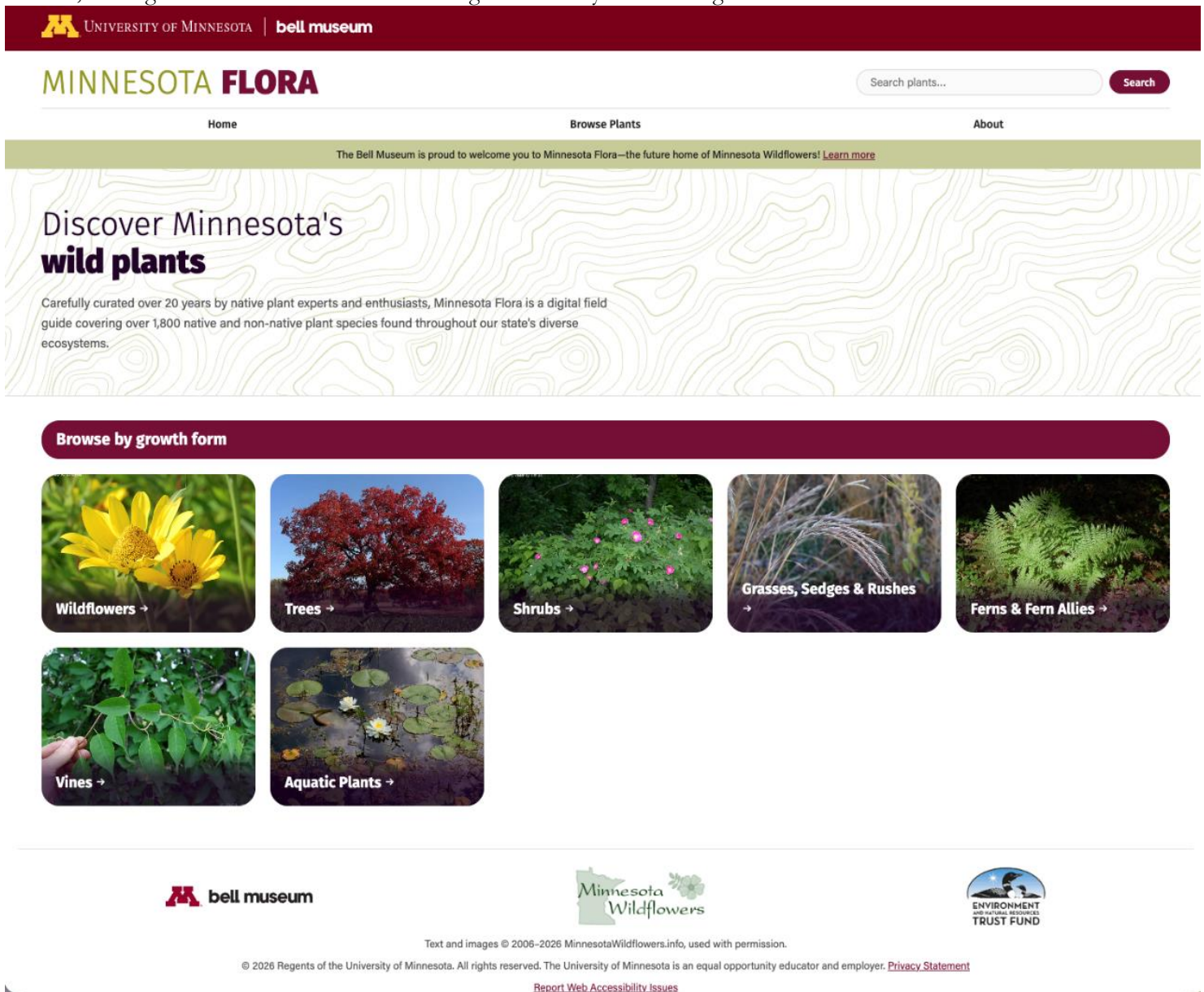


Figure 7. Home page of Minnesota Flora (<https://mnflora.umn.edu/>)

*Minnesota Flora* continues to benefit from a passionate plant community, and continues to add new sources of plant images and data, including, for example, seed images from *Minnesota PlantWatch* and 1970s-era slide images from Steven Jahns. For the time being, the original *Minnesota Wildflowers Information* will continue and is actively being updated by Katy.

In conclusion, we want to extend our special appreciation and gratitude to the valuable contributors of *Minnesota Wildflowers*. These include John Thayer, Steve Eggers, Jason Husveth, Cindy Hoffmann, Victoria Ranua, Cora Rost, Peter Dziuk, and everyone else who has supported the *Minnesota Wildflowers* project with your knowledge, funding, time, images, and data over its nearly two-

decade history. Moving forward, we will strive to uphold your vision and continue providing Minnesotans with the best quality resource for documenting and understanding our local plants at the crossroads of North American botanical diversity.

Search results (1149 plants)

Growth form: **Flower** Clear all

1 2 3 4 5 6 7 8 9 10 ... 31 32

|                                                                                                                                                           |                                                                                                                                                  |                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>Velvet Leaf</b><br><i>Abutilon theophrasti</i><br>NON-NATIVE      | <br><b>Three-seeded Mercury</b><br><i>Acalypha rhomboidea</i>   | <br><b>Siberian Yarrow</b><br><i>Achillea alpina</i>                                        |
| <br><b>Common Yarrow</b><br><i>Achillea millefolium</i>                  | <br><b>Sneezewort</b><br><i>Achillea ptarmica</i><br>NON-NATIVE | <br><b>American Bird's-foot Trefoil</b><br><i>Acemison americanus</i>                       |
| <br><b>Sweet-flag</b><br><i>Acorus americanus</i>                        | <br><b>White Baneberry</b><br><i>Actaea pachypoda</i>           | <br><b>Red Baneberry</b><br><i>Actaea rubra</i>                                             |
| <br><b>Allegheny Vine</b><br><i>Adlumia fungosa</i>                     | <br><b>Moschatel</b><br><i>Adoxa moschatellina</i>             | <br><b>Goutweed</b><br><i>Aegopodium podagraria</i><br>NON-NATIVE                          |
| <br><b>Fool's Parsley</b><br><i>Aethusa cynapium</i><br>NON-NATIVE     | <br><b>Rough False Foxglove</b><br><i>Agalinis aspera</i>     | <br><b>Earleaf False Foxglove</b><br><i>Agalinis auriculata</i>                           |
| <br><b>Round-stemmed False Foxglove</b><br><i>Agalinis gattingeri</i>  | <br><b>Purple False Foxglove</b><br><i>Agalinis purpurea</i>  | <br><b>Small-flower False Foxglove</b><br><i>Agalinis purpurea</i> var. <i>parviflora</i> |
| <br><b>Slender-leaved False Foxglove</b><br><i>Agalinis tenuifolia</i> | <br><b>Blue Giant Hyssop</b><br><i>Agastache foeniculum</i>   | <br><b>Yellow Giant Hyssop</b><br><i>Agastache nepetoides</i>                             |
| <br><b>Purple Giant Hyssop</b><br><i>Agastache scrophulariifolia</i>   | <br><b>White Snakeroot</b><br><i>Ageratina altissima</i>      | <br><b>False Dandelion</b><br><i>Agoseris glauca</i>                                      |
| <br><b>Tall Hairy Agrimony</b><br><i>Agrimonia gryposepala</i>         | <br><b>Downy Agrimony</b><br><i>Agrimonia pubescens</i>       | <br><b>Roadside Agrimony</b><br><i>Agrimonia striata</i>                                  |
| <br><b>Narrow-leaved Water Plantain</b><br><i>Alisma gramineum</i>     | <br><b>Northern Water Plantain</b><br><i>Alisma triviale</i>  | <br><b>Garlic Mustard</b><br><i>Alliaria petiolata</i><br>NON-NATIVE                      |
| <br><b>Wild Garlic</b><br><i>Allium canadense</i>                      | <br><b>Nodding Wild Onion</b><br><i>Allium cernuum</i>        | <br><b>Wild Chives</b><br><i>Allium schoenoprasum</i>                                     |
| <br><b>Prairie Onion</b><br><i>Allium stellatum</i>                    | <br><b>White Wild Onion</b><br><i>Allium textile</i>          | <br><b>Wild Leek</b><br><i>Allium tricoccum</i>                                           |

1 2 3 4 5 6 7 8 9 10 ... 31 32

**FILTERS**

**FLOWER DESCRIPTION**

**Flower color** >

**Petal count** >

**Flower shape** >

**Flower arrangement** >

**LEAF DESCRIPTION**

**Leaf type** >

**Leaf attachment** >

**Leaf extras** >

**OTHER CHARACTERISTICS**

**Growth form** ▾

☒ Flower 1149

☐ Grass-like 391

☐ Shrub 175

☐ Fern 91

☐ Vine 47

☐ Tree 98

☐ Aquatic 118

**Native to MN** >

**Bloom month** >

**Fruit type** >

**Stem characteristics** >

**LOCATION**

**Habitat** >

**County** >

**Wetland Indicator Status** >

**MISCELLANEOUS**

**Plant status** >

**Family**

e.g. Fabaceae, Amorpha

Figure 8. Advanced search page showing options for selecting plant characteristics useful for plant identification.

## Pressed in Time: Botanists in the Bell Museum Herbarium.

### First Foray: Lynden Gerdes

by Joe Walewski – *Wolf Ridge Naturalist*

Carefully pulling a specimen sheet from an herbarium cabinet can elicit memories as powerfully as opening a jar of homemade strawberry jam in mid-January – unsealing a moment and calling up the sun, soil, and scent of a long-passed summer day. When we handle these mounted plants with the care they deserve to protect their scientific and historical significance, they carry us – and generations to come – across decades back to a precise ridge, fen, or river bend. The story grows even richer when we know a little something about the collector identified at the bottom of the label. Suddenly we aren't exploring alone; that person steps through the brush beside us, guiding where we look and how we feel.



**Figure 9. Collecting from the canoe during the Ned Huff expedition. Image courtesy MJ Bach.**



**Figure 10. Working with his plant press during the Ned Huff expedition. Image courtesy MJ Bach.**

philosophies and field habits of naturalists past and present, I see Lynden as the consummate practitioner of the craft. Lynden invited me to share in his work and discovery on four extended Boundary Waters trips in the late 1990s and early 2000s. I frequently find myself quoting his wisdom and sharing stories of his field craft when mentoring others.

Botanizing the shorelines and backcountry forests of the Boundary Waters with Lynden, I've been struck by his practice of presence. He can move through dense brush with the graceful agility of a snowshoe hare, only to drop instantly to a snail's pace to examine the microscopic details on the perigynia of a sedge. I will never forget an evening at Seagull Guard Station, hunched over microscopes alongside well-worn copies of Gleason & Cronquist and Voss, grappling with botanical keys. I grew dizzy from the sheer intensity of slowing down.

In this series, we pull back the cabinet doors to meet the people listed on those labels – botanists whose field pressings form the backbone of the Bell Museum's collection. We begin with a master of North Woods flora: Lynden Gerdes. As a plant ecologist for the Minnesota Biological Survey from 1999 to 2016, Lynden focused on documenting the distribution and abundance of plant life across northeastern Minnesota, contributing roughly 6,000 carefully chosen specimen vouchers – plus many more duplicates – to regional herbaria. There's more to his story.

As an environmental educator at Wolf Ridge Environmental Learning Center for nearly four decades, I've thought long and hard about what it means to be a naturalist. Studying the



Figure 11. Locating *Woodsia oregona*. Field notes sketch by Joe Walewski.

something Lynden shared in the field to their own enduring love for the land.

That spirit of shared discovery bridges generations. On a 2012 botanical expedition along the Kawishiwi River with colleague MJ Bach, Lynden set out specifically to ground-truth Ned Huff's 1914 collection of purple meadow-rue (*Thalictrum amphibolum*) – a species undocumented in the area since Huff's journey. Carrying a collection list of Huff's trip into the backcountry, Lynden and MJ compared daily species observations against century-old records.

Much of the trip involved pulling samples to inspect under laboratory scopes, yet standing riverside, Lynden sensed by intuition what the naked eye couldn't confirm - detecting the subtle glands on a few specimens that set *T. amphibolum* apart from its common lookalike, *T. dasycarpum*. When laboratory scopes later confirmed the discovery, Lynden reflected that they had been "transported back in time those hundred years, to somehow stand there in the swamp with Ned . . . bridging time and space with a moment

Exploring with Lynden opens the aperture of the world through his practice of observation. I recall watching him lean down to feel the lower stem of a clubmoss, testing by touch alone whether he was holding *Dendrolycopodium dendroideum* or *Dendrolycopodium hickeyi*. Later, while I cleaned up camp and he arranged specimens in the plant press, he would quietly point out the haunting song of a Hermit Thrush or the ancient presence of a Snapping Turtle in the bay. Through his model of deep awareness, he teaches the art of noticing surroundings.

Every habitat, no matter how humble, invites the practice of inquiry. Windbound on Saganaga Lake, we made a safe but challenging landing on a tiny islet. Lynden grinned and suggested a complete botanical survey while we waited the wind out; with playful rigor, we cataloged every single species anchored to that rock. On another trip, parked at a busy canoe landing, he introduced me to "botrychulating". Down on hands and knees, we crawled along the edge of a gravel parking lot searching for minute *Botrychium* moonworts among wild strawberries and rough vegetation. From Lynden, I learned that every landscape deserves our attention and that a naturalist is always gathering information.

Perhaps the most impactful of Lynden's habits is his deep dedication to reciprocity. Visiting him recently, I noticed a framed photograph above a window in his garage – a 1986 group photo of Wolf Ridge naturalists. Looking at the faces, he remarked that he had taken a wilderness canoe trip with almost every single person pictured. Hundreds of naturalists across the decades can draw a direct line from

of euphoria." The true victory was more than scientific validation; as Lynden noted, "there is likely as much or more to learn from those lessons than in the botanical discovery itself... seems to me we are still benefiting and learning from his many botanical contributions."

Whether with the human or more-than-human, Lynden always prioritizes sharing with others, and we continue to benefit and learn from his many contributions as a naturalist. Following a recent afternoon of sharing coffee and conversation with me, Lynden sent a reflection on our discussion about herbarium sheets as historic treasures:

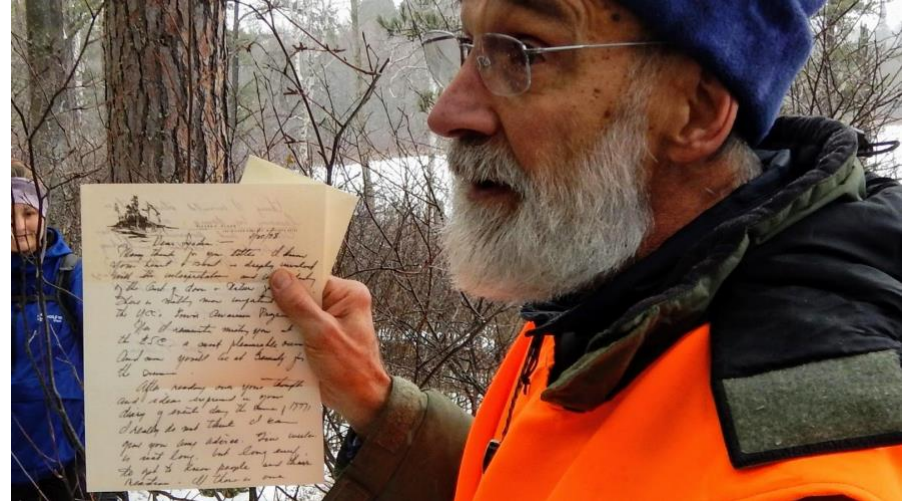


**Figure 12.** Lynden shares quotes and feelings about a letter he received from Sigurd Olson. Image courtesy Joe Walewski.

"The biggest treasures are both unplanned and hard-sought - those both rare and everyday. They are the ancient organisms and all of life that is constantly evolving about us. It may be dandelion species differentiated by the color of their achenes, the sweet smell of twinflower, or the strong odor of downy arrow-wood after the first heavy frosts of fall. Rain, rainbows, stillness, wildness... all embellishing your day-a-field."

Lynden stands prominent among those naturalists who define the core practices of the craft: slow down, notice surroundings, gather information, and share with others. The next time you pull an herbarium sheet and see his name on the label, I hope you are transported - not only by the pressed plant on the paper, but by the generous spirit of the person who paused there to collect it.

**Editor's Note:** *This is the first in a series of stories the author plans to write about Minnesota botanists.*

## ENDBAR: Naturalist Archetypes

We all navigate the outdoors through distinct observational lenses, ranging from the technical taxonomist to the community teacher - what I call naturalist archetypes. While observers shift across multiple roles, master naturalists seamlessly weave them together. I see Lynden Gerdes prominently bridging two: the Historical Naturalist and the Poetic Naturalist.

Lynden embodies the Historical Archetype by treating the landscape as a living archive, engaging with herbarium collections and historic routes – like retracing Ned Huff's 1914 paddle – to bridge deep time and honor those who botanized before us. Because so much of Lynden's life work has unfolded in the Boundary Waters Canoe Area Wilderness, where he and his partner, Lawson, built their home on its edge, they both naturally carry forward Sigurd Olson's passion for protecting and interpreting this wild canoe country.

When I asked Lynden about a cherished 1978 letter from Olson, he recalled how meaningful it was as a young adult that the wilderness icon took the time to write back. In it, Olson offered advice that reads like a compass for a lifetime as a naturalist and environmental educator: "If there is one thing I would stress it is learning by doing, absolute sincerity and conviction in your leadership. Students are looking to you. You are the epitome of the learning process. Have courage and don't waver in your belief." For Lynden, Olson's words connected him to "the real passion, deeper awe, and appreciation that nature can ignite in us if we take the time to open ourselves to it" - a spark he described as both "life-changing and contagious."

Simultaneously, he grounds his field craft in the Poetic Archetype by channeling an observational intimacy similar to that of writers like Robin Wall Kimmerer and Mary Oliver. Lynden translates botanical precision into sensory wonder. He attends as closely to the sweet smell of twinflower or the song of a Hermit Thrush as he does to diagnostic plant keys. By balancing deep historical context with poetic presence, Lynden reminds us that field botany is both a rigorous science and a lifelong relationship with place.

## *Malaxis paludosa*: A Game of Ultimate Hide-and-Seek

by Anna Schacher, CCMI MN PlantWatch Assistant

For anyone unfamiliar with MN PlantWatch, it is a community science program launched in 2023 by the Minnesota Department of Natural Resources (DNR) and the University of Minnesota Landscape Arboretum (UMLA). This initiative trains volunteers to collect survey data and seeds from rare plant populations across the state. I have had the pleasure of serving as an assistant to the program since February 2025. During my time with the program, I've had the privilege of surveying for over 30 listed species found in Minnesota, from towering Kentucky coffee trees (*Gymnocladus dioica*) to incredibly tiny moonworts (*Botrychium* spp.). While each species is special, one of the smallest and most elusive on the list left the biggest impression: the bog adder's-mouth orchid (*Malaxis paludosa*).

If you think finding a needle in a haystack is hard, try looking for a bog adder's-mouth in a cedar swamp. This whisper of a plant grows a mere 2 to 9 inches tall above the sphagnum moss hummocks it calls home. Its slender flowering stalk and light green color make it easy for the plant to get lost in the visual noise of its environment. Even trained botanists were blind to this orchid's existence in North America for quite some time. It wasn't until 1895 that the species was first



**Figure 13.** MN PlantWatch volunteer, Adam Heikkila, posed with the *Malaxis paludosa* he found in August 2025. Image courtesy Angie Miner (UMLA).



**Figure 14.** *Malaxis paludosa* flowers and developing fruit pictured through a hand lens. Image courtesy Angie Miner (UMLA).

discovered in Alaska, and subsequently in Minnesota in 1904. Minnesota remains the only state in the lower 48 with known occurrences of bog adder's-mouth, and those populations are few and scattered. This extreme rarity led to the species being listed as endangered in Minnesota in 1984.

Over the course of the 2025 and 2026 growing seasons, MN PlantWatch dedicated 15 survey days to searching for the bog adder's-mouth. Disclaimer: no MN PlantWatch volunteer or staff member was harmed by these surveys, other than maybe a temporary loss of sanity. Our first day was spent wrestling our way through an obstacle course of thick shrub cover and black spruce (*Picea mariana*) blowdown. No bog adder's-mouth plants were found, but this was just the beginning of our adventure!

The next day, we arrived at our site with a renewed sense of optimism. A single plant in high-quality habitat had been documented there the year prior. With the promise of a plant on our minds, the crew made the long trek out to the GPS point. To our surprise, it was nowhere to be found! Determined to find another, we canvassed the surrounding habitat. For the next few hours, we scanned the sprawling hummocks, searching high and low for our target species. With no luck and my energy depleting, I was beginning to think that the MN PlantWatch crew was on a ghost hunt.

Just as we were finishing our survey, an excited voice crackled over the radio. “I think I got one over here!” Adam called out. My heart skipped a beat, and I hurried toward the sound of celebratory chatter. Sure enough, a nearly invisible bog adder’s-mouth orchid was growing in the shade of a small black spruce tree, its leaves nestled deep in the sphagnum moss. Our crew of staff and volunteers gathered around to inspect it, gently parting the moss to expose its pea-sized pseudobulb. Using a hand lens, we examined the delicate green flowers before collecting a GPS point and habitat data, critical information that will help map and protect the range of this elusive species.

During the following 13 survey days, we didn’t observe a single additional plant. When you work with rare plants every day, it’s easy to lose sight of just how special those encounters are, but nature has a way of resetting your perspective. Reading that a species is endangered is one thing; spending weeks in the field and coming up empty-handed is another. It was those long, unsuccessful survey days that truly drove home the reality of its plight. It solidified for me just how vital community science programs like MN PlantWatch are to the conservation of imperiled species. Maybe one day I’ll be lucky enough to encounter this near-mythical plant again. Until then, it continues to win the most challenging, yet deeply rewarding, game of hide-and-seek of my life.



**Figure 15. MN PlantWatch volunteers scouring high-priority habitat for *Malaxis paludosa*. Image courtesy Angie Miner (UMLA).**

## A Look at the Western Prairie Fringed Orchid in Minnesota

### by Derek Anderson – Botanist, Minnesota Biological Survey

If you find yourself wandering the right prairie in the morning on an early July day, you may catch a hint of something sweet in the air. If you are lucky, it may be the remnants of the fragrant profusion produced by the western prairie fringed orchid (*Platanthera praeclara*, **Figure 16**) the night before. This seductive aroma is produced with one intention, to lure a hawkmoth of the right proportions to the flower, with the hopeful result of successful pollination.

Standing up to nearly a meter tall, with large showy white flowers, the firm stem stands tall in the mightiest of prairie winds. Up close, it is difficult to confuse it with any other plant species on the prairie. However, at a distance, there may be a few other species with white flowers (e.g., death camas (*Zigadenus elegans*), Virginia mountain mint (*Pycnanthemum virginianum*) or Indian hemp (*Apocynum cannabinum*)) that will trick the hopeful searcher. Even after more than 20 years of surveying and monitoring, I still get tricked by these species from time to time!

### A Tale of Two Regions

Looking back at historical records (this includes herbarium collections dating back to the late 1890s), we find that the western prairie fringed orchid was observed throughout much of the prairie region in the state. However, large scale agricultural land conversion in the early 1900s has reduced the state's population to two main areas – northwestern and southwestern Minnesota. A small population is also found in southeastern Minnesota.

The Minnesota Biological Survey (MBS), and previously the Natural Heritage Program of the Minnesota Department of Natural Resources (DNR), have been monitoring and surveying this rare species for over 40 years. Using this long-term effort, we can start to assess how the species is doing. One part of this effort is an annual census of flowering individuals in the state. We accomplish this task with our conservation partners (The Nature Conservancy, the U.S. Fish and Wildlife Service, and the National Park Service) and revisit between 70% and 80% of the state's population each year.

In northwestern Minnesota (**Figure 17**), the highest documented counts came in the mid-1990s, with the all-time high of 10,047 flowering plants censused in 1994. While the numbers have fluctuated considerably over the last three decades, there has generally been a downward trend since that all-time high. In 2026, we censused 2,000 flowering plants in the northwest, a number right in the middle of what we have seen over the last five years.



**Figure 16.** The Western Prairie Fringed Orchid (*Platanthera praeclara*) in northwestern Minnesota. Image courtesy Minnesota Department of Natural Resources.

In southwestern Minnesota (**Figure 18**), our highest counts came in the early-2010s, with an all-time high of 3,035 in 2012. However, over the last five years the numbers in southwestern Minnesota have been very low. In 2023, no flowering plants were observed at any sites in this part of the state, and only 21 were found in 2026.

### Why is there a decline?

While we are not sure exactly why numbers have been declining, there are a few things likely impacting the plants. One possibility is the environmental conditions leading up to our annual surveys. Often in years with drought, plants emerge and grow but then senesce and disappear in response to the drought stress before we visit the site. Another climate related issue is early, warm springs. In our phenological

monitoring, we have found that the orchid emerges early, occasionally as early as March! This early emergence means the orchid is above ground longer and therefore susceptible to more stressors, including herbivory, late season frosts, and drought.

### What Does the Future Include?

Many of the sites we monitor are found on land that is under some sort of conservation ownership. A great deal of credit is owed to the managers of these properties. They work hard to minimize impacts to the western prairie fringed orchid while optimally trying to maintain the prairie habitat this rare species needs. So, one may wonder, what else can be done?

Researchers from North Dakota State University are looking at other aspects of the orchid's biology, specifically,

pollination. They are following individual plants and tracking the fate of their individual flowers. The researchers are exploring if pollinators are a limiting factor to successful pollination and ultimately seed production.

We will continue to monitor our populations each year and work with research partners to fill in knowledge gaps in the species' biology. Recognizing the complex dependency on specific pollinators species, means we must also consider their biology and habitat needs. We also look forward to diving deeper into the data for a better understanding of what may be climate related fluctuations versus truly declining trends.

Please reach out to me ([Derek.Anderson@state.mn.us](mailto:Derek.Anderson@state.mn.us)) if you are possibly interested in volunteering with our annual monitoring effort.

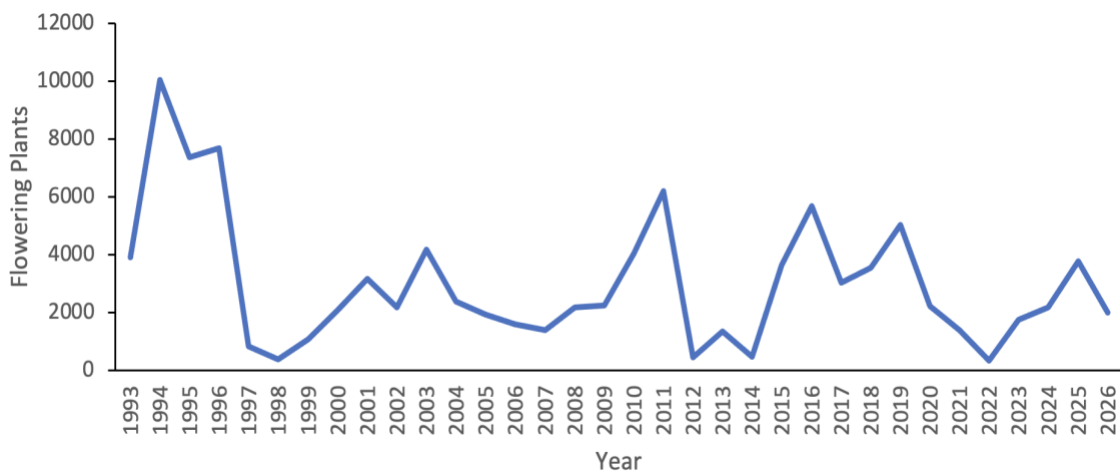


**Figure 17.** The number of flowering plants censused each year in NW Minnesota. Newly discovered or accessible populations were still adding to the annual count between 1993 and 2003 (i.e., generally after 2003 the same populations and areas have been censused each season).

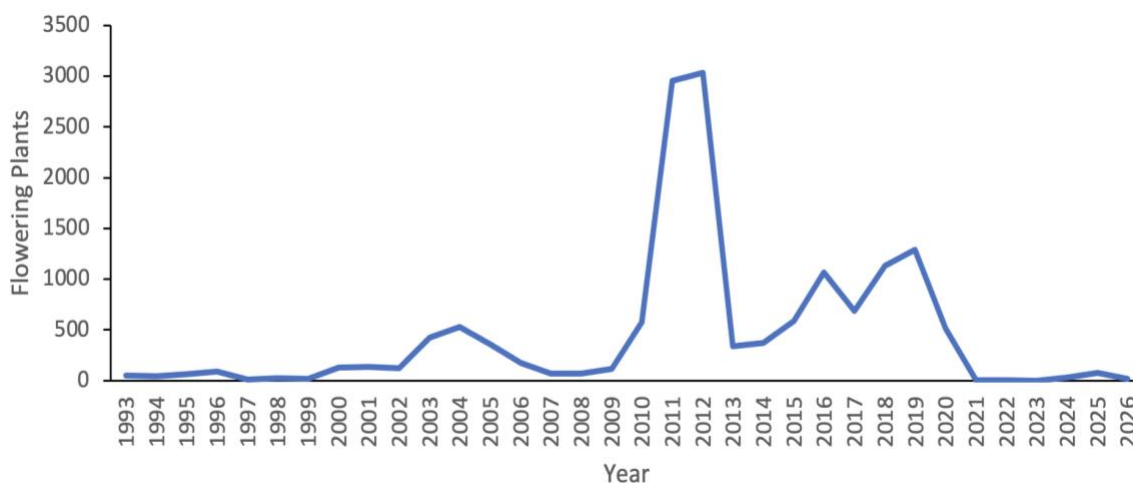


**Figure 18.** The number of flowering plants censused each year in SW Minnesota. Newly discovered or accessible populations were still adding to the annual count until 2004 (i.e., generally after 2004 the same populations and areas have been censused each season).

## Destination Botany: St. Wendel Tamarack Bog SNA

by Brian Johnson (*co-editor, MN Plant Press*) & Michael Lee (*MN DNR*)

On June 20, a group of intrepid souls (**Figure 19**) entered the wilds of the St. Wendel Bog. And most of us were able to exit with the hike completed and our bodies and sanity intact!

This SNA is located near the town of St. Wendel in Stearns County. Despite the name, St. Wendel's dominant plant community is a tamarack swamp, not a bog (**Figure 20**). However, there is also a relatively large spring fen (a type of calcareous fen) in the middle of the extensive swamp. Hiking in this peatland SNA is notoriously difficult. Like most SNA's, there are no trails. In addition to the absence of any line-of-site navigation due to trees and shrubs, fallen trees make foot travel challenging. Most significantly, a false step can cause a visitor to sink up to their knees in the muddy peat and need assistance to extricate themselves. Participants were warned that this would be an arduous trip, and the two-mile hike would feel



**Figure 19. Mike Lee providing an overview to the group before heading into the SNA.**  
*Images by Brian Johnson & Steve Saupe.*



like five! And this doesn't include the often-unpleasant effects of bugs and heat/humidity!

Despite ample warnings about these difficulties, sixteen people met to explore the SNA. The group was made up of members from the Central Minnesota Audubon Society, St. Cloud Wild Ones, and the MN Native Plant Society. Michael Lee, a botanist from the DNR's Minnesota Biological Survey, led the group. Having visited this SNA many times, Mike was very familiar with not only the challenges of this environment but also the opportunities to see interesting things.

The day in question turned out to be pleasantly cool and sunny. We met at the old St. Wendel dump site, a township-owned parcel on the north side of the SNA. Despite the name, the location had little or no visible garbage and provided ample parking for the participants. After introductions, Mike led the group through the upland perimeter wooded with oaks as we began our descent into the swamp.

The initial point of entry into the swamp was a cattail-infested zone. This gradually gave way to a brushier area consisting of dogwood and alder. The route Mike chose was torturous and non-linear, with hummocks and muddy sinkholes blocking the way. A typical stretch

**Figure 20. A typical scene in the St. Wendel Tamarack Bog SNA.**



**Figure 21. *C. reginae*, St. Wendel Tamarack Bog SNA.**

of the route is shown in **Figure 20**. Mike mentioned that these two initial zones were forested with mature tamarack trees 30 years ago when he first visited the swamp, but major disease infestations had killed most of the trees here (and we did see numerous dead tamaracks, some still standing and some deadfalls).

Eventually live tamaracks appeared and quickly became dense enough to shade the ground. Mike noted that there seemed to be a number of young trees and that recovery from the disease situation was better than he anticipated.

Despite the occasional need to pull one of our companions out of the peat, there was much to catch the eye of the botanists. Patches of *Cornus canadensis* (bunchberry), unusual in central Minnesota, greeted us. *Lysimachia thysiflora* (tufted loosestrife) dotted the route. We also observed orchids, including many *Cypripedium reginae* (Showy ladyslipper) (**Figure 21**) and *Platanthera aquilonis* (Northern green orchid), both in full bloom.

After a couple of hours of slogging we reached the spring fen. As the shrubs and trees gave way to a more open habitat, Mike pointed out numerous sedges and rushes, including *Carex sterilis*, *Cladium mariscoides* and *Eriophorum angustifolium* subsp. *angustifolium*. Pitcher plants (*Sarracenia purpurea*) in full flower provided further interest (**Figure 22**). The openness of the fen is due to a subtle flow of calcium-rich groundwater that increases the wetness of the peat and limits the growth of trees and shrubs.

The peaty trek continued back into a more wooded environment, again dominated by tamarack. Mike chose a route through a part of the swamp he had not previously visited and in doing so encountered a small stand of white cedars (*Thuja occidentalis*), which was a previously undocumented component of the swamp. Mike collected a voucher specimen for the Bell Museum of Natural History while the group had lunch.

Eventually the swamp opened back up into a sedge meadow, which provided an easier exit. The group emerged on the property of a local landowner, who had given permission for us to park vehicles to shuttle us back to our point of origin.

Upon return to our vehicles, we reflected on our good fortune. The day was much less hot and humid than we had expected. Shockingly, ticks, flies and mosquitos were almost nil. The birders reported veery, common yellowthroat, yellow warbler, Nashville warbler, black and white warbler and northern house wren among their findings. And many of us had seen plants we had not previously encountered.

If you decide to go to St. Wendel, make sure that you bring along a good GPS or have a smartphone with a proper navigation app. Plan to get both wet and dirty. And it's always a good idea to bring a friend to help get you out of the mud.



**Figure 22. *S. purpurea*, St. Wendel Tamarack Bog SNA. All images in this story taken on June 20, 2026.**

## A Big Year for Minnesota's Native Flora

by Holly Bernardo – Minnesota Biological Survey; Plant Survey Supervisor

What is the most frequent topic, the ever-present broken record, in any conversation about native or rare plant species conservation? Well, I suppose I can't say what your most frequent topic is, but mine is the unknown. A lack of information, data deficiencies, unanswered questions. We do the best we can, but so often we just don't know what's best for native plants.

Which is why this year has been so exciting! 2026 has seen the completion and publication of several new informational resources on Minnesota's native flora. Each one helps to fill critical knowledge gaps in its own way. And together they will strengthen the foundation that supports all our native plant species and plant community protection, management and conservation efforts across Minnesota.

Read on, click the links, download the documents and share with your colleagues. I hope everyone uses these resources to their fullest, because when we know more, we can do more.

### Plant Species' Conservation Status Ranks

You may already know that the MN DNR recently updated Conservation Status Ranks (or S-Ranks) for over 7,000 species following NatureServe's data-driven, rigorous and repeatable method for conservation status assessments. You can read more about the S-Ranking effort for native flora in the July 2025 *Minnesota Plant Press* (Volume 40, Number 2) headlined with an article written by Derek Anderson. The conservation status of a species is based on its rarity, trends, and a threats assessment, and is

fundamental to all the work we do as conservation professionals. One of the most important uses is to prioritize species for protection and conservation effort. These new S-Ranks are currently informing the MN DNR's ongoing revision of the State List of Endangered, Threatened and Special Concerns species. And, they fed directly into creating the State's first list of plant Species in Greatest Conservation Need (more on that next). While this effort took many years, the final updated S-Ranks for over 2,000 plant species were made official in July 2026, available now at the MN DNR's [MNTaxa](#) webpage.

### Statewide Recognition and Resources for Native Plant Conservation

Another huge win that was years in the making was the inclusion of plant species and conservation needs in Minnesota's Wildlife Action Plan 2025 – 2035: Conserving Habitats and Biodiversity published in August 2026. This Plan was built as a collaboration involving over 300 people from 64 conservation entities. It will help guide, facilitate, and inspire conservation actions that sustain the long-term health and viability of Minnesota's biodiversity, with a focus on species that are rare, declining, or vulnerable (*i.e.*, Species in Greatest Conservation Need, SGCN) and their habitats. The 2025-2035 version is Minnesota's 3rd edition of this Plan, but it's the 1st to include plants. The Plan website offers two ways to engage. The section called "Read the Plan" provides in-depth chapters about topics such as species groups (including plants), 15 primary habitat types, and public engagement. Or, "Explore the Data Portal" to find maps of habitats, the Conservation

Action Network, species associated to habitats and their conservation status. The plant-related resources you'll find in the new Plan include:

- Minnesota's first plant species SGCN list, which recognizes the critical conservation needs of 448 native plant species,
- Minnesota's first plant Species in Need of Information (SNI) list, which recognizes critical information gaps for an additional 87 native plant species,
- A dedicated chapter describing the overall conservation and information needs of Minnesota's native flora, and
- Conservation actions to benefit native plants all throughout the Plan through its focus on the critical habitat needs common among all our native biodiversity.

### Plant Species' Coefficient of Conservatism Values

A third new resource made available this year is the complete set of regional Coefficients of Conservatism (C-values) for Minnesota's native flora. Species' conservatism is a measure of a species' tolerance to degradation and its fidelity to a specific habitat. These values can be used in a variety of ways, but one key application is that C-values can be combined (*e.g.*, averaged) into community-level metrics of habitat quality that can inform protection, restoration and habitat management decisions.



The MN Native Plant Society's own Scott Milburn and colleagues developed C-values for Minnesota's wetland and wetland-transition flora in 2007. From there, Scott was instrumental in spearheading a statewide effort. For the statewide effort, C-values were assigned by botanical experts to plant species geographically by Ecological Province. C-values were done at the Province level because of Minnesota's considerable variation in microhabitats, ranging from sub-boreal in the northeast to the eastern edges of the Great Plains in the west. Some plant species occur in more than one ecological region, and some vary in microhabitat specificity between different regions. Thus, a single statewide C-value would not be the best representation of plant species conservatism in our state.

Staff from the MN DNR joined Scott and other collaborators to develop C-values for plants of the Prairie Parkland and Tallgrass Aspen Parklands Ecological Provinces, made available online in 2022. The full statewide effort is now complete with the addition of C-values for plants of the Eastern Broadleaf Forest and Laurentian Mixed Forest Provinces available as of September 2026 through the MN DNR's MNTaxa webpage.

### **A Plan for Plants' Future in the DNR's Minnesota Biological Survey**

Okay, so far, it looks like it's been a big summer for Minnesota's native flora. But the year started with an accomplishment that is a bit closer to home for me, with the publication of the Minnesota Biological Survey's (MBS) first Plant Operational Plan

and plant program Accomplishments Report (2019-2024) in February 2026, available on MBS's webpage.

The Minnesota Biological Survey created a Strategic Plan in 2019 to guide the Unit's future as they started to look past the end of the 35-year statewide county-by-county survey (1987-2022) of native plants, animals and plant communities. One of the first things I was tasked with when I joined MBS as the new plant supervisor in 2022 was to develop project-level goals for the MBS plant group that would fulfill MBS's Unit level strategic goals... and develop a plan to accomplish each project... and write it all up in a publication quality operational plan... and then get on getting it done. No big deal for someone brand new to the job, right? That fact that it took four years is perfectly normal.

But, with so much help from the amazing MBS plant group and DNR's Regional Ecology staff, it did eventually get done. And, with so much incredible work being done by the amazing MBS plant group, writing the accomplishments report for our first five years under MBS's Strategic Plan was flat-out easy.

### **Bringing Lichens Along Too**

Lastly, it wasn't just a big year for Minnesota's native plants, it was also a great year for Minnesota's native lichens. By partnering with two extremely knowledgeable and dedicated collaborators, Otto Gockman and John Thayer, MBS was able to include lichen species in many of these new resources.

John and Otto evaluated the conservation status of over 1,000

lichen species found in Minnesota. Most lichen species are too data deficient to use the quantitative NatureServe method. So, they updated S-ranks through expert review, recognizing 134 native lichen species as either Critically Imperiled (S1) or Imperiled (S2) in Minnesota. The new version of Minnesota's State Wildlife Action Plan recognizes 151 lichen species as SGCN and another 130 as SNI. The conservation and information needs for lichens was also included within the dedicated plants chapter of the Plan. The MBS Plant Operational Plan developed a project, which MBS has already begun, to complete a statewide survey of lichen species in Minnesota with the goal of better understanding their conservation status and needs. All this new information on native lichen species was also made publicly available in 2026.

### **And, We Couldn't do Anything Without our Pollinators**

The Minnesota Pollination Guide to Native Plant Communities provides data and information on the reproduction and pollination characteristics of native plant species. It is intended to provide guidance on the reliance of plants on pollinators for reproduction, in a way that can be related to the Native Plant Communities that a plant species is found within. It was actually published in 2025, complete with a website, report, and all the information in a tabular format through MNTaxa. In 2026, that information was incorporated into a spreadsheet that provides a single, easy-to-use tabular resource for all this new information about Minnesota's flora. (*more on p 22*)



## Key Resources

A [static spreadsheet](#) containing much of the new information discussed here (and more!) is available at the MN DNR's [MNTaxa webpage](#).

*Minnesota's Wildlife Action Plan 2025 – 2035: Conserving Habitats and Biodiversity.*

- [Website](#)
- [Plants & Lichens chapter](#) (link to pdf)
- [Read the Plan](#)
- [Explore the data portal](#)

Coefficient of Conservatism Values

- [Minnesota's wetland and wetland-transition flora](#) (link to pdf)
- [Species by Ecological Province available through MNTaxa](#)

Minnesota Biological Survey's (MBS) Plant Operation Plan and 5-Year Accomplishments [Report](#).

- DNR's [MBS main page](#)
- DNR's [Regional Ecology main page](#)

Minnesota Pollination Guide to Native Plant Communities

- [Website](#)
- [Project Report](#) (link to pdf)

## Botany Bits

### Minnesota Botany in the Public Press

An article in the September-October 2026 issue of *Minnesota Conservation Volunteer* features botanical work in Minnesota SNAs by the DNR. Written by AmberBeth VanNingen and entitled "[Rare Rewards](#)," it details aquatic botanical exploration at Mille Lacs Moraine SNA by Courtney Schirmers, Natasha Schmid and Arika McGraw, along with the author. In addition, Derek Anderson, Shannon Kearney and AmberBeth were featured documenting kittentails (*Besseyia bullii*) at Franconia Bluffs SNA. The story also included a description of a DNR Bee Team monitoring project. Check it out!

### Cactus Round-Up

The MN Landscape Arboretum recently sent a team out to Big Stone National Wildlife Refuge to monitor the success of transplanting pincushion cacti (*Coryphantha vivipara*). To monitor the success of the program, the team spent two days crawling over the outcrops relocating and measuring past transplants. The good news is that survival rates were very good and that many of the transplants were even fruiting! Thanks to refuge biologist Brandon Semel for sharing the group selfie.



# The Sweet History of Wolsfeld SNA

by Matthew M. Thomas ([www.maplesyruphistory.com](http://www.maplesyruphistory.com))

**Editor's Note:** This story, originally titled "Early commercial maple syrup making in Minnesota: Wolsfeld Woods," first appeared in the September 2026 newsletter of the *Minnesota Maple Syrup Producers Association* and is used with permission.

Through the first half of the 20th century, one of the largest and oldest maple syrup operations in Minnesota could be found just north of Long Lake, in Hennepin County. Known as Wolsfeld Bros. or Wolsfeld Farm, the Wolsfeld family maple syrup operation was well-known in the Twin Cities metro area thanks to frequent newspaper stories and photographs each March and April in the *Minneapolis Star Tribune* newspaper.

Maple syrup making at the Wolsfeld Farm began in 1881, when three young brothers decided to start tapping trees on the farm of their father Karl Joseph "Charles" Wolsfeld to make some pocket money. The Wolsfeld family of father Johann, mother Margarethe, son Charles, and Charles' siblings Johann "John", Gerhard, Nicholas, and Anna, left Germany in 1852

to avoid having the four young sons serve in the Prussian army. Tragically, Charles' father Johann died from typhoid fever in 1855 in Illinois, after which the family moved west to be near a settlement of other German immigrants in Hennepin County. Brother John Wolsfeld first established a homestead and title to a farm in 1857 on the western end of what is today known as Wolsfeld Lake, with Charles Wolsfeld following suit on the rolling wooded lands around the eastern portion of Wolsfeld Lake in 1861.

Following a return from service in the civil war, Charles Wolsfeld married Mary Elizabeth Merz, and began a family of three sons, Frank, John, and Nicholas, and three

daughters, Josephine, Elizabeth, and Caroline. Initially, the maple operation was simple, with the three brothers, John, Nicolas, and Frank making syrup in an iron kettle and selling it to neighboring farms. In the later 1880s, the brothers increased the number of trees that were tapped and expanded the boiling operation from the iron kettle to

boiling sap on a large flat pan under an open-sided shingle-roofed shelter. This rudimentary sugar shack was built into the slope of a hillside in the middle of the sugar bush, with a storage shed and sap storage tanks alongside. By the end of the 19th century, the operation had become a significant financial component to the diversified Wolsfeld farm, featuring a complete range of G.H. Grimm



**Figure 23. Open sided sugarhouse from the 1880s and 1890s built to cover a large flat pan at the Wolsfeld sugarbush. Photo courtesy of the Western Hennepin County Pioneer Association.**

Company sugaring equipment, including a Champion brand evaporator and a proper sugar house located in the center of the sugar bush.

The family patriarch, Charles Wolsfeld, passed away in 1896 passing the farm and sugarbush to his sons and daughters. In 1909, Frank Wolsfeld married and left the farm for twenty years in South Dakota. Under the direction of the remaining brothers, bachelor farmers Johnny and Nick Wolsfeld, spinster sister Josie Wolsfeld, and married sister Caroline Wolsfeld Potter and her husband C.G. Potter, the Wolsfeld sugarbush moved into full-fledged commercial syrup

operation, tapping around 1000 trees in their 150 acres of maple woods.

The Wolsfeld sugarbush was known for having an open, park-like appearance where the maple trees were carefully managed with selective harvest and thinning, “forest grooming” methods, perhaps learned from late 19th and early 20th century forestry methods of their German ancestors. A great deal of dead wood was removed from the forest and burned in the sugar house with around 150 cords of wood cut and gathered each year. Most of the wild ginseng was harvested by 1900, and a lot of basswood, hickory and oak was cut and sold to the barrel works in nearby Long Lake or for use for firewood and tool handles, leaving the large maples one sees today.

Through the early 20th century, the Wolsfelds ran a diversified farm operation that sold and traded eggs, honey, milked 13 cows, cut 70 acres of hay fields, and sold maple syrup and firewood. In addition, they raised and gathered a wide variety of crops and plants and game for their own use. The family owned a truck but the farm never used tractors, and instead relied on a group of eight well cared for work horses. The entrance to the farm was from County Road 6 due north of the village of Long Lake, with a long winding driveway through the maple woods and across Wolsfeld Creek at the foot of the spring fed Wolsfeld Lake.

On the farm, the family’s original log cabin was expanded and framed in with additional rooms and a second floor, growing from a simple cabin to a large 15 room farm house. At its height, the farm grew to 264 acres with 20 buildings, including house, barns, smoke house, ice house, hog shed, corn crib, chicken coop, and more. To preserve the log cabin established by Charles Wolsfeld in the 1860s, the remnants of the additions



**Figure 24. Enclosed sugarhouse with two-tiered cupola at Wolsfeld Farm, circa 1935. Photo courtesy of the Western Hennepin County Pioneer Association.**

to the farm house were removed in the early 1990s, and in 1994 the friends of Wolsfeld Woods dismantled and reassembled the cabin at the grounds of Medina’s City Hall in 1998.

It is not known where the earliest kettle boiling took place at the Wolsfeld sugarbush. The first sugar house, an open sided gable roofed structure, served as the frame for the later more substantial sugar house. Built to cover their early flat pan of the 1880s and 1890s, it was centrally located in the



**Figure 25. Nick Wolsfeld and hired hand Richard Hannen working the evaporator in 1933. Photo courtesy of the Western Hennepin County Pioneer Association.**

heart of the sugarbush, just off a curve of the driveway and connected by a network of paths and wagon trails. In the early 1900s the Wolsfelds upgraded to a continuous flow, flue evaporator from the Grimm Company. At this time, they also enclosed the walls of the initial sugarhouse shelter, and added a tall square smoke stack and cupola to the roof line to release steam.

Over the next 50 years the sugarhouse at Wolsfeld Sugar Bush went through a few changes, as windows were added, the cupola was expanded and raised to become a two-tiered affair, and the tall metal smoke stack was reinforced with a bricked-up base. By the late 1940s the exterior of the sugarhouse was painted green with white trim. In 1941 the family purchased new pans from the Grimm Company for their 5' x 16' wood fired Champion evaporator, which were shipped by rail from Rutland, Vermont to Long Lake.

The sugarbush was home to many large old maple trees that had been tapped since the 1880s, sometimes with as many as three pails hanging from them. The trees in this sugarbush were notably sweet, often taking only 32 gallons of sap to make one gallon of syrup. Sap collection was initially carried out with wood pails and sumac spiles, later replaced with metal pails and metal spiles. After more than fifty years of heavy tapping, one of the Wolsfelds commented in 1939 that it gets hard to find a fresh place on the bark of some trees to tap each year.

Sap gathering was always carried out by horse drawn wagon with a pair of 100-gallon metal sap collection tanks, using

the labor of the Wolsfeld siblings along with the help of a few hired men and neighbors. At the height of their syrup making years, the Wolsfelds hung around 1000 pails. For example, in 1937 they hung 900 pails; whereas, in 1940, they tapped 1100 trees and made 634 gallons syrup. In most years they produced between 500 and 700 gallons of syrup. In 1929, when they produced 500 gallons, their syrup sold at \$3.50 gallon.

In the sugarhouse, boiling was supervised by brothers Nick and John until they each passed away in 1938 and 1940. By 1945, all the Wolsfeld brothers had all died, but the three daughters of Josephine Wolsfeld, Caroline Wolsfeld Potter, and Elizabeth Wolsfeld Rath carried on the running of the sugarbush, assisted by the "only man of the place," Caroline's husband, C.G. Potter. Canning of syrup was always the domain of the Wolsfeld sisters and completed in the sugarhouse, where they filtered and filled a variety of glass jars and bottles as well as plain metal cans, all pasted with Wolsfeld Bros. or Wolsfeld Farm paper labels.

In addition to their popular sugarbush and syrup, the Wolsfelds also made their lake and trails available to weekend recreation and picnickers. For a quarter per car, families could rent one of 40 picnic tables on the park-like lakeshore. Or one could rent a boat on the lake for fishing or stay in a pair of cottages. The woods were popular for family reunions and company picnics and saw as many as 200 visitors a day on some summer weekends.



**Figure 24. Early 20th century image of a group of ladies sampling fresh sap in the Wolsfeld sugarbush. Note the size of the trees and multiple pails on each tree. Photo courtesy of the Western Hennepin County Pioneer Association.**

Syrup making was a significant part of the Wolsfeld farm economy from the 1880s through the 1940s. The last of the Wolsfeld siblings died in 1958 and brother-in-law C.G. Potter passed away in 1961. With the siblings aging and passing away one by one, the remainder of the family discontinued syrup making in the early 1950s.

As a result, in 1962 the heirs to the Wolsfeld Farm chose to sell the 250-acre farm to the Brooks family who formed the Wolsfeld Lake Co. and initially planned for a residential development on the property. However, the biological importance of the land as the largest piece of preserved Big Woods in the Twin Cities metro area was soon recognized. The Big Woods once covered a continuous stretch of 2 million acres of mixed maple, basswood, elm, and oak forests along the rolling hills of the glacial end moraines marking the margins of the Wisconsin glaciation in south-central Minnesota. Most of the Big Woods have been cut, plowed, and developed, making the Wolsfeld sugarbush a rare and special place.

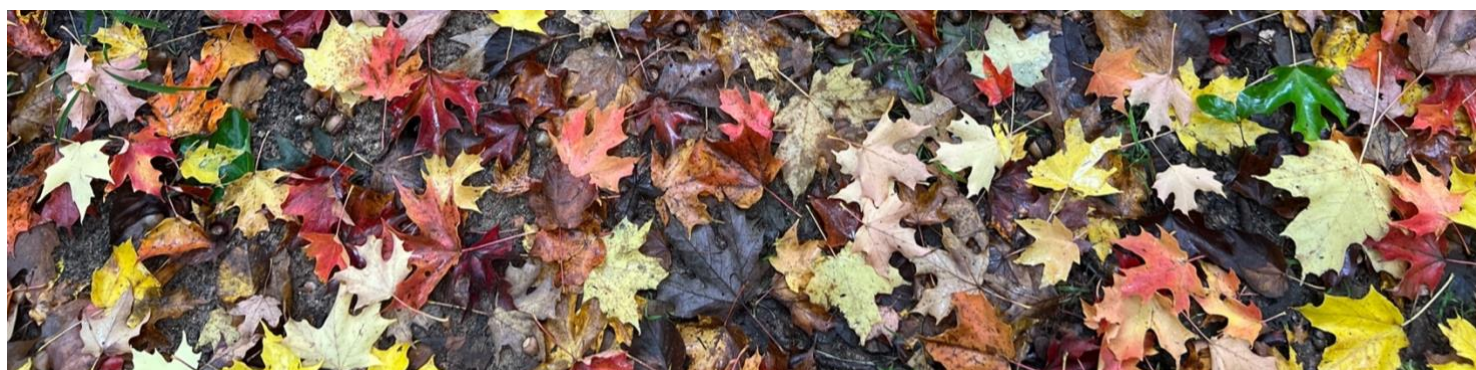
It was the importance of these woods to the Wolsfeld family for their use as a sugarbush that the large maple trees of this block of original hardwood forest remained largely uncut and minimally disturbed. As a result, the Brooks family donated a 220-acre parcel as the “Wolsfeld Woods” to the Nature Conservancy, who in turn transferred the land to the State of Minnesota in 1978, to be managed under the state’s Scientific and Natural Areas program. The sugar houses, along with other remaining farm buildings, were dismantled in 1975 in anticipation of the transfer of land to the state of Minnesota. Today one can freely hike the trails of Wolsfeld Woods, tracing the former roads through the Wolsfeld sugarbush as well as visit the lakeshore and site of the old homesite and farmstead. The former location of the sugarhouse is not marked by an interpretive sign, but there



**Figure 25.** Author Matt Thomas at the maple syrup display case at the 2026 MN State Fair. Image courtesy Matt Thomas.

are still a few remnants of the building and associated features if one knows where to look.

Dr. Matthew Thomas is a Minneapolis-based independent researcher and historian who specializes in the history of the maple syrup industry. He is the author of two books, *The Maple King: The Making of a Maple Syrup Empire*, and *A Sugarbush Like None Other: Adirondack Maple Syrup and the Horse Shoe Forestry Company*, and is the creator and primary contributor of the website “Maple Syrup History,” [www.maplesyruphistory.com](http://www.maplesyruphistory.com).



## TLA's (Triple Letter Acronyms)

by Steve Saupe, (co-editor, *MN Plant Press*)

I recently learned a new three-letter acronym – FFF.

Though familiar with a variety of other 'TLA's like AAA (American Automobile Association), BBB (Better Business Bureau), and CCC (Civilian Conservation Corps), FFF was not one of them.

Granted, I knew some similar acronyms. For example, FFA (Future Farmers of America), FAA (Federal Aviation Administration) and FCC (Federal Communications Commission). But, not FFF.

That's because FFF is the secret code for one of Minnesota's rarest plants. Actually, the word "secret" is an exaggeration. FFF is not so much a secret code as it is a quick way to refer to Fern-leaf False Foxglove (*Aureolaria pedicularia*; **Figure 28**), a plant whose common name is quite a mouthful.

I learned the secret earlier this summer when co-editor Brian Johnson and I (**Figure 29**) volunteered to assist a team of botanists from the DNR, TNC, MN PlantWatch and Winona State University with some survey work in Whitewater Wildlife Management area near Elba (MN).



**Figure 29.** Newsletter co-editors Brian Johnson (left) and Steve Saupe relax after a day in the field. Image courtesy Mike Lee, DNR.



**Figure 26.** FFF at Whitewater Management Area. Images in this story courtesy S Saupe unless otherwise indicated.

One of the objectives for our visit was to examine the effectiveness of brush mowing to help encourage FFF populations. The group monitored permanent transects that had originally been established by Welby Smith (MN DNR).

After a long day without seeing a single FFF plant, MN DNR botanist Mike Lee led some of us on an expedition to try and locate a population on a terrace where he had previously found it. I marveled at Mike's sense of direction as we bushwacked through an overgrown savanna of black oak (*Quercus velutina*; **Figure 31**), blueberry (*Vaccinium angustifolium* & *V. myrtilloides*) and huckleberry (*Gaylussacia baccata*). He navigated us to the edge of a terrace where we were rewarded to discover about four dozen plants (**Fig.**



**Figure 30.** (from left) Brian Johnson, Mike Lee and Angie Miner examine FFF at Whitewater Management Area.



**Figure 28. Italian mosaic of a saint surrounded by an aureole. The halo around the figure's head is also called a nimbus.**

The specific epithet, *pedicularia*, refers to the leaves of the plant which are reminiscent to those of lousewort (*Pedicularis*; **Figure 33**). FFF is similar to lousewort in another important way. Both are hemi-parasitic. In fact, this is a feature of their family (Orobanchaceae).

As you may know, a hemi-parasite is a plant that steals water and minerals from another plant. They do this by inserting into the host a modified root structure called an haustorium. The haustorium acts similarly to an intravenous needle stuck into a vein. Water and minerals are transferred through the haustorium to the parasite. Hemi-, or “half” parasites, don’t rob the host of organic materials but make their own through photosynthesis. Which means, hemi-parasites like FFF are green.



In contrast, holo-parasites (“whole” parasites) are completely dependent on their host for organic materials, as well as water and minerals. Since they don’t make their own food, holo-parasites lack leaves, chlorophyll, and functional chloroplasts. As a consequence, holo-parasites, like dodder (*Cuscuta*; **Figure 34**) are not green, but yellow or orange.

It’s not obvious that lousewort, FFF and other plants in the Orobanchaceae are hemi-parasites because they look like any other plant, in other words – “normal.” The only way you can tell that they are parasites is to excavate the root system and look for the haustorial root connections to another plant. Not surprisingly, it wasn’t known that the genus *Aureolaria* was parasitic until 1853, when it was reported by famous Harvard botanist Asa Gray.

**Figure 29. The orange, spaghetti-like, leafless stems of dodder (*Cuscuta*) growing over a host.**

30). The group was ecstatic, especially because Mike reported that last year he found only four plants at this site.

*Aureolaria pedicularia* is well-named. I initially assumed that the genus name was derived from the word, aureole, which refers to the luminous light or halo often depicted in artworks of religious figures (**Figure**

**32**). The tips of the unopened buds of FFF are reddish and reminded me of an aureole-type halo (see **Figure 32**). Though perhaps a reasonable idea, it is wrong. While doing research for this story I learned that Rafinesque actually named the plant in recognition of its beautiful golden-colored flowers (**Figure 33**). *Aureolaria* is derived from the Latin word for golden (*aurea*).



**Figure 31. Black oak at Whitewater WMA.**



**Figure 33. Closeup of leaf, bud and flower of FFF.**

FFF produces as many as 11,000 haustoria per plant, though fewer than 100 is more typical. The haustoria vary in size from 0.5-7.5 mm. Most are spherical though the larger ones are more elongated and flattened.

Unlike many hemi-parasites that are rather promiscuous in their choice of host, FFF is relatively selective favoring oaks and to a lesser degree blueberry.

FFF is most common in the margins of forests where it can receive adequate light yet still have an abundant supply of woody plants roots for a host. Fires, which open up forests, are thought to allow for expansion of FFF populations and was one rationale for trying the brushing management strategy to reduce wood encroachment.

It's not clear why there were so few FFF plants last year but a much healthier population this year. Smith (2021) noted that such wide fluctuations in population size from year-to-year are not uncommon, and that the fluctuations do not appear related to either fire or weather.

FFF grows as both an annual and biennial. Though our group found a few rosettes (**Figure 35**), Smith (2021) says that FFF functions primarily as an annual.

FFF (**Figure 36**) is my new favorite TLA. That's because FFF is a VIP. Right, a Very Interesting Plant!



**Figure 35.** Rosette of FFF. Image courtesy Mike Lee, MN DNR.



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**Figure 36.** Beautiful FFF at Whitewater WMA.

## Plant Quiz

*(See last page for information and answers)*

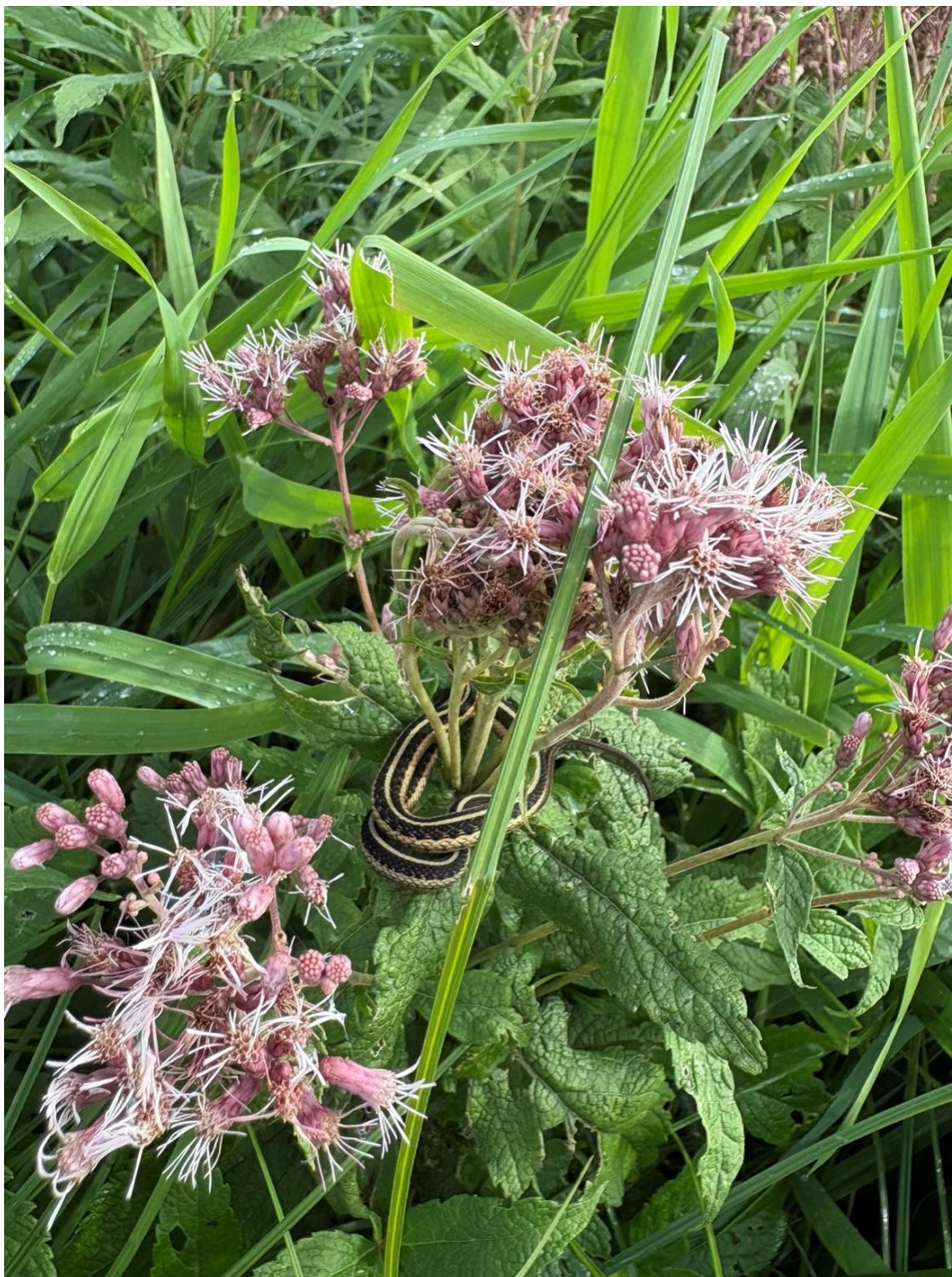


**Figure 37.** This plant was growing Stearns County. What is it and who is along for the ride? Image courtesy Caitlynn LaSota.



**Figure 38.** This plant is growing in a restored prairie in Stearns County (MN). It was introduced in a prairie pasture seed mix that was planted for grazing sheep. What is it? Left – whole plant. Lower right - inflorescence. Lower left - fruits. Images courtesy Steve Saupe.





**Figure 30.** *This beauty was growing in a wet roadside ditch in central Minnesota (Stearns County). It has tolerated regular mowing and recent ditch work. What is it? Images by Brian Johnson & Steve Saupe*





*Figure 40. This plant was found growing in Fillmore County. What is it? Image courtesy Amanda K. Weise, MN DNR 2026.*



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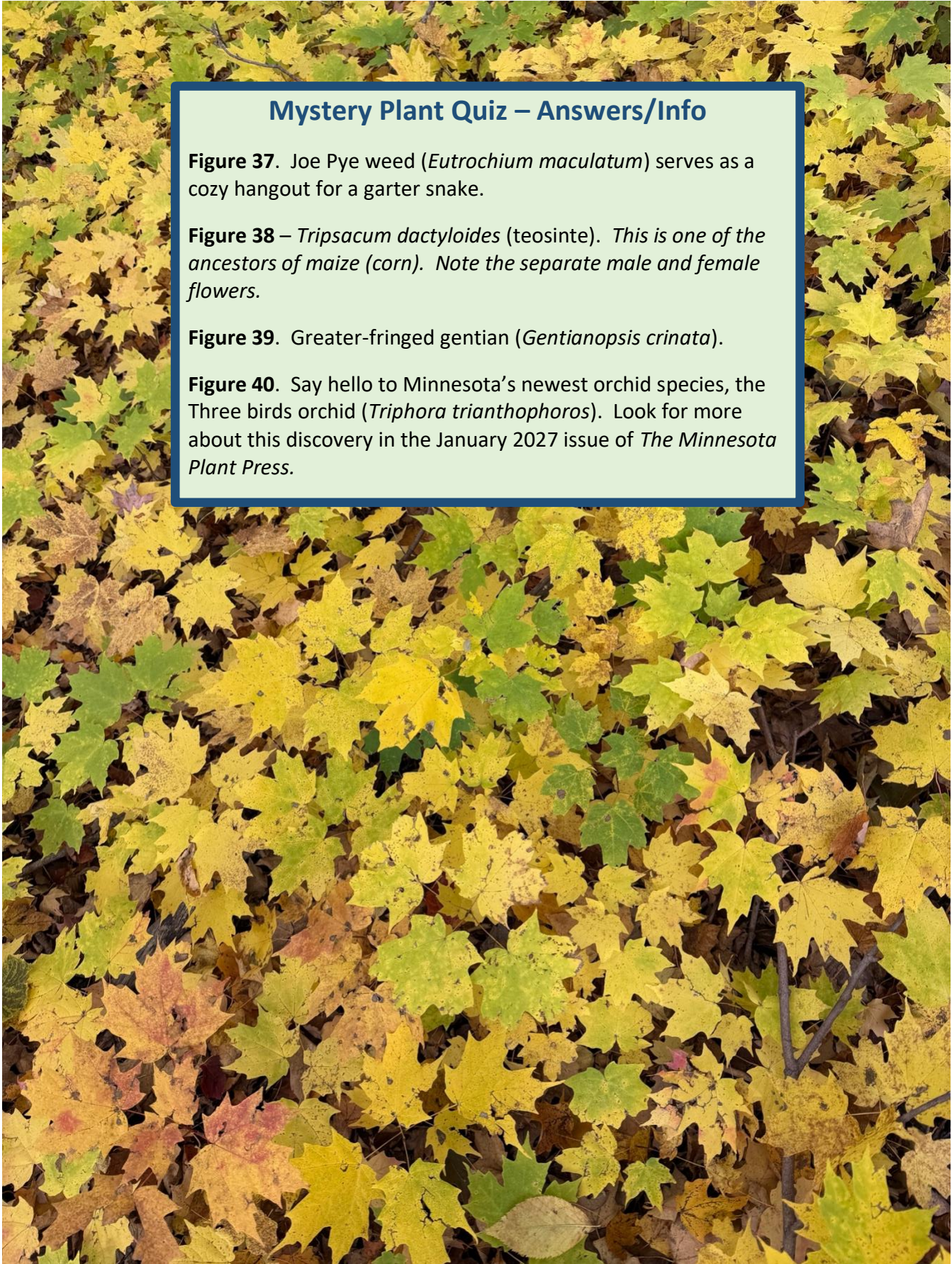
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### Mystery Plant Quiz – Answers/Info

**Figure 37.** Joe Pye weed (*Eutrochium maculatum*) serves as a cozy hangout for a garter snake.

**Figure 38 –** *Tripsacum dactyloides* (teosinte). This is one of the ancestors of maize (corn). Note the separate male and female flowers.

**Figure 39.** Greater-fringed gentian (*Gentianopsis crinata*).

**Figure 40.** Say hello to Minnesota's newest orchid species, the Three birds orchid (*Triphora trianthophoros*). Look for more about this discovery in the January 2027 issue of *The Minnesota Plant Press*.