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.*

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Eastern Leatherwood: A Humble Yet Hardy Plant

by Kate Cary *(College of St. Benedict/St. John's University Biology Department)*

Eastern leatherwood (*Dirca palustris*) is, at first glance, an unassuming shrub nearly indistinguishable from its neighbors. However, it is actually a plant with a clever strategy that allows it to thrive in forest understories. Plus, it is surprisingly easy to identify, once you know a few tricks. In fact, I like to focus on eastern leatherwood for my first lab in my Plant Systematics class because it showcases the power of noticing a few key attributes of leaves.

In technical terms, eastern leatherwood has alternate, obovate, and entire leaves that are glabrous when mature (**Figure 1**). If you're already familiar with botanical keys and plant identification guides, that may be all you need to know, but if not—no fear! Each term has a simple definition. "Alternate" means that the leaves connect one-by-one to the stem, on alternating sides (as opposed to opposite leaves, where two leaves emerge from the same point on the stem). "Obovate" means that the leaves are generally egg-shaped, but the widest point of the leaf is closer to the tip of the leaf than the base. "Entire" leaves have smooth margins, and "glabrous" means that the leaf surface is smooth instead of hairy. All together, these descriptive words can help you focus in on the key attributes that help set eastern leatherwood apart from its fellow leafy green neighbors.

Figure 1. Photograph of eastern leatherwood leaves, showcasing its alternate, obovate, and entire leaves that are glabrous at maturity. Image courtesy Kate Cary.

Plus, once you've looked at the plant closely enough to be sure it isn't

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poison ivy, you can do one final check to see if it is eastern leatherwood: bend its stems. Eastern leather-wood has shockingly flexible stems, and it is easy to see how it earned its name as "leatherwood," given that leather is a flexible but strong material, similar to the bark and stems of this plant. Researchers have figured out why eastern leatherwood's stems are so pliable: they are low in a chemical called lignin (Mottiar et al., 2020), which helps make wood more stiff and sturdy.

A couple years ago, two of my students, Anna Cole and Kayla Rigdon, as well as Dr. Gordon Brown and I, set out to discover how eastern leatherwood's low lignin and bendy stems affect its ability to withstand environmental stressors. When we examined eastern leatherwood on campus and across northern Minnesota, we found that many of the plants had twigs, branches, or even full-sized trunks that had fallen onto them. Falling plant debris can be a substantial hazard, especially in high winds—that's why you should always check for dead trees or branches above you when setting up your tent for camping. Eastern leatherwood can't get up and move like a camper can, though. Instead, its flexible branches simply bend around fallen trees (**Figure 2**) and rolled-over trunks (**Figure 3**). Of the 239 eastern leatherwood shrubs we found that had fallen plant debris on them, only one showed any sign of damage (a branch broke off due to a full-sized tree falling on it). So, our data support the conclusion that eastern leatherwood's pliable branches help it survive undamaged when other plants fall on it.

However, we knew that there is one major potential downside to having low-lignin, bendy branches: increased vulnerability to water stress. The lignin that makes stems stiff also makes the individual cells within the wood stiffer, helping them to continue functioning while water stress increases. We worried that eastern leatherwood's bendy strategy might make it vulnerable to drought, so we used a method called a "bench dry" to figure out how resistant its stems are to water stress. Essentially, we let stems dry out to varying levels while sitting out on the lab bench (hence the name, "bench dry"). Then, we took these stems and used tubing and gravity to try to push water through them. Stems that were damaged by the water stress couldn't transport as much water, and the more water stress they experienced, the less water they were able to transport. In nature, this loss of water movement can be deadly, because leaves rely on the stems continuing to supply water to them. We were relieved to find that eastern leatherwood is able to keep its wood functional at levels of water stress quite a bit higher than we measured on campus throughout the summer, likely because it keeps its water-conducting cells small and sturdy (Cole et al., 2023). While I would still worry about eastern leatherwood during moderate to severe droughts, it isn't nearly as vulnerable as I thought it would be based on its wood composition.

Every year when our graduating biology majors list their favorite organisms during our senior brunch, usually one or two of them name eastern leatherwood, and I quite agree with them. It may be a shrub that is easy to walk by without noticing, but its bendy and surprisingly drought-resistant stems allow it to thrive in the forest understory, even when much larger plants take a tumble.

Figure 2. A large eastern leatherwood stem (emerging from the right-hand side of the foreground, with smooth but lightly speckled bark) bends around a partly fallen dead tree (the trunk with rough bark that is beginning to flake off). Image courtesy Kate Cary.

Figure 3. A forked eastern leatherwood stem curves around a large, cut trunk that had rolled partly on top of it. Image courtesy of Kate Cary.

References:

- Cole, A., Rigdon, K. M., Brown, D. G., & Cary, K. L. (2023). Ecophysiological implications of low lignin in eastern leatherwood (*Dirca palustris* L.). ***The Journal of the Torrey Botanical Society***, https://doi.org/ 0.3159/TORREY-D-22-00014.1.

- Mottiar, Y., Gierlinger, N., Jeremic, D., Master, E. R., & Mansfield, S. D. (2020). Atypical lignification in eastern leatherwood (*Dirca palustris*). ***New Phytologist***, 226(3), 704-713. https://doi.org/10.1111/nph.16394

Preserving Central Minnesota's Botanical Legacy: the St. Cloud State University Herbarium

by Angela McDonnell *(St. Cloud State University)*

Nestled on the campus of St. Cloud State University, within the Wick Science Building, on the second floor, and amongst Biology offices and classrooms, the SCSU Herbarium is a quiet and growing hub of botanical information, research, and education. This fall, we are celebrating the addition of the 20,000th accessioned specimen to the collection (**Fig. 4**) and through courses such as Field Botany, sets of exchanged specimens between herbaria, and ongoing research projects, the collection is poised to grow in the coming years. Because most of the specimens are from central Minnesota, the collection itself is an archive is a vital resource for understanding the plants of the region (**Fig. 5**).

The herbarium was founded sometime in the late 19th century and includes specimens dating back to the 1880's, shortly after the time the city of St. Cloud was established in 1856. The oldest specimens include a historical contribution from the Reverend E.V. Campbell. Other important contributions have been made over the years by Dr. Lester Lindstrom, Dr. Max Partch, Dr. Gerald Wheeler, and many other SCSU faculty, students, and collaborators. Each specimen is more than just a dried plant; these are snapshots (sometimes blurry, sometimes very clear) of botanical and ecological history. Each specimen is accompanied by details including information about the locality or site on which it was collected, the name of collector and their notes, the date, and often some information about the reason it was collected. Altogether, the collection forms a detailed picture of Minnesota's botanical past and present.

Figure 4. The 20,000th specimen accessioned at the SCSU herbarium is ostrich fern (Matteuccia struthiopteris var. pensylvanica) collected during the Field Botany course in the fall of 2024. Follow us on Instagram to hear more about our upcoming celebration of this milestone. Image courtesy Angela McDonnell.

The herbarium itself supports a wide range of scientific inquiry, from floristics and taxonomy to phenology and climate change research. Data held within the cabinets will undoubtedly play a critical role in documenting shifts in plant distributions over time, the spread of invasive species, and the

status of rare plants. As such, it is an indispensable tool for conservationists, ecologists, and educators alike.

Under our stewardship, the herbarium has been experiencing a renovation of sorts. In preparation for digitization, student curators have applied unique barcodes to each specimen. We are in the early stages of capturing high-resolution images (**Fig. 6**) which will eventually make the collection accessible through platforms like the *Minnesota Biodiversity Atlas*. Our work not only preserves fragile specimens but also democratizes access to data, enabling anyone to explore the troves of information that have been and are still available only to in-person visitors.

The herbarium is a training ground for students and future botanists of all kinds. Students gain hands-on experience in specimen curation and care, data management, field collection, and museum management, which fosters a deeper appreciation for native plants and history. As of last year, there are more than 3,500 registered active herbaria in the world. There is little doubt that some answers to our biodiversity crises lie in the hands of people adept in analyzing data from museums, including herbaria.

You can follow the SCSU herbarium on Instagram (@scl_herbarium) to receive updates on our projects and progress. The herbarium has a backlog of thousands of specimens to add to the cabinets, just waiting to be processed and filed. If you are local to the St. Cloud area, passionate about plants, biodiversity, or conservation, and want to learn about helping us with various curatorial tasks, your time can make a meaningful impact. To get involved, contact Angela McDonnell at angela.mcdonnell@stcloudstate.edu. In a time of rapid environmental change, herbaria such as ours can remind us of the importance of preserving and studying our local natural world, one specimen at a time.

Figure 5. (right) This photo shows one side of the herbarium, with rows of cabinets that contain most of the collection and part of the botanical library. The other side of the herbarium features work spaces, cabinets of specimens that are being processed, and additional cabinets that contain the rest of the collection. Image courtesy Angela McDonnell.

Figure 6. (left) Students at our current digitization station work on adjusting settings to capture an image. Image courtesy Angela McDonnell.

Minnesota Wildflowers Plant of the Month: *Rubus ithacanus*

by ***Katy Chayka, MN Wildflowers (www.mnwildflowers.org)***

Family: Rosaceae (rose)
Common names: Ithaca blackberry, Ithaca dewberry
Life cycle Perennial
Plant height: 1 to 4 feet (*before arching over*)
Bloom season: June
Habitat: Sun to shade; dry to moist sandy soil; open woods, woodland edges, savanna

Plant Description

Flowers: Clusters of 5 to 15+ flowers on lateral shoots along 1-year-old stems, the cluster shape variable, sometimes a single raceme at the tip of the shoot, sometimes ascendate with single flowers or small clusters from leafy nodes below the terminal cluster, rarely in a flattish/convex cluster (corymb). Flowers are white, 1 to ~1½ inches (2.5 to 4 cm) across with 5 rounded petals. In the center is a green cluster of many styles surrounded by a ring of numerous, creamy white-tipped stamens.

Cupping the flower are 5 green sepals, mostly triangular, the tip typically abruptly narrowed with a tail-like extension, the outer surface moderately to densely covered in a mix of glandular and non-glandular hairs. Flower stalks are similarly hairy, and sometimes have a few needle-like prickles.

Leaves and stem: Leaves are alternate and palmately compound, the non-flowering first-year stems (primocanes) with 5 leaflets or sometimes 3 on the lower stem, the flowering second-year stems (floricanes) with mostly 3 leaflets. Leaflets are elliptic to egg-shaped, sharply toothed or double-toothed around the edges, sparsely hairy on the upper surface, moderately to velvety hairy on the lower. The terminal leaflet on primocanes is 3 to 5½ inches (8 to 14 cm) long, up to 3½ inches (6 to 9 cm) wide, widest at the middle or towards the base, rounded to slightly heart-shaped at the base, abruptly tapered to an extended or tail-like tip. Leaflet stalks are variably covered in a mix of glandular and non-glandular hairs, and scattered broad-based, curved prickles. At the base of the compound leaf stalk is a pair of linear to lance-linear appendages (stipules).

Prickles are up to about ¼ inch (2 to 5 mm) long, broad-based, straight to slightly curved, very strong and sharp, and sparsely to moderately abundant but unevenly spaced along the stem. Primocanes usually have at least a few glandular hairs scattered along the stem, sometimes just near the tip. Stems are up to 9 feet (to 3 m) long, green to dark red or purple, initially erect, soon arching over and the tips trailing along the ground. Arching stems tend to fall over each other and form a dense, tangled mound, and some trailing stems will take root at the tip. Stems die the second year after fruit matures. Colonies may form from root suckering and tip-rooting.

Fruit: Fruit is a round to short-cylindric cluster of fleshy drupelets, up to about ½ inch (8 to 15 mm) long, maturing from green to red to black, and are quite tasty.

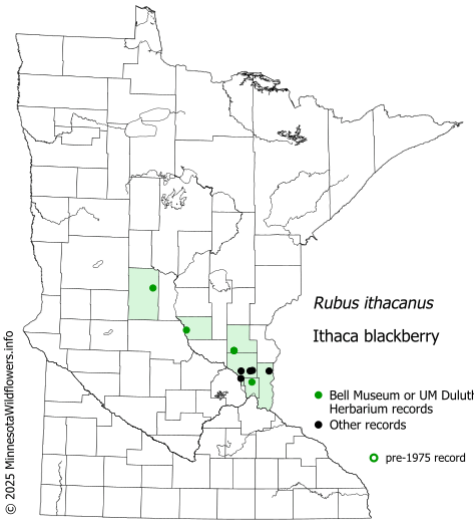
Notes

Rubus ithacanus is uncommon in Minnesota, where it reaches the northwestern tip of its range. Not a lot is known about its history here, except it appears to have a preference for sandy soil and habitats where it can get at least some sun, rather than constant shade. In Minnesota, it's mostly been found in or near woodlands dominated by oaks.

It is identified by the combination of: glandular hairs on sepals and flower stalks, usually some also on primocane stems and leaf stalks; prickles are broad-based, straight to slightly curved, 2 to 5 mm long, very strong and painful(!); lower leaf surface is usually velvety hairy; the flower cluster is variable in shape (raceme or ascendate, rarely a corymb) with 5 to 15+ flowers. Primocane leaves mostly have 5 leaflets, the terminal leaflet elliptic to egg-shaped, its base rounded to somewhat heart-shaped. Canes can reach 9 feet in length but arch over anywhere between ankle and waist height, resulting in a tangled, mounding colony, the tips usually trailing along the ground, some canes rooting at the tip.

The tip-rooting technically makes this species a Dewberry rather than a Blackberry. When trailing canes and tip-rooting are not obvious (as is the case earlier in the season), the glandular hairs and broad-based prickles could easily confuse this with one of the High-bush Blackberries, *R. allegheniensis* in particular (someone once described *R. ithacanus* as looking like *R. allegheniensis* that's been knocked to the ground), but the latter typically grows taller before arching over, its flower/fruit cluster is consistently a narrow raceme, and of course its canes do not trail along the ground or tip-root.

In many references *R. ithacanus* is lumped with *Rubus flagellaris*, along with other MN species *R. ferrofluvius*, *R. heterophyllus*, *R. multifer*, *R. satis*, and *R. steelei*, but we follow the treatments by Mark Widrlechner and documented by Welby Smith in his book "*Trees and Shrubs of Minnesota*", which keeps them split as separate species. *R. flagellaris* is apparently a dumping ground for dewberries that have broad-based prickles and stems that trail along the ground, rooting at the tips, but other characteristics can be rather variable. Most similar from this group is *R. satis*. Both have velvety leaves, but *R. satis* has smaller, less numerous (and less painful) prickles, lacks any glandular hairs, and its flower/fruit clusters are smaller and more compact, usually a flattish/convex cluster (corymb). I've also observed the *R. satis* leaflet stalks are typically quite short and leaflets seem to be more irregularly toothed compared to *R. ithacanus*, though that isn't noted in any references and may not be consistent characteristics.



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- Photos by Katy Chayka taken in Anoka County.
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- More images available at https://www.minnesotawildflowers.info/shrub/ithaca-blackberry

Notes from the Herbarium

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

As of September 2025, the Bell Museum Herbarium has 207,127 specimens collected in Minnesota. These specimens represent at least 1,941 taxa (species, subspecies, and varieties) that are considered native to the State and 433 that have been introduced following European Settlement.

To put this level of diversity into perspective, the most botanically diverse state, California, has 5,418 native taxa (according to NatureServe) and the least diverse (North Dakota) has 1,201. Much of this range is accounted for by the size of the state. However, that's not the only explanation. For example, Alaska, the largest State, has one of the lowest species tallies (1,354). Clearly, latitude and climate are also important factors in determining species diversity because not many plants can tolerate very cold winter temperatures.

Diversity of habitats is also vital. In addition to a generally temperate climate, California has mountains, deserts, coastal, and forest habitats. This means more opportunities for a wider range of plants to grow and thrive. Minnesota also has a good range of habitats (prairie, deciduous forest, coniferous forests, lakes, and plenty of wetlands) so we end up with more plant species than our latitude might predict. It's often assumed that Hawaii might be the most diverse state because of its tropical climate. However, it is small and geographically isolated so not many plants have even made it there. As a result, it sits just one place above North Dakota in the rankings with 1,249 native species.

Returning to the specimens at the Bell Herbarium: our oldest Minnesota specimen was collected in 1832 and the most recent was in 2025. **Figure 7** shows the number of specimens in the Bell Museum Herbarium by decade. Interestingly, we have a fairly consistent representation of collections through the decades (with peaks and valleys) and plenty of specimens from the late 20th and early 21st centuries. This is important for comparing past and present patterns of diversity and also for assessing environmental change. For this, we can thank the Minnesota Department of Natural Resources and, in particular, the ongoing efforts of the many botanists and ecologists working for the Minnesota Biological Survey.

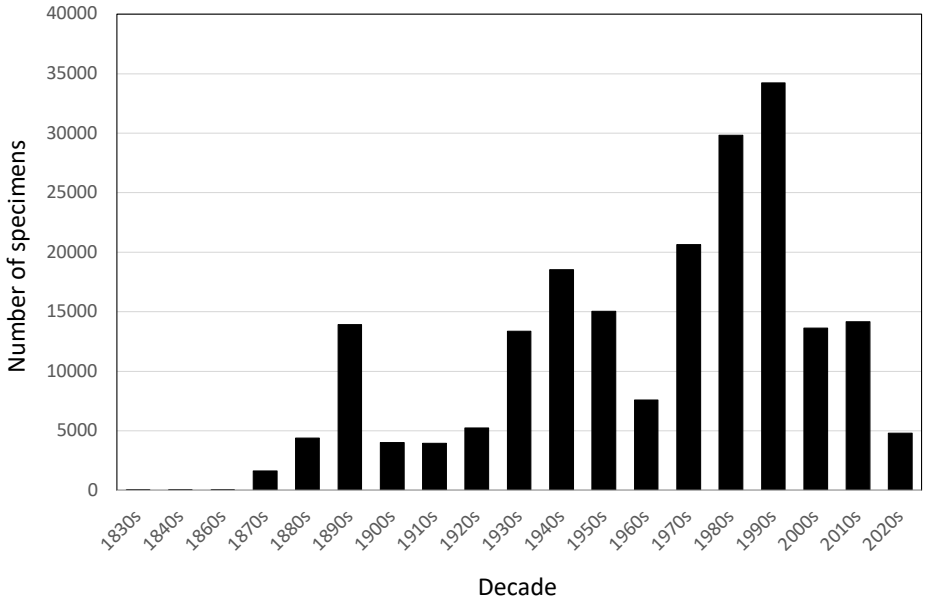

Figure 7. Number of specimens in the Bell Museum Herbarium by decade. Image courtesy Tim Whitfeld.

The Survey started in the 1980s and a peak in collections at that time is clear on the graph. Many other herbarium collections lack representation from recent decades, which hampers their ability to compare past and present diversity and understand local botanical and ecological change.

In addition to the relatively consistent temporal coverage, the Bell Museum's Minnesota collection includes the entire state and **Figure 8** shows the number of specimens per county, with darker colors representing higher numbers.

It's clear that the number of specimens in a county is partly a result of the size of the county (note, Saint Louis County) but there's also a geographic bias. The Metro area (smaller counties but home base for many botanists) has a disproportionally high number of specimens. The Arrowhead region and the southeastern part of the State are also heavily collected because these are known hotspots that botanists have targeted over the years. This "collection bias" is an important factor when using specimens to assess levels of biodiversity.

Botanical collectors tend to favor charismatic wildflowers over hard-to-identify grasses and sedges. They're also inclined to collect in more accessible areas close to roads, trails, and the comforts of home. As a result, there tends to be more specimens from these taxonomic groups and areas. More specimens nearly always lead to more species being represented so these biases must be taken into account when comparing biodiversity from one region to another. Interestingly, if we plotted a map of Minnesota with the number of species per county, it would look almost identical to the map of specimens per county. Again, more specimens equal more species!

We continue to collect specimens to fill in gaps and balance past biases. It's hard (but exciting) to get off the beaten path and collect uncharismatic and hard to identify sedges or grasses. But we do our best because it's important all species (not just the showy ones) and all regions (not just the accessible areas) are well represented in our collection. Over the coming years, we'll continue to boost our Minnesota collections to ensure we're providing data from the early 21st century for future researchers and to continue the legacy of past collectors over the past two centuries.

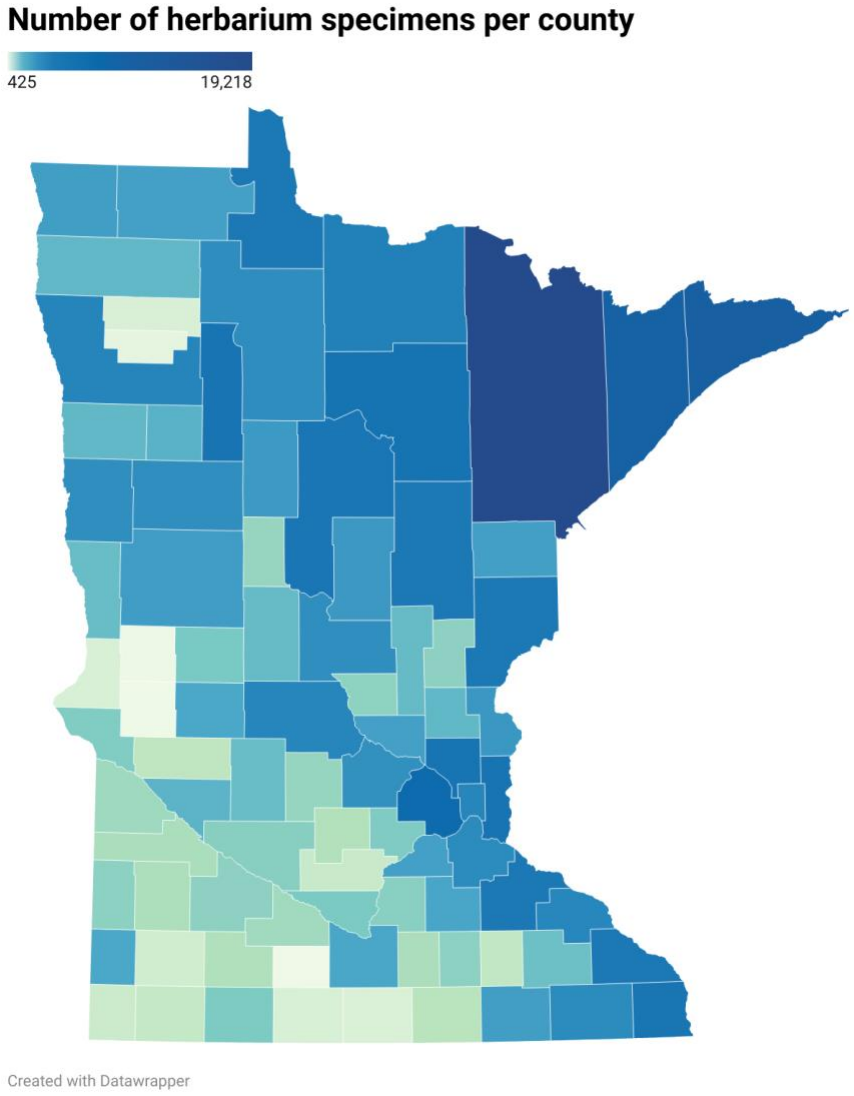

Figure 8. Number of specimens in the Bell Museum by Minnesota county. Image courtesy Tim Whitfeld.

Destination Botany: SNAs A-Z

*by **Kelly Randall** (Statewide Outreach Consultant, Scientific and Natural Areas Unit, MN DNR)*

Occasionally I am asked "What it your favorite Scientific and Natural Area (SNA)?", which is a difficult question for me to answer. I have been to almost all Minnesota's 170 SNAs in my 30+ year career with the Department of Natural Resources. Each has its own story and reason why it could be a favorite. Ok, maybe some more so than others.

When asked to write this Destination Botany story that question reared-up in my mind again. Should I try to pick a "favorite" SNA? How do I choose one site to recommend?

I decided to go outside the box and choose SNAs from A to Z, or more precisely A and Z: Agassiz Dunes and Zumbro Falls Woods SNAs. And yes, like a doting parent with more than one child—you might have guessed this would happen—I couldn't choose just one!

A final note before I dig into these sites. I consider myself better suited for a story on Destination Photography, rather than botany. My knowledge of Minnesota's native plants comes from some formal biology training, but mostly a great love of plants. I am by no means an expert. Okay, now on to the destinations.

Figure 10. Bur oak at Agassiz Dunes SNA. Image courtesy Kelly Randall.

First up is Agassiz Dunes SNA. This natural area straddles Norman and Polk County in the northwestern region of the state. The complete picture of protected lands here goes beyond the SNA's 458 acres. An adjacent DNR Native Prairie Bank conservation easement on private land and a Nature Conservancy registry site more than doubles that figure. Another 640 neighboring acres is owned and managed by the City of Fertile as the Agassiz Environmental Learning Center. All that is to say there is a very large complex of interwoven native plant communities here worth visiting, from dry sand prairie to dry barrens oak savanna to bur oak-aspen forest.

Figure 9. Creeping juniper (left) and green milkweed at Agassiz Dunes SNA. Image courtesy Kelly Randall.

What caught my photographer's eye in exploring Agassiz Dunes SNA? Firstly, the gnarly open-grown bur oak (*Quercus macrocarpa*; **Fig 10**), then the creeping juniper (*Juniperus horizontalis*) which is a species of special concern in Minnesota (**Fig 9**.). Summertime eye-catching color comes in shades of wood lily (*Lilium philadelphicum*), narrow-leaved puccoon (*Litho-spermum incisum*) green milkweed (*Asclepias viridiflora*), slender beard tongue (*Penstemon gracilis*) and harebell (*Campanula rotundifolia*). For a curious botanist

the complete plant list gives a full spectrum of the species you may find, including the rare and interesting.

On to Zumbro Falls Woods SNA! Find this "favorite" in the blufflands of southeastern Minnesota next to the town of Zumbro Falls. Like Agassiz Dunes, this SNA is a straddler too, but it's the Zumbro River that passes through the heart of this SNA. Along the river sheer cliffs expose the bedrock of sandstone/dolomite. This bedrock also forms the hilly topography that supports southern mesic hardwood forest here.

These types of forests call to me in spring to photograph the swaths of ephemerals blooming in all their glory. You can find all those you might expect to see at Zumbro Falls Woods SNA; Jack-in-the-pulpit (*Arisaema triphyllum*), wild ginger (*Asarum canadense*), dutchman's breeches (*Dicentra cucullaria*; **Fig. 12**), wild geranium (*Geranium maculatum*), Virginia bluebells (*Mertensia virginica*; **Fig. 11**), bloodroot (*Sanguinaria canadensis*) and large-flowered trillium (*Trillium grandiflorum*) among others.

Figure 11. Jeweled shooting star (left) and Virginia bluebells at Zumbro Woods SNA. Photos © John Gregor/ColdSnap Photography.

Figure 12. Wild geranium (left) and Dutchman's breeches at Zumbro Falls Woods SNA. Photos © John Gregor/ColdSnap Photography.

For a botany buff the lure may likely be jeweled shooting star (*Dodecatheon amethystinum*; **Fig 11**). DNR monitors it as a watchlist species because of its limited geographic range. Yet, here too you'll find a full range of species to explore.

From A-Z there is an SNA destination worthy of a visit for botanists and photographers alike. I hope you find the opportunity to explore your favorite SNA, or somewhere that becomes a favorite. Maybe you have, or will come to have, the difficult task of trying to pick just one. ;)

A Chicken Korma Situation

*by **Stephen Saupe** (MN Native Plant Society, newsletter co-editor)*

"We've got a chicken korma situation," our daughter Erin said as she peeked into Elodie's diaper.

We knew what she meant. Our granddaughter's diaper was overflowing with a creamy, yellowish, chunky paste. It looked just like one of our family's favorite dishes, chicken korma (**Figure 13**).

Perhaps the biggest difference was that Elodie's diaper didn't have the lovely curry aroma you might expect. In fact, there was very little odor at all.

If you have ever had the opportunity to change the diaper of a newborn, you probably noticed the "chicken korma situation," too. Breast-fed infants have rather innocuous diapers, without many solids or odor, that look like this delicious South Asian dish.

This "situation" doesn't last long. As a baby gets older and her diet becomes more varied, the contents of a diaper also change. Now that Elodie has begun solid foods, the "chicken korma situations" have evolved into "beef stew poo-nami's." The advent of solids brings with it nastier diapers with more volume, chunks, and odor.

Figure 13. The author's daughter Erin, and son-in-law James, show Elodie a bowl of chicken korma. Image courtesy Steve Saupe.

Why the change? The simple, or at least simplistic, answer is that an infant initially eats like a plant, but then switches to more animalistic ways. To explain, I'll use an analogy.

When I was a kid, dinnertime at my house was a little like a military mess hall. My dad, who served in the Pacific theater during WWII, adhered to the Marine Corps motto, "take all you want, but eat all you take." This resulted in some squabbles during mealtime, but it also meant that there were no leftovers.

Animals are like a naughty kid at the table who takes more than she can eat. Their food typically includes an assortment of bits – like hair, bone, nails, lignified plant cells – that are indigestible. Animals aren't able to use and digest all they ingest.

As a consequence, animals have a lot of wastes and needed to evolve a digestive tract. The massive amount of waste materials can't be internally stored because it would severely restrict motility, which is required for among other things, to gather food.

From one perspective you can consider an animal driven by its gut and the need to fill it up and get rid

of the excess. One of my favorite quotes comes from Professor Wayne Becker (University of Wisconsin, Madison) who wrote that animals can be viewed "as nothing more than a group of cells clustered around a gastro-intestinal tract, differentiated for and dedicated to the task of keeping that gut full."

In contrast, plants are the good kids at the table. Plants only take up from the environment what they need (carbon dioxide, water, some minerals) and use it to make sugars. Like a good Marine, they take what they need and use what they take.

That's not to say that plants have no wastes. Plants make an assortment of metabolic byproducts.

For example, oxygen is a waste product of photosynthesis. It is 'excreted' from the plant by simply allowing it to diffuse into the air through pores in the leaf (stomata). An assortment of volatiles and other molecules are similarly released into the environment from the leaves, as well as from the roots.

Other wastes, including toxins and secondary metabolites, are in low enough concentration that they can be stored in the central vacuole. This subcellular structure is found in most all plant cells. It is a fluid-filled, membrane sac that makes up about 90% of the cell volume. I think of them like a water balloon that occurs within the plant cell (**Fig. 14**).

The storage of water-soluble wastes in the central vacuole has resulted in some people calling them the cesspool of the cell. Though true, it suggests that the central vacuole is basically just a garbage dump – which is not true. These structures have many other functions and have a vital role in pH regulation, cell growth, and intracellular transport.

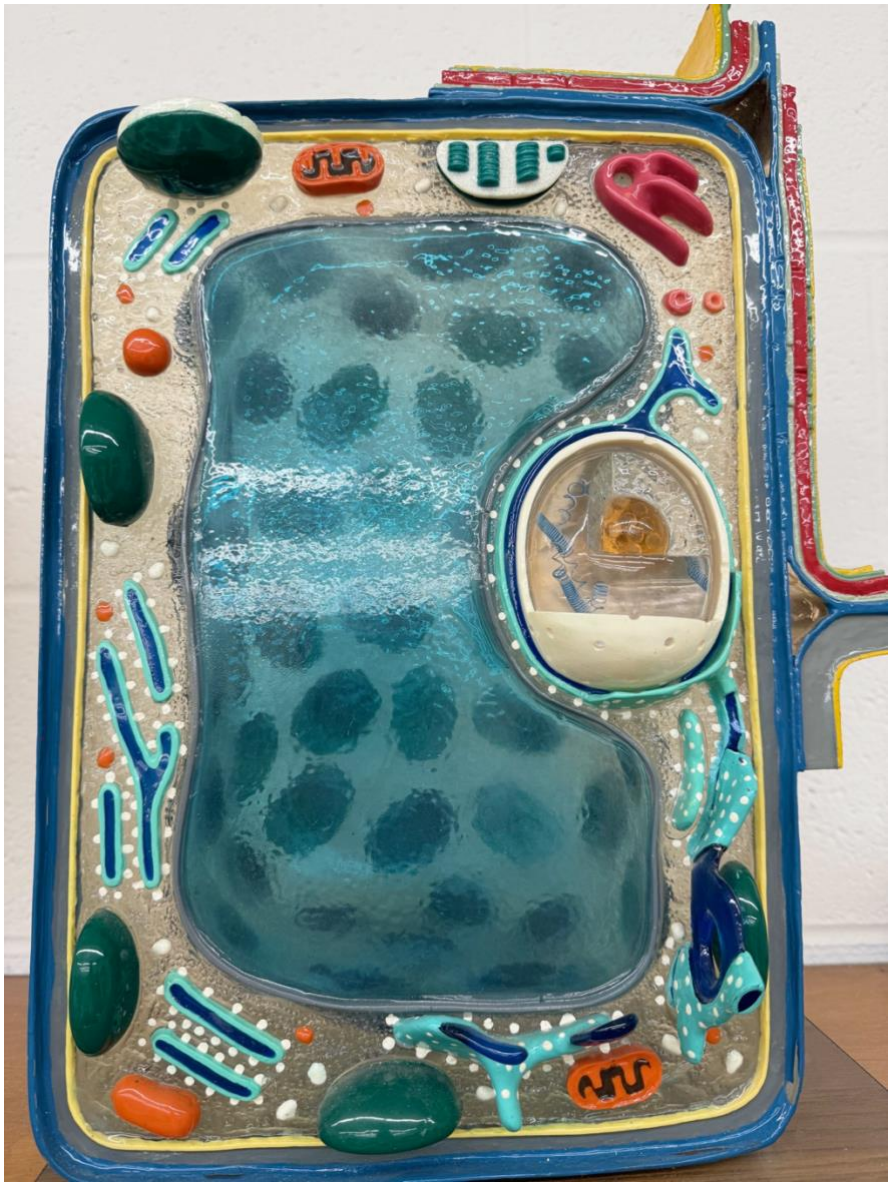

Figure 13. Photograph of a plant cell model. Note the large central vacuole. The cell cytoplasm essentially forms a thin coating around the vacuole. The cell membrane is painted yellow. To the outside of the membrane is the plant cell wall, which is a matrix of assorted molecules including cellulose, pectic polysaccharides, and some protein. The wall serves many roles such as providing support and mechanical strength. As an aside, it has been speculated that the cell wall may have initially evolved as a means to store excess (waste) carbohydrates. Rather than discard the carbohydrates, they were exported out of the cell and used to build the cell wall – a rather brilliant example of turning "straw" into gold.

To summarize, plants release their relatively limited volume of wastes directly into the environment or store them within the cell. Plants, like a US Marine who leaves a clean plate after dinner, have limited wastes and never faced the evolutionary pressure to evolve an excretory system.

Now, back to diapers.

Consider an infant's first food – breast milk. It is comprised largely

of water, lactose, whey (a mixture of soluble proteins including antibodies), casein, fats (mostly triglycerides), vitamins and minerals. Breast milk is an energy-efficient, wonderfully nutritious, and highly digestible food source. As a result, little waste remains after digestion and breast-fed infant diapers fill with a benign chicken korma-like residue.

As we incorporate apple sauce, broccoli, and other solid foods into a baby's diet, the amount of waste increases proportionately. Factor in the development of gut microbiota to help with digestion, and diaper residues become more like beef stew, and not surprisingly, much less pleasant to change.

My Dad, who passed on several years ago, would not have been happy to know that humans and other animals, at their basic level, are disobedient Marines. However, at least he wouldn't have balked too much at changing his great granddaughter's newborn diapers. A chicken korma situation is heaps better than a beef stew poo-nami.

News from *The Plant Press* Vaults

*by **Brian Johnson** (MN Native Plant Society, newsletter co-editor)*

***Editors' note**- This represents a new series of articles for The Plant Press. We will attempt to summarize important events from newsletters of the past, aiming to examine those that are having decade anniversaries. However, there are gaps in publication so that may not always be possible. To read the complete stories, please see the archive of past newsletters on the Minnesota Native Plant Society website: https://mnnps.org/newsletters/.*

Fall 1985

At the May 1985 meeting, MN NPS members were notified that a population of dwarf trout lilies has been destroyed at Nerstrand Woods State Park. Though details were not clearly laid out, this seemed to involve a bulldozing incident carried out by park personnel as part of an improvement project. NPS members responded with calls and letters to the DNR and other authorities. After some back-and-forth between the NPS and the DNR, we ultimately learned through the media that the park manager received a three-day suspension without pay. The author of this story noted that we received assurances that action will be taken to further safeguard the population and that the efforts of the Native Plant Society to protect this plant had some effect.

An upcoming fall seed exchange for MN NPS members was announced. This October event took place on the St. Paul campus of the U of MN. The article went on to suggest the best methods for collecting and storing seeds for this event.

Fall 1995

In an editorial, Thor Kommedahl noted that the US Supreme Court had ruled in June that altering an endangered species habitat had the same effect as harming the species. Thus, such damage can be prohibited by the Endangered Species Act. This was taken as a victory for environmentalists but it was noted that the ESA had not been reauthorized by Congress. Critics of the ESA noted that after the recent eruption of Mount St. Helens life had returned to the ash-filled slopes in as little as four years.

This issue included a compilation of websites that contained information about native plants. It was suggested that members try them "if you have access to the world wide web."

Fall 2005

The lead story discussed the relationship between the lupine (*Lupinus perennis*) and the endangered Karner Blue butterfly. The wild lupine is the only plant eaten by caterpillars of the butterfly, and Minnesota is on the western edge of the butterfly's range. Currently (in 2005) there are two populations in the state, both in the Whitewater WMA in southeastern Minnesota. Formerly there was a population at Cedar Creek in Anoka County, but a bulldozer scraped off the lupine population during a road improvement project. This population vanished in the 1980's. Conservation efforts in Minnesota began in the 90's, primarily through recreating Karner Blue habitat in oak savannas and pine barrens. (Editors' note--according to the DNR's rare species guide, the Karner Blue has likely been extirpated from Minnesota.)

The newsletter noted that a plant identification system on CD ROM is available at a discount to MN NPS members. The tool could be used to identify plants through any of several characteristics.

MN PlantWatch Grows Like a Weed

*by **Deanna Leigh** (MN DNR)*

In 2023 when I first started as Community Science Coordinator for the Minnesota Biological Survey, I knew my responsibilities would include recruiting and retaining volunteers for the newly minted MN PlantWatch program (**Fig. 14**). I imagined my winters would be spent traveling throughout the state, attending conferences, visiting colleges and the like, to promote the program and win people over to the obscure world of rare plants. I thought that recruiting enough people to support a viable volunteer program would be one of my biggest challenges. As it turns out, I was completely mistaken. In our first season, we worked with 19 volunteers. In 2024, that number increased to 66 and this past summer, we pushed the envelope to 117 trained volunteers (**Fig's. 16** & **17**). In March when registration for our 2025 field trainings went live, the 50 available spots filled up in *18 minutes*. My visions of winter travels? They were the part of the program that wasn't viable. Kudos to Minnesotans (and a few Cheeseheads!), you express an undeniable devotion to rare native plants. I am continually inspired by the collective knowledge and passion that is shared amongst our community members.

For anyone unfamiliar with MN PlantWatch, it is a cooperative program run by the Minnesota DNR and the University of Minnesota Landscape Arboretum and funded by the Environment and Natural Resources Trust Fund. We train volunteers to search and survey for rare plants throughout the state (**Fig. 15**) and to collect seed for conservation seed-banking (**Fig. 18**). This type of volunteer work is often called community science or participatory science, where people from all walks of life are encouraged to take part in real-world data collection and scientific inquiry. In a time when many organizations struggle to retain volunteers, it has been an absolute privilege to see the genuine interest from the public and to watch our numbers grow.

Figure 14. A rare sighting of all four MN PlantWatch staff together as they search for the even rarer Malaxis paludosa, bog adder's mouth in Cass County. From left to right: Angie Miner (UMLA Conservation Botanist), Malcolm MacFarlane (UMLA Field Botanist), Deanna Leigh (DNR Community Science Coordinator, and Ann Schacher (MN PLantWatch Assistant with the Conservation Corps of Minnesota and Iowa. Image courtesy Deanna Leigh.

Figure 15. PlantWatch volunteers practice flagging and counting plants during field training at Jay Cooke State Park, May 2025. Image courtesy Deanna Leigh.

In 2025, we visited more than 60 sites, documented over 29,000 plants and enjoyed countless hours outdoors honing our botany skills. We may be entering the season of apparent dormancy, but just like plants, our work continues behind the scenes to ensure our growth into the future.

Figure 16. (left) Newly trained volunteers pose at Springbrook Nature Center, May 2025. Image courtesy Deanna Leigh.

Figure 17. (right) Volunteers take lunch under old-growth white cedars while searching for Pyrola minor, small shinleaf, in Carlton County, July 2025. Image courtesy Deanna Leigh.

Figure 18. (from left) Newsletter co-editors Steve Saupe & Brian Johnson join Kristina Bloomquist on a seed collecting expedition. Image courtesy S. Saupe.

MINNESOTA NATIVE PLANT SOCIETY
P.O. Box 16257, St. Paul, MN 55116
www.mnnps.org

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