WILD ONES JOURNAL
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WILD ONES®

A VOICE FOR THE NATURAL LANDSCAPING MOVEMENT

Photo Credit: David Silsbee

Grateful for Autumn

By Barbara A. Schmitz

Thank goodness it's finally fall. With cooler temperatures, and leaves turning yellow, red and orange, it's one of my favorite times of the year to be outdoors.

If you're spending time outdoors this season, it's a great opportunity to collect native seeds. Not sure what to do with those seeds or running out of space in your own yard? Consider working with your chapter to steward a Wild Ones-sponsored seed library. Chapter leaders can support the effort by organizing volunteers, coordinating seed donations and ensuring best practices. Learn how Wild Ones chapters have launched successful seed libraries and expanded their community impact on Page 24 —empowering more people to grow native and join the movement.

Fall is also the perfect time to conduct a planned burn. Learn from Nicole Riendeau on Page 14 what she learned about the process as she completed her native plant certification course from the Wild Ones Root River (Wisconsin) Chapter. It's also a good time to battle any buckthorn you may have on your property; see Page 45 to learn more about this invasive species.

Of course, Halloween also is celebrated each fall, so it's the perfect time to learn how you could create a moon garden for bats on Page 33. Thankfully, author Courtney Downing explains that it isn't too difficult as much of what you do for day time insects will work for night foragers, too.

On the light side, learn how you can take the Soil your Undies Challenge — really, it involves a pair of men's cotton briefs! — to determine the amount of life in your soil on Page 4.

One of the most important stories in this issue, however, has nothing to do with seasons. On Page 7, Nancy Lawton introduces us to two landowners who successfully mounted defenses when home insurers threatened to cancel policies, due in part to their native plant gardens. Learn what you need to do if your insurance company tries to drop your policy, too.

I thought one of the most interesting stories in this issue was on Ma's, Montana's original plant-based food on Page 19. The tuber *Pediomelum esculentum*, from the legume (Fabaceae) family, was widely harvested on the northern Great Plains before interaction with Europeans or Americans. Native to the region, it once grew all across the prairies in (what is now) central and eastern Montana.

Of course, there's more: book reviews on Page 37, research that shows how temperature changes due to climate change destabilize animal populations on Page 17, botanical gardens in Southern Florida on Page 39, and more.

So, enjoy your time outdoors this fall, but when you come indoors, take the time to read this issue. And if you have ideas for future stories, please reach out to me at journal@wildones.org.

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Learning About SOIL

THIRD IN A 4-PART SERIES

Is your soil full of life? Soil your undies to find out!

By Janet Allen

In addition to knowing your soil's chemical and physical properties, it's good to know its biological properties. One teaspoon of *healthy* soil is full of life, containing tiny organisms and more microbes than there are people on the planet! Plants grow better in healthy soil, and it provides many other ecological benefits.

How does your soil stack up?

There's an easy way to find out: Take the Soil Your Undies Challenge! This USDA project launched in 2018 to raise interest in soil health, and it has since spread around the country and beyond.

Here's how

1. In late spring, bury a pair of cotton undies horizontally under about 3 inches of soil. Generally, a pair of men's cotton briefs with an elastic waistband is used. Mark the spot.
2. Wait two months, then dig them up.
3. The amount of the cotton briefs remaining is inversely related to the amount of life in the soil — the more life, the less of your undies remains.

Your results

If only the elastic waistband and the outline of the undies remain, it shows that your soil is full of life. Keep doing what you're doing.

If your undies are still fairly intact, it's time to improve the biological health of your soil. Avoid using pesticides and herbicides, add organic matter such as compost, cover the ground with native plants, and leave the leaves. When you Soil Your Undies again in a few years, you'll likely find that less of your undies remain!

Here's more information from a few of the many sites describing the challenge:

Pennsylvania Soil Health Commission: https://www.pasoilhealth.org/soilyourundies/

Bedford 2030: https://bedford2030.org/soil-your-undies/ (includes a short video)

Janet Allen is president and co-founder of the Wild Ones Habitat Gardening in Central New York Chapter and a speaker on native gardening. Check out her website at www.ourhabitatgarden.org.

PLANTS THAT FILL THE GAPS

Unplanted ground is an invitation for something to grow there.

Often, what grows is a plant we don't want. In new plantings, space exists between plants until they have matured, even if you're planting densely. In established plantings, disturbance creates openings. Whatever the reason, leaving gaps increases weed pressure and your garden workload. It also makes it tempting to fill in with mulch, which adds minimal ecological benefits. Plants are the best way to fill gaps.

Conoclinium coelestinum (blue mistflower) will occupy space quickly and spread where there's open ground, making it difficult for unwelcome species to establish.

Part of the solution lies in using plants whose survival strategies give them an edge when there's open space. Often referred to as dynamic fillers, these plants fill gaps quickly, reducing weed pressure and the need for mulching down the line. They're also an opportunity to give plantings a visual boost until slower-maturing species fill the space.

Many of the best fillers have ruderal tendencies. They've evolved to thrive in disturbed environments and can take advantage of temporarily favorable conditions. They're typically short-lived and produce copious amounts of seed. Over time, as other species enter the picture and shade them out, these species may be outcompeted. Yet, their seed lies dormant, waiting for disturbance to provide another opportunity.

To learn more about using dynamic fillers, what makes a good filler, and to see examples, read our post, Plants That Fill the Gaps.

All photos courtesy Theresa Berrie

A growing concern?

When insurers threatened to cancel policies of these native plant gardeners, they mounted successful defenses

By Nancy Lawson

The welcome committee at Theresa Berrie's home beguiles visitors from the moment they step off the road. First among the greeters are the vibrant faces of black-eyed Susans (*Rudbeckia hirta*), coneflowers (*Echinacea* spp.) and phloxes (*Phlox* spp.) abuzz with native bees. Virginia creeper (*Parthenocissus quinquefolia*), grapevines (*Vitis* spp.) and a magnolia (*Magnolia* sp.) overhang a path lined with ostrich ferns (*Matteuccia struthiopteris*), beckoning friends toward a bench and a lush edible garden. In front of a trellis covered in honeysuckle (*Lonicera* sp.), a wildlife pond filled with arrowhead (*Syngonium* spp.) and common duckweed (*Lemna minor*) thrums with green frogs and dragonflies. Orioles, hawks, deer, groundhogs, squirrels and hummingbirds have all made themselves at home on this thriving 1/5-acre lot amid a sea of lawns.

"People walk into it and just have this reaction like they've gone into the middle of the woods or a different world," says Theresa, a master naturalist and permaculture gardener who has nurtured habitat on this little patch in Ridgeway, Wisconsin, with her partner, who goes by Bear, for 20 years.

But that feeling of escape from concrete and turf-covered modernity was apparently too different for an insurance company representative who showed up unannounced last summer. Not long after he walked around the property taking photos, the Berries received a letter informing them of cancellation.

The front yard of the Berrie home. Filled with native plants, Theresa was able to prove to her insurance company that the native plants were planned and maintained.

"The overgrown vegetation on the dwelling and premises presents an increased exposure to loss and makes the policy ineligible," the notice read.

The Berries had signed up with the company less than 3 months before, after their previous home insurer raised its standard rates. "I had absolutely no inkling that anything was wrong or that there was even a possibility that something could change," says Theresa. "It was just

kind of horrifying to suddenly get a letter with no warning and to feel like you had no recourse."

Making the case

By the time Theresa emailed me to ask for help, we'd been acquainted for a year, after I'd written an article highlighting her book, "How to Build a Backyard Wildlife Pond" (which I highly recommend!). Oddly, in the intervening months, I'd already heard about two other homeowners, including a native plant greenhouse manager in Michigan, in danger of losing their home insurance because of their gardens.

Cindi Martineau of Designs by Nature had also recently switched insurance companies to save money. When a letter arrived in summer 2023, she, too, felt blindsided. Her new company had two demands: replace the roof of her Lansing home and "clean up" the "overgrown yard." Cindi ceded to the first one but pushed back on the second. Unlike Theresa, she was given an explicit chance to respond.

Describing the purpose of the garden as an intentional wildlife habitat, she highlighted the seasonal dynamics of native plant gardens: In early spring and summer, the plants are shorter, she explained, but the insurance representative had visited when the garden was past its peak, with tall plants flopping over after recent winds and rains. But that didn't mean the garden wasn't cared for.

"We spend dozens of hours planting, weeding, thinning every year," Cindi wrote. " … We do plan to continue treating the yard as a wildlife conservation area with conscientious care and maintenance as it does not place the property in any danger."

Forging a compromise

In the end, Cindi's response was sufficient, and her insurance policy remained intact. Her approach also inspired Theresa to defend her garden.

A bird nest in Virginia creeper (*Parthenocissus quinquefolia*) overhangs a path on the Berrie property.

"I'm not a person who can stand up to institutions and fight them; that's a really scary thing for me," Theresa says. "So, I didn't feel like I had any power at all against a big insurance company. Only knowing that someone else had done it and that it had worked made me brave enough to at least try."

It took repeated calls to a faceless 800 number to learn more. An agent pulled up the underwriter's report, took a look at the photos, and concluded that the native vines intentionally cultivated on and near the house had likely triggered the cancellation notice. Grapevines grew on a trellis and on some hooks the Berries had installed over a window, providing food as well as nesting habitat and tree frog perches. The leaves gave the window the look of stained

Ferns grow in this alley on the Berrie property. Vines can still be seen on the house to the left.

The Berrie pond in spring 2024 is filled with arrowhead (*Syngonium* spp.) and common duckweed (*Lemna minor*).

glass from the inside. Virginia creeper had also been growing for 15 years, helping the Berries retain a feeling of privacy and a woodland atmosphere. Often mistaken for structure-damaging English ivy, the native vine doesn't pull down walls or trees; its worst offense is leaving suction-cup marks after removal.

To save their policy, the Berries took down the vines and removed some tree limbs touching the roof—something they'd planned to do anyway. Theresa wrote a letter and attached "after" photos showing that the integrity of the structure hadn't been compromised.

"Our yard is not overgrown," she concluded. "It is a planned garden that we have been working hard to create for almost 20 years and does not present a danger to our home. It is a permaculture garden that produces food and medicinal herbs for us."

She described their wildlife habitat, adding that "the success of our efforts is shown in the fact that we've had a verified sighting of the federally endangered rusty patched bumblebee in our yard."

Four days later, the Berries received a letter asking them to disregard the previous cancellation notice and apologizing for the inconvenience.

A cultural problem

The sudden appearance of cases like the Berries' in my in box and social media feeds made me worry that native plant gardens were coming under new scrutiny from insurers. But it seems more likely that attitudes from insurance agents are simply a reflection of the broader cultural tendency to equate turfless yards — no matter how beautiful or well-cared-for— with neglect. Though the movement to rewild residential lands is ever-growing, natural landscapes are still far from the norm.

Ironically, when sited and planted appropriately, disaster-related damage that insurers try to avert can be mitigated by the very plants they sometimes eschew. Well-rooted native plants are one of our best hopes for slowing stormwater, filtering pollutants and minimizing erosion. In drought- and wildfire-prone regions like California, native species like toyon (*Heteromeles arbutifolia*) can hinder mudslides, and coast live oak (*Quercus agrifolia*) and coyote brush (*Baccharis pilularis*), if hydrated, can help to block or diffuse embers.

In researching this topic, I found articles on insurance company websites extolling the virtues of native plants for preventing flooding, helping pollinators and beautifying homes. But it was difficult to locate industry professionals interested in speaking to these concepts more specifically.

However, Theresa Berrie and Cindi Martineau's experiences show how important it is to follow up and question assumptions; their persistence was key to saving both their insurance policies and their gardens. To guard against future problems, Cindi also posted habitat signs explaining her garden's purpose. And if she has to switch insurance companies again, she says, she'll do it in the spring or winter, just after she has trimmed back her plants.

Nancy Lawson is a nature writer, founder of The Humane Gardener and a Wild Ones member in Maryland.

Not all native bees affected equally by urban honeybees, study finds

Fall blooming plants could aid vulnerable ground-nesting species

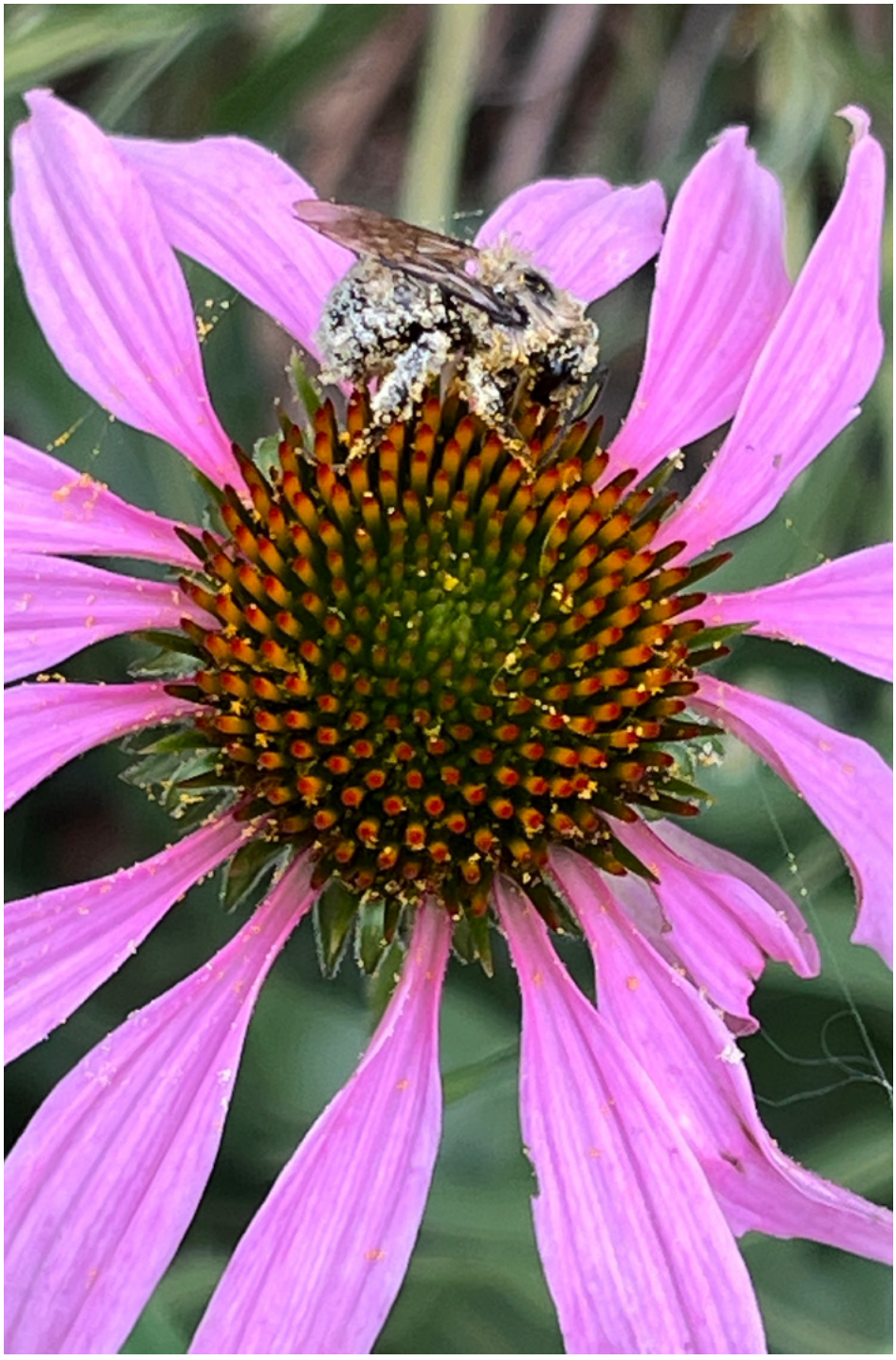
By Katie Bohn

There are approximately 4,000 native bee species in the United States contributing to pollination in agricultural, urban and natural landscapes. Honeybees, however, are not native to the U.S., which has led to concerns that managed honeybee populations might negatively impact wild bees via competition for resources and sharing of pathogens, according to researchers at Penn State. However, the team recently found that of the 33 genera of native bees studied, only a small number seemed to be negatively affected by the presence of honeybees.

The study, the largest of its kind, is available online at https://doi.org/10.1016/j.scitotenv.2024.175783, and appeared in the November 2024 issue of *Science of The Total Environment*.

The findings will help identify the groups of bees that may be most at-risk and aid in creating conservation strategies, according to Gabriela Quinlan, lead author on the study and a U.S. National Science Foundation (NSF) postdoctoral research fellow in Penn State's Center for Pollinator Research and the College of Agricultural Sciences.

The researchers found that the presence of managed honeybee apiaries and/or urban land correlated with reduced numbers of bees from six of 33 wild bee genera, suggesting that one of these factors negatively impact these bees' ability to main-



Recent findings will help identify the groups of bees that may be most at-risk and aid in creating conservation strategies, according to researchers. *Photo: Barbara A. Schmitz*

tain their populations. Since the honeybee apiaries in the study were located in urban areas at greater densities, the researchers sought to disentangle the relative role of apiary density versus developed land.

The six bee genera showed different responses to these two factors, with apiary density having the greatest negative impact on the long-horned bees in the genus *Svastra*, while abundance of *Florilegus*, which is also a long-horned bee, was impacted most negatively with urbanization. The others included green bees in the genera *Agapostemon* and *Augochlora*, sweat bees in the genus *Lasioglossum*, and long-horned bees in the genus *Melissodes*.

After analyzing the data, the researchers found the genera most affected by apiaries and land development tend to nest in the ground, forage later in the season and, in some cases, specialize on specific types of seasonal flowering plants.

"Urban environments can be especially challenging for ground-nesting bees because the hardscaping — asphalt and concrete — can make it difficult to find bare ground for nesting," Quinlan said. "Small bees can't fly very far, so they may have trouble finding nesting and flowering resources within their flight range. Moreover, specialist bees require very specific flowers, which may be difficult to find in urban settings."

Quinlan explained that some wild bees also forage later in the season, which happens to be when honeybee colonies are at their peak size and competing for limited floral resources.

"Planting late-season forage and leaving bare ground as nesting resources in urban gardens could help alleviate some of the stressors that developed land and urban beekeeping can put on these bee groups," Quinlan said.

For their study, the researchers obtained the locations of nearly 4,000 registered apiaries across the state of Maryland and used this information to build a state map of apiary density. They then compared this with data on wild bee populations from within the state's boundaries collected by the U.S. Geological Survey's Bee Monitoring and Identification Lab.

In recent decades, the researchers said there has been wide recognition that pollinators are experiencing declines associated with pesticides, pathogens, poor nutrition and climate change. There also has been increased attention paid to how honeybees may affect wild, native bees by transmitting pathogens and exacerbating competition for resources.

But despite these strong concerns, evidence of the effects honeybees have on wild bee abundance was lacking in the literature.

"There is very little data on population sizes of most wild bee species across the U.S., so we did not have a good understanding of the factors that influence the abundance of different wild bee species," said Christina Grozinger, Publius Vergilius Maro professor of entomology, director of the Center for Pollinator Research and co-author on the study. "Here, we explicitly tested the question of whether the presence of managed honeybee populations was linked with reductions in wild bee abundance."

The study provided additional insights into how different bee genera, with different natural histories, are influenced by environmental factors, Quinlan noted.

For example, they also found that apiary density negatively affected the abundance of *Triepeolus* — a cuckoo bee — that parasitizes the nests of long-horned bees like *Svastra*. In this case, it may be the negative impact of apiary density on *Svastra* abundance that causes a negative effect on *Triepeolus* abundance. Grozinger noted that this highlights the interconnectedness of these different species, and the importance of thinking about bees as communities, not as individual species.

The researchers said that in the future, additional studies could be done in other areas of the U.S. to further tease out genera- and species-specific wild bee responses to honeybees. The new INSECT NET graduate training program at Penn State is aiming to develop nonlethal, automated monitoring systems for bees and other insects that will help with these studies.

In the meantime, Grozinger said one of the best ways people can help both wild and managed bees is to add more flowering plants to the landscape, including city streets and backyards.

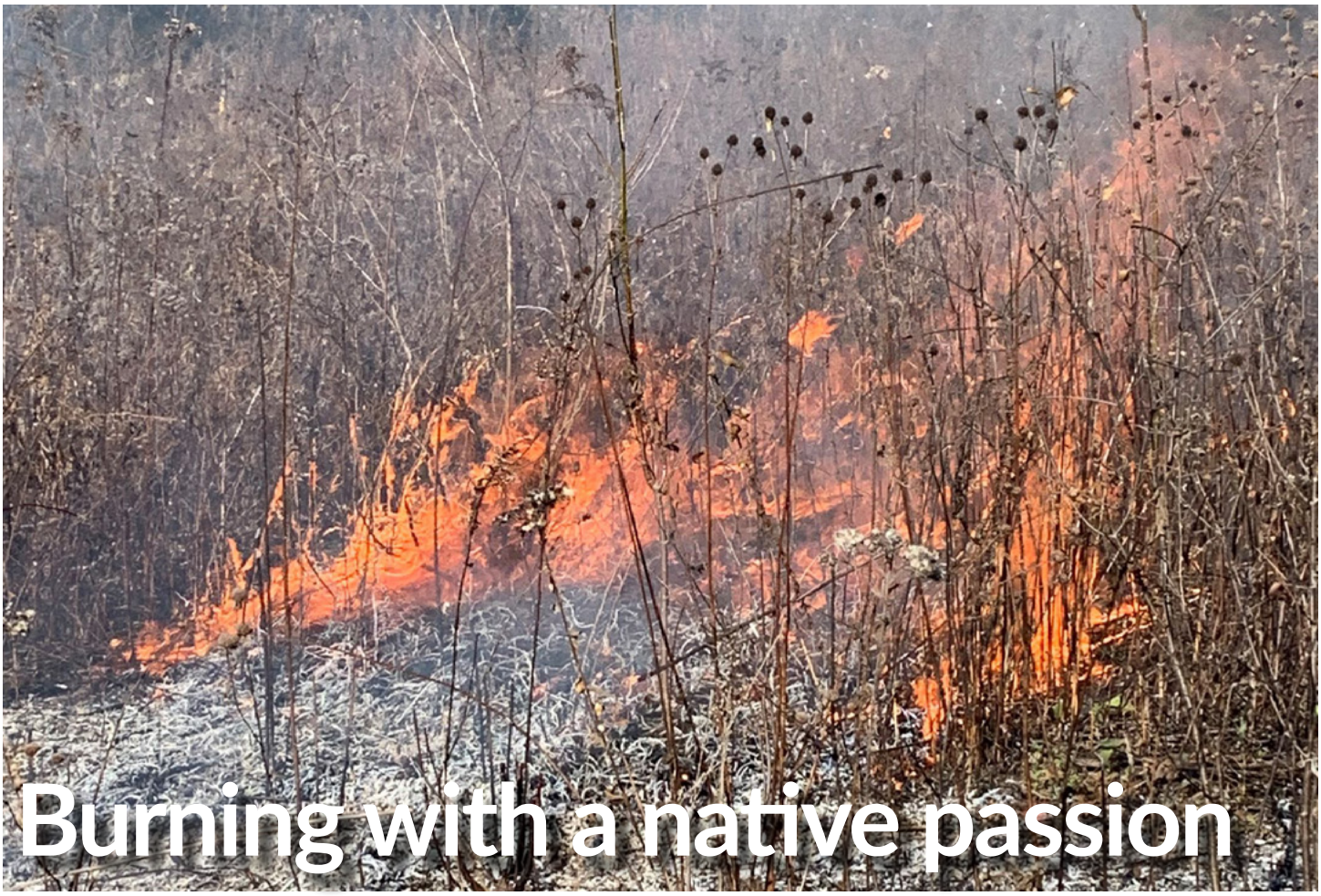
"Native flowering trees and shrubs in particular provide a bonanza of resources for bees," she said. "Beekeepers can help their bees become more resilient to climate variation by managing pests and diseases within their colonies, and this can also reduce the potential for honeybees to spread diseases to wild bees."

People can learn more about the resources available to bees in their area, and the risks posed by pesticide use and weather conditions, by using Penn State's Beescape decision-support tool.

Katie Bohn is a science and news writer for Penn State University.

This story first appeared on Penn State News and is republished in the Wild Ones Journal with permission.

Photos by Nicole Riendeau



Burning with a native passion

By Nicole Riendeau

"Fire, good!" That's what the caveman said in a television advertisement for a local home fireplace installation company many years ago, but I'm sure humans had that same thought a couple millennia earlier. I love to sit by a nice warm fire on a cold winter night. I also have a passion for natives, so I decided to combine these two things in my coursework to obtain my native plant certification through my local Wild Ones chapter. I wanted to learn more about the important role fire plays on native plant, animal and pollinator communities. The various Wild Ones Native Plant Certification courses that I completed through the Root River (Wisconsin) chapter opened my mind and helped me appreciate the connection we have with nature and everything in it.

My capstone project, a controlled prairie burn, was one that I think captivates everyone, both young and old. Fire, whether natural or man-made, is a force to be respected. We enjoy it when we camp in the great outdoors, but if we're not careful it can decimate thousands of acres of land in a hot minute! Statistics from the National Interagency Fire Center bear that out: In 2024, wildfires in the United States consumed 8,924,884 acres of land. This was across 64,897 wildfires, which also destroyed 4,552 structures, including 2,046 homes.

While this is devastating data, some positive things can result from fire. Take for example, the wildfires in the Pacific Northwest. Many plant species depend on fire for survival. When noxious weeds are taken out by fire, native plants can take that opportunity to thrive. New generations of species rise from the ashes.

Flames making their way through the dry prairie.

Ash contains valuable nutrients to promote new growth. Trees, like giant sequoias (*Sequoiadendron giganteum*), need fire to reproduce. Save the Redwoods League explains: "Giant sequoia cones are serotinous, which means that fire on the forest floor causes them to dry out, open and release their seeds. This adaptation ensures that the tree times the release of most of its seeds to coincide with fire, which creates ideal conditions for regeneration success. Fire burns off woody debris and exposes the soil. It also creates an ash layer that returns nutrients to the soil and increases sunlight by killing some of the competing pines and firs."

But what about in other parts of the country, such as the Great Lakes region? While the Great Lakes

Above left: A portion of prairie waiting for the controlled burn. Right, Color on the prairie is once again abundant after the burn. This photo was taken in 2024.

region doesn't have giant sequoias or redwoods, they do have many restored prairies, savannas and other valuable forests. Some of these areas can be thousands of acres of quality habitat for all animals great and small, while others are just as valuable but on a much smaller scale.

For example, Wild Ones member Diane Battisti owns 22 acres of land in rural western Racine County, Wisconsin. Her restored prairie is home to deer, fox, coyote, turkey, rabbits and a healthy population of ticks. For more than 20 years she has been adding various native plants to her prairie, even creating numerous native pocket gardens throughout her property. As I worked to complete my native plant certification coursework over the past two years, I started wondering how we could reduce the number of invasive plant species on her property such as buckthorn (*Rhamnus* spp.) and garlic mustard (*Alliaria petiolata*), and reduce the numbers of those nasty bloodsucking ticks. A prescribed burn could be the answer.

Prescribed burns, or controlled fires, have many benefits for the land and people. Benefits include fire prevention, habitat creation, nutrient recycling, invasive species control, reduced pest insects and diseases, increased wildlife opportunities and improved and protected habitats for threatened and endangered species. Repeated prescribed burns can even increase biodiversity of plant species and reduce tick populations. In my opinion, that last benefit was a win all by itself!

The constant battle to eradicate invasive plants and shrubs was becoming exhausting for Diane. Her usual method of pulling or cutting and a brush application of a glyphosate mixture only goes so far for unfriendly plants like common and glossy buckthorn (*Rhamnus cathartica L.*), Canada thistle (*Cirsium arvense*) and a variety of unidentified honeysuckle (*Lonicera* spp.). These plants, along with others, were all too common on her prairie. Dotting the prairie in all its glory was non-native Queen Anne's lace (*Daucus carota*). The native gray and red twig dogwoods (*Cornus racemosae, C. sericea*) had also become a bit prolific, so reducing those populations was also something we hoped to accomplish with a burn.

Surveying the land and mapping out our burn area was an important detail we needed to consider first. This property not only contained several acres of dry prairie brush,

Prescribed burn rules vary

Be aware that rules and licensing for prescribed burns vary from state to state. It is crucial to understand and comply with the specific laws and regulations of the state and local jurisdictions where a prescribed burn is being planned.

Consulting with local forestry or fire management agencies, or certified burn professionals, is highly recommended to ensure compliance and safe prescribed burn practice. See https://perc.org/2023/01/10/burn-back-better/ for more information.

Kat O'Connell provides important safety procedures and burn instructions to volunteers prior to starting the controlled burn.

but it was also surrounded by several pine and evergreen trees. Nearby neighbors were notified, and the local Raymond fire department was put on notice. Hopefully, they would not be needed.

By late fall 2023, when conditions were right, a group of friends and family volunteered alongside dedicated Wild Ones members to help me complete my project. We were finally going to perform a controlled burn on a small section of the prairie, which was an area roughly 20 feet by 50 feet. The remaining prairie acreage would have to wait. We were not burn experts, but we did recruit the help of a fellow Wild Ones member and prairie enthusiast, Kat O'Connell Valuch, who had participated in several prescribed burns. She was extremely knowledgeable in making this project successful.

It was a sunny, crisp 41-degree day in November. Humidity was 48% with winds coming from the west/southwest at 11 mph. At around 10 in the morning the flame was lit. Everyone had an important job to do, as outlined on my plan. Our main goal was to successfully burn this area of prairie without fanning the flames toward Diane's house or outbuildings. Following the detailed burn plan, we directed the fire in the right direction, moving it along as it burned everything in its path. By 11:30 a.m., the flames had extinguished themselves, hotspots were watered down and a successful burn was in the books. Next was the real test. Did this event achieve the results of reducing invasive and abundant woody plant material? Had plant diversity increased for our friendly pollinators? Would the tick population decline?

One week following the burn the ash had settled. We noted that the more mature woody shrubs like buckthorn, honeysuckle and dogwood remained, although they had a slight singe to them. Winter came in December and as the cold months slowly dragged, the burned area quietly slept under a light blanket of snow. Amazing things were happening!

Spring 2024 brought an overabundance of rainfall, but the plants didn't mind. They were natives after all. Their deep roots were happy. Young seedlings were enjoying the ash-fortified soil. By early spring the burned area was regenerating, and everything was in bloom! Of course, the rabbits and deer returned on cue to their salad bowl of natives, but these plants were hearty. As spring continued, we noticed the area attracted more pollinators like bees. But the area also provided better habitat for wildlife. (We all know we can rarely control populations of deer or rabbits.) The controlled burn did help reduce the Queen Anne's lace and Canada thistle … for now, so vigilance will be key. We also noticed that the tick population was lower, but that may have been an anomaly due to the wet spring.

Continued burns will be needed to improve the prairie, rejuvenate the soil and allow native plants to flourish. Watching the prairie come back to life with renewed vigor was truly rewarding. After a full year of transformation, the prairie and I both gained something beneficial from the burn. Performing a controlled burn is a reminder of how fire, when managed wisely, can be a powerful tool in restoring and enhancing our natural landscapes. Yes, fire was indeed good, but having a passion for natives and giving them the right prescription of an occasional burn was even better!

Nicole Riendeau is a member and director of the Wild Ones Root River Area (Wisconsin) Chapter. She thanks Diane Battisti for being a good steward of the land and allowing her to learn from the burn.

Study: Climate change 'reshuffles species like a deck of cards'

Photo: Haoyang1, CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0>, via Wikimedia

By Jasmin Galvan

A study finds that temperature changes due to climate change have a doubly detrimental impact: Not only do they destabilize animal populations, but the impacts accelerate as temperatures change more rapidly.

In the study, "Warming and cooling catalyse widespread temporal turnover in biodiversity," published Jan. 29, 2025 in *Nature*, the international team of researchers found that changing temperatures—either warming or cooling—drive changes in the composition of species in an ecosystem. The results also suggest that behavioral adaptation and changing species interactions are not enough to preserve species composition in the face of higher rates of temperature fluctuations.

"It's like shuffling a deck of cards, and temperature change now is shuffling that deck faster and faster," said lead author Malin Pinsky, associate professor of ecology and evolutionary biology at UC Santa Cruz. "The worry is that eventually you start to lose some cards."

The study's findings are unique because the impacts of temperature change have often not been clear on land or in freshwater ecosystems. While impacts on ocean species have been more overt, and therefore easier to measure, plants and animals on land adapt in subtler ways, the researchers said.

Unlike ocean animals, those on land can often move short distances to find new locations that better suit their temperature needs. Though this can mitigate the effects of temperature change a bit, this research finds that terrestrial creatures are still susceptible to destabilization and replacement due to temperature change. In their paper, the researchers focus on the rates of species replacement, which refers to the loss and gain of species over time. While this happens naturally, they found that the rate of replacement is increasing due to faster temperature changes.

If that trend continues, species could be lost and ecosystems could begin to break down, the study concludes. The most effective ways to avoid these outcomes are to avoid further global warming, preserve

landscapes with a diversity of temperatures and reduce the alteration of natural environments. Benefits could include more abundant wildlife, clean water and clean air.

"Temperature affects everything from how fast the heart beats to how flexible and porous our cell membranes are; from how much food animals eat to how fast plants grow," said Pinsky. "Temperature is in many ways the metronome for life."

Why diverse environments are important

In addition, the researchers found that species in ecosystems with less-varied habitats were more sensitive to temperature change than those with more diverse temperatures nearby. For example, if a person stood in an open field during summer and started to overheat, there would be nowhere cooler to hide. But if a forest were nearby, one could simply move into the shade of a tree to cool down. The paper concludes that plants and animals take advantage of habitat variation to buffer themselves against major temperature swings. Living near these temperature escapes allows organisms to move nearby for relief, rather than going extinct or being replaced entirely.

Whether due to natural conditions or human interference, not all environments have a diversity of temperatures to help protect the species that live in them. It is these animals that are most at risk due to faster temperature changes. Understanding the differing needs of species living in more or less varied environments can help society identify which ecosystems need the most attention and protection, the study concludes.

"Establishing this explicit link between rates of climate change and rates of species turnover allows us to better understand how

Photo: Cristian Ibarra Santillan, CC BY 2.0 <https://creativecommons.org/licenses/by/2.0>, via Wikimedia Commons

changing temperatures can impact different ecosystems," said senior author Shane Blowes, from Germany's Centre for Integrative Biodiversity Research (iDiv) and Martin Luther University Halle-Wittenberg. "Pinpointing factors that impact the rate of local species replacement can help prioritize conservation actions."

How human activity impacts turnover

Importantly, the researchers found that human impacts like land use, pollution and introduction of invasive species exacerbate the impacts of temperature change on species replacement. This is possibly due to human activity reducing the diversity of landscapes and increasing stress on species that are already near their temperature limits.

To conserve ecosystems and their benefits to people, humans can help by "preserving more natural habitats, reducing pollution and reducing the spread of invasive species," Pinsky said. "In the ocean, factors like reduced fishing pressure and protecting habitats are important and helpful."

Jasmin Galvan is a graduate of the UC Santa Cruz Science Communication program. This story first appeared on UC Santa Cruz News and is republished in the Wild Ones Journal with permission.

Ma's, Montana's original plant-based food

The story of Ma's centers on a human, Feather Woman, who married a star, Morning Star, the son of the Moon and Sun. Feather Woman moved to the Sky World to live with her new husband and in-laws. The Moon became her mentor, teaching Feather Woman about the various plants in the Sky World, the importance of water, and several religious rituals.

Artist George Catlin described Chin-cha-pee, Assiniboine, in 1832, as "fine looking … in a handsome dress of the mountain-sheep skin, holding in her hand a stick curiously carved, with which every woman in this country is supplied; for the purpose of digging up the…prairie turnip." *Photo: Smithsonian American Art Museum*

By Rosalyn Lapier

Women and plants

The most widely harvested plant-based food on the northern Great Plains before interaction with Europeans or Americans was the tuber *Pediomelum esculentum*—or Ma's (pronounced "mahs," with the vowel like the "ah" in "father"), as it is called by the Blackfeet.

Pediomelum esculentum, formerly called *Psoralea esculenta*, is from the Fabaceae or legume family. It is native to the Great Plains and it grew all across the prairies in (what is now) central and eastern Montana.

A common misconception about Indigenous people of the northern Great Plains is that they only ate meat, such as bison (*Bison bison*), elk (*Cervus canadensis*) or white-tailed deer (*Odocoileus virginanus*). But this is incorrect. According to anthropologist Eugene Hunn, Indigenous peoples of the past probably "obtained in the neighborhood of 70% of their food energy needs from plant foods harvested by women."

Recent research has hypothesized that millions of *Pediomelum esculentum* tubers were gathered each year by Indigenous women on the Great Plains. If Indigenous people ate plant-based diets, and Ma's was such a widely harvested plant, how is it that we know so little about *Pediomelum esculentum*?

The most likely reason is that the first European and American explorers, traders and settlers were men. These men usually talked to, observed and recorded the lives of Indigenous men. They rarely interacted with Indigenous women. If they had they would have learned about the plant-based foods and medicines that women harvested from the wild or grew in their gardens.

Contemporary scientists are now working to correct this bias in the historical narrative and focusing new research on the lives of Indigenous women. They are learning that the prairies were the realm of women harvesting plant foods and medicines, not just men hunting bison.

Ma's, the original root

I learned about *Pediomelum esculentum* from my Blackfeet grandmother Annie Mad Plume Wall. My grandmother shared stories of this essential plant food, its mythological origin story and its importance to Blackfeet religion.

The Blackfeet word Ma's translates as "root." This may seem like a simple name, but it is the "original root" of Blackfeet mythology and their most important food item.

It became widely known by its French name *pomme-de-prairie* or *pomme-blanche*—prairie apples or white apples—after first contact. And then early Americans called it "prairie turnip," which remains its common name today.

Harvesting roots

Pediomelum esculentum is a perennial that grows in the early summer. The plant itself is small, usually only 2-6 inches tall, with palmate leaves and densely packed light blue flowers. It has a short life span before going dormant. It can grow each year, or in times of drought remain dormant for up to two years. The tuber is harvested when the plant begins to seed and before its leaves and stems dry up and blow away.

Pediomelum esculentum looks like the familiar lupine, or *Lupinus spp.*, which is poisonous. *Photo: Matt Lavin, Flickr*

Recent research tells us that Ma's is well adapted to live in a prairie environment and can survive drought, hot summers, animal grazing, prairie fires, major summer hailstorms and harvesting by humans.

Scientists theorize that Indigenous women harvested Ma's in different locations each year, because it can take two to four years for Ma's tubers to become mature enough to harvest. Indigenous women likely rotated their harvesting to different patches each year on a three to five-year rotation schedule, never using the same Ma's patch two years in a row.

Ma's disperses its seeds via wind in the same way a tumbleweed does, depending on strong winds to uproot the plant and blow it across the prairie, scattering seeds as it goes. Scientists theorize that Blackfeet and other Indigenous women probably re-seeded their Ma's patches each year by refilling each hole with seeds and soil.

We know that Indigenous women wait until Ma's is seeding before they harvest the tuber. With millions of holes being dug each year, it makes sense that Indigenous women would reseed into the same hole from which they had just dug the tuber. They could then return to the same Ma's patch every three to five years, and teach the next generation their methods of sustainability.

Digging roots

Historically, Indigenous women and girls harvested *Pediomelum esculentum*. It has a brief harvesting season because it has a short growing season. Once the plant goes dormant, the leaves and stems blow away and leave little evidence of its existence, so Indigenous women could not return to harvest at a later time. This is probably why it was important to know exactly where to go each season to harvest this valuable resource.

Indigenous women made digging sticks out of green ash (*Fraxinus pennsylvanica*) or other hard wood. They were about 3-4 feet in length and their tips were sharpened and then hardened over fire. Some digging sticks were personalized with carvings, bone handles or decorations. Digging sticks became lifelong personal possessions and were highly prized.

An Indigenous woman would position her stick next to the plant and move the stick back and forth to push it into the ground. The tubers, usually the size of a small egg, were not far below the surface. Indigenous harvesters removed the outer covering of the tuber to expose the white inner flesh, then used the long taproot to braid together dozens of tubers to preserve and store them for future use.

Preserving and eating roots

Blackfeet and other Indigenous women historically preserved plants for food and medicine by drying them. The braids of Ma's tubers were commonly 3-feet long, but could be up to 6-feet long, and were hung up to dry in the sun.

Once a plant was dried it could be stored for years. Dried Ma's could be rehydrated whole or pounded into a flour. It was usually boiled and added whole into a soup or stew, or the flour was added as a thickener.

Pediomelum esculentum is very nutritious. It is high in carbohydrates, protein, vitamins and minerals. Its high-quality protein is similar to the levels found in quinoa (*Chenopodium quinoa*). And it has high levels of iron, magnesium, zinc and potassium.

Ma's tastes mild or plain, such as other carbohydrates like polenta or potatoes. Its flavor can be enhanced with spices or by adding it to other foods. Early American explorers and settlers commented that Indigenous people could subsist on Ma's for a long time without any meat, and noted that Ma's was good to eat in any season of the year.

Ma's became a popular trade item because of its longevity when dried, easy rehydration and taste. In the mid-19th century, four arm's-length braids of Ma's could be traded

Nonnative Americans should avoid harvesting *Pediomelum esculentum* because it is a culturally important plant to Native Americans and is rare in many locations on the prairies. *Photo: Alexandra Gross, speakwithyourfood.com*

for one basket of shelled corn or a bison robe on the Missouri River.

Revering roots

Ma's was not just a staple food. The Moon called it "medicine" or sacred.

The Blackfeet and other Indigenous people view certain plants, animals and other natural resources as sacred. A plant or animal is revered because it is a gift from the divine, a part of an origin story, introduced from the supernatural realm, or used for spiritual healing.

Indigenous people will often have restrictions on the use of these plants, either not harvesting them at all or setting restrictions over harvesting. Or they might restrict who can harvest and then use them. They will also develop land management strategies to sustain their abundance within certain ecosystems. Understanding how these ecosystems work is key to sustainable use.

This blending of ecological knowledge and religious understanding is called "traditional ecological knowledge."

Ma's today

Ma's is no longer a staple in the Blackfeet diet. This is due to land loss, colonization and the creation of the reservation that is near the mountains. Elders on the Blackfeet reservation rarely harvest Ma's today because it grows on the prairies in their former homelands, not up against the mountains. Modern farming and ranching have changed the natural landscapes where it grows as well. It is still abundant in small undeveloped areas on the central and eastern Montana prairies, and Indigenous people in those regions still harvest it today.

Despite this, each summer its story is told within an elaborate ceremony at the O'kan, or Sundance. Blackfeet women play the central role within the O'kan. They serve as its religious leader, or medicine woman, as instructed by the Moon. They incorporate the imagery, symbolism, songs and story learned from Feather Woman as part of their regalia for the Sundance, such as wearing a headdress with eagle plumes that symbolize the leaves of the Ma's and walking with the digging stick given by the Moon.

There is hope for the future of Ma's. Many young Blackfeet women are interested in learning about the stories of Ma's, Blackfeet plant-based foods and the role of women in religious practice. They are interested in restoring our natural landscapes so that native plants can flourish. They are interested in revitalizing our traditional Blackfeet foods systems for both human health and the health of the planet. And they are showing their interest by learning traditional ecological knowledge from elder women in the tribe and helping pass that knowledge to other young women and girls.

Rosalyn LaPier (Blackfeet/Métis), Ph.D., is the author of "Invisible Reality: Storytellers, Storytakers and the Supernatural World of the Blackfeet" and an associate professor of environmental studies at the University of Montana.

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SFE grant helps school create pollinator garden with broad community support

With the support of a Wild Ones Lorrie Otto Seeds for Education grant and dozens of community volunteers, Thomas Prince School of Princeton, Massachusetts, created a pollinator garden in memory of a former kindergarten teacher, Lisa Beaupre.

Project coordinator Dot Odgren wrote in their SFE project report that the garden supports 131 plants representing over 40 native plant species, providing habitat for pollinators like bees, butterflies, moths, other insects and wildlife. The garden was rededicated in Beaupre's memory in September 2024.

Some of the plants in the garden include foxglove beardtongue (*Penstemon digitalis*), wild geranium (*Geranium maculatum*), evening primrose (*Oenothera biennis*), common milkweed (*Asclepias syriaca*), butterfly weed (*Asclepias tuberosa*), coneflowers (*Echinacea* spp.) and New England aster (*Symphyotrichum novae-angliae*). School staff also created a chart showing the Latin and English names of the plants in the garden, as well as the time and color of bloom.

The school plans to add more plants, including grasses and small trees, as well as additional signage and a pond, according to Odgren. In addition, community volunteers are offering programs on birds, endangered species, citizen science and plant-pollinator relationships to students and the public at the garden.

She said Lisa's Pollinator Garden provides an outdoor, hands-on learning environment for more than 330 kindergarten through eighth grade science, technology, engineering, arts and mathematics (STEAM) students. She wrote that about 75% of the students have participated in activities in the garden; students, teachers and hikers travel the nature trails, and families and pets walk by

A plaque at the Thomas Prince School honors the memory of former kindergarten teacher Lisa Beaupre as bright blooms highlight the variety of flowers in the new garden.

Above: A September 2024 dedication ceremony for the garden was attended by about 50 people. Left: Girl Scouts plants spring blooming bulbs in Lisa's Pollinator Garden.

the garden and stop to admire the beauty and wildlife.

"Our town and school have been very supportive of this project and were able to carry out our original plan and timeline," Odgren said, adding that the garden site had previously housed an old, outdated playground. "The Princeton Highway Department removed the old playground equipment and moved butterfly chairs down from a former garden dedicated to Lisa that was shady and hard to reach. They also dug out the plant beds and placed cement footing to reinstall the butterfly chairs in the new garden."

In addition, about 230 students plus community members helped to spread the soil and plant, water and weed. This includes teachers, students, parents, the Wachusett Garden Club and the Princeton Outdoor Space Committee.

Students have been excited about the butterflies, bees and other insects that visit the plants for nectar and pollen, as well as the birds that visit the habitat, she said. "They love to touch the plants and work in the garden outside in fresh air. We are learning about many wonderful relationships between native plants and pollinators. Students love relating the shape and color of flowers and how they evolved to entice pollinators to get nectar and pollen ..."

Odgren also said practical activities such as planting, watering, saving seeds and observing the life cycle, structure, function and interdependence of plants and insects across many disciplines enrich students' education. "Teaching environmental stewardship helps students gain firsthand knowledge of how to create and maintain a sustainable ecosystem within their school environment that they can apply at home," she said.

As more people find out about the garden and watch it grow, they want to spend time there and participate in the garden, Odgren said. "The most surprising outcome is always the children's questions as they see and describe things."

Lastly, Odgren thanked Wild Ones for giving the school "this wonderful opportunity to contribute to our youth's appreciation and knowledge of native plants and pollinators, as well as contribute to creating a healthy ecosystem."

Photos: Marcie Ponder

Seed library sows native beauty, one seed at a time

Seed packets can be placed in pre-stamped bags at the Loess Hills Seed Library.

By Marcie Ponder

In the rolling landscapes of Northwest Iowa, Southeast South Dakota and Northeast Nebraska, the Wild Ones Loess Hills (Iowa) Chapter has quietly transformed how communities connect with their native ecosystems. At the heart of this mission lies the chapter's seed library, an initiative that has empowered gardeners and nature enthusiasts to cultivate native plants and restore biodiversity. Since its inception, the seed library has grown from a spark of inspiration into a cornerstone of ecological stewardship, fostering a deeper appreciation for the region's unique flora.

The seed of an idea

The seed library sprouted from a vision to make native plants accessible to all, regardless of experience or resources. The idea took root in 2020, when Ruth Rose, former co-president of the Wild Ones Loess Hills Chapter, launched a traveling seed library. Rose's innovative concept was simple yet powerful: bring native seeds directly to community events, workshops and garden walks, allowing people to take home packets of seeds to grow plants adapted to the Loess Hills' unique soil and climate.

Her traveling library was a hit at plant sales, educational programs and local gatherings. Still, it required constant setup and transport, which prompted Rose and Dawn Snyder, also a former co-president, to start making plans for a permanent seed library at the local nature center. However, the pandemic put a long pause on this idea.

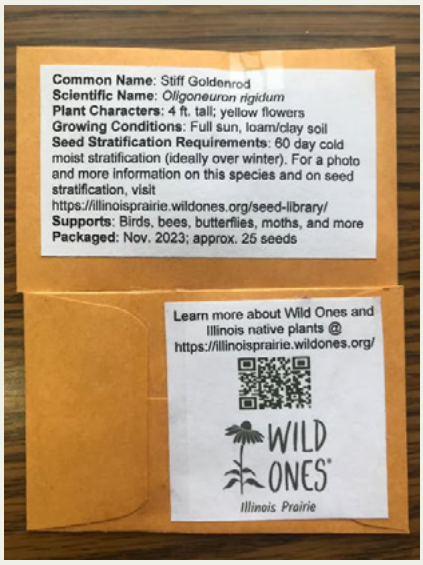
The permanent seed library at the Dorothy Pecaut Nature Center in Sioux City, Iowa, was finally established in early 2025. The transition from a traveling model to a fixed location marked a significant milestone, making the seed library more accessible and sustainable while continuing Rose's legacy of sharing nature's bounty.

How it works: Setup and operations

The seed library is elegantly simple and designed to encourage community participation. Located on the lower level of the nature center, it features a custom-built cabinet stocked with packets of native prairie plant seeds. A companion binder offers detailed descriptions, photographs and growing tips for each species, helping even novice gardeners feel confident in their choices. Visitors can browse and select seeds, then sign them out by filling out a library-style check-out card with their name, email, and the seeds they've taken. Completed

What other chapters are doing with seed libraries

Seed libraries are a common way for Wild Ones chapters to promote native landscaping and get community members involved in the native plant movement. Here's what a few other chapters are doing:



A seed library packet from the Wild Ones Illinois Prairie Chapter includes information about the seeds within, as well as seed stratification requirements

Illinois Prairie

In 2024, the Wild Ones Illinois Prairie Chapter contributed 500 packets of native plant seeds — 26 species in total — to an existing seed library at the Normal Public Library in Normal, Illinois. (This library also offers seeds for annuals and vegetables.) The response was overwhelmingly positive: 98% of the donated native seed packets were taken by residents eager to plant their own native gardens.

Due to library renovations in 2025, the chapter instead donated 200 packets of native seeds to two seed swap programs hosted by the University of Illinois Extension. However, if enough volunteers are available, the chapter plans to resume donations to the Normal Public Library in the future.

Chapter members collect seeds from native plants on their own properties, while others handle packaging, label creation and label application. The most time-consuming step is creating and affixing labels; members agree it's essential, not only to ensure that people have pertinent information about the seeds they were taking, but also to promote the chapter.

Our advice to other chapters starting a seed library is simple: Include clear planting and maintenance instructions and a link to more information, especially for species that require cold stratification. And ask participants to take only one packet per species so more people have a chance to benefit. Comments on Facebook suggested that some people were going to wipe out the entire supply of donated seed in one visit!

— Janet Rasmussen, chapter director and plant sale/swap chair


The Illinois Prairie's seed library resembles a card catalog from decades ago.

Southern Kentucky

The Warren County Public Library had existing seed libraries at each of their four branches. Most are repurposed library card catalogs with drawers labeled for the types of seeds in each (beans, greens, flowers, etc.). We spoke with their team about having our Wild Ones chapter donate native seeds and asked if they could add a drawer specifically for Kentucky native plants. They loved the idea and added the drawer before our first seed donation in 2023.

Each fall, chapter members harvest seeds from their own gardens and donate what they can. In November, the chapter hosts a seed packaging event where volunteers label and prepare the seeds for donation to the library.

The seed library is promoted year-round by both the library and the chapter. The chapter highlights it on its website as a valuable resource for people interested in native plants and also promotes the fall seed packaging event to encourage community involvement.

Advice for other chapters:

Look for existing resources and then see if you can join forces. Is there a library that is already offering seeds or would like to start? Also check with a local extension office or conservation district.

If you plan on packaging many seeds (500+ packets) for the next few years, buy labels and key or coin envelopes in bulk. We purchased stickers to add to the back of our seed packets that explain the cold stratification process. The front label with the species indicates if the seed needs pre-treatment.

Be ready with a press release when the seeds become available. We got great local news coverage about the native seeds, and the library gave away much of the donated seed within the first few months. We had to package more to cover the demand.

-Katie Marquardt, president of the Southern Kentucky chapter

A handmade cabinet provides for storage of the native seed packets.

cards are placed in a locked metal suggestion box, ensuring personal information is kept secure. This system fosters both accountability and connection, enabling the chapter to track interest and engage more deeply with participants.

The seeds are a labor of love, collected and cleaned by trusted and dedicated Loess Hills volunteers during fall seed harvests. From milkweeds to coneflowers, the library offers around 40 varieties of native plants, including favorites like butterfly milkweed (*Asclepias tuberosa*) and lead plant (*Amorpha canescens*), known for its striking purple flowers with orange centers. Each fall, volunteers meticulously gather seeds from local prairies and gardens with landowner or manager permission, ensuring they are suited to the area's ecosystem. The volunteers then package seeds in small coin envelopes, labeling them with pertinent species information and the harvest date. While the Dorothy Pecaut Nature Center is currently the library's sole location, the chapter's history of hosting seed shares at events suggests potential for future expansion or pop-up libraries.

Seeds distributed: Exceeding expectations

Since the seed library's permanent home opened in early 2025, it has distributed thousands of seed packets, building on the momentum of the traveling library's efforts from 2020-24. While exact numbers are still being tracked, the chapter estimates that more than 2,000 packets of seeds have found their way into community gardens, backyards and restoration projects since Rose's traveling library began.

Community reception: A growing love for natives

The community's response has been overwhelmingly positive, and they have embraced the seed library as a tool for creating vibrant, ecologically significant landscapes. At the nature center, visitors of all ages delight in discovering species like early and late figwort (*Scrophularia* spp.), which attract hummingbirds, or the bright orange butterfly milkweed that supports monarch butterflies. The library's accessibility — no cost, no membership required — has made it a beacon for inclusivity, inviting everyone to participate in conservation. Events like the winter sowing workshop in January 2025, where participants learned to start seeds in milk jug terrariums, further deepened community engagement, with attendees leaving inspired and equipped to grow native plants. (Learn how to winter sow in milk jugs here.)

Promotion: Spreading the word

The Loess Hills chapter promotes the seed library through a multifaceted approach. Their *Wild Wednesdays* newsletter, a near-weekly publication, highlights the library alongside upcoming events, seasonal tips and native plant care advice. Chapter volunteers share infor-

Wild Ones Loess Hills Chapter member Marcie Ponder, left, keeps the seed library well stocked. The cabinet was built by Tyler Flammang, right, a nature center employee and carpenter.

mation about seed availability and related programs on social media, particularly their active Facebook page with over 1,600 followers.

The chapter also leverages partnerships with the Dorothy Pecaut Nature Center to reach broader audiences. Events like the annual Spring Native Plant Sale and "Meet the Plants & Rollout the Grants" program in April further amplify the library's visibility, drawing crowds eager to learn and take seeds home.

Lessons learned: Wisdom from the journey

Reflecting on the seed library's evolution, the chapter has gleaned valuable insights.

"We wish we'd known how much people crave hands-on guidance," Rose said. Early on, the traveling library assumed users would know how to sow seeds, but workshops revealed a need for education on techniques like winter sowing or stratification.

Another lesson was the importance of clear documentation. The binder of seed information at the nature center has become a critical tool, helping users make informed choices. The seed packets note the botanical and common names, the year the seeds were collected, ideal growing conditions, and height, color and spacing requirements of the species contained within each packet. Finally, the chapter learned that community involvement in seed collection fosters a deeper connection to the mission, turning participants into advocates for native plants.

Advice for other chapters

The Loess Hills team suggests other Wild Ones chapters considering a seed library to start small, noting that Rose's traveling library was a low-cost way to test the concept. Second, partner with a trusted community hub like a nature center or library to maximize reach and credibility. Third, invest in education; workshops and detailed resources empower users to succeed. Finally, engage trusted volunteers in seed collection to build community and ensure a sustainable supply.

"It's about creating a cycle of giving and growing," Rose said. "The more people participate, the stronger the impact."

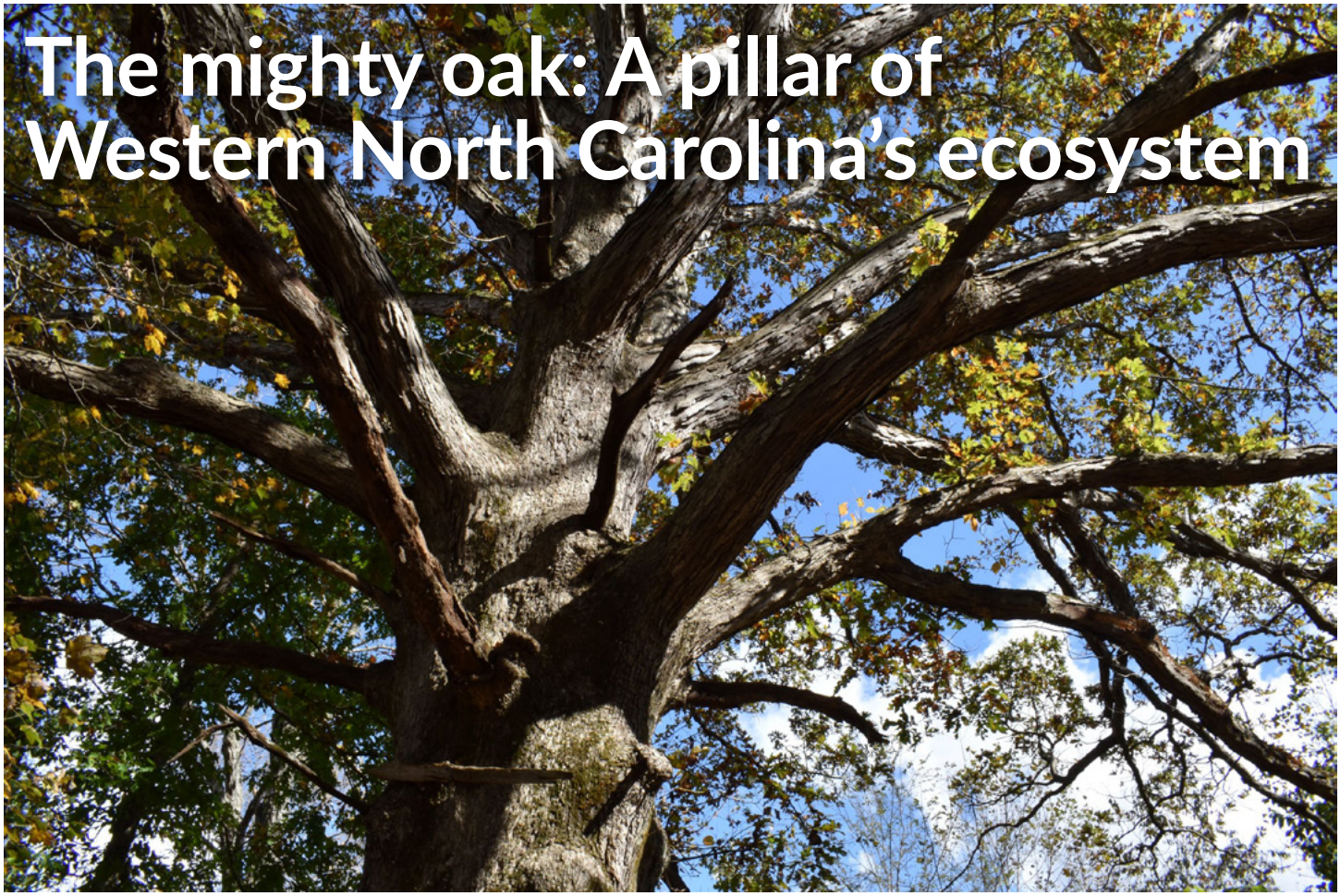
Beyond the seeds: A vision for the future

The Loess Hills Seed Library is more than a collection of packets; it's a movement to restore the ecological heritage of the area. By offering free local seeds, the chapter empowers individuals to create habitats for pollinators, reduce water usage and combat the loss of prairies that once defined the heartland. In doing so, they embody Wild Ones' mission of promoting native landscapes through education, advocacy and collaborative action and demonstrate how local chapters bring our shared vision of native plants and natural landscapes thriving in every community to life.

For chapters inspired to join the movement, connect with the Loess Hills chapter at https://loesshills.wildones.org/.

Marcie Ponder is the treasurer of the Wild Ones Loess Hills Chapter.

The mighty oak: A pillar of Western North Carolina's ecosystem



A 256-year-old white oak (*Q. alba*), in Macon County, Tennessee. *Photo by Kristin Baley Wilson (Middle Tennessee Chapter)*

By Janet Whitworth

Western North Carolina is home to a diverse and thriving ecosystem, but few natural elements play as pivotal a role as the mighty oak tree. In his book "*The Nature of Oaks*," ecologist Doug Tallamy champions these towering giants, stating that oaks (*Quercus* spp.) support more life forms and ecological interactions than any other tree genus in North America. Yet, the devastating impact of Hurricane Helene has left thousands of these vital old-growth trees destroyed, raising concerns about the future of the region's environment.

Hurricane Helene's toll on the oaks of Western North Carolina

When Hurricane Helene tore across Western North Carolina in September 2024, it left behind a trail of destruction that reshaped forests and neighborhoods alike. State forestry officials estimate that more than 822,000 acres of timberland were damaged, with hardwoods like oaks and hickories taking the brunt of the storm. In Buncombe County alone, up to 40% of trees were damaged or destroyed, many of them large oaks that once anchored both forests and neighborhoods.

Observers noted that oaks appeared especially hard hit. As North Carolina Cooperative Extension Agent Steve Pettis explained, this was partly due to their biology: oaks rarely lose limbs in storms, so while pines and poplars often stand battered but upright, oaks tend to either remain standing or topple entirely. The result was a landscape littered with massive trunks.

The sight of so many toppled oaks raised more than aesthetic concerns. Their fall represents a blow to biodiversity, carbon storage and watershed health across the Blue Ridge. For a tree that has long stood as a pillar of Western North Carolina's ecosystems, Helene served as a reminder of both the oak's importance and its vulnerability in a human dominated landscape wracked by changing climate.

Biodiversity powerhouses

Oaks are considered both a keystone and a foundational species. As a foundation species, their abundance and long lifespan help shape and maintain the physical environment, such as soil health, canopy cover and microclimates, that other plants and animals depend on. As keystone species, they disproportionately support biodiversity both directly by providing food and indirectly as habitat and host for a large number of species.

A majestic oak (*Q. virginiana*) in Currituck County, North Carolina. *Photo by David Carson (Nation's Capital (D.C.) Region Chapter)*

In addition to serving as browse (leaves, twigs, bark, pollen, and sap) for mammalian and insect herbivores, oaks produce one of the most important food sources in ecosystems across their range: acorns. A single mature oak can produce up to 10,000 acorns in a mast year. Well over 150 species of wildlife have been documented feeding on acorns. White-footed mice (*Peromyscus leucopus*) rely so heavily on acorns that their population cycles rise and fall with mast cycles. In heavy mast years, acorns can account for more than half of a squirrel's diet and nearly half of a black bear's food intake by volume. Whether tucked into a squirrel's cache or piled into a bear's stomach, acorns are the currency of the forest economy!

Yet the true power of oaks lies not only in their acorns, but in their leaves and flowers. Native bees, which emerge in late spring anxious to reproduce, also rely on plentiful oak pollen as an important source for their offspring's protein requirements. Bees must consider oaks and other blooming trees as meadows in the sky! By supporting this intricate food web, oaks enable the survival of countless species that depend on them for sustenance.

Tallamy's work in the mid-Atlantic shows that oaks serve as a host plant for 557 species of caterpillars, an essential food source for baby birds. In fact, 90% of terrestrial bird species depend on caterpillars to feed their young. Studies reveal that raising a single clutch of chickadees requires between 6,000 and 9,000 caterpillars. That's hundreds of baby birds, fed with thousands of caterpillars and each one powered by the humble oak leaf.

Environmental benefits of oaks

Beyond their contribution to biodiversity, oaks are environmental champions. Their ability to sequester large amounts of carbon helps mitigate climate change by reducing atmospheric carbon dioxide levels. Large-canopy trees like oaks sequester far more carbon than small ornamental trees. A mature white oak can store 3,000–4,000 pounds of carbon aboveground, while continuing to pull in 48–90 pounds of carbon per year as it grows. The mechanism is simple: through photosynthesis, plants and trees absorb carbon dioxide (CO_2) from the air and convert it into biomass (roots, leaves, trunks and branches). Because oaks are long-lived (often 200-400 years), they can lock up carbon for centuries. At the landscape level, an acre of oak-dominated forest can store 50–70 tons of carbon in living trees and often more in soils as the root systems deposit carbon deep into the soil.

Additionally, their extensive root systems, which grow three times wider than their branches, stabilize soil, prevent erosion and facilitate deep water absorption. Depending on species and climate, a mature oak can absorb 50-100 gallons of water per day through its roots. In urban forestry studies, large-canopy trees like oaks intercept thousands of gallons of rainfall annually through their leaves and bark, slowing runoff before it hits the ground. This, in turn, promotes healthier watersheds by reducing runoff so less sediment, fertilizers and pollutants are carried into streams.

Studies show oak forests support higher fungal diversity (especially

Help oaks thrive

• Replant the right species in the right place. Prioritize local native oaks from local seedstock.

• Plant in groves, not alone. Plant two or three young oaks about 6 feet apart so their roots interlock and their canopies buffer each other against wind.

• Set them up for success. Place the seedling with its root flare at ground level in a hole 2–3 times wider than the root ball. Backfill with native soil, mulch 2–3 inches (not against the trunk), water deeply during dry spells and protect it from deer or mowers.

• Fight invasives early and often. Clear out species like tree-of-heaven (*Ailanthus altissima*) and privet (*Ligustrum vulgare*) right after disturbance, before they take over. A few hours of work now saves years later.

As Ralph Waldo Emerson once wrote, "The creation of a thousand forests is in one acorn." Every oak planted today carries that same promise: of shelter, food and resilience for generations to come.

Left: A white oak (*Q. alba*) located in the town of Swannanoa with about a 40-inch diameter. Half of it failed in Hurricane Helene, and the second half, pictured here, failed months later due to its compromised structural integrity. Above: A northern red oak (*Q. rubra*) with an approximate 40-inch diameter, was still blocking road traffic six days after Hurricane Helene. A volunteer works to cut the log free and roll it into a ravine. *Photos by April Wilson, Stump Sprouts Tree Consulting.*

ectomycorrhizal fungi) than many other tree-dominated systems. A big reason is the chemistry of oak leaf litter. Rich in lignin and tannins, these organic compounds act as the tree's armor: lignin provides physical strength and decay resistance, while tannins offer chemical defense against herbivores and pathogens. Oak leaves decompose slowly creating a long-term "mulch" layer that moderates soil temperature and moisture and a slow-release nutrient bank that feeds soil microbes and fungi.

Planting for a sustainable future

The recovery of oaks in Western North Carolina requires thoughtful planting strategies. Solitary trees,

while visually striking, are more vulnerable to high winds. Tallamy recommends planting young oaks in small groves of two or three, spaced 6 feet apart. This method encourages root interlocking, creating stronger trees that are less susceptible to blowdowns. Furthermore, planting a mix of species alongside oaks, such as hickories (*Carya* spp.), maples (*Acer* spp.) and understory dogwoods (*Cornus* spp.) will create layered, storm-resistant habitats that provide even more ecological value.

In the wake of Hurricane Helene, forestry experts also emphasize planting native species suited to local soils and slopes, removing invasive plants early after disturbance, and leaving some fallen wood to enrich soils and shelter wildlife.

Tallamy stresses the importance of individual action: "Property owners are the hope and future of conservation. We have to practice conservation on our private properties and balconies, not just in parks and preserves." This message is especially relevant in human-dominated landscapes, where sustainable practices are essential.

In Western North Carolina, where more than 85% of forested land is privately owned, individual choices are shaping the region's ecological future. Each oak planted today may host hundreds of insect species, feed generations of birds and mammals, and anchor a thriving ecosystem for centuries to come.

Wild Ones Western North Carolina Chapter member Mary Weber, of Mary Weber Landscape Architecture, said the majority of oaks that fell during the hurricane were northern red oaks (*Quercus rubra*), which are more short-lived. So recommends planting white oak (*Quercus alba*) for more longevity.

Oaks should be planted " in places where they have plenty of room to spread," Weber said. For instance, she is awaiting city approval on an apartment project where she plans to use a number of oaks. However, most of her post-Helene projects haven't used oaks because the properties were too small or the people wanted faster growing trees to screen the neighboring houses that they now see, she said.

It's important to plant native oak trees with plenty of space, and allow them to have an open, wide form to be able to stand for centuries, agreed Stump Sprouts Tree Consulting Master Arborist April Wilson.

"For private landowners in our area, species selection is primarily influenced by cultural traditions, as well as what's available in nurseries and the entrances of grocery stores and hardware stores," she said. "This limits the typical new tree planting to a handful of mediocre or even invasive species, and unfortunately due to gaps in knowledge, doesn't include most of the hundred or so native tree species to our area."

Oaks, when available, typically include northern red oak or pin oak (*Quercus palustris*), she said, both which are not as well adapted to their locality.

"In forested areas with less input, the oaks that populate the landscape are the right selection as far as species," Wilson said, "but their growing conditions and stand density usually promotes tall, top-heavy growth, leading to a less stable tree in the long term."

Wilson said people need to be looking to the south to identify species that will be best adapted to the climate we will have beyond our lifetimes, as well as phasing our species that are no longer adapted to this one.

As the oaks of Western North Carolina face a critical juncture, the need for collective action has never been greater. While Helene's destruction was heartbreaking, it's worth remembering that disturbance has long been part of oak country. Fires, storms and pests have shaped these forests for 56 million years, and oaks are remarkably resilient. Our actions like planting native trees, supporting conservation organizations and raising awareness can help tip the balance so that the forest recovers stronger than before.

The stem of a large red oak is being removed by a crane. The oak fell on a house during Hurricane Helene. *Photo by April Wilson, Stump Sprouts Tree Consulting.*

Let the mighty oak inspire us all — not just as a symbol of strength, but as a reminder of the interconnectedness of life on Earth.

Janet Whitworth is a Wild Ones Western North Carolina Chapter member. Wild Ones Education & Program Coordinator Sara Ressing contributed to this story.

All photos by Courtney Denning unless otherwise noted.

Creating a moon garden for bats: Native plants that support nocturnal wildlife

By Courtney Denning

When we think about wildlife-friendly gardens, we often focus on the creatures we see during the day, such as bees, birds and butterflies. But as the sun sets, another vital group of animals becomes active: bats! If you're planting native plants to support daytime pollinators and wildlife, you're also contributing to the habitat needs of their nighttime counterparts.

Bats are some of the most remarkable animals on the planet. They're our only flying mammals, with more than 1,300 species found worldwide. In Ohio, we have 13 bat species, all of which are insectivorous, meaning they only eat insects. They help keep insect populations in check, including those that feed on agricultural crops such as moths, and the ones that bother us humans, mosquitoes. Among the most frequently spotted in Ohio are the little brown bat (*Myotis lucifugus*) and the big brown bat (*Eptesicus fuscus*). These bats are voracious insect eaters; a single bat can consume its body weight in insects each night.

In honor of Bat Month in October, let's talk about one creative and beautiful way you can support bats in your own backyard: by planting a moon garden.

Little brown bat (*Myotis lucifugus*). *Photo: Andy Reago & Chrissy McClarren, CC BY 2.0 via Wikimedia Commons*

What is a moon garden?

A moon garden is a space filled with plants that reflect moonlight with their pale petals or silvery foliage, creating a beautiful and serene garden from dusk to dawn. Moon gardens can feature plants that bloom at night or have strong fragrances that attract nocturnal pollinators, such as moths and other insects. These insects, in turn, are food for bats.

You can use native plants to create a stunning moon garden that supports local wildlife. Not surprisingly, when gardening for any form of wildlife, from bats to bees to butterflies, it's essential not to use pesticides.

Growing flowers to attract butterflies, bees and hummingbirds is a common gardening and landscaping goal. Growing plants to have their leaves eaten by insects is less common and can take some time to get used to. As gardeners, we invest a lot of time and care in growing our plants, and traditionally, we protect them from insects, which we refer to as pests. We may spray our plants with insecticides to prevent damage from insects.

Gardening for wildlife turns this idea on its head. We choose plants, called host plants, to be eaten by insects, and we don't use insecticides. We want holey leaves on our plants. It's a sign that insects are using the plants for food.

When we plant native plants in large numbers and diverse groupings, insect damage is usually minimal and hardly noticeable. If a host plant is being completely devoured, that's a sign to plant more of that species. The fuller garden beds are with plants, the less noticeable insect damage will be to any one individual plant.

Courtney Denning's moon garden at night.

Native plants for a moon garden
These are Midwest native plants you could include in a moon garden, grouped into eight categories:

White-flowering plants
These blooms stand out under moonlight, creating a glowing effect in the garden.:

- Common yarrow (*Achillea millefolium*)
- Canada anemone (*Anemone canadensis*)
- Tall thimbleweed (*Anemone virginiana*)
- Whorled milkweed (*Asclepias verticillata*)
- White woodland aster (*Aster divaricatus*)
- White false indigo (*Baptisia alba*)
- Hairy wood mint (*Blephilia hirsuta*)
- False aster (*Boltonia asteroides*)
- Eastern shooting star (*Dodecatheon meadia*)
- Bonesets (*Eupatorium* spp.ecies)
- Pale spiked lobelia (*Lobelia spicata*)
- Foxglove beardtonguepenstemon (*Penstemon digitalis*)
- Mountain mints (*Pycnanthemum* spp.)
- Bloodroot (*Sanguinaria canadensis*)
- Heath aster (*Symphyotrichum ericoides*)
- Panicled aster (*Symphyotrichum lanceolatum*)
- White goldenrod (*Solidago bicolor*)
- Great white trillium (*Trillium grandiflorum*)

Night-blooming flowering plants
These flowers attract nocturnal pollinators, such as moths, making the garden active after dark.

- Common evening primrose (*Oenothera biennis*)
- Foam flower (*Tiarella cordifolia*)
- Adam's needle (*Yucca filamentosa*)

Structural plants
These plants serve as focal points, adding unique architectural elements to your moon garden. Their striking forms create visual interest, even when not in bloom.

- Black cohosh (*Actaea racemosa*)
- Goat's beard (*Aruncus dioicus*)
- Rattlesnake master (*Eryngium yuccifolium*)
- Wild quinine (*Parthenium integrifolium*)
- Culver's root (*Veronicastrum virginicum*)

Silvery-foliage plants
The leaves of these plants are often soft, hairy or fuzzy, reflecting light and giving them a light green, white or silvery appearance.

- Pearly everlasting (*Anaphalis margaritacea*)
- White sagebrush (*Artemisia ludoviciana*)
- Virginia waterleaf (*Hydrophyllum virginianum*)

Spotted bee balm (*Monarda punctata*)

Sweet everlasting (*Pseudognaphalium obtusifolium*)

Clustered mountain mint (*Pycnanthemum muticum*)

Low-growing groundcovers

These plants act as green mulch, filling gaps between taller plants to reduce weeding and retain soil moisture. They also provide additional habitat for insects and other wildlife.

Pussytoes (*Antennaria* spp.)

Ivory sedge (*Carex eburnea*)

James' sedge (*Carex jamesii*)

Pennsylvania sedge (*Carex pensylvanica*)

Robin's plantain (*Erigeron pulchellus*)

Woodland sstonecrop (*Sedum ternatum*)

Cream violet (*Viola striata*)

Grasses and sedges

Often underutilized in garden design, grasses and sedges are essential for both aesthetic and ecological purposes. They serve as host plants for many insects while providing structural support for taller flowers. Their soft, flowing forms also create a neutral backdrop, allowing vibrant flower drifts to stand out.

Side oats grama (*Bouteloua curtipendula*)

Silvery-flowered sedge (*Carex argyrantha*)

Cherokee sedge (*Carex cherokeensis*)

Plantainleaf sedge (*Carex plantaginea*)

River oats (*Chasmanthium latifolium*)

Tufted hairgrass (*Deschampsia cespitosa*)

Prairie dropseed (*Sporobolus heterolepis*)

Shrubs

Like structural plants, shrubs add height and architectural interest to a garden. Many also provide food for wildlife and contribute white or silvery tones, enhancing the glowing effect of a moon garden.

New Jersey tea (*Ceanothus americanus*)

Buttonbush (*Cephalanthus occidentalis*)

Northern bayberry (*Myrica pensylvanica*)

Snowberry (*Symphoricarpos albus*)

Trees

Trees add height to a garden bed and serve as a focal point, enhancing the overall aesthetic.

River birch (*Betula nigra*)

Flowering dogwood (*Cornus florida*)

American snowbell (*Styrax americanus*)

Viburnums (*Viburnum* spp.)

Why create a moon garden?

By planting a moon garden, you're not only enhancing the nighttime beauty of your yard, but you're also supporting a wide array of nocturnal wildlife. Moths and other night-flying insects will be drawn to the plants in your garden —and they, in turn, become food for bats and other animals.

Since insectivorous bats rely on nocturnal insects as their food source, your moon garden can become a crucial part of their nighttime ecosystem. And let's face it, there's something magical about sitting in a quiet garden, watching bats swoop overhead while the moonlight dances off pale blooms and silvered leaves.

Courtney Denning loves spending time in her garden. She has a background in environmental and plant biology. She has worked at nature centers, a conservatory and currently works in marketing for the Piqua Public Library. Denning is also a member of the Wild Ones Dayton Area (Ohio) Chapter.

Reprinted with permission from Deeply Rooted Landscapes.

Native plants that have white or pale blooms, light-colored foliage or bloom in the evening are ideal for nocturnal insects to enjoy, which may attract the bats that eat them.

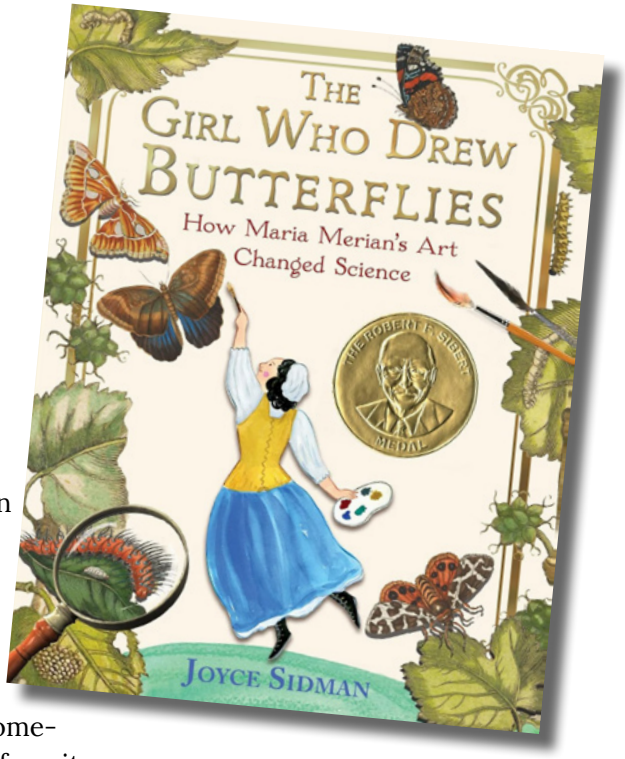
Book Review

Title: "The Girl Who Drew Butterflies: How Maria Merian's Art Changed Science"

Author: Joyce Sidman

Published: 2018

Rating: ★★★★★



By Sara Ressing

I am all about books about Wild Ones, people who flout convention for the pursuit of passion and knowledge. Maria Sibylla Merian is the archetypal Wild One. A 17th-century German naturalist and artist, she risked everything to study insects and the plants they rely on. She left her husband, ran her own book press, and journeyed to Suriname in South America to conduct fieldwork at a time when most women couldn't even read, let alone publish under their own names.

"The Girl Who Drew Butterflies" by Joyce Sidman is a compelling middle-grade biography that brings the life of Maria Sibylla Merian into focus. What drew Sidman, a poet, into Merian's life is what drew me in, too: the intricate beauty of her art. I was so inspired that I wrote about Merian's influence on botanical art and advocacy in a Wild Ones blog post.

Thankfully, Sidman includes a wealth of this imagery in the book, from Merian's delicate watercolor studies to her engraved plates. Additionally, photographs, maps, archival book excerpts and other supplemental visuals provide further historical and informational context.

Sidman frames the book around the stages of butterfly metamorphosis, using them as both a chronological structure and a metaphor for Maria Merian's growth as an artist and scientist. Opening each chapter, Sidman includes her own photographic documentation of a painted lady butterfly (*Vanessa cardui*) developing through its life stages, paired with an original poem that transforms scientific observation into something deeply felt. One of my favorites is from Chapter 9: *Eclosing*, but I'll share one more apt to both Merian's life and to the world young people are navigating today: Chapter 4: *Second Instar* (Page 20):

> The world is a plant,
> always growing.
> I consume it,
> Leaf by leaf.
> The world shrinks,
> I grow large.

Chapter 4 marks a turning point in Merian's life when she begins to assert herself as both an artist and scientist. Still young, still learning, but insatiably curious. "The world shrinks, I grow large" speaks directly to Merian's expanding awareness and ambition, even as societal roles tried to contain her. It's a feeling many young readers will recognize: the desire to learn everything, to grow past the limits set by others.

The poem also feels strikingly relevant today as more young people question inherited limitations and reshape the world around them through art, science and action. It's one of many ways Sidman connects the personal with the universal in this beautifully structured biography.

But this isn't a bedtime read for younger kids (trust me, I tried). The language, structure and historical context make it better suited for older children and teens with an interest in science, art or feminist history. For younger audiences, Merian's story is also told through excellent picture books like, "The Bug Girl: Maria Merian's Scientific Mission" by Sarah Glenn Marsh or "Summer Birds: The Butterflies of Maria Merian" by Margarita Engle.

That said, this book isn't just for kids. It's also a perfect read for curious adults—especially late-30-somethings who enjoy a good biography in a sunny garden. Sidman's poetic framing and visual storytelling make this more than a biography. It's a quiet celebration of observation, transformation and the power of pursuing your passion despite the odds.

Sara Ressing is the education and program coordinator at Wild Ones, where she blends her love of native plants, learning and storytelling to support community-based conservation. She's also a parent of two, a cat enthusiast and a big fan of muddy hikes and good books.

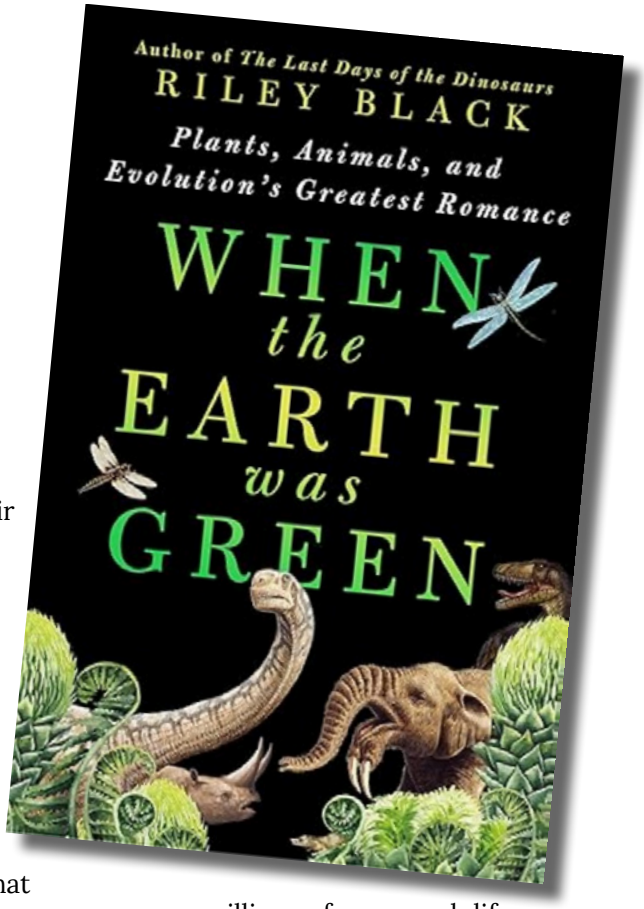
Book Review

Titled: "When the Earth was Green: Plants, Animals and Evolution's Greatest Romance"

Author: Riley Black

Published: February 2025

Rating: ★★★★☆



By Rose Rankin

Can plants cause mass extinctions? The answer is yes, although it's really not that simple. The idea that living things exert forces on the larger planet, and a reappraisal of the complexity of life on Earth generally, runs through many recent books like "Becoming Earth" by Ferris Jabr and "The Light Eaters" by Zoë Schlanger.

In "When the Earth Was Green" by Riley Black, the interplay between living organisms and geological conditions is again on display, but Black puts a unique spin on this genre of science writing by presenting it as a narrative. Essentially, the reader time travels through epochs and observes life as we think it may have been on any given day.

A paleontologist by training, Black takes the reader all the way back to the Proterozoic period over 1 billion years ago, to some of the first multicellular organisms that could photosynthesize and produce oxygen. This molecular change to the atmosphere did cause a mass extinction of anaerobic organisms, but as we readers know since we're still here, the story doesn't end there.

Black continues through time and the fossil record, from the first tiny plants clinging to the shoreline to the massive forests of the Carboniferous period, 300 million years ago. The author moves to the age of dinosaurs, writing as if walking alongside grazing Apatosaurus and the small mammals scampering through the trees, narrating their movements and how their environment came to be.

We visit forests of "new" plants — those that reproduce by flowers, not spores — following the asteroid collision that ended the Cretaceous period and its dinosaurs. We're stuck in a tree with early primates floating helplessly across the Atlantic to what is now South America. Then it's on to grasslands tens of millions of years ago, following the ancestors of horses, house cats and humans. Black finishes by bringing the reader to the doorstep of our geologic age, just after the last Ice Age, with the megafauna that will become modern humans' prey.

The story is enveloping; told in vivid prose, it feels like you're transported to these long-ago versions of the world, but with a tour guide explaining the science in laymen's terms alongside you. Black also knows how to build tension in these tableaus of daily life and describes imaginary but realistic scenes in living color:

"It all happened so fast… The storm surge scoured the already-loose soil beneath their refuge, causing it and everything its roots were entangled with to slide down the bank like a photosynthetic crocodile doing a belly slide."

At times the book feels slightly disjointed, with chapters jumping across millions of years and different continents. But in a way it's understandable: Black adheres to the fossil record and what we think we know today, and that invariably means there are gaps along the way.

Overall, "When the Earth Was Green" is a lyrical retelling of the Earth's natural history, and the feeling of being transported back to the distant past as a wordless observer is downright refreshing, particularly when we look around at the current state of humanity's impact on the natural world.

A breezy read for anyone who enjoys science but who also appreciates a good storyline, this book is a solid four out of five stars. It will take you far from our world today while also illuminating how it came to be.

Rose Rankin is a freelance writer and member of the Wild Ones Greater Kane County (Illinois) Chapter. She gardens northwest of Chicago, and you can follow her on Instagram at @bringbackprairies.

Photos by Matthew Ross

Reframing the landscape: The public gardens and preserves of South Florida

Extensive wetlands surround the Naples Botanical Garden.

By Matthew Ross

It has been more than a decade since I first dipped my toes in the swamp, literally. I hiked a wet walk in Big Cypress National Preserve, navigated the mangrove swamps of the Florida Keys, and ended up going chest deep in the flooded trams of Fakahatchee Strand Preserve State Park with botanists from across the Southern U.S. One might even say it was a baptism into the other worldly realm of exploring the orchids, epiphytes and wetland wonders of the natural lands of South Florida.

I have deep respect and reverence for an ecological community unlike any other that spans the Gulf to the Atlantic. For those of you who have had the joy of traversing these biodiversity hotspots and getting immersed in the native plant world it encompasses, you understand the addiction and the intrigue.

So I was elated when the opportunity arose to go back to Southern Florida to revisit Naples Botanical Garden for the first time since the pandemic, retrace my footsteps at Corkscrew Swamp Sanctuary and experience Marie Selby Botanical Gardens and their newly adopted Historic Spanish Point. My experience even included a chance to hike the towering 70 feet of Mt. Celery at The Celery Fields Preserve. In addition to fantastic bird watching, there are demonstration plantings around the nature center featuring South Florida native shrubs and perennials that now include a pocket forest. What another visitor said looked like an area with a "shaggy" appearance was where I spent most of my time checking out the species mix and layering that was underway as I chased around several groups of monarchs that didn't have a problem with a little bit of overgrowth. I look forward to seeing how the forest progresses and once established, its effectiveness at attracting pollinators in comparison to the demonstration backyard garden that's on site.

Celery Fields is not the only Audubon site in the region, and the following day I met up with horticultural colleagues to revisit one of my favorite spots to botanize, Corkscrew Swamp Sanctuary. The Audubon Society has really enhanced the experience with guides sharing insight, new interpretative signage and an expanded visitor center. While we didn't time our hike to coincide with the timing of the famed ghost orchid (*Dendrophylax lindenii*) bloom, we did get a chance to see several outstanding Tillandsia (*Tillandsia* spp.), flowering southern swamp lilies (*Crinum* spp.) and one small native butterfly orchid (*Encyclia tampensis*) still in bloom during our jaunt along the 2.5 mile trail.

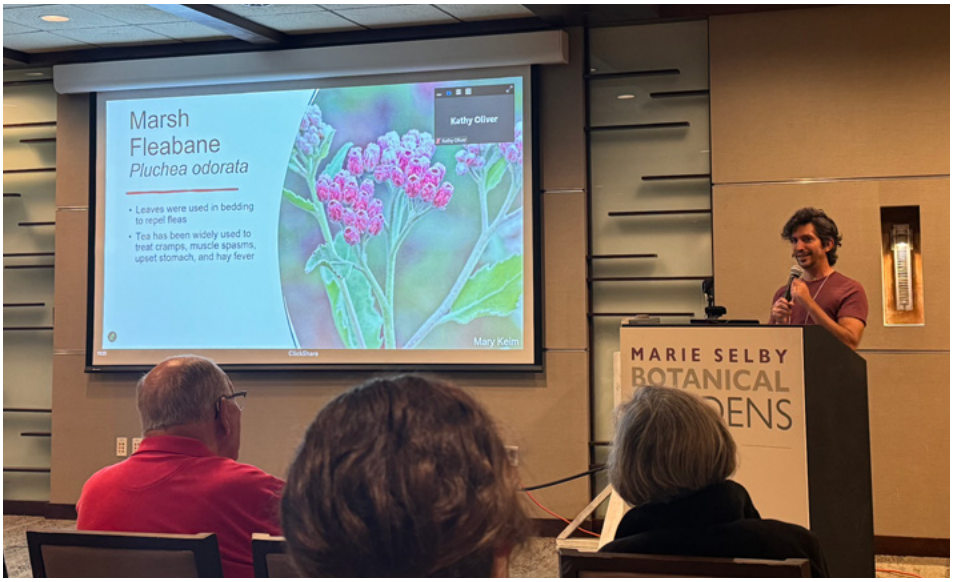
It was bittersweet having spent time in both sanctuaries as we continued to drive through massive developments knowing that many

The "Frame and Flora" exhibit at the Naples Botanical Garden brings attention to the convergence of natural beauty and cultivated gardens including this view of the slash pine (*Pinus elliottii*) among Sabal palms (*Sabal palmetto*) and other scrubland species.

of the subdivisions and homes were displacing such an incredible landscape. But there is hope for change and given the recent damage from a barrage of hurricanes, it was encouraging to see examples of native plant gardens peppered across the communities and to witness the passion of the native plant community through programming and interpretation at two of the region's top public gardens.

Located in downtown Sarasota, Selby Gardens has a satellite location not too far away in Osprey called Historic Spanish Point that they recently acquired. I started my journey at Historic Spanish Point where I took part in an immersive ethnobotanical interpretive hike led by David J. Turner. It was fascinating and eye-opening to learn about a plethora of native plants with such depth and their role throughout history. We explored the multiple uses of the Sabal palm (*Sabal palmetto*) and its exploitation for the use of palm hearts. We also discussed the coontie (*Zamia pumila*) and the flour industry that nearly led to the extirpation of the species. Other intriguing plants that were highlighted were the American beautyberry (*Callicarpa americana*) and water hickory (*Carya aquatica*). David also shared a long list of uses for and horticultural fables of Spanish moss (*Tillandsia usneoides*). I could have listened to David and his wife Norma for hours as they traversed the historical site. The program was inspiring and a small glimpse into the reasons for conserving the native landscapes dotted across the historic point. In addition to the program, I really appreciated the interpretation of the "Window to the Past," which highlights a cross-section of a midden where archaeological evidence of ancient civilizations was visible. It will be interesting to see how the property now managed by Selby Gardens will continue to evolve; I hope that the ethnobotanical and archaeological elements will become an increasingly visible element to the garden.

After experiencing Historic Spanish Point I visited the main campus of Selby Gardens and their expansive collection on epiphytes that includes several endemic species in their formal conservatory and throughout the grounds. It is an urban campus that has recently been reimagined with a new entry plaza and research facility. In addition to touring the 15-acre garden, I attended one of their evening programs hosted by the Florida Native Plant Society. The seminar, "Ethnobotany: Florida Native Plants that Healed, Fed and Occasionally Poisoned us," was presented by Elliot Prout to a crowd of nearly 100 native plant enthusiasts and professionals. It was a riveting discussion about the Indigenous communities that lived in the region and the trials and tribulations of the early colonialists who



Eliot Prout discusses the marsh fleabane (Pluchea odorata) during a lecture on ethnobotany at a Florida Native Plant Society meeting at Selby Gardens.

tried homesteading and utilizing local flora for their food sources and their industrial needs. Who knew that you could eat the fresh flower petals of Spanish bayonet (*Yucca aloifolia*) or that the latex sap of the native Florida strangler fig (*Ficus aurea*) made good chewing gum, or that Florida is home to a wide range of native plums (*Prunus angustifolia*, *P. umbellata*, *ximenia americana*)? As Elliot continued his talk it was encouraging to hear stories from the audience about the increased use of native plants in landscapes that were directly hit by Hurricane Helene and other recent storms and the infusion of many of the more obscure native plants, too.

The concept of building resilience through the use of native plants is becoming an increasingly important aspect of life not just in South Florida, but across the country and globe. As my trip through Florida's public gardens continued, I really homed in on this notion when traversing the extensive grounds and natural lands of Naples Botanical Garden. Over the past 15 years I have had a front-row seat to watch the continued evolution of this gem. While it has been hit with increasingly powerful hurricanes since its inception, the team at the garden and their volunteers have found innovative strategies to tackle these challenges with the power of native plants and wetlands. It is easy to get swept away by the bold textures and colors of one of the largest outdoor epiphytic orchid and tropical waterlily collections, but their commitment to creating and maintaining high quality conservation land is equally as impressive.

"Frame and Flora," an exhibition that highlights the beauty of nature, includes several key stops within the conservation lands including four frames along the Smith Upland Preserve Trail and a signature installation of marshes and mangroves at the James and Linda White Birding Tower. Making a direct connection between formal gardens and areas like the Smith Uplands Preserve encourages visitors to think about their role in creating habitat and living landscapes that transcend beyond traditional views of beauty. One of the most impressive features in their conservation land is the Hamilton Avenue Bioswale, which blends the worlds of ecological restoration, engineering and display horticulture in a new and innovative way. I was encouraged to see several visitors making their way through the gardens to explore the trails. Naples Botanical Garden's commitment to the use of native plant landscaping is front and center through the Center for Nature-Based Solutions.

The work being done through the programming, interpretation and advocacy of Selby Gardens, Naples Botanical Garden and the Audubon Society is critical in framing the future of the landscape of South Florida. Every garden has the potential to become a solution rather than add to the challenges faced by continued sprawl and increased frequency of natural disasters. Whether it is a pocket forest providing refuge for monarchs or a bioswale comprised of local grasses and shrubs, we can all make a difference and tell the stories of incredible plants that have weathered the storms.

Wild Ones member Matthew Ross is executive director of the Botanic Garden at Historic Barns Park in Traverse City, Michigan.

One of many old-growth bald cypress (*Taxodium spp.*) that are protected within the Corkscrew Swamp Sanctuary.

Bittersweet: Ain't that the truth!

By Jeff Hoyer

American bittersweet
(Celastrus scandens)

Oriental bittersweet
(Celastrus orbiculatus)

Flower & fruit

Leaves

Bark

The bittersweet vine comes in two varieties, Dr. Jekyll and Mr. Hyde if you will. The native species, American bittersweet (Celastrus scandens), is a mild-mannered vine that grows slowly, feeds many birds and mammals, and does little harm. The non-native version, Oriental or round bittersweet (Celastrus orbiculatus), reproduces and grows faster, crowding out other plants and strangling trees. These related species are similar in appearance, but a closer look will easily distinguish the native vine from its invasive relative.

American bittersweet (Celastrus scandens) has a lot of desirable traits (Dr. Jekyll). Historically, it grew wild over the eastern two-thirds of North America and was used medicinally by Native Americans. Early European settlers cultivated and harvested the plant to use ornamentally or to reduce soil erosion. Unfortunately, overharvesting and competition with the non-native bittersweet has severely reduced its numbers in the wild. American bittersweet is listed as a threatened species in Massachusetts. Gardeners should cherish growing this plant on a trellis or arbor.

American bittersweet is a generally a well-behaved native vine that grows at a moderate rate in a wide variety of soil types and is one of the few vines that tolerates nearly full shade and alkaline soils. It provides a valuable source of winter food for a wide variety of birds and mammals. However, the U.S. Department of Agriculture,Äôs Plant Fact Sheet notes that American bittersweet can be aggressive, and so they recommend it not be planted in areas where it can easily climb favorable trees. In addition, American bittersweet can hybridize with Oriental bittersweet and while the hybrid is sterile, it may grow with more vigor.

Oriental bittersweet (Celastrus orbiculatus) has a more sinister reputation (Mr. Hyde). It was introduced into the U.S. in the mid-1860s for erosion control and for its ornamental value. Oriental bittersweet outcompetes the native American bittersweet, growing faster and with a higher germination rate. The vines of Oriental bittersweet wrap around trees more tightly, girdling the tree (cutting off the flow of nutrition in the tree branches or trunk), which

weakens the tree and makes it more susceptible to ice and wind damage. The density of the Oriental bittersweet vines can also shade other plants, suppressing their growth.

Oriental bittersweet (the evil twin) has been listed as a noxious weed in several states, making it illegal to sell or transport in these states. A study by the University of Illinois, however, found that half of retailers mislabeled the invasive Oriental bittersweet as American bittersweet, according to the Illinois News Bureau. So be careful when purchasing, especially online. To prevent spreading the seeds of Oriental bittersweet, it should be bagged and disposed of in landfills, not composted. Report any outbreaks of Oriental bittersweet to authorities, who will cut the vines and apply herbicide to the roots.

Characteristics both bittersweet vines share

According to the Cornell Cooperative Extension, both American and Oriental bittersweet:

- Are diecious (separate male and female plants and flowers).
- Have colorful fruits that persist in winter, giving these plants a high ornamental value for floral arrangements when cut fresh or dried.
- Are mildly toxic (causing vomiting) to humans or pets, but they are loved by native animals. That includes over 15 species of birds including wild turkeys, grouse and quail, as well as squirrels, foxes, cottontail rabbits and deer.
- Have leaves that are alternate and simple and stems that twine without tendrils.
- Have suckers from roots, which sometimes form large colonies.
- Are pollinated by bees, ants, wasps and possibly the wind. Often need both male and female plants near to bear fruit on female plants.
- Are a larval host for a geometrid moth (common tan wave, Pleuroprucha insulsaria).
- Prefer habitat of woodlands with road edges, lake and stream shores and rocky slopes.
- Prefer rich moist soil, but will tolerate drier soils, clay and a wide range of pH.
- Can tolerate full sun to shade.
- Live in USDA Hardiness Zones 3b-8.

Ways to distinguish native and non-native bittersweet

	American bittersweet	**Oriental bittersweet**
Native to	East & Central North America	China, Korea, Japan
Flower & fruit clusters	Panicles (loose branching clusters > 6 flowers or fruits)	Cyme (clusters of 2-3)
Flower & fruit position	Terminal (end of stem)	Axial (sides of stems)
Fruit and capsule color	Red fruit inside an orange capsule	Red fruit inside yellow capsule
Pollen color	Yellow	White
Leaf shape	Oval with sharp elongated tip	Distinctly round with toothed edges
Bark texture & color	Smooth and grey	Highly textured and brown
Vine behavior & diameter	Loosely wrapped, < 4 inches	Tightly wrapped, < 10 inches
Growth rate	Moderate	Fast
Vine length	20-40 feet	60-100 feet

Sources: Morton Arboretum, Minnesota Department of Agriculture and U.S. Geological Survey

Natives can aid in your fight against buckthorn

By Jeff Hoyer

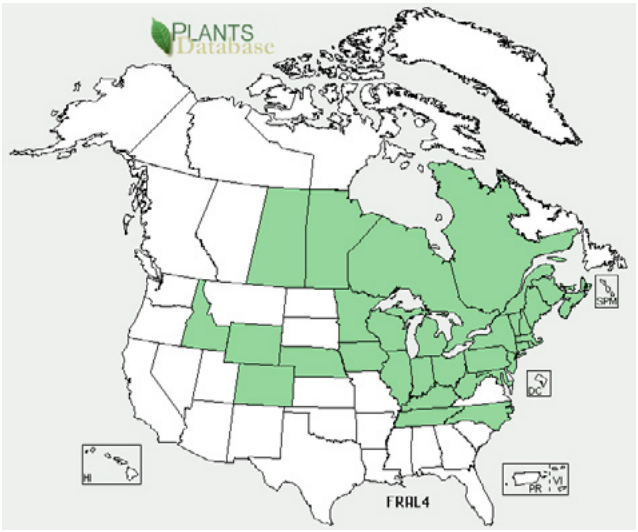
Common buckthorn (*Rhamnus cathartica*) is an invasive plant brought to North America in the early 1800s as an ornamental shrub. It reproduces rapidly and outcompetes native plants for light, nutrients and water. Left on its own, buckthorn can form dense, almost impenetrable thickets in forests, prairies and along rivers and roadways.

Since buckthorn did not evolve here, it does not provide adequate food or shelter for animals in the Northeastern and Midwestern regions of the U.S. where it is commonly found. This causes further disruptions to native food webs, creating "green deserts" with much lower biodiversity compared to healthy ecosystems.

As it has no natural controls each stem must be treated chemically or non-chemically to prevent resprouting. Chemical treatment is effective for large stumps, but herbicide applicators frequently miss small stems of less than ¼ inch that then resprout vigorously.

Buckthorn can also sprout from seeds dropped directly beneath the shrub or dispersed by birds. Although birds eat buckthorn fruit, it is not a preferred food; the fruit contains laxatives that help the seed pass through the digestive system but deprive birds of essential nutrients.

Each buckthorn fruit contains two to four seeds. Uneaten fruit dropped by the shrub can leave 500-1,000 seeds per square meter in the soil. Therefore, buckthorn control measures must be repeated for several years in a row to adequately suppress this aggressive species.



Map shows distribution for common buckthorn (*Rhamnus cathartica*). *Courtesy of USDA PLANTS Database*.

Buckthorn produces an organic compound called emodin that deters insects and other herbivores from eating its leaves, stems, bark and seeds. Buckthorn leaf litter has a high nitrogen content, resulting in rapid decomposition. This accelerated decay, especially when combined with earthworm activity, often thins or eliminates the leaf litter, creating exposed soil patches that promote buckthorn seedling establishment while making it harder for native understory plants to persist.

Once established, buckthorn shrubs can live for decades, even in well shaded areas, because they retain their leaves for several weeks after native plants have dropped their leaves in the fall. One study found 38% of buckthorn growth occurred after other plants lost their leaves. While mature buckthorn shrubs tolerate shade well, seedlings are far less shade tolerant. This may be buckthorn's long sought Achillies' heel.

Recent studies by the University of Minnesota offer a method for suppressing buckthorn using grasses and other native species to outcompete buckthorn seedlings. Contrary to long-held belief that claims buckthorn seeds remain viable in the soil for up to 6 years, recent scientific studies prove 98% of buckthorn seeds germinate during the first year and the remaining 2% germinate the second year. Furthermore, buckthorn seedlings are most sensitive to competition for light during their first two years of life. Therefore, re-establishing dense vegetation quickly on sites cleared of mature buckthorn shrubs is essential to prevent buckthorn from quickly regaining dominance in the landscape.

Any native plant taller than buckthorn will suppress its growth by shading the plant. Native trees, shrubs and even tall wildflowers can work, but they do have significant disadvantages compared to grasses, especially during those first two critical years after clearing a site:

Be cautious with herbicides

- Wear appropriate personal protective equipment (PPE) such as gloves, protective eyewear, long sleeves and long pants when handling and applying Triclopyr or other herbicides.
- Carefully read and follow all instructions on the product label, as safety guidelines and application rates vary between products.

• Many native trees and shrubs grow slower than buckthorn and may lose the race toward the sun.

• Native trees and shrubs are browsed by native animals like deer and rabbits much more often than buckthorn.

• Native trees and shrubs planted as saplings are often too expensive for large-scale restorations.

• Native trees and shrubs are vulnerable to herbicides used to kill resprouting buckthorn.

However, native grasses are cheaper and easier to obtain in large quantities. Grasses sown at >60 seeds/ft^2 effectively shade new buckthorn seedlings.

Seed mixes for revegetation should be composed largely of cool season grasses, which grow the most during spring and fall, effectively shading buckthorn sprouts when buckthorn grows best. Grasses establish more quickly than wildflowers and form a dense thatch that provides the fuel needed for prescribed burns used to manage restoration sites. Among the most effective cool season grasses for suppressing buckthorn are wild ryes (*Elymus* spp.). Wild ryes establish quickly, are tall enough and have big enough leaves to shade young buckthorn sprouting from the seedbank. In particular, Canada (*Elymus canadensis*), Virginia (*Elymus virginicus*) and silky (*Elymus villosus*) wild ryes have been used effectively to prevent buckthorn from regaining dominance across a wide range of forest understories, according to the Minnesota Department of Agriculture.

However, buckthorn resprouting after being cut will not be suppressed by most native species since they use energy stored in the root to quickly outgrow the competition. Therefore, areas cleared of mature buckthorn must be treated chemically the following season to kill any stems missed after cutting. As Wild Ones Kettle Moraine (Wisconsin) Chapter member and author Mariette Novak writes in her book, "*Birdscaping in the Midwest: A Guide to Gardening with Native Plants to Attract Birds*," "There are times when the judicious use of pesticides may be needed to kill weeds on a site in preparation for landscaping with native plants in order to provide long-term habitat for birds and the insects they need."

Once again, native grasses have an advantage in revegetation over other native plants because selective herbicides like Triclopyr will kill broadleaf plants but not grasses.

Warm season grasses and wildflowers can be included in the mix, but don't become effective at suppressing buckthorn for several years. Woody species that hold their leaves late into the fall are more effective since buckthorn relies on late autumn light for much of its success.

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Alternatives to chemical controls for buckthorn

If you don't want to fight buckthorn with chemicals, there are alternative control methods. However, efficacy is tied to vigilance and it will require a larger investment of time, physical effort and other resources.

1. **Hand pulling**: This is best for small seedlings, especially after rain when the soil is moist. To prevent regrowth, loosen the soil around the plant and pull out the entire root system. Then dispose of pulled plants where they can't re-root or let them dry out.

2. **Cutting stems**: This is best for larger shrubs. Cut the stems close to the ground with hand tools, a chain saw or a brush cover. Then cover the cut stump with a tin can or black plastic bag to block sunlight and prevent resprouting. Secure the cover with nails, zip ties or other methods, and check regularly and remove any new growth that escapes. Another option is a critical period cutting or high cut. In this option, cut the stem in the spring, leaving a 4-5 foot tall stump. Remove all branches and leaves. Return in the fall and remove any new growth, repeating the process the following year after spring leaf-out.

3. **Repeated Mowing**: This option is best for large areas with dense buckthorn stands. Repeated mowing will weaken buckthorn over time and can create space for native plants to establish. However, mowing alone may not be sufficient for complete control and may require follow-up treatments, such as covering stumps or using herbicide.

4. **Prescribed Burning**: This works best for fire-adapted upland sites with established buckthorn. Burns should be conducted by trained professionals and with property safety precautions. Burns will need to be done yearly or every other year for several years to kill buckthorn seedlings and stems. Early spring burns, shortly after leaf-out, may be more effective.

5. **Other considerations**:

a. Minimize soil disturbance when pulling or cutting buckthorn to prevent the spread of seeds and encourage native plant growth.

b. Be aware that buckthorn produces a large seed bank, and continued monitoring and management may be needed even after initial control efforts.

c. In some situations, controlled grazing by goats can be an effective method for buckthorn control.