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# Soil: Taking a deep dive into what happens belowground



By Barbara A. Schmitz

Most people just think of the beauty of plants that they see aboveground. But in our third installment of our series the Year of Climate Action, we explore soil and what happens belowground.

In “At the root: The belowground complexity of perennial herbaceous plant species,” Jesse Nippert, a biology professor at Kansas State University, gives a detailed look at roots and what we normally don’t see. Did you know that a plant that survives one drought increases the likelihood of it surviving the next? Nippert writes: “Roots don’t simply capture resources; they determine when, where and how plants exploit heterogeneous belowground environments.” Read more on [Page 9](#).

In “Reading the weeds: What pioneer plants tell us about soil succession,” Wes Sander, programs mentor for Soil Food Web School, discusses plants that thrive in recently disturbed environments, protecting the ground surface and holding it together until recovery can gain traction. Read more on [Page 4](#) to learn what happens beneath the soil surface to help set the stage for the eventual return of lost plant communities.

But there’s more than just soil articles in this issue. Wild Ones member Janet Allen updates us about the changes in community science and shares tips for getting involved and making meaningful contributions. See [Page 13](#).

On [Page 32](#), learn about Megan Linden, a North Carolina high school biology teacher who is making a difference for her students and her community with the creation of a school pollinator garden. Or find out how four members of the Wild Ones DFW (Texas) Chapter all contribute to environmental change and have their yards certified through Wild Ones’ Certified Native Habitat Program on [Page 19](#). Lastly, former Wild Ones National Director and President Bret Rappaport gives a fun look how architect Frank Lloyd Wright approached landscape design, as well as architecture itself, on [Page 34](#).

There’s more to read, of course. But there’s one change I want to make you aware of: Our new and improved index, which makes it easier to find stories with just one click. The changes were made in response to a member’s request, so if there’s anything else you’d like to see changed, email [journal@wildones.org](mailto:journal@wildones.org). I can’t guarantee we can do it, but we’ll certainly try.

Secondly, I want to say good bye and good luck to Sara Ressing, Wild Ones’ education and program manager. I worked closely with Sara on the *Journal* for more than three years and will miss her guidance, contributions, dedication and passion.

Lastly, let me introduce our new graphic designer, Lynn Stuart, pictured above with me in front of wild senna (*Senna hebecarpa*). Lynn moved to Wisconsin from Florida, in large part to be somewhere where she could cook with seasonal produce and grow a tomato. This year she’s growing 27 varieties of tomatoes in her garden, and her yard is also filled with native trees, shrubs and flowers. A graphic designer for 25 years, Lynn is on the organizing committee of Oshkosh Seed Savers, a network of food gardeners and seed savers.

So, enjoy this issue as much as I enjoy the cooler temperatures of fall. No matter what you are still growing this season, enjoy nature and being outdoors.



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Wild Ones’ definition of a native plant: A native plant is a species that occurs naturally in a particular region, ecosystem and/or habitat and was present prior to European settlement.



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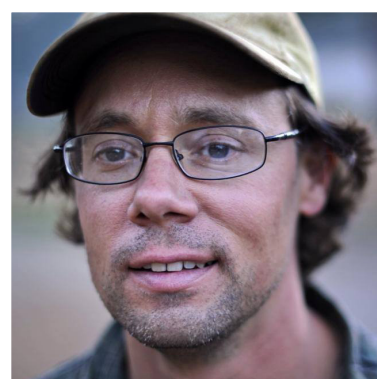




# Reading the weeds: What pioneer plants tell us about soil succession



The native yerba santa (*Eriodictyon californicum*) thrives in recently disturbed environments, where plants that had previously thrived now struggle. Photo: Wes Sander (pictured right)



By Wes Sander

On the steep upper slopes of the Sierra Nevada foothills of Northern California, in the hot and dry summer months when wildfire commands the respect that it does, there's a certain aroma that one eventually comes to recognize.

It's the smell of *Eriodictyon californicum*, California yerba santa, a short, shrubby, insect-pollinated plant that loves the dry soils and rocky slopes of this rugged landscape. Near areas recently burned — which are not difficult to find, especially these days — one might catch that sticky-sweet, somewhat off-putting (depending on whom you ask) aroma on the wind. If you were to venture into the burn scar, drenched with intense sunlight now that much of the tree canopy is missing, it would take only a few minutes for your shoes and clothing to accumulate enough of that pungent resin that they'll still bear the aroma months later.

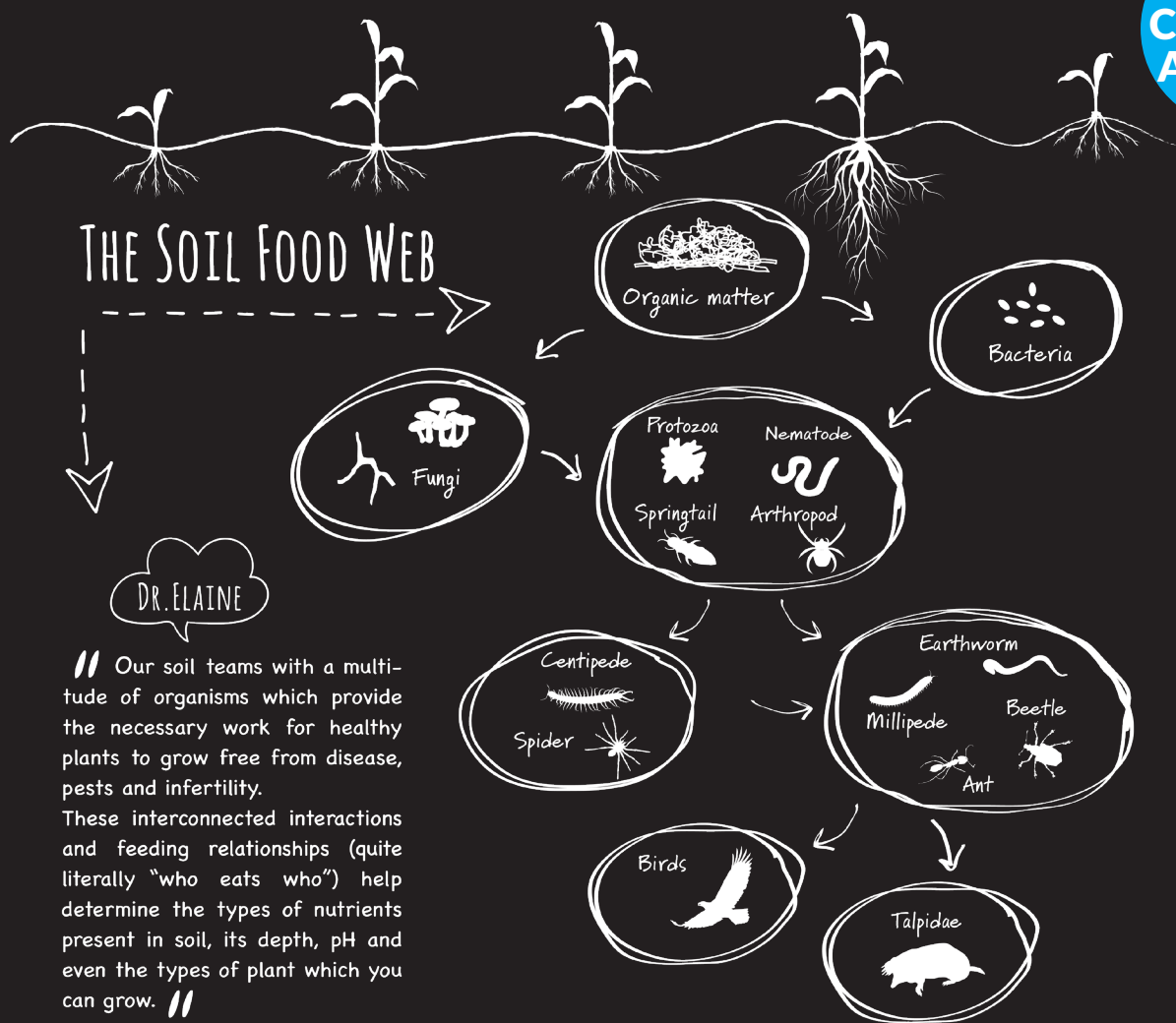
Yerba santa is one of those native plants that are well attuned to the early successional role into which they have evolved. Like many others that perform similar roles, it thrives in recently disturbed environments, where

plants that had previously been thriving now struggle. Without pioneer species like yerba santa to protect the ground surface and literally hold it together, recovery cannot gain traction, either above or belowground.

What happens belowground, however, is just as important as what develops above. All plants must interact, through their roots, with communities of various soil microfauna. Barring any further disturbance, the structure of those microbial communities evolves through the long process of ecological succession, making possible the eventual return of the plant communities that were lost.

Yerba santa is a plant well suited to the early stages of this process; it is a hardy plant that is minimally dependent on the complex microbial plant interactions that, in a later-successional soil, would constitute a rich nutrient economy. Soils harboring diverse, well-developed microbial communities bustle along each day through a vast array of interactions and transactions, their domain starting at the ground's surface and extending down through the entire root zones of the plants that anchor their communities.





Graphic: SoilFoodWeb School

## A city underground

The aftermath of an intense wildfire is quite the opposite. Abundance and stability have given way to what might be thought of as a war zone, a chaotic place. The usual fungal, bacterial, plant and animal denizens of this landscape, having together formed a sort of thriving city, are mostly gone, along with most of the trees and smaller plants on which they had relied for food and shelter.

In the underground part of this forbidding landscape, only scattered bacteria are functioning for the most part, and for pioneer plants like yerba santa, that's just fine. It can grow aggressively and set seed quickly, while that sticky resin protects it from grazers, helping to ensure its success. The rhizome from which it grows allows it to sprout new foliage and feeder roots while spreading underground, thereby holding the soil in place — especially important on steep slopes, where erosion can cascade for miles downstream, impacting the landscape and waterways.

While soil stability is important on such a large scale, it's also important on the imperceptibly small scale. Holding the soil in place is the first step in the process, because any development of a microbe plant community, as with any living community, first requires stability. It can be tempting to assume that microbial life, existing on a scale so much smaller than our own, must always be ubiquitous; unable to see them, we can easily imagine such tiny life forms always going about their business, regardless of what happens on the larger scale we more readily perceive. But microorganisms, just like any living things, are keenly sensitive to disruptions to their immediate surroundings.

## Decomposers: Nature's only recyclers

Bacteria and fungi are the only organism groups on Earth that produce the enzymes necessary for dissolving natural materials into their constituent chemical compounds. This means that without them, the process of releasing nutrients from soil particles cannot even begin.



In healthy soils, bacteria and fungi secrete gluey substances containing the enzymatic compounds that break down soil particles, thereby making the nutrients locked within those particles available as food. Those slimy substances allow the decomposers to adhere to surfaces and to each other, forming stable communities and spreading digestive compounds, whose action infuses the immediate area with available nutrients. This means decomposers can directly make necessary nutrients available to the plant roots immediately nearby, but only to an extent – most of those nutrients are instead absorbed by the bacteria and fungi themselves, thereby becoming “immobilized.”

### Introducing the poop loop

This is where we come to the next nutrient-cycling level of the soil food web, the one occupied by protozoa and nematodes. Protozoa are single-celled organisms that eat mostly bacteria; nematodes are microscopic worms that consume bacteria, fungi, protozoa and other nematodes. Like most living things, protozoa and nematodes often consume more nutrients than they require, secreting the extra as waste. This waste is nature’s version of fertilizer – concentrated bits of nutrition in mineralized (water-soluble) form, released from the bacteria and fungi that had been monopolizing them, and once again available to be absorbed by plants.

All these microbial groups can be dramatically impacted by any disturbance event, whether caused by natural catastrophe or human activity. Bacteria can be considered the best equipped to weather such big changes. Even in repeatedly disturbed soils, we can expect to find a significant bacterial presence. With basic microscopy skills, it is easy to see the difference between a healthy and an unhealthy bacterial community. Fungi, by contrast, are nature’s other primary decomposer, but their sprawling networks of filamentous growth can be torn apart by disturbance and ultimately eradicated if that disturbance is severe or frequent enough to prevent them from rebuilding.

### Disturbance isn’t all or nothing

However, it’s important to think of disturbance as more nuanced than an all-or-nothing scenario. Those fungi might develop to some extent before further disturbance sets back the successional timeline once again

– but the disturbance may not be catastrophic. Thus, the setback is not so dramatic.

A few hundred miles to the northwest, along the California and Oregon coastline, a wide array of native true lilies (*Lilium* spp.) have long shared ground with cattle ranching and logging. They include such visually striking examples as the Columbia lily (*L. columbianum*), the coast lily (*L. maritimum*) and the endangered western lily (*L. occidentale*). Periodic traffic from human activities across the landscape for many decades was enough to keep soils in many areas at an earlier successional stage, with just enough disturbance to keep setting soils back toward a more bacteria-dominated environment that favors lilies.

It’s been noted that conservation efforts in recent decades have resulted in the loss of much of that lily habitat; with those human endeavors now absent from the landscape, natural succession can advance relatively rapidly, so native shrubs and trees crowd out lilies and other earlier-successional plants in these moist, nutrient-rich conditions.

### When the ground keeps moving

Just inland from those rich habitats lies another example, where the rolling slopes of the Coast Range often give way to periodic sliding. These sliding events may be relatively minor, often occurring so slowly as to be imperceptible, in contrast to the dramatic landslides that often follow wildfires in California’s arid south. This habitat, like that of the coastal lilies, is stable enough to support microbe plant communities at an intermediate point in the successional timeline. The regular ground motion can make it challenging for larger species to take root, and so the area has developed its distinctive appearance, with stately coast live oaks (*Quercus agrifolia*) gathered in patchy groves, the space between them blanketed by shorter grasses that thrive at a relatively early point in the successional spectrum. Among them are California melic (*Melica californica*), native to Oregon and California, a plant similar to yerba santa in that it spreads from a rhizome, thereby providing similar services to its community, growing quickly and holding the ground in place.

### Roadsides, farm fields and dove weed

However, there are vast swaths of land where disturbance happens both dramatically and repeatedly. Two good examples are the distinctly human-made circum-





stances on roadsides and in farm fields. The construction of a road immediately sets the successional timeline back to the very beginning — bare dirt, where even bacteria have difficulty surviving. Afterward, regular herbicide applications make it possible to keep the roadside foliage-free with minimal effort, thereby maintaining those early-successional conditions. On a typical conventional farm, the regimen is similar but more intense, with routine plowing and chemical applications repeated each year. In both scenarios, certain plants will quickly populate. In California's Central Valley and Sierra Nevada foothills, there are various introduced species, as well as natives like turkey mullein (*Croton setigerus*), also known as dove weed.

Many broadleaf groundcover plants are later-successional, more at home in the shaded understory underneath taller plants and trees that thrive in a more fungal-dominant soil. But dove weed is the opposite, seeming perfectly attuned to the soil's need for protection when there's no upper canopy to take the brunt of the elements. It grows its blue-green foliage only a few inches above the soil surface and then spreads out, protecting the soil surface so that a new microbial community can begin developing beneath it. Its nutrient-packed seeds attract various birds, including those as large as the wild turkey, whose droppings contribute to the buildup of organic matter that will ultimately lead to microbial development and therefore improved soil structure, and advancement of the area's successional profile.

### Weeds as teachers

It is owing to the context in which we tend to interact with such plants that they have borne the designation of weeds. From a common practical perspective, they are weeds because they show up uninvited as we move soil around in our gardens and yards; and from an ecological perspective, they serve as a sort of annoying confirmation in our gardens and farm fields that our soils are not



Native turkey mullein (*Croton setigerus*), also known as dove weed, is native to most of the western U.S. and can quickly populate disturbed land. Photo: Wes Sander

optimal for the later-successional fruits and vegetables we're actually trying to grow.

But even in our human endeavors, it's helpful to keep in mind the ecological significance of what we do and how nature shows us what's really going on. In any given region, knowledge and awareness of common early successional plants creates a lens through which one can observe any piece of ground, and learn. In ecosystem restoration, knowing which local pioneer plants are native is useful for planning how best to support the area's ecological recovery.

Since June 2020, Wes Sander has served as an Advanced Programs mentor for [Soil Food Web School](#). Sander earned a bachelor's degree in journalism, with background study in biology, from Humboldt State University.





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# At the root: The belowground complexity of perennial herbaceous plant species

A cut bank in tallgrass prairie shows the density of herbaceous roots in the top 50 cm of soil. Photo: Jesse Nippert

By Jesse Nippert

Look around your garden or the broader natural landscape and you'll see a myriad of leaf shapes and sizes, colorful fruits and flowers, and a tremendous variety of plant structures, forms and densities. This visible portion of our plant world forms the base of the global food chain, turns radiant energy into chemical energy, sequesters carbon, produces oxygen and serves as a valve regulating the global hydrological cycle.

With such tremendous form and imperative function, it's hard to perceive anything as complex and important as the plants we see aboveground. And yet, the portion belowground rivals, in both diversity and complexity, what we see aboveground.

The belowground world of plants is often referred to as the "hidden half." This expression captures several realities about how we perceive plants and plant roots. Roughly half (or more for herbaceous species) of plant biomass occurs belowground. Roots perform many functions, beginning with water and nutrient uptake. While gas exchange occurs above the ground, resource uptake occurs primarily via the soil. Roots also anchor plants and stabilize soils despite changing aboveground environmental conditions.

Particularly for herbaceous plants, roots serve as carbohydrate reservoirs. This is obvious for our vegetable tubers, but it is commonplace across most species. Roots are also dynamic in their exploration of the soil, competing with other species, interacting with the soil microbial community and transmitting information on the belowground conditions from roots to leaves to help harmonize whole-plant function based on changes in belowground resource availability.

Historically, root research lagged behind studies of shoots because roots and the rhizosphere are difficult to observe without disturbance. A discussion on the roles and diversity of root functions is important, however, because belowground processes often control ecosys-

tem responses to drought, nutrient cycling, carbon storage and resilience — topics that have become central in ecological and environmental research and the broader understanding of our natural world. The roles of perennial roots (particularly for herbaceous species) can be summarized into four broad themes: resource acquisition, structural capital, biotic interactions and engineering resilience.

## **Resource acquisition under environmental variability and competition**

Fundamentally, roots are viewed as organs of resource acquisition. Roots are the key structures that absorb water and, in doing so, absorb nutrients. This process of root exploration to acquire water and nutrients from the soil is neither passive nor random. Plants use hormones, electrochemical sensors and other mechanisms (potentially including soundwaves) to identify resource-rich soil and allocate root growth proportionately. In soils where nutrients are immobile and bound to soil particles, roots excrete organic acids to alter the chemical composition of the rhizosphere and facilitate the release of key nutrients. Remarkably, the organic acids released by roots vary with the specific nutrient deficiency! Roots are therefore active foragers rather than passive absorptive organs.

A common misconception is that root presence at a particular portion of the soil implies root function. Meaning, if a root is there and water is available, then surely that water will be absorbed, right? While that is often true, there are many cases where it is not. Root water uptake requires no cellular energy, but the pathways of absorption and transport can be gated. As such, roots can exist in wet soil and not use that moisture. This outcome would be very uncommon in the shallowest soil layers but is quite common for deep-rooted herbaceous species. The answer to why this occurs is largely unknown, but it is likely related to the longer



path lengths of water transport required for deep water uptake and lower nutrient concentrations in deeper compared to shallower soils.

Finally, plant roots have the unlikely ability to transport water from wetter to dryer portions of the soil. This process is termed hydraulic redistribution and can be common in semi-arid and arid ecosystems. Hydraulic redistribution happens at night where water moves passively through the plant from wet, deep soils to shallow, dry soils where soil nutrient concentrations are higher. Then during the subsequent day, roots absorb water and nutrients from this shallow soil layer. In summary, roots don't simply capture resources; they determine when, where and how plants exploit heterogeneous below-ground environments.

### Structural capital

In many grasslands, the root system is the true long-lived organism; the shoots are temporary organs renewed each growing season. Unlike annuals, perennial herbaceous plants invest heavily in belowground structures that persist for years or decades. Portions of the root system routinely turn over in response to wetting and drying cycles. When this happens, it's typically the fine roots and root hairs that senesce or deteriorate with age first. Coarse roots primarily transport water resources, whereas fine roots and root hairs specialize in foraging and absorption. Grass species maintain dense fibrous root systems specialized for surface-soil competition, whereas forbs develop taproots that access deeper resources and avoid competition with grasses.

For herbaceous perennials, pools of bud banks are maintained belowground. Buds replace stems (~phytomers) and regulate the density of aboveground canopy. Bud banks are often held just below the soil surface, which facilitates rapid regrowth following disturbances by fire, drought and herbivory. Buds may remain dormant for years or survive only a single season before developing or senescing and becoming old. Their dynamics vary by species, location, resource availability and age. The cues for triggering the transition from bud dormancy to stem development are a combination of hormones, season, environmental conditions and competition. These interacting controls explain why shoot density varies greatly across space and time.

Other belowground tissues regulate processes beyond absorption and regeneration. Corms, tubers, rhizomes, stolons and crown tissue all play key roles in energy storage, transport and spatial patterning. Each of these tissues can store energy in the form of nonstructural carbohydrates (glucose, fructose, starch, etc.).

The Year of  
**CLIMATE  
ACTION**



Bud banks of big bluestem (*Andropogon gerardii*) following winter dormancy are shown at 7.1x magnification.  
Photo: Jacqueline Ott

While most woody plants store their cellular energy in tissues aboveground, herbaceous perennials store much of their energy reserves belowground in association with their root systems. Tubers and corms are examples of tissues highly modified for energy storage. In species that develop rhizomes (belowground) or stolons (at the soil surface), plants can even be thought of as mobile. By extending rhizomes and stolons year after year, a genetic individual can expand in size or gradually relocate across the landscape in search of more favorable habitat or reduced competition from neighboring plants.

### Biological marketplace

Soil biotic communities are highly diverse and spatially heterogeneous. With technological advances, including DNA and metagenomic sequencing, we know that roots are ecological hubs constantly interacting with other organisms. The area around roots that includes soil and microbial communities is called the rhizosphere. The rhizosphere hosts interactions between the plant and mycorrhizal fungi, nitrogen (N)-fixing bacteria and growth-promoting rhizobacteria. The nature and strength of interactions with mycorrhizae and microbes depend on the plant species. Plants invest up to 30% of their energy budget in these partnerships. For mycorrhizae, some species, especially grasses, are obligate, meaning they rely on fungal part-



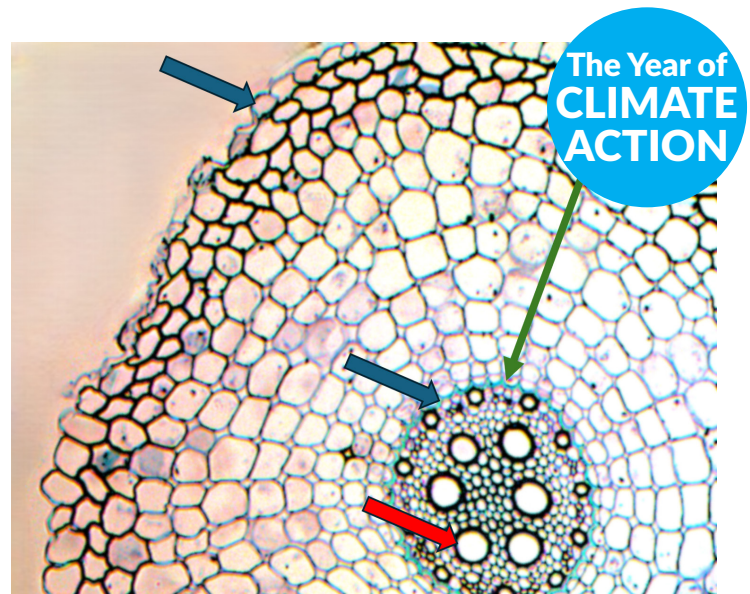
ners to thrive, while many forbs are facultative, meaning they can benefit from the relationship but do not require it. The relationship between legumes and N-fixing bacteria is strictly facultative. When plant-available N is abundant in the soil, the plant does not invest energy in the microbial partnership.

The rhizosphere also hosts competitive interactions between roots and pathogens, nematodes, soil fauna and neighboring plant roots. Roots function as chemical communication centers that shape soil microbial communities and ecosystem processes. The root exudates, which include organic acids and other compounds released by roots into the soil, actively recruit, suppress or manipulate these organisms. Competition for resources between roots of varying plant species can be intense. It is not uncommon for native grasses to use water aggressively, drying the soil to levels that limit the growth and activity of nearby less drought-tolerant forb species. Grasses are then capable of using water conservatively at these lower resource levels with reduced competition. Some species, mainly forbs, can release secondary metabolites into the soil to limit the growth, metabolism and survival of competing plant species.

### Legacy and resilience

Over the last two to three decades, we have refined our understanding of plant roots and their roles. We now recognize that perennial roots are integrative organs linking plants, soils and the biotic environment. Root processes regulate the movement of materials and integrate responses to both the physical environment (abiotic factors such as water, nutrients and soil conditions) and the living community (biotic factors such as microbes, fungi and neighboring plants) belowground. Because of these key roles, perennial root systems are the structures that determine persistence of the entire organism over time.

A key aspect of persistence is ecological memory, the lasting influence of past experiences on how organisms respond to future conditions. Drought provides a useful example. Following a prolonged or intense drought, survival depends less on the number of surviving leaves, but rather on belowground traits including bud banks, carbohydrate reserves and intact vascular root systems. Mortality often occurs when roots can no longer supply water and carbon to bud banks, rather than due to declines in leaf gas exchange. If the plant survives, drought legacies impact subsequent root characteristics. Following exposure to a severe drought, new roots can have anatomical modifications including fewer and smaller-diameter water-transporting conduits (xylem) that are less susceptible to hydraulic failure, varied



Root cross section of Indian grass (*Sorghastrum nutans*) showing dermal (blue arrows), ground (green), and vascular tissues (red) at 10x magnification. Notice the majority of the cross-sectional area is ground tissue used for energy storage, while only six large xylem conduits transport water. **Photo: Jesse Nippert**

root distributions across the soil profile, and increased reliance on mycorrhizal partnerships for water uptake. Surviving one severe drought increases the likelihood of surviving the next. In this sense, roots influence whole-plant resilience because they connect past environmental conditions to future plant performance.

### A synthesis

Roots of herbaceous perennials are long-lived structures that integrate resource acquisition, storage, regeneration and interactions with diverse soil biota. Through their architecture, physiology and symbiosis, roots determine persistence, resilience and ecosystem function.

Given these myriad functions, an argument can be made that perennial root systems are better described as the “persistent half,” rather than the “hidden half.” For perennial species, particularly grasses and forbs, their defining root characteristic is not simply that they are hidden, but rather that they are the long-lived component that persists through repeated cycles of drought, fire, grazing and dormancy. Shoots come and go; the root system, together with the bud bank, is what carries the individual organism through time. So, the next time you marvel at the beauty of the aboveground natural world, pause to think about the complexity and significance of the portion you cannot see beneath your feet.

*Jesse Nippert is a Distinguished Professor of Biology at Kansas State University. He is a grassland ecologist that specializes in plant ecophysiology and has led the Long-Term Ecological Research Program at Konza Prairie since 2017.*



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# Community science

## A valuable conservation activity

By Janet Allen

Shortly after I started my habitat garden in the late 1990s, I discovered “citizen science”—now generally referred to with the more inclusive term “community science” — and I joined the Cornell Lab of Ornithology’s Project FeederWatch (PFW) program.

Back then, I kept track of my bird sightings on a printed copy of PFW’s tally sheet, and at the end of each week, I snail-mailed the completed sheet to Cornell. It was a welcome change a few years later when I could enter the data on their website.

By 2020, though, there was an app for that! Now, I can enter my count directly in the app and just hit “submit” at the end of the week. It can’t get any easier.

Fortunately, many other projects today also provide phone apps or data entry on their websites, making it much simpler and more enjoyable to be a community scientist in 2026.

### Does community science matter?

I appreciate having my PFW count history of birds I’ve seen in my yard over the last 26 years, but we all benefit from the information collected by the many thousands of community scientists. Each spring, for example, I eagerly watch the daily progress of monarchs and hummingbirds as they make their way back to Central New York where I live. Seeing their journeys wouldn’t be possible without the contributions of the many people who take a minute to report their sightings to Journey North.

Even more important, as these and other projects accumulate data over the years and decades, we can better design effective conservation practices.

### Can research based on community science be trusted?

We respect the training and knowledge of scientists, so some question whether data collected by laypeople can be useful. Studies have found that the data collected are indeed valid, and have routinely been used in respected research. For example, iNaturalist data have been cited in more than 7,000 scientific papers, and research using FeederWatch data regularly appears in scientific journals.

It’s not surprising that this data is trustworthy. People interested in being community scientists (such as us Wild Ones members) may indeed be laypeople, but we’re typically knowledgeable about biodiversity and conservation issues. Just as important, we are highly

MONARCH WATCH PROJECT

April 2022

May 2022

June 2022

July 2022

August 2022

Lat: 43.040728  
Long: -76.212590

List the number of adult monarchs seen each day in which seeing a monarch was a possibility.

\* If you were outdoors and saw none, record a zero (0).

\* If there was no opportunity to make any observation leave that date record blank.

\* When monarchs can't be active due to weather conditions (e.g., temperatures below 50), extreme overcast, heavy rainfall, a "W" (for weather) should be entered.

Register and learn more: monarchwatch.org/calendar/

Not that long ago, community scientists had to keep track of their monarch observations on paper and then snail mail their findings in.

*Photos and screenshots: Janet Allen*

motivated to collect information carefully because we care deeply about preserving biodiversity.

The bottom line, of course, is that scientists themselves could not possibly collect the amount of data needed to address many large conservation issues. For example, eBird alone has had more than 2 billion sightings contributed by community scientists. It would be difficult for researchers alone to collect that much data!

### Tips for being a happy and productive community scientist

The first and most important tip is to pick a project you find interesting and that fits your lifestyle constraints. Some projects require more effort or have more exacting protocols than others.

Don't go overboard. There are so many interesting and valuable projects that it's tempting to sign up for more than you can reasonably do. It's better to faithfully collect data for one or two projects than to become overwhelmed and drop them altogether. As you become an experienced community scientist, you can add more as you discover them.

You don't have to be an expert naturalist, but it's important to learn your chosen project's protocols: the



Apartment Balcony  
Mar 19, 2025-Mar 20, 2025

Search

House Sparrow 6

Dark-eyed Junco 4

Blue Jay 2

White-breasted Nuthatch 1

Settings My Count Review & Submit

The Cornell Lab of Ornithology app allows community scientists to keep track of birds they see on their property.

Monarch Calendar Project

Location of monarch observation

Syracuse, NY, 13219, United States

Date of monarch observation

July 29, 2026

Number of adult monarchs observed

1

Report the number of adult monarchs seen each observation day. Enter a zero (0) if you were able to observe outdoors and saw none. Enter a W (for weather) for days monarchs were not active due to weather conditions (e.g., low temperatures, extreme overcast, heavy rainfall). Do not report anything if there was no opportunity to make observations due to work, vacation, etc.

Complete details are available on the Monarch Calendar Project website.

Back Submit Calendar My Log

The Monarch Watch Monarch Calendar Project app makes it easy to submit your monarch observations.

Project FeederWatch Tally Sheet

Effort

Mark the time periods that you watched your FeederWatch Count Site.

Day 1, morning Day 2, morning

Day 1, afternoon Day 2, afternoon

Mark the estimated cumulative time you watched your FeederWatch Count Site.

Under 1 hour Over 8 hours

1 to 4 hours I watched my feeders, but no birds were present.

4+ to 8 hours

Weather

Daylight temperature

Mark the box that indicates the temperature extremes on each day. Transfer only the extreme low and the extreme high to your Data Form.

Low High

Day 1 Day 2 Day 1 Day 2

Temperature

Under -18°C (under 0°F)

-18° to -10°C (0° to 14°F)

-9° to 0°C (15° to 32°F)

1° to 10°C (33° to 50°F)

11° to 20°C (51° to 68°F)

Over 20°C (over 68°F)

Daylight Precipitation

Mark all the boxes that indicate the kind of precipitation that occurred during the 2-day count.

Type

None

Rain

Rain and Snow

snow

Duration

Under 1 hour

1 to 3 hours

3+ to 6 hours

Over 6 hours

Snow depth and snow cover

Mark the conditions during the majority of your 2-day count.

REMEMBER!

FeederWatch ID number: Personal online password: Online screen name:

My FeederWatch Count Days: April 5, 2001

Species seen:

Use the space below to tally the numbers of birds of each species you see at one time. Then transfer your highest counts to the Data Form. (Don't add your counts together—transfer only the highest number seen at one time.)

| Species Number in Data Booklet | Species Name           | Highest Number Seen at One Time |
|--------------------------------|------------------------|---------------------------------|
| #12                            | Cedar Waxwing          | 2                               |
| #27                            | House Finch            | 3                               |
|                                | Sharp-shinned hawk     | 2                               |
|                                | Cospar's hawk          | 2                               |
|                                | Whining Dove           | 2                               |
|                                | Downy Woodpecker       | 3                               |
|                                | Blue Jay               | 3                               |
|                                | American Crow          | 3                               |
|                                | Black-capped Chickadee | 2                               |
|                                | Northern Mockingbird   | 2                               |
|                                | European Starling      | 1                               |
|                                | Northern Cardinal      | 2                               |
|                                | Rock-crested Junco     | 2                               |
|                                | American Goldfinch     | 30                              |
|                                | House Sparrow          | 35                              |
|                                | Am. Robin              | 1                               |
|                                | House Finch            | 2                               |
|                                | Parula                 | 1                               |

Janet Allen still has a tally sheet for Project FeederWatch (PFW) that she used to keep track of birds in her yard. Today it's much simpler to keep track of birds with Cornell's PFW app.

step-by-step instructions used to collect data so that everyone is observing according to the same rules. Even similar-sounding projects can have different purposes and rules. For example, you don't count birds flying over your site in PFW since its purpose is to count birds feeding in your yard, but you do count these flyovers in eBird, since its purpose is to discover what birds are there.

If you're new to community science, [SciStarter](#) offers free, self-guided training modules. Some individual projects, such as [eBird](#), even have free video courses that help you participate.

### Not just for individuals

It's convenient for many people to do community science at home, but people can participate in other places, too.

In schools, community science gives kids the chance to do science, not just read about it. Some projects, such as PFW, even provide [teacher resources](#) and [classroom guides](#).

Libraries can also be [hubs for community science](#), providing training, to-go field kits and spaces for people to gather as they collect data.

One of the most popular community science projects is iNaturalist, which many people use to identify plants and animals. iNaturalist's mission is "... to connect people to nature and advance biodiversity science and conservation."

Sounds a lot like our Wild Ones' mission, doesn't it? Community science provides Wild Ones members and chapters with a practical way to support conservation while deepening their connection to the natural world.

Janet Allen is the co-founder and president of the Wild Ones Habitat Gardening in Central New York Chapter. Her yard is certified as Monarch Way station #581 by Monarch Watch and as a Certified Wildlife Habitat #27815 by the National Wildlife Federation. Her website is [ourhabitatgarden.org](http://ourhabitatgarden.org).





# Lawns:

## One solution that solves many problems

By Janet Allen

*At least 40 million acres of lawn blanket the United States, but what do we get from all this lawn? Not much, at least not much that supports life on Earth.*

*The solution is easy: shrink our lawns. This one action will help solve many problems.*

### **Problem 1: Habitat loss**

Loss of habitat is a primary reason many species of wild-life and native plants are disappearing. Lawn isn't the only cause, but those 40 million acres are a significant factor, and much of that lawn is growing in what were formerly natural areas.

Another way lawns reduce habitat is that "leaving the leaves" kills lawn, so people diligently rake them up and haul them out to the curb as yard waste rather than leaving them as habitat.

### **Problem 2: Water use**

Even as some areas of the U.S. face long-term water shortages, an estimated 9 billion gallons of water are used on lawns each day to keep shallow-rooted turf grass lush and green, according to the [Environmental Protection Agency](#) (EPA).

### **Problem 3: Pesticides**

Every year, we use 80 million pounds of pesticides on our lawns, according to [Environment & Human Health Inc.](#) These toxic chemicals harm pollinators, other wildlife and pets. They're bad for people, too, especially children. The [American Academy of Pediatrics](#) warns that these chemicals can harm children's cognitive and behavioral development and may even lead to childhood cancers and other serious problems.



Surrounding your trees with native plants such as common milkweed (*Asclepias syriaca*), shown here growing beneath a bur oak (*Quercus macrocarpa*), creates a "soft landing" and provides shelter and habitat for months, butterflies and beneficial insects. Photo: Barbara A. Schmitz



Even worse, many lawn pesticides contain neonicotinoids (“neonics”), synthetic neurotoxic insecticides that can persist in plants and soil for years. The European Union banned three of the most widely used neonics. Why haven’t we?

Many people concerned about pesticides choose organic products, so why not simply use organic lawn pesticides? The answer is more complicated than it may seem. As the [University of New Hampshire](#) notes, organic lawn pesticides are derived from naturally occurring ingredients. While some may be less toxic or less persistent than their synthetic counterparts, they are still designed to kill or repel target organisms and are often applied at concentrations much higher than those found in nature.

#### **Problem 4: Fertilizers**

It’s easy to see that lawn pesticides can harm living things, but what can be so bad about fertilizing the lawn to keep it lush and green?

One reason is that lawn chemicals pollute watersheds. Many people associate excess nitrogen and phosphorus pollution with agriculture because it contributes to harmful algal blooms in lakes and waterways. However, fertilizers applied to home lawns are also a significant source of this pollution.

#### **Problem 5: Air pollution**

Most mowers, leaf blowers and string trimmers are gas-powered, yet they are not required to meet the same emissions standards as passenger vehicles. According to the 2023 report “[Lawn Care Goes Electric](#),” this equipment is a significant source of air pollution in the United States, contributing 5-10% of all toxic air pollution, including nitrogen oxides, carbon dioxide (CO<sub>2</sub>),

formaldehyde, benzene and tons of fine particulate matter.

Commercial lawn service trucks add to the problem by hauling heavy riding mowers and other equipment around our neighborhoods.

#### **Problem 6: Scent pollution**

Related to the air pollution caused by gas-powered lawn equipment is the scent pollution it creates, along with odors from lawn pesticides and fertilizers. While these scents may be unpleasant for people, they can have more serious consequences for wildlife. According to the [Yale School of the Environment](#), scent pollution can alter the chemical signals plants and animals use to communicate, affecting foraging behavior, navigation and even pollination.

#### **Problem 7: Noise pollution**

Sounds of 85 dB can damage hearing over time, and most gas-powered lawn equipment exceeds that level. Lawn mowers range from 82 to 90 dB, while weed whackers can reach 96 dB. Worst of all are leaf blowers, which range from 90 to 110 dB, and are used not only to clear leaves in the fall, but also to chase down every stray clipping of grass that lands on a sidewalk or driveway.

For a typical yard, each of these activities may produce noise for “just” an hour or so. But as anyone who lives in the suburbs can attest, as soon as one person finishes, the next one starts, creating a seemingly endless barrage of noise, especially on weekends.

In addition to harming hearing, this noise contributes to stress, raises blood pressure and diminishes our overall quality of life and sense of well-being.

The effects extend beyond humans. Noise pollution disrupts communication among animals, increases stress and can ultimately

affect their health, behavior and long-term survival.

#### **Problem 8: Human costs**

Besides pollution, lawn maintenance exacts other costs. Americans spend an average of two to three hours a week maintaining their lawns, and as a nation, we spend more than \$60 billion on lawn maintenance. Think of all the ways this much time and money could be better spent.

Worse, though, are the 85,000 injuries and 70-90 fatalities caused by lawn equipment accidents in the U.S. each year.

#### **Problem 9: Effects on trees**

In many landscapes, lawns extend right up to the tree trunks, which can lead to the problems described below.



Power mowers often gouge a tree’s trunk, which can strip away the bark and expose the tree to rot, pests and diseases. If the damage is severe, it can cut off the tree’s nutrient transport system, potentially leading to the tree’s death. *Photo: Janet Allen*



Native trees are important because they support insect populations, but many insects need a “soft landing” beneath trees to complete their life cycles. Although lawn is technically “soft,” it doesn’t provide the habitat those insects require. As a result, native trees can become a dead end for the insects we need to support, according to [Homegrown National Park](#).

Another problem is that power mowers often gouge tree trunks during routine mowing.

The most serious problem of all, however, is that people sometimes remove trees altogether, complaining that grass doesn’t grow well beneath trees, or that it is too much trouble to rake their fallen leaves.

#### **Problem 10: Climate**

We know plants produce oxygen and sequester CO<sup>2</sup>, and lawns consist of plants. Therefore, lawns — as so many lawn-industry websites boast — must be good for the climate, right? These companies often compare lawns to impervious urban surfaces in cities, and lawns are indeed less harmful than concrete.

But when the full carbon footprint of lawns and their upkeep is considered, the picture is not so rosy. The carbon emissions produced by various aspects of lawn care dwarfs the small amount of oxygen production and carbon sequestration provided by the shallow-rooted turf grass.

#### **Problem 11: Connection to nature**

Research is increasingly finding that connecting with nature is good for our minds, bodies and souls. In fact, some doctors prescribe time in nature as treatment for some illnesses.

News flash! A lawn isn’t nature — or at least not the kind of nature that nurtures us. Being outside in a lawn-dominated landscape may

indeed be better than sitting indoors all day. But in a yard full of life, we can enjoy bird song, the buzz of busy bees, the fragrance of plants and more. A home landscape full of life is one of the easiest ways to connect with nature.

#### **Ticks: A problem lawn doesn’t solve**

With increasing concerns about tick-related diseases, lawn-dominated landscapes free of any leaf litter might seem like the obvious solution. After all, these spaces support very little life.

But as [Dr. James Shepherd of Yale School of Medicine](#) points out, our denuded human-shaped landscapes are good hosts for ticks and other infectious organisms, whereas the “dilution effect” of biodiversity helps protect us from ticks and other disease hosts.

#### **A problem masquerading as a solution**

So, does lawn causes problems? Why not eliminate the natural lawn and install an artificial one instead? But this “solution” trades the problems created by synthetic pesticides and fertilizers, water use and noise pollution for those of additional plastic pollution and destruction of soil degradation. It may even create a false sense of connection to nature, with the appearance of green plants but without experiencing any of the living things those plants support.

#### **Partial solutions**

Having a “good enough” lawn helps. My definition of a “good-enough” lawn, which describes our tiny lawn area between our planting beds and the road, is that It’s green and you can walk on it.

Recommended lawn-care practices to lessen the problems created by conventional lawns include mowing high to shade out weeds

and encourage grass to have deeper roots, watering deeply but less frequently, and leaving grass clippings on the lawn to decompose as a natural fertilizer. Instead of using pesticides and fertilizers, undesirable weeds can be pulled by hand, and more beneficial plants such nitrogen-fixing clover can remain.

Using electric-powered lawn mowers and human-powered lawn rakes instead of gas-powered mowers and leaf blowers reduces air pollution, greatly reduces noise pollution and helps protect the climate.

This kind of lawn is less harmful than a conventionally managed lawn, but it is not the best solution. Reducing lawn area and replacing it with native plants does far more to address habitat loss and reconnect us with nature.

#### **In conclusion**

Is a large lawn worth the impact it has on our health, our communities, wildlife and the environment?

Though we can care for our lawns in less harmful ways, the bottom line is that a smaller lawn will be even less harmful than a larger one. Replacing portions of lawn with native plants creates more habitat, supports biodiversity and provides benefits for people, wildlife and future generations.

Inspired to shrink your lawn? The [Homegrown National Park website](#) has a wealth of resources to help you, as well as the Wild Ones website and your local chapter.

*Janet Allen is the co-founder and president of the Wild Ones Habitat Gardening in Central New York Chapter. Her yard is certified as Monarch Way station #581 by Monarch Watch and as a Certified Wildlife Habitat #27815 by the National Wildlife Federation. Her website is [ourhabitatgarden.org](#).*





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## GREATER THAN THE SUM: THE POWER OF COMPOSITE FLOWERS

Ever wonder why goldenrods, asters, and sunflowers are irresistible to pollinators? It's not only their vibrant colors—it's also their ingenious design.

They're composite flowers in the family *Asteraceae*. What may look like a single blossom is a collection of multiple, smaller florets. Ray florets ring the outer edges of the flowerhead and are what we think of as petals. Disc florets make up the flower's center. Depending on the species, the head of a composite flower may have both kinds of florets, only disc florets, or only ray florets.

Pollinators love composite flowers, in part, because each floret offers the possibility of nectar and pollen. Visiting a member of the *Asteraceae* family is like hitting a buffet with zero travel time. Pollinators can forage efficiently, moving from floret to floret while burning minimal energy.

Composite flowers are the ultimate team players. They top the lists of herbaceous keystone species for North America, serving as hosts for caterpillars and providing pollen to specialist bees. Adding them to your landscape gives it a big boost in biodiversity and ecological resilience.

Ready to bring the power of teamwork to your garden? Discover how composite flowers work and which ones to plant next in our post:

[The Power of Composite Flowers: Greater Than the Sum of Their Parts.](#)



*Solidago rigida* (syn. *Oligoneuron rigidum*), offers dense clusters of flowerheads for late-season pollinators.







Photos of Lisa Kearns's property

# Wild Ones' certification program helps to sustain biological diversity

By Jennifer Yang and Rosie Sunseri  
Texas is home to more than 5,000 native plant species, making up about a quarter of North American native flora. From the white blooms of the buttonbush (*Cephalanthus occidentalis*) to the native fruit of the Barbados cherry (*Malpighia glabra*), Texas holds countless stunning native species to observe year-round.

However, there remains a significant need to protect native species, and many native conservation programs work to prevent their decline and extinction. One approach encourages people to help conserve native wildlife right in their own backyards.

The Wild Ones Certified Native Habitat Program (CNHP) gives participants the opportunity to make a commitment to biodiversity, community engagement and collaborative action through the cultivation of native plants. All gardeners working toward having at least 75% native

species in their habitats are eligible for certification, providing a tangible way to sustain biological diversity in their communities.

Nationally, Wild Ones has certified more than 500 habitats since the program began. But its goal is to certify 5,000 native habitats across the country, and thus help to restore biodiversity by establishing ecological corridors for pollinators and other species. Wild Ones members of the CNHP are Partners at Large (PALS) or belong to one of the 100 chapters and 48 seedling chapters in 38 states across the country, facilitating local community engagement.

Teddi Zonker, Thomas Schick, Lisa Kearns and Trent Cruthis, four members of the Wild Ones DFW (Texas) Chapter with thriving native habitats, show how widely varied backgrounds and even very different yard sizes can contribute to environmental change and inspire more people to participate.

## Becoming certified

To be eligible for certification, your habitat should:

- Be stewarded by an active Wild Ones member
- Use mostly native plants (75% of your planted species or actively working toward it). Wild Ones defines native plant species as "one that occurs naturally in a particular region, ecosystem and/or habitat, and that was present prior to European settlement."
- Support local wildlife and pollinators by providing food, shelter and a place to raise young
- Incorporate regenerative gardening practices such as avoiding pesticides, reducing runoff and leaving the leaves

Since every garden is unique, habitats at all stages of development, from container gardens to rewilded acres, are welcome to certify. Apply at [wildones.org/cnhp](http://wildones.org/cnhp). The cost is \$50, and once approved, the Certified Native Habitat sign will be mailed directly to you.



## Getting started with Wild Ones DFW

Zonker, now a chapter director and the vice president, said she was first motivated to create a native habitat while she was watering her front lawn in Keller, Texas, a suburban city located in the middle of the Dallas-Fort Worth metro area. As a Master Gardener and Master Naturalist, she couldn't reconcile her knowledge of environmental sustainability with continuing to water her grass. She soon replaced it with a water-efficient garden where neighbors stop to see butterflies and vibrant flowers in "Miss Teddi's yard," and she eventually applied for Wild Ones' Native Habitat certification in 2025.

Around the same time, Schick, who lives just 30 minutes away from Zonker in Arlington, Texas, was already involved in many other local nature conservation organizations and joined Wild Ones because he was drawn to the program's conservation focus. Schick spent about three years planting native prairie blazing stars (*Liatris pycnostachya*) and other natives until he achieved a mix of native plant species and received his certification. He said he is eager to contribute to the educational work of Wild Ones.

Kearns had a completely different reason for planting native plants. When she moved into her first house in 1991, she wanted to find "plants that would be harder for [her] to kill" for her backyard and found that native plants had the best chance of survival. As she learned more about her plants, she realized the positive impact of her native habitat on the environment. When she moved to a newly constructed home, she replaced Bermuda grass (*Cynodon dactylon*) with native plants, spent two years nurturing her new native habitat and then applied for habitat certification through Wild Ones.

Already a member of another wildlife program, Kearns joined Wild Ones to take on a new challenge and contribute to an organization focused primarily on plants.

Cruthis, social media chair of the Wild Ones DFW Chapter, said he has a persistent love for wild things that was inspired by his grandmother during his childhood. "Catching lightning bugs and roly-polies, walking in the woods [and] climbing trees," Cruthis discovered his role in nature and wanted to continue living in a beautiful space full of other kinds of life, sharing his space with "little bugs and birds and critters." The program motivated him to create a native landscape in his Homeowners Association (HOA) neighborhood, which attempted (and only somewhat succeeded) to "temper [his] exuberance."

## What I wish I knew

Each with their own motivation, Zonker, Schick, Kearns and Cruthis can watch their habitats flourish and be part of a growing community of people focused on sustainable living practices and the cultivation of lively, native spaces. The length of the certification process varies depending on the status of applicants' habitats at the time of application, as gardening is always an ongoing process.

Kearns said that her habitat is "constantly evolving" as plants change and grow. Schick acknowledged the difficulty of controlling tree growth and uprooting invasive species, but said morning coffee on the porch and butterfly sightings make the continuous process worthwhile.

## Beyond the garden

Beyond managing their respective habitats, each member has enjoyed connecting with others over their shared interest in nature, and



Photos of Teddi Zonker's property



they've taken the opportunity to pass along what they've learned with others within and beyond their Wild Ones community. The DWF chapter held two events in 2025 on the Wild Ones' certified native habitat program, including one lead by Cruthis.

Similarly, Schick turns to social media to share photos of his garden with followers around the world. The posts he shares consist of daily snapshots of the plants, documenting their growth and seasonal changes. Rain or shine, he posts to show others that even non-blooming plants are interesting and life-affirming. He hopes that by sharing the plants and wildlife that visit his garden, he can connect with his online following and influence them to "kill [their lawn] and plant native plants."

Kearns has accomplished the same goal by selecting books such as Doug Tallamy's "Nature's Best Hope"

for her neighborhood book club meetings. While she was initially met with skepticism from community members, she saw a budding interest in her neighbors, who began to venture to their local nursery and plant native plants. Since then, she's managed a Facebook page for neighbors to connect with each other for native plant recommendations. In a talk Kearns gave titled "Encouraging Native Landscapes in HOA Neighborhoods," she was able to pass on her experiences to those interested in navigating HOA restrictions on gardens.

To many people, a front yard is simply a plot of land waiting to be filled, perhaps by artificial, store-bought turf. What most people don't realize, however, is the surprising ease of transforming space into a one-of-a-kind garden, all the while being able to save native plant species and support wildlife. Zonker, Schick, Kearns and Cruthis celebrate the sat-

isfaction that comes from building a garden and contributing to biodiversity. They have also seen the joys that come with sharing their knowledge with others. All four members continue to make a significant impact on their communities in the Dallas-Fort Worth area and enjoy the thriving native habitats they nurture.

*Rosie Sunseri is a recent graduate of the University of California, Los Angeles, where she studied public health and professional writing. She hopes to continue writing and collecting personal narratives as she pursues a career in medicine. Jennifer Yang is a rising senior at the University of California, Los Angeles, where she is studying physiological science and biomedical research. She plans to pursue a degree in medicine and research in women's health fields, working to bridge gender disparity in patient outcomes and clinical research.*



Photo by Catherine McKenzie. Spring-Ephemerals in the North Woods





# Ohio career center creates pollinator garden with help of Wild Ones' SFE grant

Students at the Pickaway-Ross Career and Technology Center created and planted a pollinator garden at the Chillicothe, Ohio school. It was first planted in fall 2025.

About 85 high school students and staff planted over 100 native plants in the Pickaway-Ross Career & Technology Center pollinator garden, thanks to a 2025 Lorrie Otto Seeds for Education grant. Located in Chillicothe, Ohio, the vocational-technical school serves Pickaway and Ross counties.

Project Coordinator Donna Patrick, who is also co-founder and president of the Wild Ones South Central Ohio (Seedling) Chapter, said because of drought earlier in the planting season, all plants were first installed in the school garden, named the Crouse Chapel Pollinator Garden, in the fall and were “coming up nicely.”

In her project report, Patrick wrote that the students helped with site and garden planning, planting and establishment and observation and discovery. Students also gained leadership skills while learning all about the

importance of native plants.

The garden will serve as an outdoor learning space as well as a place for students to relax and unwind in nature.

“The garden is in a very peaceful spot and will allow classes to bring a blanket and sit nearby,” she said.

Already, teachers have used the garden as part of their curriculum. For instance, students in science classes took soil samples. In addition, cosmetology students helped plant the pollinator garden as part of their Lean Six Sigma project, and other classes helped with the watering. Lean Six Sigma helps to improve efficiency and quality in processes.

In June, the school posted on Facebook that the flowers were beginning to bloom and included a video of the new garden space.

Patrick wrote that there are plans to expand the garden and make it a foundation for other

projects. “We hope to have garden art made, possibly stepping stones or kindness rocks, and add a border,” she said.



Flowers in the new pollinator garden started to bloom in June 2026.





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Native flora are anchored directly into the moist, moss-covered rock along the dolomitic slope. Photo: Dr. James Zimmerman

# Ice age time capsules

*The ancient plumbing and rare plants of Tennessee's dolomite seeps*

By Marialuisa Quinonez

Picture yourself in a hot and humid river valley in East Tennessee in the peak of summer, and then, suddenly, the forest opens up and you step into a small, cool oasis.

"It's like going into an air-conditioned space," says Dr. Edward Schilling, a professor in the Department of Ecology and Evolutionary Biology at the University of Tennessee in Knoxville who has spent years researching these unique ecosystems. "The cool water is just continually evaporating, and the coolness from the seep keeps the entire area cool."

Such are Tennessee's Ridge and Valley Dolomite Seeps of the Powell River Basin, which are rare and operational "ice age capsules" and home to various plants that are able to survive away from their natural northern

habitat. The complex interplay of geology and the presence of water year-round have led to the formation of this unique plant community.

## **A digital discovery in an overlooked valley**

Due to the rigorous exploration carried out by generations of botanists in East Tennessee, the Ridge and Valley region had long been thoroughly searched and thought to have no new botanical discoveries left. The beliefs of the researchers were shaped by several decades of previous surveys in the area, which made them think that the flora of the Ridge and Valley region had been thoroughly studied.

However, everything changed in the early 2010s when a student botanist named Aaron Floden (now

## **Dolomite seeps at a glance**

- Dolomite seeps are natural formations where dolomitic rock releases water.
- They are important for studying geological and hydrological processes.
- These seeps may also serve as habitats for unique plant and animal species.
- There are 82 documented locations where dolomite can be found across the United States. Dolomite seeps are found in areas where dolomite is present, including natural springs, coastal areas, caves and caverns, riverbanks, quarries and wetlands.



known as Dr. Floden who works as an assistant scientist at the Missouri Botanical Garden) started to search for the rare type of sedge known as *Rhynchospora* that had been known only from historical records. Floden used Google Maps' Street View option to explore the remote regions to the north of Knoxville, Tennessee to find the areas of naturally open vegetation lacking tree cover that could host the targeted species of *Rhynchospora*. After identifying some spots, he then traveled to them to verify his finds and managed to find the dolomite seep plus many others. According to Dr. Schilling, "Aaron

entered the fray, discovering new things ... and bringing in the need to recognize where to find them." During his journey, Floden also found out about an entirely new species of plant, then unnamed, that came to be called *Trautvetteria fonticalcareia*.

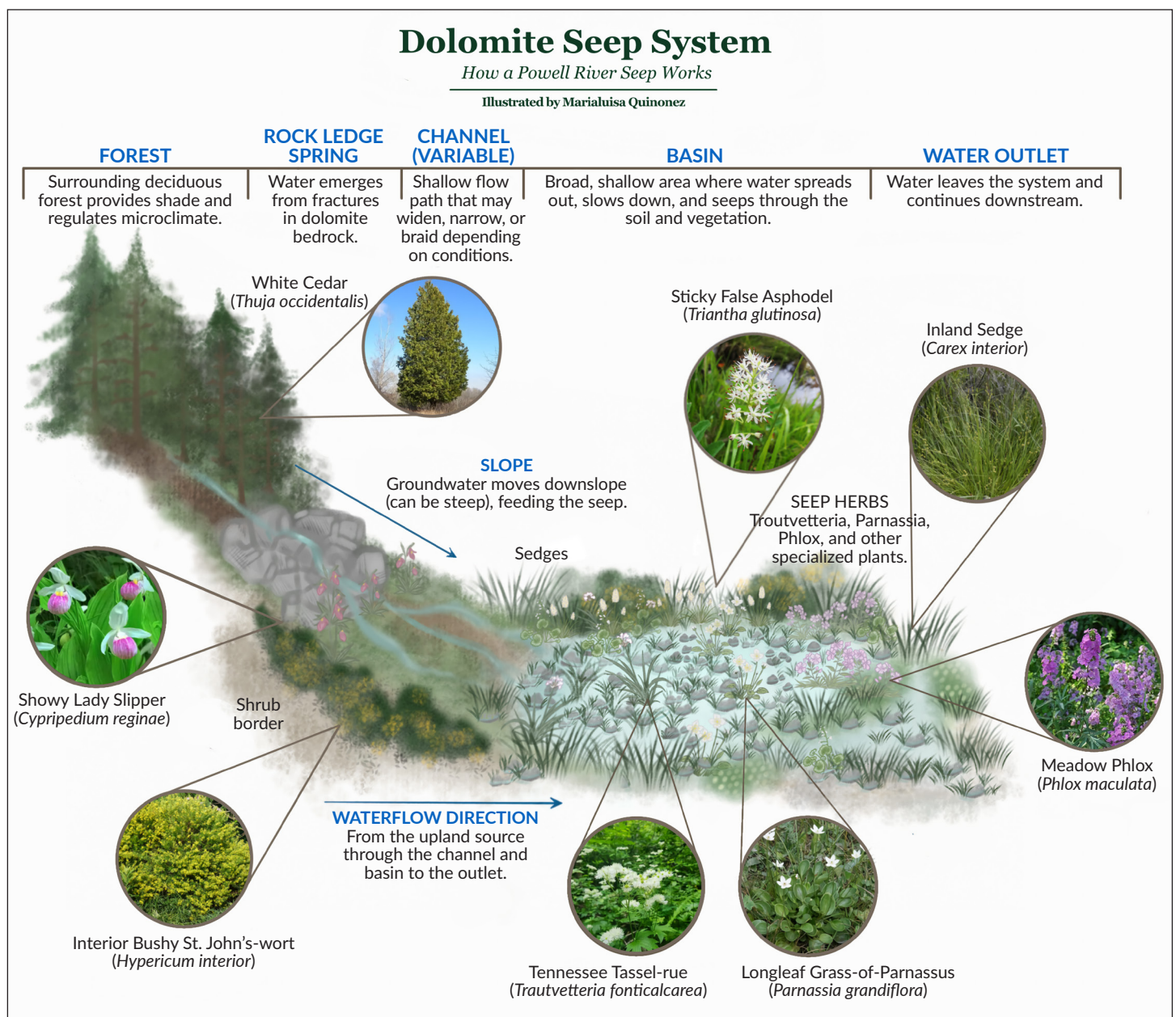
### The Ridge and Valley Dolomitic Seep ecotope

The plant communities of the Ridge and Valley Dolomitic Seep are made up of small, localized altitudinal ecozones formed by several environmental factors. Generally, these plant communities are small. The average site is about a quarter acre

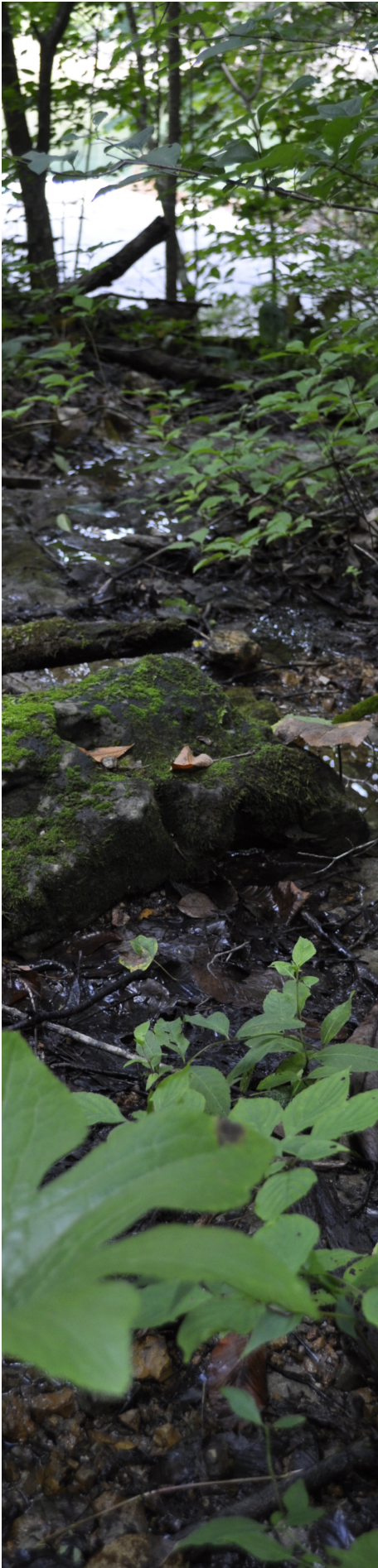
in size, while the largest sites are only about half an acre.

As hydrology and geology change across the seep, the vegetation shifts through a series of distinct environmental zones:

- Surrounding forest: The canopy matrix of trees surrounding the seep system.
- Rocky ledge and spring: An outcrop of dolomitic rock associated with a spring from which ground-water constantly flows, shaping the regional hydrology.
- Flowing channels and basin: Water flows from the rocky layer into smooth channels of water







that lead to the open basin. The basin, which contains water saturated with oxygen and has rocks on the surface, supports specific, low-lying plants.

- The shrub border: Surrounding the basin, where conditions are somewhat drier, is a zone often dominated by shrubs.
- Return to the forest: Beyond the shrub border, the plant community gradually transitions back into the surrounding forest.

This specific local ecotope features an uncommon relationship between hydrology and geology, as groundwater emerges year-round through the crevices of dolomitic limestone. As the constant flow of water washes away unbound soil and organic material, the resulting substrate is primarily rocky.

This rough natural substrate forms an important ecological barrier. Most notably, it inhibits the growth of trees, creating an open habitat. It remains unclear, however, to what extent invasive shrubs are excluded.

Although the native plants found here can grow in more typical soils, they are weak competitors and are often unable to compete with invasive weeds outside the harsh conditions in the seep's constant water flow. In garden settings, however, they can be successfully grown when protected from competition by weeding.

#### **Plant communities: Common beauties and novel wonders**

Plant communities located in these seep areas contain both common species and rare, unusual plants. Schilling, who spent several years investigating this type of ecosystem, said the cool groundwater flow keeps the area free of any invasive plants and trees by washing away soil and creating a cooler, wetter microclimate than the surrounding landscape.

The constant flow of water

also helps remove organic material containing nitrogen from the substrate. This appears to be one reason why the carnivorous plant *Triantha glutinosa* is growing in this community. Several other unique plants can be found in this community as well, including species already established in horticulture and others that show promise for future cultivation.

#### **Horticultural and common plant species**

Several seep-dwelling plants offer spectacular ornamental appeal and are available to gardeners for horticultural purposes:

- Showy lady's slipper (*Cypripedium reginae*): Extremely rare in Tennessee but widespread further north, breeding plants of this orchid species from local seeps could provide genotypes successfully grown in southern gardens. Sustainably propagated plants are available from sources such as Plant Delights Nursery in Raleigh, North Carolina.
- Pretty or wood's sedge (*Carex woodii*): A terrific contributor from the sedge family. This short, rhizomatous sedge forms soft, lush green mats and serves as an excellent ground cover or turf substitute in shady areas where traditional grasses struggle to grow.
- Meadow phlox (*Phlox maculata*): Valued for its colorful, beautiful and fragrant tubular flowers, the plant is well-known among gardeners due to its contribution of colors in the summer months.
- Goldenrod (*Solidago* spp.): Attractive, easy-to-grow seep plants that are widely available in the nursery trade. They are highly valued in the horticultural industry for providing an important late-season nectar source for insects and for their tolerance of a wide range of environmental conditions.



## Novel discoveries and research opportunities

Moreover, other species found in these seeps are completely new to science, while others might lead to other scientific breakthroughs:

- Grass of Parnassus (*Parnassia palustris*): A striking late-season bloomer, flowering in October, this plant has a unique mechanism for delivering pollen to pollinators. The flower releases its pollen when touched by an insect. Similar mechanisms in violets and Venus flytraps have recently been discussed in Science magazine as important inventions that can change robotics.
- Leatherleaf tassel rue (*Trautvetteria fonticalcareia*): This newly discovered seep plant is a key species in the paper by Schilling and Floden. Its striking, leathery, vinyl-like leaves may offer new opportunities for materials science, though those possibilities have yet to be investigated.
- Sticky false asphodel (*Triantha glutinosa*): This plant was recently discovered to be carnivorous. It possesses small glands on its stem allowing it to trap insects, an adaptation to growth in the nutrient-poor soils of the seeps.

## Experiencing the seeps: Ex situ conservation

Because genuine dolomite seeps seldom expand over a quarter-acre in size and can be easily damaged by outside disturbances, they are not suitable destinations for hiking or ecotourism.

As botanists have increasingly recognized the need to protect these fragile habitats, educational efforts have shifted toward showcasing seep ecosystems without disturbing them. At the Knoxville Botanical Garden and Arboretum's Seep Garden, researchers collabo-



Researchers conduct field surveys in an open seep basin, which typically spans 1/4 to 1/2 acre within the forest canopy. Photo: Dr. Edward Schilling.

rated with landscape designers to create a model of the seep ecosystem and its processes using limestone, hydrology and a carefully selected range of species.

Such gardens allow people to learn about these ecosystems while viewing rare plants up close. This approach, known as ex situ conservation, involves protecting plants and animals outside their natural habitats. Through cultivation in places like botanical gardens, arboreta and seed banks, researchers and conservation organizations can preserve biodiversity, conduct essential studies and research and promote public education without disrupting delicate ecosystems.

## The modern threat

Although real estate development, invasive species and pollution pose a threat to many ecosystems, dolomite seeps are jeopardized by a phenomenon that is not noticeable on the surface: the depletion of aquifers. Because these seeps depend on a

consistent supply of groundwater, they are vulnerable when aquifer levels drop due to groundwater withdrawal and well drilling.

Without a steady flow of water, the cooling effects of evaporation are lost, and soils and organic material are no longer washed away. Over time, these changes can lead to the collapse of the seep ecosystem.

While aquifer depletion is the greatest threat to this unique habitat, other risks remain at the ground level, including deforestation and bulldozing.

## How the public can help

Though some amateur conservationists are afraid of damaging native ecosystems through direct contact, there are effective ways to support seep conservation:

- Practice sustainable cultivation: Use associated plants such as *Carex woodii* or native phlox in your garden to admire the beauty of these ecosystems on your own property.



- **Avoid wild harvesting:** Collecting plants from their natural habitat is heavily regulated and, in many cases, prohibited. For example, in Tennessee, wild ginseng may be collected only during certain periods, only mature plants may be harvested, and their berries must be replanted immediately. Collection is generally not allowed on public lands, and harvesting rare plants is illegal. Removing large numbers of plants from small, isolated populations reduces genetic diversity and can lead to inbreeding. Schilling said it is similar to the impact the lack of genetic diversity has on large carnivorous animals. “You can’t just have a pair of them and expect them to continue indefinitely,” he said. “You have to have some genetic diversity.”
- **Advance support of land conservation:** One of the best ways to protect the aquifers that sustain these seeps is to support organizations working to conserve them. The Tennessee Department of Environment and Conservation (TDEC) and land trusts, such as the Foothills Land Conservancy,

work directly with landowners to establish and maintain conservation easements.

### **Designing a future for our hidden ecosystems|**

Recent revelations regarding Tennessee’s dolomite seeps are telling us that our environment still possesses unexplored ecological prospect, concealed right at the surface. These unusual “ice age time capsules” exist in a precarious and ancient combination of geology and hydrology, sustained by continuously circulating cool groundwater. Since their existence hinges on aquifers below, the main danger to such habitats is not necessarily what we build around them, but rather what we take from the Earth beneath them.

Preserving such fragile ecosystems requires a shift in our approach to conservation. Rather than exposing these sensitive areas to tourism, the next step is to utilize the principles of landscape design, ecological imitation and ex situ conservation. If we implement ecologically sound conservation techniques, like those used at the Knoxville Botanical

Garden, we have an opportunity to build not only functional, but also aesthetically pleasing representations of these unique ecosystems that raise awareness of their remarkable plant communities.

In our effort to protect these plants, we must remember that this work extends beyond Tennessee’s Ridge and Valley Region. Conservationists, gardeners and nature enthusiasts can support these efforts by replicating the complex ecosystems in their own landscapes, using commercially available, sustainably propagated native plants. Through such practices as advocating for the responsible use of groundwater, avoiding the harvest of endangered species in the wild and supporting land trusts that protect vital habitats, we will be able to preserve these ecological treasures.

*Marialuisa Quinonez is a first-generation Honors Landscape Architecture student at the University of Delaware currently conducting research on rare regional ecotopes and native plant systems. She is passionate about ecological design and environmental communication.*



Shallow water pockets formed by cool groundwater continuously seep through crevices in the dolomitic bedrock. Photo: Dr. James Zimmerman



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# Book Review

**Title:** “The Secret Book of Lichens”

**Author:** Kristupas Sabolius

**Illustrator:** Aistė Ambrazevičiūtė

**Published:** 2021

**Pages:** 32

**Language:** English (Translated edition available)

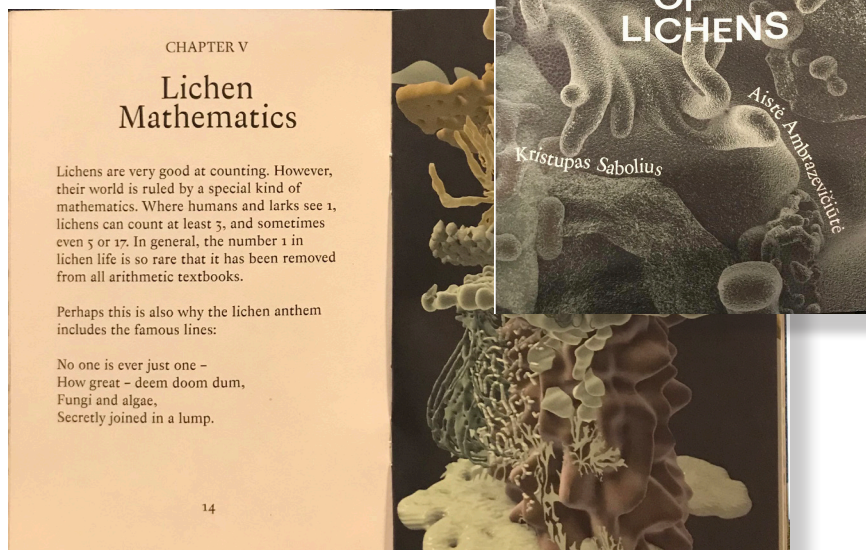
**Rating:** ★★★★★

*By Jone Karuza Arsenault*

I was immediately taken by this lovely little book when I saw the cover with its beautifully illustrated lichens that float around and through the title and names of the author and illustrator. The book itself invites readers on a delightfully humorous and informative journey into the world of the lichens living in the forest.

“The Secret Book of Lichens” frames lichens as metaphorical reflections using poetry, imagination and humor to describe their journeys and contributions to the forest community. They are the storytellers of the forest in a raw and bold way, creating a mystical tale of illusion and humor. If you are looking for the soul of forest life rather than a natural history book focusing on taxonomy and biology, you may find it in these pages.

What I loved most about this book is the sense of humor, wonder and anticipation that it created. I wondered what lichen adventure was next and what would be the resolution. The chapter on lichen mathematics revealed a love of numbers that is vaguely familiar, but very different from human numbers. For example, the number one has been completely eliminated because “no one is just one.” That idea speaks volumes about symbiosis and the importance of community for survival.



Apparently, lichens have special powers, values, enemies, humor and the ability to fly into space. All of this is explored beautifully in the secret book written by the Graphics Scripta lichen, a special type of lichen that has growth that resembles writing and thus must contain messages to be received in an exploration of the words and the thoughts of the forest. The stories and thoughts revealed in the book were left discreetly on the bark of trees all through the forest.

“The Secret Book of Lichens” will appeal to you if you enjoy nature as an equal and understand that creativity and poetic justice can serve as an avenue for cross-species communication. It will also help to intuitively understand complex biological and ecological ideas.

While the publisher lists this book as a children’s book, adults are likely to find it equally appealing. I enjoyed it tremendously as an avenue of imagination that took me places in the forest that I had never seen. The beautiful illustrations throughout the book lend it the feel of an art

book. The book is small enough to slip into your pocket rather than display on a coffee table, allowing you to enjoy its artwork whenever the mood strikes.

I give this book a rating of 5/5 due to the beauty of its illustrations, its message about lichens and its deep appreciation of the forest that is evident on every page.

“The Secret Book of Lichens” is a limited print run book and is periodically republished. You can purchase it from [Inga Books](#) in Chicago and in some small European bookstores. (Note: It was currently sold out as we went to publication, but check with the website occasionally as it will be restocked.) It was published in 2021 by Kirvarpa in Lithuania.

*Wild Ones member Jone Karuza Arsenault is a visual artist and ecological psychologist who lives and works in Chicago, Illinois. She uses arts-based research techniques and a process called deep mapping to explore her interest in the sacred worlds of plants and animals.*



# Book Review

**Title:** “Guardians of Life: Indigenous Knowledge, Indigenous Science, and Restoring the Planet”

**Author and photographer:** Kiliiii Yüyan

**Published:** February 2026

**Pages:** 224

**Rating:** ★★★★★

By Kristine Nemec

“Guardians of Life: Indigenous Knowledge, Indigenous Science, and Restoring the Planet” is a gorgeous book that features nine worldwide examples of Indigenous-led conservation. Its 224 pages consist largely of photos taken by Kiliiii Yüyan, an award-winning National Geographic photographer of Chinese and Nanai/Hèzhé (East Asian Indigenous) descent. The text includes photo captions and brief essays by Indigenous leaders and allies. Heavy-weight, quality paper brings out the rich, crisp colors in the photos; the book’s oversized dimensions of 12 inches by 9 inches also contribute to its substantial feel.

The projects described in the book occur in a wide range of terrestrial and aquatic ecosystems. Examples include Djabugay and Dabu Jajikal use of slow, cultural burning to maintain healthy forests in Australia; Siksikaitsitapi efforts to reintroduce bison to grasslands in Montana and Alberta, Canada; Klamath nations’ successful fight to have dams removed in California; and Islanders of Palau management of fish populations using traditional approaches.

Each story demonstrates how Indigenous communities use Traditional Ecological Knowledge (TEK) to sustain biological and cultural diversity. The author defines TEK as “the fine-grained, practical understanding that comes from centuries of experience in a specific landscape ... communities working together on

the basis of shared understanding to monitor, protect and shape their worlds.”

For example, Amazonian Cofán villagers have met every year for as long as they can remember to agree on harvesting rules based on their observations of local wildlife. They set limits to prevent overharvesting of some species and may take actions to replenish populations, such as creating a breeding program to increase the number of river turtles. In recent years, they also have determined ways to restrict illegal activity from outsiders, which may include patrolling forests to find illicit gold mines or settlers.

One of the book’s strengths is its emphasis on elevating Indigenous voices to tell these stories of renewal. The book opens with essays by Yüyan and Hän Gwich’in/Oglala Lakota model and activist Quannah Chasinghorse explaining their relationships with nature and the origin of the Guardians of Life project. Each section that forms the core of the book begins with a two- to four-

page story describing the conservation project, which is followed by ample photos illustrating the people and places associated with it and quotes by community leaders. The book concludes with essays by four Indigenous authors presenting their visions of the future.

For readers who want to learn more, the appendix includes one-paragraph descriptions of 12 additional worldwide examples of communities using Traditional Ecological Knowledge and lists relevant organizations and books for further reading. The informative appendix further adds value to this unique, inspirational book. “Guardians of Life” should appeal to people interested in attractive photojournalism and Indigenous approaches to healing the planet.

*Kristine Nemec is a Wild Ones Cedar Rapids Iowa City (Iowa) Chapter member, program manager at the University of Northern Iowa Tallgrass Prairie Center and freelance writer-editor.*





# School pollinator garden benefits students, butterflies

By Barbara A. Schmitz

One person can make a difference in a child's life. For Megan Linden, that person was her grandmother, Wild Ones member Janet Young, who inspired Linden's love of nature.

"As a kid, I loved visiting my grandma's jungle of a garden. We went on the best nature walks," she recalled.

Today, however, Linden is the one making a difference as a biology teacher at Northwest Guilford High School in Greensboro, North Carolina. She and her students started a pollinator garden a few years back, which students continue to plant and maintain.

Linden said she decided to create a school pollinator garden about four years ago after visiting the Greensboro Science Center that included an enclosed butterfly garden. She immediately thought a butterfly garden would be a good addition for her school but realized the garden should be outside, so it was available to all bees, butterflies and other insects.

She proposed the garden be part of a club and promoted it in her classes. Much of the first year was spent raising money so they could afford to purchase seeds and plants.

Northwest Guilford High School is 64 years old, Linden said, and its property had been home to multiple small gardens in its lifetime. "But around the pandemic, when they were trying to get the students to social distance, they tore out all the plants and put in tables so the students could spread out more," she said. All they left were a few trees and a rose bush.

"It was literally a 2,000-square-foot wasteland," she said. With little money to start, they first accepted any plant that people were willing to donate to create their oasis. But as time went on, they became more focused on native plants.

They added to their garden bit by bit as money and time allowed, and Linden said it's "still a work in progress." Weeds are a big issue, but students put in service



The grounds of Northwest Guilford High School, in Greensboro, North Carolina, before Megan Linden and her students started the pollinator garden. All photos courtesy of Megan Linden

hours each week to maintain the space. "The garden has created unlimited service opportunities for the kids," she said, noting that some students weed, others water plants, and still others add fresh water to the bird fountains. They don't use chemicals and worked with the school district to ensure that they weren't spraying pesticides either.

Linden said it was easy to get students interested in the garden since she has natural ways to bring up nature and conservation in her classes. But one of the biggest motivators was her use of butterfly tents in class that allowed students to see butterflies' metamorphosis. Before the garden, Linden had to purchase caterpillars, but now they use caterpillars found outside their doors. About 30 students are consistently involved in the garden, she said.

Her classes have successfully raised and released variegated fritillaries, gulf fritillaries and monarchs. In 2025, the students started testing for *Ophryocystis elektroscirrha* (OE), a protozoan parasite that primarily infects monarch butterflies and related species; they also limit the number of caterpillars brought inside the classroom to ensure the butterflies' health.



The school garden is home to a variety of native plants, such as common milkweed (*Asclepias syriaca*), swamp milkweed (*Asclepias incarnata*), coreopsis (*Coreopsis* spp.), golden Alexander (*Zizia aurea*), coneflowers (*Echinacea* spp.), asters (*Symphyotrichum* spp.), hyssop (*Agastache* spp.), coral honeysuckle (*Lonicera sempervirens*), foxglove beardtongue (*Penstemon digitalis*), beebalm (*Monarda fistulosa*) and yellow passionflower (*Passiflora lutea*). Linden estimated that about 50% of their plants are native, and each year they are adding more native plants. But they also plant nonnatives like marigolds and nasturtium, which Linden said helps to control the number of aphids.

Already their garden has become a home for many insects, including skippers (family *Hesperiidae*); eastern tiger (*Papilio glaucus*), black (*Papilio polyxenes*), zebra (*Eurytides marcellus*), pipevine (*Battus philenor*) and spicebush (*Papilio troilus*) swallowtails; question mark butterflies (*Polygonia interrogationis*); eastern comma butterflies (*Polygonia comma*); variegated (*Euptoieta claudia*) and gulf (*Dione incarnata*) fritillaries; monarchs (*Danaus plexippus*) and others. “We’ve seen an explosion of life by adding flowers to the garden,” Linden said.

She also comes up with incentives to get students to volunteer. For instance, this year she is rewarding students who put in a certain number of volunteer hours with a fun T-shirt. “It’s a thank you for them doing all the work,” she said. Plus, the T-shirts will help recruit new students when the current students graduate.

The garden is used by some teachers as a classroom. But more importantly, the space is used as a place where students can go to enjoy nature or to unwind, especially those students in crisis or who have special needs, Linden said.

Last year the school received a grant that allowed them to add raised beds for vegetables, such as tomatoes, basil, radishes, squash and zucchini. “It allowed students to learn about growing crops,” she said. This year, they plan to start growing strawberries.

For other schools looking to create gardens, Linden offers this advice: “Find a few kids who are really into gardening and have them network with other students to keep your garden going year after year. Also, reach out to nurseries and conservation groups to look for grants and donations. You never know who has free plants and seeds to share.”

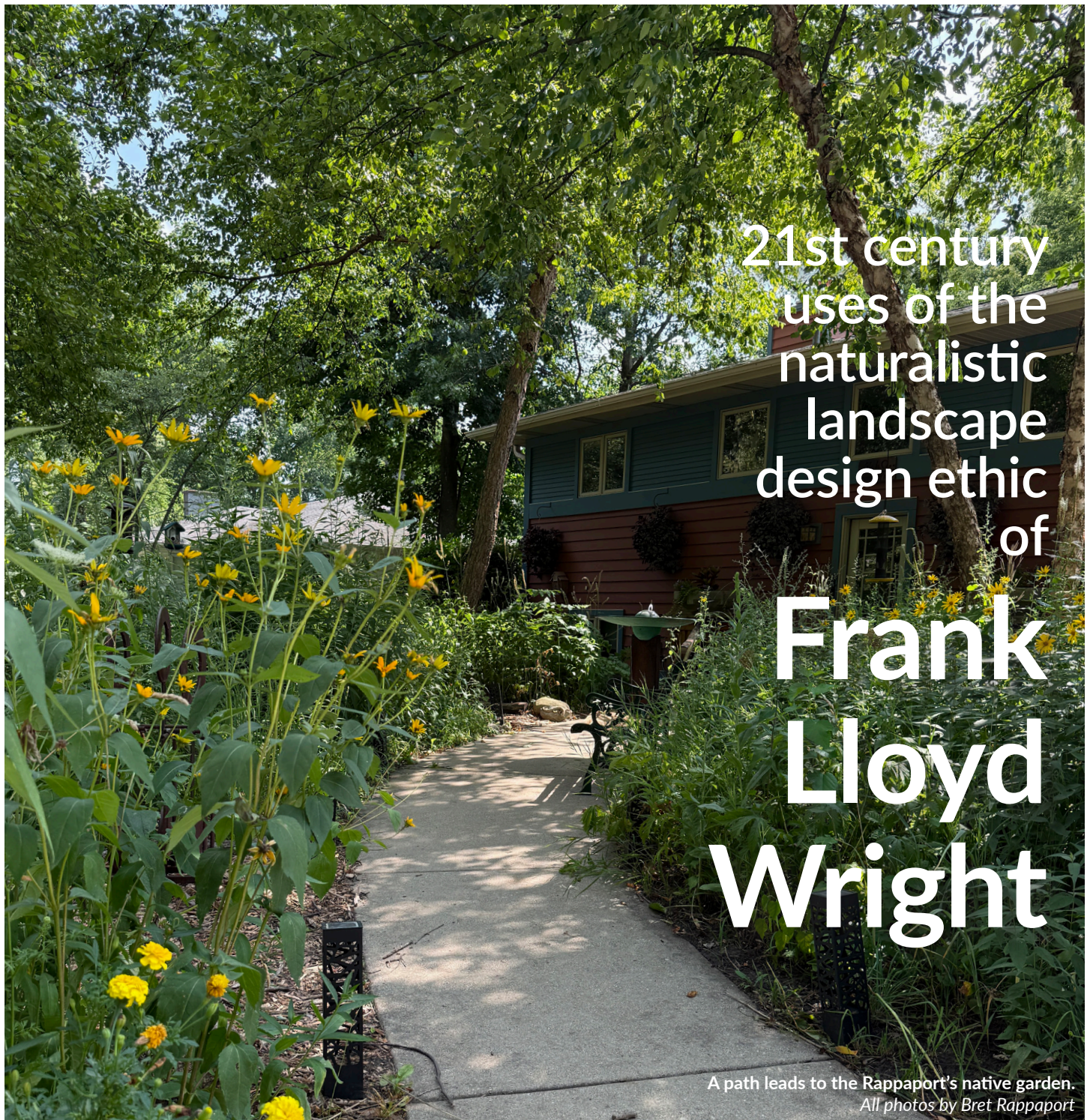
Lastly, fundraise! Sell native seeds and plants. Host a bake sale.

“This year we are going to sell bricks to seniors and use the painted bricks to line the edges of our garden,” Linden said. “Club funds and weed control? A win-win!”



The grounds of Northwest Guilford High School, in Greensboro, North Carolina, are ablaze with color and buzzing with bees, butterflies and other insects after biology teacher Megan Linden decided to start a pollinator garden with her students. Today, those gardens are a certified Monarch Waystation.





# 21st century uses of the naturalistic landscape design ethic of Frank Lloyd Wright

A path leads to the Rappaport's native garden.  
All photos by Bret Rappaport

By Bret Rappaport  
Fallingwater. The Guggenheim.  
Taliesin. Unity Temple. SC Johnson  
Headquarters. Robie House. Famous  
structures of stone and glass, all  
monuments to a man who justifiably  
is regarded as the greatest architect  
of the 20th century, Frank Lloyd  
Wright. Inside these buildings lives  
the art glass, the chairs, the tables,

the mantels and every knickknack  
designed to be part of that building.

Organic architecture was Wright's  
term for the practice of designing the  
whole building, including its interior,  
exterior and furnishings, to fit within  
a comprehensive whole. He explained  
the concept this way: "Organic archi-  
tecture is an architecture from within  
outward, in which entity is an ideal.

(...) Organic means, in the philosophic  
sense, entity. Where the whole is [to]  
the part as the part is to the whole  
and where the nature of the mate-  
rials, the nature of the purpose, the  
nature of the entire performance  
becomes a necessity."

Buildings with furniture, fur-  
nishings and art glass do not exist  
in an abstract space. Buildings with





The pathway and arch are an example of compression and release leading from the Rappaport's garden to their open yard.

furniture, furnishings and art glass live in a place we call the landscape. And Wright's organic architecture existed not only within the building, but also without the building. Wright strove to let in natural light and invited views out as he sought to employ design that blurred the distinction between the indoor and the outdoor.

In "Wrightscapes: Frank Lloyd Wright's Landscape Designs," authors Charles and Berdeana Aguar point out that Wright approached landscape design, as well as architecture itself, as essentially environmental design. Wright wrote: "Architecture in all its aspects is to be studied as environment . . . Nature is the great teacher – man can only receive and respond to her teachings."

Wright's genius, some say, was his ability to first visualize the interior space of a building – the actual room, envision movement within that space, and then – and only then – draw the walls and ceilings to give boundaries to that space. But there was a step before that step. Wright's architecture is an "architecture of place." Building a building to fit within the extant environment was seminal to every Wright building. Wright's natural landscaping philosophy and practice are the multi-leveled frame of those buildings. Those frames, and how Wright conceived and crafted the land, serve as lessons for us 21st century natural landscapers.

First, on a macro-level, from the so-called bird's-eye view, Wright strove to make sure that his buildings "fit" into the landscape into which they were being built. He once said: "No house should ever be on a hill or on anything. It should be of the hill. Belonging to it. Hill and house should live together, each the happier for the other."



Not just “talking the talk,” Wright’s Wisconsin home, Taliesin, was built into the hillside, not on top of the hill. This view of where buildings should be placed is essentially the “building envelope” practice advocated by the late Andy Wasowski and others.

This macro-level embrace of natural landscaping is nowhere more obvious than in Wright’s masterpiece, Fallingwater, the home of Edgar J. Kaufmann, Sr. in Mill Run, Pennsylvania. Designed in 1935, the home sits on a waterfall, wedged into the hillside and disturbing very little of the pre-existing landscape.

In a November 1955 article in *House Beautiful Magazine*, Wright explained how he designed Fallingwater with nature front and center.

“First, a good site,” he wrote, “then standing on the site look about so that you see what has charm. What is the reason you want to build there? Find out! Then build your house so that you may still look from where you stand upon all that charmed you, and lose nothing of what you saw before the house was built, but see more.”

Alas, this macro-level design ethic may play no role in our landscaping. Few of us have the choice of where to build. Rather, we purchase an already built home. However, two other aspects of Wright’s approach to landscape design provide doable ideas for us 21st century natural landscapers.

On a mid-level of landscape design where Wright focused on

harmony with the outdoors, he again lived by his credo: “Stay close to nature. It will never fail you.” In this mid-level of design, he strove to preserve and create a feeling of being “in” nature. On the most intimate level, plants were selected and placed in a manner to encourage human engagement in nature’s subtle beauty. The built environment was always close to nature. Pathways and sidewalks “flowed” and where they met, they merged like rivers.

In her article on Wright’s landscape design at Florida Southern College, freelance writer Mary Schier explained how Wright employed compression and release at this mid-level of landscape design. In Wright’s buildings, like Unity Temple and Fallingwater, he used



[Left] 60 foot long bridge over the W. Branch of the Chicago River inspired by F.L. Wright’s Prairie Style. [Right] A bridge over a ditch and an arch invite passersby into Bret and Jina Rappaport’s yard to grab a book from their Little Free Library. Once on their property, the Rappaports also provide places to sit and read.



a compression and release design feature that pulls the visitor into the space “creating a sense of tension followed by a powerful feeling of freedom.”

Wright often employed this device in views of the landscape from within the structure looking out – with windows overhung by deep eaves like at Taliesin in Wisconsin. As Wright wrote in *Architectural Forum* in January 1938: “Landscape seen through the openings of buildings thus placed and proportional has greater charm than when seen independent of the architecture. Architecture properly studied in relation to the natural features surrounding it is a great clarifier and developer of the beauty of the landscape.”

This design practice can be employed in a landscape, creating tight or low-ceilinged spaces that open into a vista with an arbor, pergola or other structure through which a visitor walks before emerging to an open space. Leafy tunnels, either of overhanging trees or a vine-covered arbor, also serve to create the compression and release that excites those who stroll.

Finally, today’s budding and full-grown home natural landscaper can look to Frank Lloyd Wright’s micro-landscape design features for inspiration on what to do in their yards. As explained in detail in Derek Fell’s “The Gardens of Frank Lloyd Wright,” Wright would always consider the use of indigenous plants as more reliable and relatable to the site. Wright looked to texture, shape and form above color, and allowed trees and shrubs to grow naturally.

Wright also often employed statuary, urns, planters and other garden fixtures in his landscape designs. For example, Wright employed sculptures as focal points, particularly at the end of a path or entrance to a garden space. At Robie

House, Wright used large planters and urns to bring nature to an otherwise unplantable space — the top of the ledges and parapet walls around the house.

A recent publication on Robie House explains the integration of inside and outside, and the importance of the urns and planters. “The

horizontality of the house is reinforced at every level of the design, from the projecting roofline to the very bricks and mortar of the building itself. Through his use of materials, Wright achieves a remarkable balance of texture and color that further emphasizes the palette of the prairie. Broad balconies and



A path with stone marker near Frank Lloyd Wright’s Larkin Company Administration Building. The building was demolished in 1950.





A path through an area formerly choked with buckthorn that has been restored to a native landscape.

terraces cause interior and exterior space to flow together, while urns and planters at each level were intended to bloom with the seasons.”

The modern natural landscaper should embrace these elements. Sculptures and other manmade elements have been part of landscape design for as long as people have been designing landscapes. Histor-

ically, sculptures, as scholar Margot Dudkiewicz notes, are “a compositional element strengthening the style, spirit and the atmosphere of the garden [and] trigger associations in the mind of the visitor, the need for contemplation, feelings of pleasure, relaxation, amusement, satisfaction, a sense of grandeur, power, authority or intimidation. Using the

sculptures, it is possible to create a new spirit of a place.” Wright used them to evoke the natural landscape in which the building itself lay.

For example, in front of my wife’s and my Midwest home stand two large century old Prairie Style cement planters. Those planters originally graced the driveway entrance to Deep Dene, my parents’ home built in 1910



by Seth Gooder, a structural engineer who is believed to have worked on Chicago's Auditorium Building along with a young Mr. Wright. Those planters are all that is left of Deep Dene, demolished in 2003.

So, what was Frank Lloyd Wright's message to 21st century homeowners about natural landscaping? While each may take what they will, to me Wright counseled to let nature be the guide in your built world. Landscapes do not exist outside the home or building, but rather must fit within the native landscape. And so, too, a bit of the built world can fit in the native landscape – blending and blurring the distinction many make. To Wright there was little distinc-

tion. Inside and outside, these were spaces for people to live, to draw inspiration and to be.

So there, in front of Jina's and my naturally landscaped home, dotted with the Frank Lloyd Wright-inspired planters, and birdbath, bench and the cement child figures beside the door, we embrace both nature and human-made objects that fit in the natural landscape. Human-made objects, like planters, sculptures and even gazing balls (we have a couple of those) add structure, texture and interest to the landscape. They bring the inside out, just as good design of the home brings the outside in. No distinction.

A natural landscape need not be a human-free zone. People are part

of nature, not apart from it. If Frank Lloyd Wright's landscape design practices and philosophy demonstrate anything, it is that.

*Bret Rappaport, a conservationist and native plant enthusiast, was Wild Ones first national president and served on the national Board of Directors for years. Now a retired Chicago attorney, Rappaport was known for representing the "Chicago Five" who the city of Chicago cited for growing native plants under their weed ordinance. Today, Chicago not only allows native plant gardening, but also encourages it. Rappaport is a lifetime member of the Wild Ones Lake-To-Prairie (Illinois) Chapter.*



View looking west over the sunken garden at Frank Lloyd Wright's Taliesin in 2015.