On The Fringe

Journal of the Native Plant Society of Northeastern Ohio

Program Schedule – Summer 2018

Saturday, June 23 – 9:00 – 1:00 pm – Kent Bog & Kent Bog Expansion. Kent, Portage County. Explore Kent Bog State Nature Preserve with Tom S. Cooperrider and Chuck Fletcher, ODNR staff. They will lead us on a winding board walk through this living relict from the Ice Age. Kent Bog supports the largest southernmost stand of tamarack in the continental United States, as well as populations of gray birch, both species of more northern distribution. Gray birch and tamarack are both potentially threatened species in Ohio. Afterwards, we will hike the Portage Park District's recently acquired 215 acres adjacent to Kent Bog State Nature Preserve. Natural Areas Steward Bob Lange will lead us off-trail to see this property containing 50 acres of kettle hole bogs, three quarters of a mile of the Plum Creek tributary of the Cuyahoga River, riparian wetlands, early successional and wetland seeps, plus forested upland habitat. **Directions:** 1028 Meloy Rd, Kent, OH 44240. From I-76 East take the Kent exit (SR 43) north to Meloy Road, head west to the parking lot. **Note:** there are no facilities at either site. Pack snacks to eat on the hikes. **Registration required:** email Judy at judysbarnhart@gmail.com.

Saturday, July 14 – 9:00 – 1:00 pm – Woodland Ferns of Bedford, Cleveland Metroparks Bedford Reservation. Immerse yourself in the beauty of native ferns on this summer hike led by Naturalist Fred Losi. This is a joint outing with Cleveland Metroparks. Tinker's Creek has a gorge overlook, and we will learn some local history. Moderate terrain, some hills, 3.5 miles. **Directions:** 14505 Button Road, Cleveland, OH 44146. Meet at Hemlock Creek Picnic Area. Be prepared to carpool to a few locations during this program. **No registration** required.

Wednesday, August 8 – 6:30 – 8:00 pm – Wetlands Walk, Punderson State Park, Geauga County. Using Punderson State Park's new boardwalk, discover the diversity of wetland plants along this glacial lake with botanist Judy Barnhart. Meet at Punderson Manor parking lot. **Directions:** Just west of St Rt. 44 on the south side of St RT 87, 11755 Kinsman Road, Newbury, OH 44065. **No registration** required.

Native Cultivars vs. Native Plants Video

Are native cultivars as valuable to pollinators as true native plants? Annie White, is the first person to conduct research on this important issue. Join Kim Eierman of EcoBeneficial! for an interview with Annie White about her 2013 research on the attractiveness of native plant cultivars versus straight species native plants. At the time Annie was a Ph.D. student at the University of Vermont in the Department of Plant and Soil Science.

Go to the website https://www.ecobeneficial.com/videos/native-cultivars-vs-native-plants-annie-white/ to watch this amazing video.

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The Mission of the Native Plant Society of Northeastern Ohio is to promote the study, appreciation and conservation of the native plants and plant communities of Ohio.

38 Species of Invasive Plants Now Illegal to Sell in Ohio

By Marion Renault

Under new rules that went into effect February 9, 2018, the sale and distribution of 38 destructive, invasive plant species will become illegal.

In its list, the state agriculture department included various types of honeysuckles, Bradford pear trees, autumn olive shrubs and fig buttercup flowers that line freeways, coat forest floors and choke wild spaces across Ohio.

The Ohio Department of Agriculture also will assemble a five-person invasive plant advisory committee to review potential future additions to the no-sale list, agricultural administrator Dan Kenny said.

At least half of the 50,000 non-native species introduced to the United States are plants, which wreak more than $34 billion a year in environmental, agricultural, industrial and public health damage, according to the Ohio Invasive Plant Council.

The agriculture department's no-sale list is a good first step, said Jim Bissell, botany curator and director of natural areas for the Cleveland Museum of Natural History.

"These are among the worst," Bissell said. "Some of these things are so rampant and widespread, unchecked they would cover every floodplain in Ohio."

The list will limit plant selection available to nurseries and landscape artists, said Andy Doesburg, president of Thornton Landscape, based in Maineville, a village in Warren County. But it's a small setback compared to the benefit of instructing professional landscapers that these species do more harm than good.

To read the entire article and to see the list of 38 invasive plants that are now illegal to sell in Ohio, go to: *The Columbus Dispatch;* (http://www.dispatch.com/news/20180107/38-species-of-invasive-plants-now-illegal-to-sell-in-ohio).

Why Bees and Wasps Matter

June 18-24, 2018 has been designated *National Pollinator Week*

The need to protect and preserve pollinators is center stage these days. Butterflies and hummingbirds often take the spotlight, but bees and wasps work tirelessly in the background, their collective labors far exceeding those of the flashy poster children. Many wildflowers rely on only a few pollinator species. Milkweeds require strong insects like large butterflies (Monarch, swallowtails), large wasps, and bumble bees to dislodge the pollen packet ("pollinarium") from a blossom. Smaller insects may become hopelessly entangled, and even die. A pollinarium successfully extricated and attached to a wasp foot, for example, dries and changes orientation as the insect flies to another plant. The pollinarium "key" is then able to fit in the "lock" of another milkweed blossom.



In the long view, pollinating insects are major drivers in the evolution of flowers, and much of the fantastic diversity in flowering plants is due to their interaction with pollinating insects, most importantly the bees. "Long-tongued" bees like bumble bees, honey bees, carpenter bees, long-horned bees, leafcutter bees, and mason bees, have evolved to reach into deep flower corollas; short-tongued sweat bees and others are adapted to shallow corollas.

In addition to pollination services, bees and wasps play a large role in the food web. Scores of pollinators are food for assassin bugs, mantids, spiders, birds, lizards, and other predators.

Wasps are flower visitors (for nectar), but also chief predators of other insects, including those that damage crops and forests. The Smoky-winged Beetle Bandit wasp (*Cerceris fumipennis*) has been employed in some areas as an agent for detecting the Emerald Ash Borer, an introduced beetle from Asia that is killing North America's ash trees. Females of this solitary species find, paralyze, and cache beetles in underground burrows to feed their larval offspring. Many species of wasps are so specific in their choice of hosts that they are sometimes reared in the laboratory and released into fields and orchards for toxin-free control of agricultural pests.

The venoms and glandular products of Hymenoptera are of increasing value in medicine and industry. Many patients swear by "bee venom therapy" for various illnesses, especially of the joints, even if such treatments are relegated to the category of alternative medicine by the healthcare establishment.

Article taken from *Common Bees & Wasps of Ohio* field guide, Ohio Division of Wildlife; publication 5488 (0147).
Picture taken from www.grow-it-organically.com

Pollinators and Predators

By Peter Lesica

We are attracted to flowers because of their beauty; their color and form enchant or intrigue us. However, other animals are attracted to flowers not for aesthetic reasons but for matters of life and death. We all know that flowers have evolved to attract insects that carry pollen between individuals and allow plants to produce seeds without inbreeding. Pollinators such as bees and butterflies are most noticeable. Then there are the insects that eat the flowers. Pull apart a seed head or developing fruit from most plants, and you're likely to find a beetle, fly or moth larva feeding and growing. Sometimes the same insect does both pollination and seed predation. Probably the most famous example of this comes from the yucca. The female yucca moth gathers pollen and places it on

the stigma of a yucca flower. The moth then lays an egg in the ovary of the same flower, and the developing larvae feed on the developing seeds (my taxonomy professor used to quip that this was the first known case of a pistil-packing mama).



Crab spider on goldenbush flower. Picture taken from www.projectnoah.org.

There are other animals frequenting flowers that are not pollinators or seedeaters. Most of us have reached to examine an inflorescence and been surprised by the presence of a bright white or yellow spider camouflaged among the flowers. Most often in our area these flower spiders are crab spiders, so called because they hold their legs in a way that resembles a crab. Spiders benefit from waiting on inflorescences because the flowers attract insects, but there is a less obvious advantage to frequenting flowers. Spiders are usually thought of as feeding solely on insects; however, crab spiders have been observed feeding on pollen and nectar. Researchers in Virginia found that mature male crab spiders do not capture prey but instead feed on nectar while looking for a receptive female. Males that had nectar available to them lived 25% longer. So male spiders sip nectar, and the females prey on both pollinators and seed predators. It's obvious that pollinators have a positive effect on the plant, and seed predators a negative effect. So, what is the overall effect on the plant?

The answer seems to be that it is different for each situation. Recently Reuven Dukas, a student at Simon Fraser University in Vancouver, attempted to answer this question with a series of experiments using artificial flowers much like hummingbird feeders. He placed a dead honeybee or a frozen spider on some artificial flowers but not others and compared how often honeybees visited them. Bees never landed on flowers with the dead bee and only 25% of the time on flowers with the spider, but they landed 75-95% of the time on those without the dead bee or spider. Dukas's study clearly demonstrated that the presence of a spider can deter pollinators. We might expect that fewer pollinators mean lower seed production, but his study did not directly address how plants are affected by their arachnid guests.

Nearly thirty years ago Svata Louda, then a student at San Diego State University, devised a field study that did assess how and how much spiders affected seed output. She studied goldenbush (now known as *Haplopappus venetus Isocoma menziesii*), a shrub similar to our rabbitbrush. At least 11 species of insects feed on the inflorescence of goldenbush, while two bees and a wasp are the common pollinators. Spiders on the inflorescences of goldenbush had good and bad effects by reducing both pollination and seed predation. However, in her study the reduction in seedeaters more than compensated for the loss of pollinators because inflorescences with spiders produced more viable seeds than those that were unoccupied. Nevertheless, Louda admits that her results could have been reversed had the spiders arrived earlier and deterred more pollinators while allowing late-hatching seed predators to lay their eggs unimpeded. Although goldenbush inflorescences with spiders produced more seeds, we don't know if this translated into a larger population of shrubs.



Haplopappus venetus Isocoma menziesii, Goldenbush. Picture: www.plants.usda.gov.

The plant inflorescence is the scene of complex interactions among the different insects and spiders. But it's far more than a neutral stage because these animals affect and are affected by the plant. Research to date suggests that there are no generalizations in such complex systems. Spiders may or may not enhance the performance of their host plants. Most likely it depends on what plant you're looking at and which year you're looking at it. One thing is sure; it makes a fascinating story.

Reprinted from *Native Plant News,* a Newsletter of the Native Plant Society of Saskatchewan, Fall 2009. The original version of this article was first published in 2005 in *Kelseya*, the quarterly newsletter of the Montana Plant Society.

Ecological Design, Native Plants, and Fine Garden Design

By Craig Limpach

Ecological design. What is it and what has it got to do with your property? Ideally, everything. Simply stated, ecological design is creating something based on a naturally occurring model. If you're into native plants, and you are because you're reading this publication, and you're interested in creating a beautiful landscape garden on your property, then ecological design is for you.

Over twenty years ago, I was at the end of a twelve-year career as a field biologist specializing in birds, and I began to look for a career change that would allow me to keep a finger on the pulse of nature while also expressing a creative outlet to restore the natural world. I returned to Ohio State University as a fulltime student in landscape architecture. A professor offered me a book simply entitled *Ecological Design*, by Sim Van Der Ryn, and it changed my life. Landscape architecture provided a classical training in the world's great garden styles, and ecological design provided a framework for the interpretation of different ecological communities. Marry the two disciplines and one has the process to design and build fine landscapes that are ecologically relevant, biodiverse, self-sustaining, and reinforce a sense of regional identity. Perhaps most importantly, landscapes that are beautiful and appropriate.

In Ohio, landscape-scale ecological design models include woodland, tall grass prairie, wetlands and aquatic biomes. There are many sub-categories included under these main headings. Oak savannah (an open woodland interspersed with tall grass prairie), bogs/fens/marsh, and beech/hemlock ravines are just a few examples. I believe that landscape design can also be an act of ecological restoration. Compare this idea to that of the majority of landscapes we see daily and one quickly realizes that the dominant cultural model is one that views plants as ornaments requiring constant maintenance to keep a place in a static condition. Real nature has its own mind and seeks to express itself in dynamic ways. The common result is a state of disharmony and conflict. We see nature as an active senior partner that informs us of its intent to express itself. We then act as an interpreter/co-designer to assist this process while also meeting the needs and functional desires of our human clients.

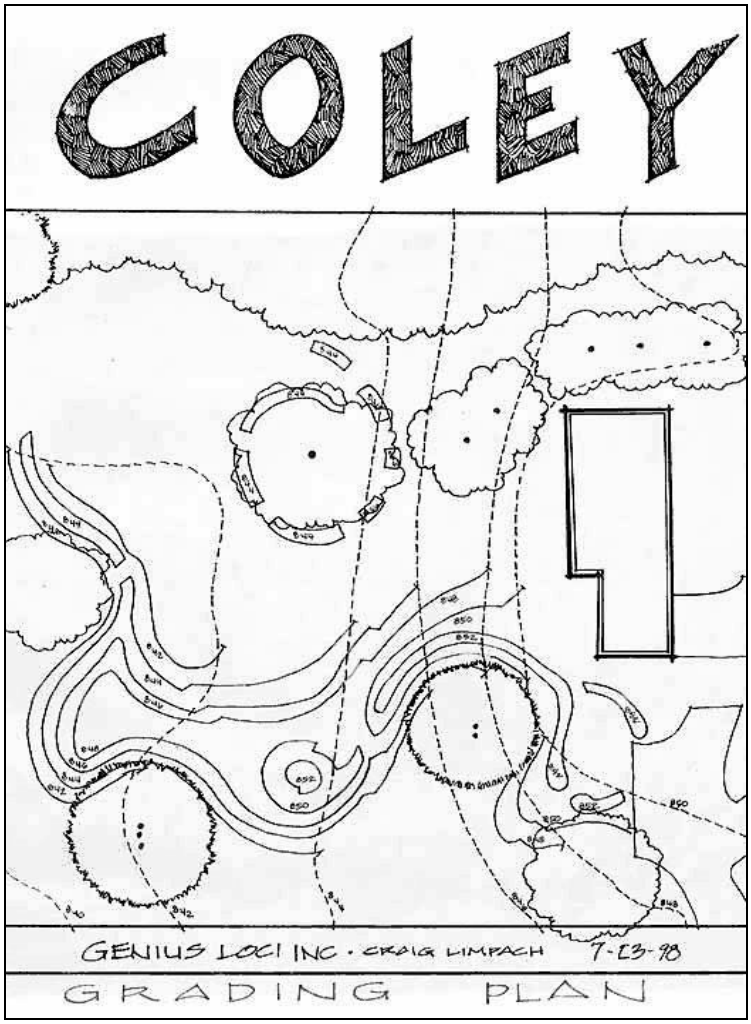
Can art and nature co-exist? Absolutely. We are culturally enriched by many of the world's great landscape traditions—Italian Renaissance, French country formal, English cottage, and Zen are just a few that come to mind. Ohio Native American traditions can also be considered among these cultural expressions. The Serpent Mound in Adams County is such an example. Is it possible to successfully conflate these artistic traditions to enhance and restore our local ecology? It is indeed.



The lone Cottonwood tree at the center of the picture and the surrounding "tail" was used to create a sun dial. Notice the shadow falling through the intended opening of the tail. The Mound was seeded with tall grass prairie plants and mulched to prevent erosion from rainfall.



Here we see the Mound one year later as the prairie has taken hold. Gravel trails allow access to interior spaces. Traffic and street noise has been almost completely relegated to the outside. What once was nothing but boring lawn with little ecological value has been transformed into a functional Indigenous expression of biodiversity, art, ecological restoration, and functionality.



The drawing is a plan for a person in Dublin, Ohio, who had an interest in local archaeology and was inspired by the previously mentioned Serpent Mound. The site consisted of a one acre front yard bordered by residential streets on two sides. The house sat atop a low hill and was an imposing presence, the energy “leaked out” onto the streets, turf grass maintenance was significant, and the end result was that no one ever used the space. The new design created a sense of enclosure, protected their young children from traffic, reduced maintenance costs, and visually linked other disparate elements. We sculpted the mound by importing 1100 cubic yards of soil.

Craig Limpach is a landscape architect in Elyria, Ohio, doing business as Genius Loci, Inc.

You can see more of his work and read more about his philosophy at www.indigination.com.

Upside-down Anthers of Clethra Stand Out

By W. John Hayden

For the most part, *Clethra alnifolia*, Sweet Pepperbush, is unremarkable. It has five separate sepals, five separate petals, 10 stamens in two whorls, and a three-carpellate superior ovary—an organization that can only be considered prosaic among the dicots. One floral feature, however, stands out: the anthers in the open flowers are upside-down! (See Figure 1A.) Further, these upside-down anthers open by pores (Figures 1B, 1C) rather than longitudinal slits, as in most flowering plants. These pores initially form on what would normally be the lowermost extremity of the anther, the inversion of which brings the pores to a forward position in the open flower. The significance of these acrobatic anthers—found not just in Sweet Pepperbush but through all 65 members of the genus *Clethra*—is twofold: anther inversion is essential to the plant's pollen-presentation strategy, and the odd morphology taxonomically links *Clethra* with the large and diverse heath family, Ericaceae.

Barnes provided one of the first descriptions of anther inversion in *Clethra.* In flower bud stages, the anthers of *Clethra alnifolia* take on a sagittate shape (Figure 1A), narrower at the apex and flared outward toward the base. Before the flower bud opens, the future pore for pollen release is located on the external (petal) side of the anther, a position technically described as extrorse. As the bud opens, the staminal filaments rapidly elongate, pushing the anthers past the opening petals. At the same time, the anthers begin to invert, quickly becoming horizontal, with their tips temporarily pointing toward the center of the flower. From the rapidly achieved horizontal position, complete inversion proceeds a bit more slowly (over the course of a few minutes), so that the narrow tip of each anther now points toward the base of the flower (Figures 1C, 1D). An additional consequence of anther inversion is that the pores for pollen release, formerly extrorse in orientation, become introrse, i.e., positioned on the stigma side of the now fully inverted anther.

How do these anthers invert? Barnes attributes the anther acrobatics of *Clethra* to cellular processes in the connective, the tissue located at the apex of the filament that serves to attach (connect) anther and filament together. In most plants, connective cells are uniform, but in *Clethra*, connective cells vary from longer thin-walled cells containing oil droplets to shorter thick-walled cells devoid of oil. In unopened flower buds, before anther inversion, the long, thin-walled cells are located on the petal side of the connective. As described by Barnes, bud opening brings relatively dry air into contact with the thin-walled connective cells, which collapse, presumably from evaporative water loss. This collapse of these thin-walled cells pulls the tip of the anther downward, accomplishing anther inversion as the bud opens.

So, if the anthers of *Clethra* did not invert, pollen would be shed extrorsely (petal side) from the anther bottoms. But since they do invert, pollen is shed introrsely (stigma side) from the original bottom of the anther that in open flowers occupies the extreme tip of the stamen. Arguably, pushing the pollen-releasing pores to a foremost



Clethra alnifolia in flower. Photograph by W. John Hayden

position makes sense for efficient transfer to pollinators. In *Clethra alnifolia*, pollen is shed soon after flowers open. In other species, for example *Clethra acuminata*, pollen is shed before the flowers are fully open. In either case, these flowers are protandrous, shedding pollen before stigmas become receptive, an adaptation that promotes cross-pollination. Later, styles elongate, pushing stigmas beyond the level occupied by the anthers (Figure 1A), at which point stigmas become receptive to pollen. Presumably, introrse orientation of the inverted anthers allows for self-pollination, which has been documented, should cross-pollination fail.

Inverted porous anthers also occur in the heath family, and the shared presence of this unusual character is part of the evidence indicating a close relationship

between these two families. See, for example, the stamen of *Arctostaphyllos uva-ursi*, Bearberry, (Figure 1E). But the anthers of Ericaceae are not identical to those of *Clethra*. In most Ericaceae, anther inversion takes place much earlier in flower development, when flower buds are still quite small. Further, anthers of Ericaceae are usually equipped with slender appendages (Figure 1E) that are absent in Clethra. These anther appendages come in two forms: awns (as defined in this context) are hollow, elongate extensions of the pollen-bearing region, whereas spurs are solid and develop independently of the pollen-bearing anther sacs.

Regardless of their internal structure and how they originate, anther appendages in Ericaceae are critical for pollination. Typical ericaceous flowers are urceolate (urnlike) and pendent, which forces pollinators to probe the flower from below. As the insect, typically a bee, rummages around, it inevitably contacts one or more anther appendages, which act as tiny levers, causing pollen to sift out of the porous anthers onto the probing pollinator; when it moves on to another flower, some of that pollen will be deposited on its stigma.

As is often the case in comparative biology, the details are a little more complicated than the simple overview described above. Ericaceae is a large family, and intermediate states of anther modifications have been documented. For example, in *Arbutus* and *Enkianthus*, anther inversion happens late, as the flower buds open, pretty much as in *Clethra*. In *Cassiope*, partial anther inversion happens a little earlier, shortly before bud break, and reaches completion as the flower becomes fully open. Anthers of *Enkianthus* also differ from those of all other Ericaceae in that they open by longitudinal slits, not pores. And some of the most familiar members of Ericaceae have nonurceolate corollas; examples are *Rhododendron* (azaleas and rhododendrons) and *Kalmia* (Mountain Laurel). These genera have completely different pollen-presentation strategies, and, correlated with that fact, they have no anther appendages. So, the situation regarding anther structure and development is relatively complicated in Ericaceae. Nevertheless, the acrobatic anthers of *Clethra* provide—conceptually—a reasonable starting point for interpreting ericaceous anther diversity and the peculiar pollination mechanism characteristic of those members of the family that possess urceolate corollas.

Prosaic flowers? *Clethra*? Hardly! Its acrobatic inverted anthers earn Sweet Pepperbush a place of distinction among flowering plants, and a noteworthy addition to our Society's roster of beloved native plants.

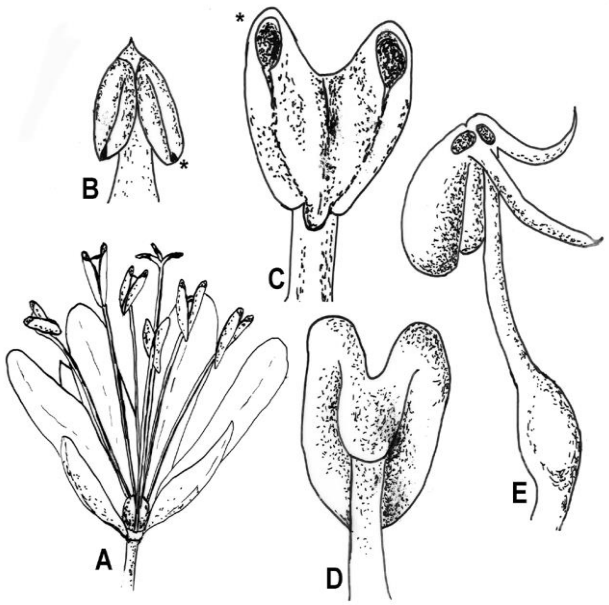


Fig. 1. (A) Flower of Clethra alnifolia. (B) Immature anther of Clethra, before inversion, as viewed from external (petal) side; asterisk (*) indicates initial basal position of dehiscence pore. (C) Mature anther of Clethra, after inversion, as viewed from internal (stigma) side; asterisk (*) indicates ultimate terminal position of dehiscence pore. (D) Mature anther of Clethra, after inversion, as viewed from external (petal) side. (E) Mature inverted anther of *Arctostaphylos uva-ursi*, with appendages. Illustrations by Sheila M. Hayden.

W. John Hayden is the Botany Chair of the Virginia Native Plant Society.

Reprinted from *Sempervirens*, the Quarterly of the Virginia Native Plant Society, Spring 2015.

Book Review:

Native Plants for New England Gardens

By Mark Richardson and Dan Jaffe



Publisher: Globe Pequot (2018)
Pages: 221 pages
ISBN-13: 9781493029259
Paperback
Package Dimensions: 10.2" x 8.2" x 0.8"
Price: $21.95

Review By John Barber

This little gem should find a home on the bookshelf of all who desire a thriving native plant habitat. Mark Richardson and Dan Jaffe from the New England Wild Flower Society have picked 100 native plants, including herbaceous plants, groundcovers, vines, trees and shrubs, sedges, and grasses. Understand right away that for native planters in the Midwest, most of the plants covered are also native to the Eastern Great Lakes ecoregion in Ohio. As the Botanic Garden Director and the head propagator, respectively, for the New England Wild Flower Society, these two have worked intimately with all these species, and it shows.

The authors boldly step into the debate about what's "native" with a simple answer— "those that existed in a given location at a specific point in time." Good discussion follows to address different issues like "dating back to European settlement"; co-evolution; plant migration; and introduced plants, both invasive and non-invasive. The most valuable part of the introduction is the discussion of the "right plant for the right place"—an admonition that is the foundation of the individual plant overviews that follow. This section should be read again and again to understand what knowledge about a particular plant is crucial to its success in your garden.

The foundation of Richardson's and Jaffe's philosophy is that of "ecological gardening", where native plants will thrive, beautify, support wildlife, and have a positive impact on environmental quality. Their success with native plants is based on an unbending prohibition on fertilizers and pesticides, and a limitation on water and mulch beyond the first few years.

The heart of the book is a plant-by-plant presentation of the authors' favorite 100 plants, with excellent pictures of each. The information presented on each species is rich with specifics on that plant as well as how best to use it in your garden. In addition, there are suggestions for interplanting species and massing several species together. Richardson and Jaffe clearly speak with experience about each plant: "Sweet Fern is a shrub masquerading as a fern. Mayapple is often thought of as a garden thug…." Even if your habitat is not suitable for some of the species—like Pitcher Plant for me—reading the descriptions and life histories is fascinating.

The authors have written a very practical book useful well beyond the title's mention of "New England" gardens. This book will earn its place on your bookshelf.

Mark Richardson will be the featured speaker at the Cleveland Pollinator and Native Plant Symposium on September 21, 2018. See https://www.clevelandpollinatorsymposium.org/ for details.

The reviewer, John Barber, is a member of the Native Plant Society of Northeastern Ohio.

The Nature Conservancy Buys Snow Lake



Conservation of Geauga County glacial lake and surrounding wetlands is crucial to maintaining integrity of Cuyahoga Wetlands.

The natural beauty of Snow Lake and the surrounding expanse of virgin hardwood forest, sedge meadows and pristine wetlands has stayed relatively untouched for the past century, reserved as a hunting and fishing playground for business titans from Cleveland.

The Nature Conservancy has purchased 272 acres in Geauga County that includes Snow Lake, an ancient kettle lake in Geauga County, at the heart of one of the finest remaining glacial wetlands in Ohio.

"There is no other wetland complex in Ohio that is like the Cuyahoga Wetlands, and Snow Lake is the crown jewel of those wetlands," said Terry Seidel, director of protection for The Nature Conservancy in Ohio.

"It's not often that you have the opportunity to purchase a property as preserved as this is in developed Northeast Ohio," said Seidel, who has worked on the Snow Lake deal since 2011.

What makes the Snow Lake Preserve such an environmental treasurer is its integral place in a vast filtration system that helps to purify the drinking water for more than 1.6 million people in the two largest metropolitan areas in Northeast Ohio: Cleveland and Akron.

As water flows through these lakes and wetlands, it's naturally purified, eventually emptying into Bridge Creek, which carries its valuable cargo into the Akron watershed, a patchwork of 18,000 acres the city owns and manages to protect its reservoirs—LaDue, East Branch and Lake Rockwell—downstream.

"As long as you can let the rainwater flow across the flood plains and through the riparian wetlands, these natural areas are filtering the water for free, and with little or no maintenance," said Paul Kovalcik, stormwater projects specialist at the Northeast Ohio Regional Sewer District, which provided, with the Ohio EPA, a substantial portion of the funds used to purchase the preserve.

"In addition to filtering stormwater, the sedge meadows and upland forests slow the water flow, minimize flooding during heavy rains and major weather events, and hold the water during drought," Seidel said.

"If we maintain these areas in good condition, the people downstream are receiving runoff that has been filtered by the natural landscape, instead of runoff shooting from a stormwater pipe, which delivers pollutants from the urban landscape," Kovalcik said.

It's unlikely the founders of the Snow Lake Hunting and Fishing Club could have imagined the value of their weekend getaway to the health of the region when Frank Joseph Holzheimer and a few of his friends bought the property in 1906.

Little seems to have changed since the club was closed. Visitors to the preserve trundle along a wobbly wooden boardwalk, where they are welcomed by a breathtaking view of a serene blue lake framed by stands of native flora: swamp loosestrife, pickerel weed, lotus flowers, swamp milkweed and buttonbush.

Across the lake, the Nash Preserve features the state's only natural white pine bluff, where rare bunchberry grows in an upland fen. At the lake's edge, a pair of elegant trumpeter swans paddle in and out of a hidden cove. A single sandhill crane passes overhead toward a field where they nest, and wood ducks whistle as they streak past.

Along the shoreline, a marsh has emerged after beavers dammed Bridge Creek. Green frogs leap at our approach and spotted turtles—listed as "threatened" by the Division of Wildlife—have been found there, although now there are none to be seen. Cardinal flower and white meadowsweet are in bloom, and several trees lay on the ground, freshly felled by the resident beaver.

A walk through the woods reveals a trail of thick leaf litter, skirted by stands of blue cohosh, wild geraniums, mayapple, and royal, cinnamon and sensitive ferns.

The haunting fluted song of a wood thrush echoes through the shady forest, woodpeckers drum, and a scarlet tanager sings from the canopy of towering oaks, beech, maple and basswood trees. In spring, the vernal pools hold multitudes of frogs and salamanders, including the rare four-toed salamander, found only in forests surrounding bogs.

"We talk a lot about the clean water benefits of these habitats, and we can't overstate the importance of that," Seidel said. "But you can't forget the intangibles, either: the trumpeter swans, the beaver pond, the sandhill cranes. There's no way to place a value on preserving their habitat."

Seidel and his Conservancy colleagues are still discussing the best ways to protect the most sensitive areas of the preserve, and how and when to open it to the public. They haven't decided what to do with the historic six-bedroom Craftsman lodge with the grand brick fireplace in the great room or the hand-built stone cabin, the ice house, the solar kiln for drying wood, or the two-seater outhouse.

Snow Lake includes a small kettle lake surrounded by emergent marsh, vernal pools and swamp forests. It is located adjacent to the southern boundary of the Conservancy's 376-acre Lucia S. Nash Preserve (a National Natural Landmark) and just a few miles to the southeast of Punderson State Park. Both Snow Lake and the Nash Preserve are part of a 20,000-acre complex of boggy bottomland known as the Cuyahoga Wetlands, an area that hasn't been drastically altered since the last glacial sheet receded about 10,000 years ago. The complex also includes the Geauga Park District's Burton Wetlands Nature Preserve and Fern Lake, which is owned by the Cleveland Museum of Natural History.

The property was purchased from members of the Holzheimer family, who have helped maintain the wild character of the property for more than a century. The lake is named for Oliver Snow, who was deeded property through a Connecticut land grant in the early 1800s, said David Holzheimer of Chagrin Falls. In 1906, Holzheimer's grandfather and several friends purchased Snow Lake and established the Snow Lake Hunting and Fishing Club. As years passed, interest in the club waned and the Holzheimer family gradually bought out the remaining members.

"Conservation-minded organizations have been interested in protecting Snow Lake for more than 30 years," said Bill Ginn, an honorary life trustee of The Nature Conservancy in Ohio and a longtime broker of conservation deals in Northeast Ohio.

"Once I saw what was out there, it became immediately apparent that this place needed to be saved, for the future of those wetlands," Ginn said.

"The City of Akron applauds the efforts of The Nature Conservancy, the Ohio EPA and the Northeast Ohio Regional Sewer District, in cooperating to protect the integrity of these wetlands," Akron Mayor Dan Horrigan said. "Not only does this purchase aid in preservation of the wild beauty of the Scenic Upper Cuyahoga River Watershed, it also supplements Akron's existing significant efforts to protect the quality of the drinking water supply for Akron and surrounding communities by adding to the permanent conservation of land in the watershed."

Information for this article taken from www.cleveland.com and https://www.nature.org/.

Downy False Foxglove, *Aureolaria virginica*

By Lytton Musselman



Downy False Foxglove, *Aureolaria virginica*.
Picture taken from www.flickr.com.

Parasitic plants are a small but fascinating component of our flora. Most of ours are in the family *Orobanchaceae*, which now includes the parasitic members of the Scrophulariaceae. This family has gone the way of the Santa Fe Chief and rational political discourse. Its status is what botanists have unfeelingly called "disintegration". While this may be viewed as progress, it does take some getting used to. I feel like the victim of botanical devaluation, having obtained a degree from a department that no longer exists (botany at UNC-Chapel Hill) working on a family that no longer exists (Scrophulariaceae).

Parasitic species that were once placed in the Snapdragon Family, Scrophulariaceae, are now included in the Orobanchaceae, the Broomrape Family. They are parasitic because they form a connection with the roots of host plants through a specialized organ called a haustorium (plural haustoria). This includes species of the genus *Aureolaria*, sometimes known as false foxgloves because their flower shape resembles that of true foxglove, *Digitalis purpurea*. In downy false foxglove, these small nodule-like structures are evident when carefully excavating a plant and tracing the white roots of the parasite to the brown roots of the oak host. Haustoria look like nodules and may be as wide as ¼ inch. All species of *Aureolaria* parasitize oaks. The perennial species, like downy false foxglove, are restricted to white oaks. However, this is not a narrow host selection but rather a strong host preference.

A word of caution—proximity does not determine a host. I have often been told, "I found a false foxglove parasitizing okra" (or something similarly improbable) just because the plant was growing near the okra. Host verification mandates excavation of the parasite and surrounding plants to determine which are bearing haustoria.

Aureolaria virginica flowers in Spring, early to mid-June on the coastal plain of Virginia*, and produces bright yellow flowers reflecting the meaning of the Latin name of the genus, appropriately, golden-yellow. All species in the genus have similar, brightly colored flowers, but downy false foxglove is the first to flower. Bumblebees and other bees are the most frequent floral visitors. As they approach the flower, the insects turn upside down, apparently in response to markings on the corolla. This approach ensures that the insect body catches on the small projections on the anthers. As the insect withdraws, these projections force open the anther, causing the powdery pollen to fall on the back of the insect.

Corollas usually last only a day. By late afternoon on a sunny day, the corolla is blotched where the insects handled it; the corolla usually falls by the end of the day. Fruits develop in the summer, containing numerous seeds with a honeycombed surface.

Seeds are easy to germinate after a cold treatment. Unlike many related parasitic plants, species of *Aureolaria* do not need a host stimulant to germinate. But a host is needed for healthy development. I have grown species in pots with host plants by allowing the host plant, in this case a white oak, to become root bound. This provides ample opportunity for the seedlings to find the host roots and form haustoria.

Downy false foxglove is also one of the most widely distributed *Aureolaria* species, found throughout much of the Appalachian Mountains, piedmont, and coastal plain. Favored habitats are margins of dry oak woods, roadsides, and other open sunny areas. Like many other parasitic plants, this species likely has a very high rate of transpiration, necessary to ensure movement of water

and foodstuffs from the host to the parasite, so favors full sun to drive the process.

Two other species of *Aureolaria* may be found with downy false foxglove. These are *Aureolaria flava*, a widespread species, and *A. laevigata,* which is most frequent in the mountains. Only *A. virginica* has short dense hairs on the leaves, providing the basis of the common name. It is indeed downy, and the only one of its congeners with unlobed stem leaves.

Chinquapin Editor's note: Would it be accurate to refer to these plants as "semi-parasitic" in that they do have chlorophyll and would produce some of their own sugars? And if they do produce sugars, would they pass some of it on to the host plant? And might these combinations have any other value to the host plant, such as providing some sort of antibiotic? I would assume that other non-chlorophyllus plants like beech drops, *Epifagus virginiana*, would be true parasites.

**OTF* Editor's note: Downy False Foxglove, *Aureolaria virginica,* is native to Ohio and blooms mid-summer.



Downy False Foxglove, *Aureolaria virginica*.
Picture taken from www.marylandbiodiversity.com.

Reprinted from *Chinquapin*, the Newsletter of the Southern Appalachian Botanical Society, 2011, Vol 19, No 1.

Invasive Plant:

Tree-of-Heaven, *Ailanthus altissima*

By Ellen Jacquart

Natural History

Tree-of-Heaven is a deciduous tree native to China. The species was apparently introduced into America by two different routes. The first route was through Pierre d'Incarville, who mistook it for the lacquer tree in China and sent seeds to England around 1751. It was then introduced to America by a Philadelphia gardener in 1784. Because of its rapid growth and ability to grow in unfavorable conditions with little care, it became common in eastern nurseries by 1840. The second route was through Chinese miners. During the days of the California gold rush, many Chinese miners brought alianthus seeds with them as they settled in California, probably because of its medicinal and cultural importance to them.

Identification

Tree-of-Heaven has long, pinnately compound leaves which look somewhat like black walnut leaves. The easiest way to tell them apart? Crush some leaves—the telltale peanut butter smell of Tree-of-Heaven is very distinctive. The tree is dioecious, with male and female flowers on separate trees. In June, female trees are quite obvious as yellowish-red fruits dot the green tree canopy. The fruits turn to a beige color by early winter and remain on the female trees until early spring. The stout twigs of Tree-of-Heaven have an olive-tan color in winter, with huge leaf scars and very small buds, with no true terminal bud. The bark of Tree-of-Heaven remains fairly smooth as the twigs become branches, taking on a subtle checkered appearance.

Reproduction
One mature Tree-of-Heaven can produce up to 350,000 seeds per year. These seeds are easily airborne and can be transported by water and birds as well. Germination of seeds is quite high. Mature trees also reproduce extensively by sending up root suckers and sprouts from cut stumps. Sapling growth can reach 3-4 feet a year, faster than any of our native tree species.

Range and habitat in the United States
Tree-of-Heaven is reported to be invasive in natural areas in 30 states across continental U.S., including Ohio and Hawaii. Tree-of-Heaven is tremendously tolerant of drought, poor soils, and air pollution, surviving in urban landscapes where no other tree can. It is found in arid regions bordering the Great Plains, very wet regions in the southern Appalachians, cold areas of the lower Rocky Mountains, and throughout much of the California Central Valley. Prolonged cold and snow cover cause dieback, though the trees re-sprout from the roots. Habitats include woodland edges and openings, thickets, riverbanks, vacant lots, landfills and dumps, gravelly back alleys, areas along roads and railways, fence rows, and urban waste areas. This tree is more common in urban areas than rural or natural areas; it is especially common in impoverished and poorly maintained areas of cities, where it is sometimes cultivated as a yard tree. Tree-of-Heaven is a pioneer species that prefers areas with a history of disturbance.

Impacts
It does best and establishes first where disturbance has increased the available light in a forest area—along roadsides, trails, or in canopy gaps—but once established it will move into undisturbed forest. Generally, it will not dominate in undisturbed forest but will simply hold on until windthrow, ice storms, timber harvest, or other disturbance introduces more light. Then it quickly fills all available gaps, elbowing out any native trees in the area. Tree plantations are particularly vulnerable to it because it out-grows all the planted trees and forms a pure Tree-of Heaven forest. Tree-of Heaven roots give off a toxin that acts as an herbicide that can kill or inhibit the growth of other plants, which may also explain its success at outcompeting native species.



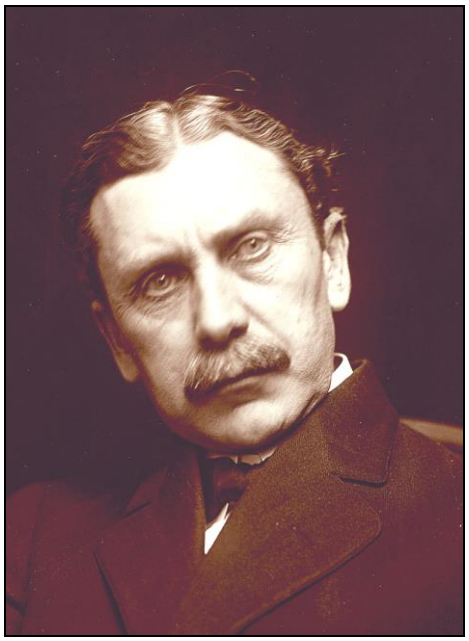
Ellen Jacquart is Director of Stewardship for the Indiana Chapter of The Nature Conservancy, coordinating management of TNC preserves in Indiana, with a particular focus on invasive plant control. As chair of the INPA WS Invasives Committee, she led the effort to develop the *Invasive Plants of Indiana* brochure.

Reprinted from the Indiana Native Plant and Wildflower Society News, Winter 2004, Vol 11, No 4. Range and Habitat information taken from www.wikipedia.org and www.eol.org.
Picture taken from www.gobotany.newenglandwild.org

Folklore:

James Mooney & Cherokee Plant Lore

By George Ellison



Picture taken from www.anthropology.si.e

Anthropologist James Mooney (1861-1921) was born in Richmond, Indiana, a village situated on a tributary of the Ohio. From the time he launched his career with the Bureau of American Ethnology in 1885 until his death, Mooney devoted his life to detailing various aspects of the history, material culture, oral tradition, language, arts and religion of the Cherokee, Cheyenne, Sioux, Kiowa and other tribes, adding a new dimension to the writing of Indian history by combining various methods of research and incorporating sources from the Indians themselves.

He is most widely remembered for his research and writing on the Ghost Dance movement. But some of his most inspired work took place in the mountains of Western North Carolina, where he lived among the remnant Eastern Band of Cherokees [now officially designated as the Eastern Band of Cherokee Indians] for parts of four years from 1887 through 1890 and for interim periods thereafter through 1916. He was the first serious student of that then neglected tribe and probably the most influential. University of Georgia anthropologist Charles Hudson, a leading authority on the Indian tribes of the southeastern United States, concluded that without Mooney we "would know next to nothing about the world view of the southeastern Indians."

Mooney's major works on the Eastern Band were *Sacred Formulas of the Cherokees* (1891) and *Myths of the Cherokee* (1900). Both appeared as Bureau of American Ethnology publications.

After graduating from high school, Mooney took a job with a newspaper in his hometown, but his free time was given over to reading about Indian cultures and studying the publications of early American anthropologists and explorers such as John Wesley Powell. In 1882, he wrote Powell—then director of the Bureau of American Ethnology at the Smithsonian Institution in Washington, D.C.— asking for employment. The bureau ethnologist Powell referred the letter to was not impressed and responded negatively to repeated requests. Not deterred, Mooney journeyed to the nation's capital in 1885 and presented himself to Powell, who was "much impressed" and gave him a position.

That summer Mooney met Nimrod Jarrett Smith, principal chief of the Eastern Band, who was often in Washington lobbying for official recognition of the tribe as a legal entity. Smith warmed to Mooney and invited him to visit the Cherokee. Shortly after his arrival, he was able to observe what turned out to be the last Green Corn Ceremony—with attendant individual and tribal cleansing rituals, involving conjuring, singing and



Partridge moccasin, *Cypripedium acaule,* with the Bombus bee pollinator.
Picture taken from www.perverdonk.com.



Deereye (Rudbeckia hirta or serotina).
Picture taken from www.myshopify.com

prayer that lasted all day and into the night—fully enacted by the Eastern Band for over a century. That summer Mooney started learning the Cherokee language, collected native medicinal plants, blowguns, fish spears and other objects, becoming acquainted in the process with individual tribal members and their mountainous homeland.

Mooney found that old Cherokee traditions were dying out in the face of an onslaught by white Christianity, culture, and material goods. He directed his energies toward helping to preserve Cherokee history, lore and rituals before they faded from tribal consciousness. In retrospect, we can appreciate the fact that he arrived in the nick of time, since most of the Cherokee traditionalists then able to provide him with essential information and insights passed away by the turn of the century.

The great medicine man Swimmer and other members of the Eastern Band concluded that the courteous white man who came to visit and talk with them each year was *u:da:nu:ti*; that is, he was "a man of soul"—he possessed the correct "emotional attitude." Swimmer lived in the isolated and traditional Big Cove community, which remains a bastion of Cherokee traditionalism to this day. He was Mooney's most valuable informant by far. The anthropologist credited "nearly three-fourths" of the stories related in *Myths of the Cherokee* to him. Shortly after Swimmer's death, Mooney penned an elegiac tribute to his friend: "He died in March, 1899, aged about sixty-five, and was buried like a true Cherokee on the slope of a forest-clad mountain. Peace be to his ashes and sorrow for his going, for with him go about half the traditions of his people."

The 576-page *Myths of the Cherokee* consists of eight parts: *Introduction*; *Historical Sketch of the Cherokee*; *Notes to the Historical Sketch*; *Stories and Storytellers*; *The Myths*; *Plant Lore*; *Notes and Parallels*; and *Glossary*. The Cherokees were exceptional observers of the natural world in all its aspects long before the first Europeans arrived and began the systematic survey of the plants and animals found in North America. Here are several excerpts from Mooney's account of Cherokee plant lore.

***

The Cherokee have always been an agricultural people, and their old country is a region of luxuriant flora, with tall trees and tangled undergrowth on the slopes and ridges, and myriad bright-tinted blossoms and sweet wild fruits along the running streams. The vegetable kingdom consequently holds a far more important place in the mythology and ceremonial of the tribe than it does among the Indians of the treeless plains and arid sage deserts of the West, most of the beliefs and customs in this connection centering around the practice of medicine, as expounded by the priests and doctors in every settlement. In general it is held that the plant world is friendly to the human species, and constantly at the willing service of the doctors to counteract the jealous hostility of the animals. The sacred formulas contain many curious instructions for the gathering and preparation of the medicinal roots and barks, which are selected chiefly in accordance with the theory of correspondences.



Greensnake, *Xerophyllum asphodeloides*.
Picture taken from www.biology.burke.washington.edu.

Some of their plant names are peculiarly apt. Thus, the mistletoe, which never grows alone, but is found always with its roots fixed in the bark of some supporting tree or shrub from which it draws its sustenance, is called by a name which signifies "4 it is married" ... The bear-grass with its long, slender leaves like diminutive blades of corn, is called "greensnake," and the larger grass known as Job's tears, on account of its glossy, rounded grains, which the Indian children use for necklaces, is called "the mother of corn." The black-eyed Susan of our children is the "deer-eye" of the Cherokee, and our lady-slipper is their "partridge moccasin". The May-apple, with its umbrella-shaped top, is called "it wears a hat," while the white puff ball fungus is "the little star," and the common rock lichen bears the musical, if rather unpoetic, name of utsäle'ta, "pot scrapings."

Ginseng, or "sang," as it is more often called by the white mountaineers, is known to the laity as "the mountain climber," but is addressed in the formulas as "Little Man," while selu (corn) is invoked under the name of "The Old Woman" ... The beliefs and ceremonies in connection with the gathering and preparation [of ginseng] are very numerous. Ginseng, which is sold in large quantities to the local traders, as well as used in the native medical practice, is ... addressed by the priests as "Little Man, Most Powerful Magician," the Cherokee sacred term, like the Chinese name, having its origin from the frequent resemblance of the root in shape to the body of a man. The doctor speaks constantly of it as of a sentient being, and it is believed to be able to make itself invisible to those unworthy to gather it. In hunting it, the first three plants found are passed by. The fourth is taken, after a preliminary prayer, in which the doctor addresses it as the "Great Ada'wehï," and humbly asks permission to take a small piece of its flesh. On digging it from the ground, he drops into the hole a bead and covers it over, leaving it there, by way of payment to the plant spirit.

Mysterious properties attach to the wood of a tree which has been struck by lightning, especially when the tree itself still lives, and such wood enters largely into the secret compounds of the conjurers. An ordinary person of the laity will not touch it, for fear of having cracks come upon his hands and feet, nor is it burned for fuel, for fear that lye made from the ashes will cause consumption. In preparing ballplayers for the contest, the medicine man sometimes burns splinters of it to coal, which he gives to the players to paint themselves with in order that they may be able to strike their opponents with all the force of a thunderbolt. Bark or wood from a tree struck by lightning, but still green, is beaten up and put into the water in which seeds are soaked before planting, to insure a good crop, but, on the other hand, any lightning-struck wood thrown into the field will cause the crop to wither, and it is believed to have a bad effect even to go into the field immediately after having been near such a tree.

[In the Notes and Parallels section, Mooney, ever diligent, appended the observation: "The ancient Tuscarora believed that no tree, but black gum was immune from lightning, which, they declared, would run round a tree a good many times seeking in vain to effect an entrance.] [John] Lawson, who records the belief [in A New Voyage to Carolina, 1709], adds: "Now, you must understand that sort of gum will not split or rive; therefore, I suppose the story might arise from thence."



"It wears a hat," *Podophyllum peltatum*.
Picture taken from www.lookfordiagnosis.com.

Note: George Ellison wrote the biographical introduction for the reissue, in one volume, of *Myths of the Cherokee* and *The Sacred Formulas of the Cherokees* as *James Mooney's History, Myths, and Sacred Formulas of the Cherokees* (Asheville NC: Historical Images, 1992).

Reprinted from *Chinquapin*, The Newsletter of the Southern Appalachian Botanical Society, Vol 19, No 4.

Interesting Factoid:

Allelopathic Plants: Mother Nature's Own Weed Killers

Plant allelopathy is all around us; yet, many people have never even heard of this interesting phenomenon. Allelopathy can have an adverse effect in the garden, resulting in reduced seed germination and plant growth. On the other hand, allelopathic plants may also be considered Mother Nature's own weed killers.

Allelopathy is a biological phenomenon where one plant inhibits the growth of another. How? Through the release of allelochemicals, certain plants can greatly affect the growth of other plants either in a good or bad way by leaching, decomposition, etc. In essence, plant allelopathy is used as a means of survival in nature, reducing competition from plants nearby.

Various parts of plants can have these allelopathic properties, from the foliage and flowers to the roots, bark, soil, and mulch. Almost all allelopathic plants store their protective chemicals within their leaves, especially during fall. As leaves drop to the ground and decompose, these toxins can affect nearby plants. Some plants also release toxins through their roots, which are then absorbed by other plants and trees.

Companion planting has long been part of the organic gardener's tool kit. We're all aware that some crops aid in the growth of other crops. The "three sisters"—corn, squash and beans—are probably the best-known example of different plants that do well when planted close by. Other plants are known to repel pests. Geraniums are often planted in the garden to repel leafhoppers, corn earworms, even mosquitoes. And planting legumes—beans, field peas, hairy vetch—where heavy feeding vegetables will later grow helps increase soil nitrogen.

One problem with these principles is that there's little scientific study to back up what we know from experience. And, in the case of companion planting, some of the scientific "proof" can be questionable. But science is beginning to take a serious look at one form of companion planting known as allelopathy. Scientists have discovered that certain allelopathic plants have the ability to produce toxic substances that inhibit the growth of other plants. And when those "other plants" are common weeds, well, the ears of organic gardeners begin to perk up.

Interesting Factoids:



- Author William Olkowski's newly revised *The Gardeners Guide to Common Sense Pest Control* provides a chart that shows the various plants that carry allelopathic properties**:** asters to control ragweed; barley, wheat, and sorghum to control pigweed, foxtail, and purslane; cucumber to control mustard and Bermuda grass. He cites the example of using ryegrass mulch in combination with the growing of large-seeded crops like peas and beans. Not only does the ryegrass offer the usual cover-crop benefits of increased soil moisture, greater microbial activity, and moderated soil temperatures, it also helps control a variety of invasive weeds; a win-win situation if we ever heard of one.
- To date, the use of allelopathic cover crops, such as rye and oats, has been the greatest application of this concept in agriculture. Rye residue has been reported to reduce green foxtail, redroot pigweed, common ragweed, and common purslane emergence by 80, 95, 43, and 100%, respectively.

Using synthetic chemical compounds in agriculture has brought various types of ecological and environmental disasters to the present world. These toxic chemicals are damaging the ecological balance to a severe extent and introducing many fatal diseases. That's why the demand for sustainable agriculture and eco-friendly alternatives to chemical compounds has increased. Plant allelopathy is a great alternative to using toxic chemical herbicides in weed management.

Allelopathic study is in its infancy, but early research suggests that allelopaths can be used as effectively as herbicides for organic weed control. For example, an allelopathic crop might be used to control weeds by planting it in rotation with other crops. Are organic herbicides based on allelopaths commercially available already or will they be soon? It's interesting to think about the possibilities of allelopathic chemicals for the organic gardener.

Information for this article taken from *Gardening Know How* (www.gardeningknowhow.com); *HGTV* (www.hgtv.com); *Planet Natural* (www.planetnatural.com). Picture taken from www.lifeofplant.blogspot.com.

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