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Indiana Native Plant and Wildflower Society

Summer 2018

Mulberry weed, a new threat

By Judith Lieberman

Invasive plant profile

In the summer of 2016 I discovered a new plant near my back door. Coincidentally, I had just been putting together a personal notebook about invasive species, using many of the articles from the *INPAWS Journal*. The new plant seemed to look like one I had seen in my notebook. When I checked, sure enough, I found the plant, mulberry weed (*Fatoua villosa*), featured in an article by Kay Yatskievych in the 2004 Spring issue of what was then called *INPAWS News*. In her "What's New" column, Yatskievych wrote that this native of Asia showed up in Louisiana in 1964 and was rapidly spreading in the southern states, especially in nurseries and disturbed soil. Forty years later, it had appeared in Indiana.

Michael Becker – hortipedia.com

"This noxious invasive has the trick of setting seed when it is still tiny," and can "explosively eject seeds up to four feet away."

After confirming the plant's identification with invasive plant expert Ellen Jacquart, at her suggestion I submitted the information to the GLEDN* invasives database. I became alarmed when, only two or three weeks after seeing the first plant, I saw dozens of new seedlings of this species growing in the flower beds next to the back door and up through the bricks on my patio. Given the plant's prolific habit, it is easy to see why mulberry weed has potential to become the latest weed on a list of extremely invasive plants in Indiana.

Inside

Mulberry weed, also known as hairy crabweed, prefers moist, shady conditions. Its seeds can tolerate cold temperatures, and it has been seen growing as far north as New York.

"It's a horrendous re-seeder," according to Sue Arnold, an INPAWS member who works at Newfields (formerly IMA) Greenhouse in Indianapolis. Arnold says copious mulberry weeds are growing behind the greenhouse and also at her residence in Brownsburg, following a path of spreading similar to what Yatskievych described in her 2004 article.

Mature plants can grow to three and a half feet, but this noxious invasive has the trick of setting seed when it is still tiny, only three to four inches! Because of its ability to explosively eject seeds up to four feet away, these plants are often found in colonies.

New threat – *continued on page 18*

Wooly pipevine

Larval host for pipevine

Host plant profile

By Katherine Newkirk

The pipevine swallowtail (*Battus philenor*) relies almost exclusively on plants of the pipevine genus (*Aristolochia* spp.) to nourish its larvae. Dutchman's pipe or wooly pipevine (*A. tomentosa*) is native to southwestern Indiana, where the vine twines through shrubs and trees along stream banks, flood plains and bottomlands.

The species epithet *tomentosa* means "hairy" and refers to the leaves, hence "wooly." These overlapping, heart-shaped leaves can grow 4-6 inches in length.

Like many members of the genus, wooly pipevine contains aristolochic acid. While munching on pipevine leaves, pipevine swallowtail larvae consume and sequester the toxic acid, making them unpalatable to predators. The adult butterflies are also unpalatable to predators such as birds.

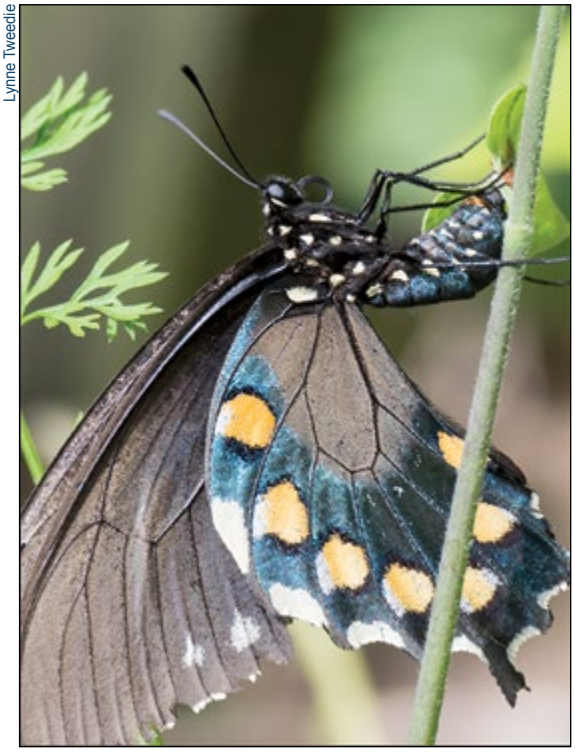
Due to the butterfly's toxicity, "swallowtails are involved in a complex mimicry ring," writes Jeffrey Belth in *Butterflies of Indiana: A Field Guide* (2013). A number of butterflies mimic the colors of the pipevine swallowtail, including the spicebush swallowtail, black swallowtail and eastern tiger swallowtail as well as the red-spotted purple and female Diana fritillary.

Hidden under the pipevine's leaves, greenish-yellow flowers bloom inconspicuously in mid- to late spring. Their shape gave rise to another common name, Dutchman's pipe, for the flower's resemblance to a deeply recurved smoking pipe of the sort often depicted in the hand of Sherlock Holmes. The flowers exude a fetid odor that draws small flies. Some crawl inside and get trapped by hairs in the flower's tube for about a day. As the anthers mature, the hairs wither and the flies escape–covered in pollen–hopefully buzzing off to fertilize other pipevine flowers.

The large, dense leaves made pipevines popular during the Victorian era for cooling and privacy, but "the decline of the porch has left pipevine without a horticultural niche," wrote William Cullina in his 2002 book *Native Trees, Shrubs, & Vines*. Yet, said Cullina, "its vigor, shade tolerance, and easy nature may yet find it a place in modern gardens."

While the foliage was once pipevine's chief appeal, many present-day gardeners choose pipevine to attract butterflies. If the Pipedream Project of the North American Butterfly Association has its way, more will nurture

Lynne Tweedie



A femaile pipevine swallowtail butterfly deposits eggs on pipevine.

Lynne Tweedie

The tiny orange eggs oviposited by the female may change color as they age.

Lynne Tweedie

Orange spots on larvae advertise toxicity to predators.

swallowtails

pipevine. “We believe that just as placing nesting boxes for bluebirds has led to a resurgence of that species, people can greatly help pipevine swallowtail by planting pipevines.” (*nababutterfly.com/pipe-dream-project*).

Once established in the garden, wooly pipevine grows vigorous woody vines that can wind 15-30 feet along a sturdy wire, fence or other support and can spread 15-20 feet via underground stolons.

“I love mine!” writes Ellen Jacquart on INPAWS’ Facebook group, “But you should be ready for it to spread quite aggressively if it is happy (enough sun and moisture). I ended up moving mine into a shaded habitat to keep it from being so aggressive.”

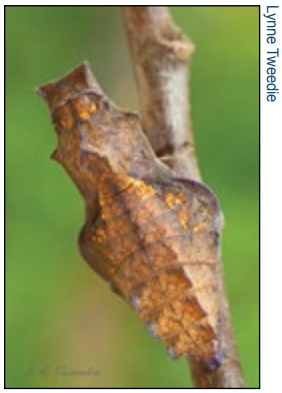
Belth agrees: “I don’t think the aggressiveness of this plant can be over-emphasized.”

Missouri Botanical Garden (*www.missouribotanicalgarden.org*) suggests, “If needed, cut back in late winter to control growth.”

Some INPAWS members report that the plant can be slow to establish in the garden and that tender young vines may be nearly denuded by voracious caterpillars, while others report waiting several seasons for the reward of observing pipevine swallowtais patronizing their vines.

Wikipedia

Katherine “Kit” Newkirk is layout editor of the INPAWS Journal.



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Larvae often wander from the host before forming a chrysalis.

Lynne Tweedie

Adult pipevine swallowtails rely on nectar for nourishment. Nectar of thistles is among their favorites.

© Jeffrey Belth

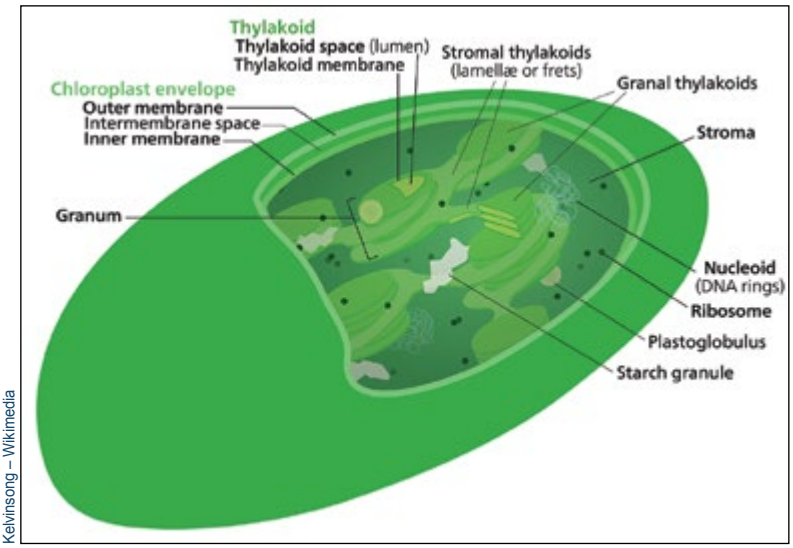
Above: foliage and flower of pipvine

Photosynthesis: the backbone of life

Botany basics

By Adrienne Funderburg

Plants don't ask for too much in life; just some water, sunlight, soil and air will keep most plants happy and healthy. But how is it that a plant can turn such basic, inorganic components into food and energy for itself, and by extension, the rest of us? Simply put, the answer is photosynthesis. In this column, we'll deviate from the field of botany and brave some introductory chemistry and cellular biology in order to learn how plants make inorganic matter and the sun's energy available to the rest of us through the process of photosynthesis.



Kelvinsong – Wikimedia

The structure of a chloroplast, the cellular organelle in which plants collect energy

Energy is needed to build sugar molecules, so energy collection is the first step of photosynthesis. It's performed by pigments found in the cells of the green parts of plants, be they leaf blades or stalks. On the cellular level, pigments are stored in *thylakoids*, which are folded membranes that look like small disks stacked atop one another (Evert and Eichhorn, 2013). A thylakoid stack is called a *granum*, and many *granna* (plural) are interconnected, bundled into cellular organelles called *chloroplasts* (Berg, 2008).

Chlorophyll, the main pigment found in plants, is the source of their iconic green hues; it reflects green while absorbing the blue and red portions of the light spectrum for energy. Other pigments, such as *carotenoids* (red, yellow or orange organic pigments), are also present in plants, but in lower amounts, to absorb the wavelengths chlorophyll doesn't cover (Berg, 2008). They are visible in the fall as chlorophyll breaks down, causing leaves to change colors.

Pigment molecules in the thylakoids accept packets of energy, called *photons*, that are present in visible light (Berg, 2008). Photons energize an electron, which passes the energy along to another electron, which passes it again, like a wire carrying electricity. This system is called the *electron transport chain* (Berg, 2008). Ultimately, that light energy is converted into short-term chemical energy molecules ATP and NADPH (acronyms for long names given for their chemical structure), which the plant uses to make carbohydrates in the second step of photosynthesis (Evert and Eichhorn, 2013). The plant gets the electrons into the transport chain by dividing water molecules into their components. Each molecule gives the plant two electrons to use in the transport chain, as well as two *protons* (positively charged hydrogen molecules – the two H's in H_2O) and one oxygen molecule. The oxygen molecules pair up and leave the plant as oxygen gas, which we and other animals breathe.

These ongoing energy transfer operations are referred to as the *light-dependent reactions* of photosynthesis. The second half of the photosynthetic process is *carbon fixation*, also known as the *Calvin cycle*. Carbon fixation takes place in the chloroplasts but outside of the granna, in a surrounding substrate called the *stroma* (Berg, 2008). In carbon fixation reactions, carbon molecules taken from carbon dioxide (CO_2) gas are "forged" together into short chains by proteins in the chloroplasts and the energy-carrying molecules ATP and NADPH that are created in the light-dependent reactions (Berg, 2008). These short chains are paired up to create the carbohydrates glucose and fructose, two simple sugars. Through a bit more carefully crafted botanical biochemistry, plants can then make starches for storage, table sugar/syrup (sucrose) or cellulose for the walls of their cells (Berg, 2008; Evert and Eichhorn, 2013).

These sugars have carbon "backbones," which makes them *organic compounds*. You and I are built of such compounds; they make up all living things and many substances that living things rely on. Photosynthesis is the most incredible feat plants perform: converting *inorganic* molecules, water

Botany – *continued on page 19*

Florathon grows Letha's Fund

By Barbara Homoya

Groups of Hoosier native plant enthusiasts enjoyed natural areas, saw blooming spring wildflowers and showed their competitive streak – all while raising money for INPAWS' Letha's Youth Outdoors Fund. The first annual Florathon in April and May commemorated INPAWS' 25th anniversary. Teams solicited pledges, chose a day, then sought as many flowering native species as they could find.

One of the first teams to publish results was Quaker Ladies, led by Amy Perry. Despite a cool spring, the team located 33 species in bloom on April 17 at Holliday Park in Indianapolis. On May 13 the Bloomin' Stellarias, led by Ellen Jacquart, identified 150 species in four counties.

As of this writing, results were in from seven teams. Contributions to Letha's Fund from 60 donors totaled over $2,700, and 10 new members were recruited. Final results will be in the fall *INPAWS Journal* and winners will be honored at the conference Nov. 3. Thanks to all who participated or donated!

Barbara Homoya is a member of Central Chapter and chair of INPAWS' first annual Florathon.

Katie Neill, Holliday Park office administrator

The first Florathon team to report results was the Quaker Ladies. From left are Amy Perry, Wendy Ford, Terry Trierweiler and Norma Wallman. On April 17, they found 33 blooming plants at Holliday Park, Indianapolis, and raised over $400 for Letha's Youth Outdoor Fund.

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Intervention seeks to save endangered clover

Endangered plant profile

Sarena Selbo

"Despite management plans and attempted reintroductions, the species remains in a perilous state in the wild."

By Jonathan O.C. Kubesch

Running buffalo clover (*Trifolium stoloniferum*) (RBC) is native to Indiana and Ohio, as well as six other Midwestern states. According to some sources, loss of habitat has contributed to it becoming a federal endangered species (Hattenbach, 1996; Leugers, 2016). Presumed extinct around 1940, researchers rediscovered small populations in the mid-1980s along the Ohio River corridor.

Throughout the past 30 years, conservationists discovered and protected wild populations of RBC. Despite management plans and attempted reintroductions, the species remains in a perilous state in the wild (Leugers, 2016). Regulators report high fatalities in field translocations in Ohio and neighboring states. Low survival rates doom the clover's already small populations, thus an improved intervention strategy is imperative. Especially given the threat of land development in the Midwest, determining ideal transplanting procedures is crucial for endangered native species (Hattenbach, 1996).

The objective of a recent Ohio State University research study was to ascertain an optimal intervention-transplantation strategy based on collecting field stolons (runners), generating new plants and using a general purpose fertilizer.

During an establishment phase, 23 to 25 individuals were collected from stolon cuttings of Cincinnati populations in May-June, 2017. These grew over the summer to become nursery plant material (Sparks and Barker, 2013). Stolons from these plants then went into root trainers for re-planting in the original forest sites in October-November, 2017. All Ohio sites generated at least four times as many plants as stolons originally collected. The greenhouse intervention resulted in a low fatality rate (five plants of 392 produced). Branching rate for stolons and continued stolon elongation varied. RBC grew easily in the greenhouse, but would they grow well in the field?

The greenhouse-grown plants were field-acclimated for two weeks before planting. Transplants were planted in a grid in November, 2017, with half receiving a general fertilizer. Stolons-per-plant and stolon length were measured after planting, and plants were left to grow undisturbed from fall until spring.

Sites in Shawnee Lookout and Miami Whitewater Forest near Cincinnati were planted November 8, 2017, and monitored April 15, 2018. Sites were chosen near source populations, and plants were transplanted into areas without any existing RBC.

The Shawnee Lookout plants had a high survival rate (>90%). Approximately 70% of the Miami Whitewater Forest plants survived. Loss of plants during winter could be attributed to grazing, flooding and death of some smaller plants. By April, 2018, the larger fall plants remained significantly larger than the smaller plants. Fertilizer didn't appear to help; in fact, fertilized plants ended up smaller.

Greenhouse intervention has so far proven that vegetative collection can provide propagules (plant parts that can be used to start new plants) via non-destructive stolon sampling. Primary analysis suggests that RBC can easily be propagated (Barker and Sparks, 2014). Survival and growth differences will determine the effectiveness of transplants. Using small unfertilized transplants propagated from stolon tips appears to be the optimal strategy in transplantation experiments.

Greenhouse transplants survived the extremely harsh winter and variable early spring in Cincinnati. The negative fertilizer reaction may be due to the timing of the application; as the plants entered dormancy, fertilizer may not have been taken up. Or fertilizer burn may have injured some roots during field acclimation.

Given the initial success of the Cincinnati sites, similar strategies might translate into increasing the running buffalo clover populations in southeastern Indiana as well.

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Leugers, S.D. 2016. A Review of the Current Status

Clover – continued at right

Iva Spangler: Early park naturalist

By Terri Gorney

Indiana's state park system was founded in 1916, and naturalists were first hired in the 1920s to work from Memorial Day to Labor Day. Many early state park naturalists were educators. It was a perfect summer job for teachers who loved the natural world. One such teacher was Iva Spangler.

Born Feb. 14, 1898, on the family farm in Adams County, Iva grew up loving the wildflowers in their woods. She owned the family farm until she died and, as a teacher, sometimes used the woods as her outdoor classroom.

Iva started teaching in a one-room schoolhouse and saved her money to attend Ball State University, where she graduated in 1923. She held master's degrees from University of Michigan and University of Wisconsin. After teaching in Decatur, she moved to Fort Wayne to teach biology at Central High School, where she founded a Nature Study Club. After mandatory retirement from Fort Wayne Schools at age 65, she taught biological sciences at Indiana University-Purdue University Fort Wayne until 1976.

Her distinguished teaching career was only one part of Iva's life. She was a member of the Indiana Academy of Science (IAS). At one IAS meeting in 1940, her colleagues included Eli Lilly, Frank Wallace, Stanley Coulter, W.S. Blatchley and Charles Deam.

Iva spent over 20 summers as a naturalist at Spring Mill State Park in Lawrence County, Clifty Falls State Park in Madison and Pokagon State Park in Angola. She shared her knowledge of birds, plants and wildlife on hikes in the parks.

According to Iva, her job was to "help visitors enjoy the beauty of the park."

Ten summers were spent at Spring Mill, where her most popular hikes led to the pioneer village and the caves. She wrote, "One of the outstanding attractions we always point out is the wonderful primeval forest that still exists here – there is a wonderful study of successions in the forest."

She created a special "gift" for Pokagon State Park guests in 1961 when she wrote and illustrated a simple color-coded "Flowers of Pokagon" guide and dedicated it "To all who enjoy wildflowers where they grow." It was published by the Indiana Department of Conservation (now IDNR). The guide is compact and could easily be held in the hand or in a backpack. It features 120 wildflowers, most of which could be found all over the state, not just at Pokagon.

Naturalist profile

Pages from Spangler's "Flowers of Pokagon"

Iva wrote, "Pokagon is a park of flowers. The parade opens in early March when skunk cabbage leads the way, often through the snows of late winter. The procession continues through spring, summer and fall until, finally, after autumn colors have disappeared, the witch-hazel puts on its display of delicate yellow fringe, giving a preview of next year's parade."

The guide "was made possible," she said, "by years of experience in field work at Pokagon State Park and elsewhere." She hoped that users would become interested in conservation of our native flora.

After her death in 1986, Indiana Academy of Science remembered Iva Spangler as someone who was "very accommodating and friendly ... and knew plants well."

Terri Gorney is a member of INPAWS Northeast Chapter and vice-president of Friends of the Limberlost.

Clover – from left

of Running Buffalo Clover (*Trifolium stoloniferum*) in Ohio. Ohio Biological Survey

Sparks, P.M., and D.J. Barker. 2013. Vegetative reproduction of *Trifoilum stoloniferum* stolons. Ohio State University

Sparks, P.M., and D.J. Barker. 2013. Susceptibility of Running Buffalo Clover, an endangered species, to Soybean Cyst Nematode. Ohio State University

Barker, D.J., and P.M. Sparks. 2014. Running buffalo clover-lost, forgotten, or overlooked? American Forage and Grassland Council AFGC

Jonathan Kubesch is a master's degree student in the department of plant sciences at University of Tennessee, Knoxville.

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To promote the appreciation, preservation, scientific study, and use of plants native to Indiana.

To teach people about their beauty, diversity, and importance to our environment.

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Submissions

All are invited to submit photos, articles, news and event postings. Acceptance for publication is at the discretion of the editor. INPAWS welcomes differing points of view. Please submit text and high resolution photos (300 ppi) via e-mail to journal@ inpaws.org. Submission deadlines for specific issues are: Spring – Jan. 22 for April 1 mailing; Summer – April 22 for July 1 mailing; Fall – July 22 for Oct. 1 mailing; Winter – Oct. 22 for Jan. 1 mailing

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INPAWS is a not-for-profit 501(c)(3) organization open to the public at inpaws.org.

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Please direct information of interest to webmaster@inpaws.org.

President's message

By Michael Homoya

What a spring it's been for INPAWS! After a chilly April, warm weather finally arrived and such a treat it was, especially for Florathon participants. Several teams traipsed the trails in Indiana's natural areas in pursuit of blooming native plants for the purpose of supporting a good cause. Missed out on the fun? Florathon chair Barbara Homoya shares more on page 5 of this issue (See "Florathon grows Letha's Fund").

Another exciting INPAWS project is the certification program for homeowners who grow native plants on their properties. Watch – this will grow by leaps and bounds as more people become educated about the virtues of native plants. Ellen Jacquart, chair of the Grow Indiana Natives program, spearheads the effort that we hope will inspire others to join the "growing" native plant movement. (See "Grow natives? Get certified!" on page 15 of this issue.)

I hope you were able to attend our annual spring native plant sale. Coordinators Tammy Stevens and Kelly Spiegel and a host of volunteers did a superb job. The plant sale is a big undertaking and a significant source of income for our organization. Thanks to everyone!

If you're a regular at our plant sale you might remember that last year's auctioneer, author and Indianapolis-based WISH-TV reporter Dick Wolfsie, mentioned his confusion caused by the INPAWS signs in the parking lot. He thought he'd arrived at an event for furry pets, "IN*PAWS*." I've often wondered if other people were similarly confused. In my small but diverse survey of those unfamiliar with our organization, I found that when asked to name the focus of a group named "INPAWS," all had a similar response. That concerns me because it may be detracting from our mission. Therefore, I am asking our leaders and members to consider modifying our name and acronym, even if just a little. While there are other reasons I think we should refine our name, such as the redundancy of "native plants" and "wildflowers," I won't go into the details here. Instead I invite you to read my blog, accessible from the INPAWS home page via the gold button at the upper right. My hope is that a name change will provide us greater effectiveness in spreading our mission. Send your suggestions for a possible new name to *president@inpaws.org.*

Katherine Newkirk

On May 12, INPAWS' 2018 native plant sale drew scores of buyers, earned nearly $11,000 and garnered a dozen new members.

Need a grant?

October 1 is the application deadline for INPAWS general fund grants. Awards will be announced Nov. 3 at the annual conference. Funds will be provided as reimbursement after a project is completed. Applications must fit one of three categories: research, land management and restoration, or demonstration garden.

However, Letha's Youth Outdoor Fund still accepts applications any time of year, restricted to educational field trips: transportation for students or youth groups, naturalist fees and supplies. These awards are also disbursed as reimbursements of actual costs.

For details, see the winter 2017-18 issue of *INPAWS Journal* and w*ww.inpaws.org/about-us/grants-awards-2.*

Journal to join Harvard database

The *INPAWS Journal* team is honored to announce that our quarterly publication is becoming part of Harvard University's Biodiversity Heritage Library (BHL), a global online database of literature accessible to both scientists and the public.

The invitation to participate came two years ago, but a signed agreement with Harvard was just concluded in April of this year. The INPAWS board resolved initial concerns about copyright liability and ultimately decided in favor. It is appropriate that it came to fruition during our organization's 25th anniversary year.

Scores of publications are searchable in the BHL database, which has 136,268 titles to date. Founded in 2006, it is now a consortium of more than 30 organizations. Its contributors include universities, herbaria and botanical gardens around the world, the Library of Congress and individual collections. Topics range from agriculture and geology to insects, extinct species, flora and fauna of the world, and even "A History of Cats." Volumes also include scientists' handwritten field notes that have been transcribed and digitized.

BHL's web site states its purpose: "In order to document Earth's species and understand the complexities of swiftly-changing ecosystems in the midst of a major extinction crisis and widespread climate change, scientists need something that no single library can provide – access to the world's collective knowledge about biodiversity."

INPAWS Journal has been published in some form since 1994, one year after the organization's founding. INPAWS co-founder and historian Ruth Ann Ingraham and former Journal editor and current webmaster Wendy Ford have assembled a set of back issues which BHL will digitally scan into its database. As of this writing, we do not know when *INPAWS Journal* will appear on the web site.

Writers who wish to submit articles to the Journal should keep in mind that if their work is published in its pages, it will automatically become part of BHL. INPAWS does not retain any rights to the submissions it receives, so writers and photographers, as always, are free to submit their work elsewhere after it appears in the Journal.

The Biodiversity Heritage Library can be found at *www.biodiversitylibrary.org*.

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Nov. 3, IUPUI – Indianapolis

New conference date and venue!

By Bill McKnight

The 2018 annual INPAWS conference will be held at IUPUI. Originally, our meeting was to be held at the Scottish Rite Cathedral in Indianapolis, but their attorney informed us that they will not allow us to use their building even though we have a valid contract dated August, 2017. (This is the second time in three years that a venue has done this to us.) The late notification created headaches for me, the conference organizer, as I already had the entire meeting planned down to the menu.

Fortunately I was able to find a substitute venue: Hine Hall on the IUPUI campus in Indianapolis. However, due to the change of venue, we also had to change the date. Rather than Oct. 27 as announced in Bloomington last October, the conference will be Nov. 3. We are sorry for any inconvenience this change may cause, but it was necessary and certainly not our fault.

There is a silver lining! This new date will allow us to avoid the humongous Future Farmers of America convention in Indianapolis and the Natural Areas Association meeting in Bloomington.

Following up on post-event evaluation suggestions from last year, there will be Friday afternoon field trips this year in the Indianapolis area, including a motor coach tour of Jens Jensen-designed properties led by Jensen expert Robert Grese, director of Matthaei Botanical Garden and Nichols Arboretum, Ann Arbor. Additional Friday afternoon field trips are being offered to Eagle's Crest Nature Preserve (Roger Hedge will be the guide) and to Woody Warehouse in Lizton (with Pete Berg at the helm). All field trips will have limited participation (50, 25 and 25 respectively), will be first-come, first-served, and will require preregistration separate from the conference registration. There will be a fee for the Jensen tour, which will start and end at Holliday Park. More details on these field opportunities will be forthcoming via the INPAWS web site, email, the fall journal and the conference flyer.

Speakers for the 2018 conference will be: Peter Del Tredici (Arnold Arboretum), Gerould Wilhelm (Conservation Research Institute), Laura Rericha (Cook County Forest Preserve District), Jesse Kharbanda (Hoosier Environmental Council), as well as Eric Knox and Paul Rothrock (IU Herbarium). This is an august group and their presentations will be thought-provoking.

Hine Hall holds a maximum of 370 people. We expect it will fill, so we recommend you register a.s.a.p. If full, there will be no opportunity for walk-ins. We will keep an updated registration tally on the web site.

Lastly, given that 2018 is INPAWS' silver anniversary, other special activities and displays will be featured at the conference. For example, for locals and early arrivals (those staying in the Indy area overnight on Friday, Nov. 2) space has been reserved at the Slippery Noodle Inn for a pre-conference get-together, starting at 8 p.m.; live blues music begins at 8:30 p.m. We have taken care of the cover charge (just tell the doorman you're with INPAWS) but the food and drinks are on you. GO, INPAWS!

Bill McKnight is a member of INPAWS Central Chapter and 2018 conference chair.

Conference seed swap returns

By Mark Sheehan

Thanks to many INPAWS members, the seed swap at the 2017 annual conference was a great success. Participants from all over the state collected seeds from native species and brought them to exchange with others. Building on last year's momentum, the seed swap at the Nov. 3 conference promises to be bigger and better!

Think about what you might contribute. If you tend native plants that set viable seed, dry and clean the seeds and place them in wide-mouth, lidded jars (plastic or glass). Label clearly with the full common name of the plant and the county where the seeds were grown. If you know the scientific name, include that as well.

As last year, those who contribute seeds will be allowed to enter the seed swap before other conference-goers.

Seeds of some species require special care to remain viable after collection. The Lady Bird Johnson Wildflower Center web site is a great source of that information. For example, look under "Propagation" on this page for information about Virginia bluebells: *www.wildflower.org/plants/result.php?id_plant=MEVI3*.

Check the fall *INPAWS Journal* for conference day instructions.

woodleywonderworks, Wikimedia

Members are invited to save seeds for swapping on Nov. 3.

Chapter activities heat up

North

North Chapter met March 18 at the new Ethos Science Center in Elkhart to hear Sandy Messner of the Indiana Forest Alliance (IFA) deliver a presentation about IFA's work titled "Trees Talk." The organization has six staff members who work on state forest protection, including the controversial Yellowwood State Forest, carry out economic studies of forests, and conduct bioblitzes. Sandy encouraged members to read *The Hidden Life of Trees* by Peter Wohlleben. (See a review of Wohlleben's book in the spring, 2018, issue of *INPAWS Journal*.) She discussed the "Wood Wide Web," a group of studies of trees and their fungal network started in 1997 which explain how trees share carbon and other nutrients via underground networks.

As part of its outreach program, North Chapter had booths at the March 10-11 Growing Summit at St. Joseph County Library, organized by Unity Gardens of South Bend; the March 10 Master Gardener Spring Seminar at Goshen Greencroft Center; and the March 24 LaPorte County Garden Show at Michigan City High School.

The chapter's contribution to the celebration of 25 years of INPAWS was a May 5 hike at the private property of an INPAWS member in Jasper County. The hike was led by botanist and chapter member Scott Namestnik.

On June 16-17 members joined the Botanical Club of Wisconsin for a weekend of botany in the Badger State. The group spent most of its time in southeast Wisconsin in and around the Southern Unit of the Kettle Moraine State Forest, a region marked by various glacial land forms. Floristically, it's one of the jewels of the Upper Midwest. Excellent examples of oak savanna can be found throughout the state forest, along with high quality calcareous fens, and Scuppernong Prairie, the largest mesic prairie east of the Mississippi River. We saw plants both familiar and new to the Indiana botanist. It was a great weekend of botany!

The chapter's annual summer potluck will be in July, date to be announced. Members will enjoy a hike, a botany scavenger hunt, great food and fellowship. Educational summer hikes to natural areas are ongoing.

South Central

SCINPAWS members toured the Indiana University Herbarium March 3 with Paul Rothrock, its associate curator. Rothrock also led a spring wildflower walk March 31 at a wooded ravine in northern Monroe County.

Chapter outings included a combined hike with Owen County Master Gardeners at Fish Creek Preserve April 21. Members staffed information tables at several organizations' spring events, organized a May Florathon team to raise money for Letha's Fund, and participated in The Nature Conservancy's (TNC) work day at Rabbit Hash Trail in Harrison County, followed by a tour of Harrison County Glades with TNC's southern Indiana land steward Dawn Slack.

Upcoming: Ellen Jacquart will lead a rugged hike Sept. 1, 10–11:30 a.m., at Cedar Bluff Nature Preserve in Monroe County. Participants must RSVP to Steve Dunbar at *clarencestevendunbar@hotmail.com*. Bring a lunch to enjoy atop the bluff.

Southwest

Heath Hamilton, wildlife refuge specialist at Patoka River National Wildlife Refuge and Management Area, delivered a presentation to SWINPAWS members May 19 at Evansville Vanderburgh Public Library. His topic was local land restoration activities at Patoka River and the positive impact it has for wildlife.

Members enjoyed a great display of spring ephemerals on an April 21 educational hike at the 254-acre Ouabache Trails Park in Knox County. The park offered the opportunity to see native plants of woodland, wetland, along streams and near the Wabash River floodplain. The hike was led by Michael Broz, Terri Talarek King, Linda Wilcox, Linda Sutterer, Will Drews and Denise Egel.

Upcoming: On July 21 at 9:30 a.m., Ellen

in warm weather

Jacquart, INPAWS vice-president and former director of northern Indiana stewardship for The Nature Conservancy, will speak on invasive plants and the work currently being done towards prohibiting their retail sale. Her talk will be part of the chapter's regular meeting at Wesselman Woods Nature Center in Vanderburgh County.

Upcoming: SWINPAWS will hold its 2nd annual native plant sale Sept. 8 at the Southwest Indiana Master Gardeners Display Garden at 3501 E. Lloyd Expy., Evansville, to raise money for the chapter, educate the public about native plants and provide native plant stock to the public. Time to be determined.

The chapter's regular bi-monthly meetings are on 3rd Saturdays in January, March, May, July, September and November. Each meeting features a guest speaker.

Northeast

While waiting for wildflower season, Northeast Chapter organized a few indoor programs. Their first 2018 event was Feb. 10, when the chapter partnered with Little River Wetlands Project to host a native seed propagation workshop attended by 50 people. The group received classroom-style instruction about native seeds and where to buy them. Participants then enjoyed the hands-on portion — soaking seeds, adding sand and planting prepared seeds. A private grant allowed the chapter to supply take-home seeds to all attendees to further their skills. The group chose from seeds of 18 wildflowers, including white wild indigo and cardinal flower.

On March 20, "Frogs, Snakes, and Brew" allowed members to enjoy food and locally-brewed beer while Dr. Bruce Kingsbury, director of Indiana Purdue Fort Wayne (IPFW) Environmental Resources Center, spoke on how to make their yards more amphibian friendly. Attendees learned how to create *refugia* — areas of security — on their properties to protect and provide habitat for frogs and salamanders.

In April, chapter volunteers staffed tables to spread the word about native plants for Earth Day events at Eagle Marsh, Oak Farm Montessori School and IPFW. In May, members handed out INPAWS brochures and answered visitors' questions alongside the native plant table at the Foellinger-Freimann Botanical Conservatory's Mother's Day plant sale in Fort Wayne. This popular four-day event, attended by more than 2,600 people, reached people who may have been unaware that planting natives is an option.

Betsy Yankowiac

A Northeast Chapter workshop on seed propagation gave participants hands-on experience. Soaking seeds to prepare for planting are, from back to front, Cammy Sutter, Laura Stine, Michael McKinney, Steve and Beth Hague.

Part of the chapter's 2018 initiative pairs stewardship activities with other programs. The first two pairings combined hikes at Chain O' Lakes State Park (April 29) and Brooks Upland Dunes (May 6) with eradicating garlic mustard in those locations. Hikers enjoyed guided hikes to help them identify spring ephemerals, prior to the dirty work of pulling the garlicky-smelling nuisance plants.

Time to get planting

By Melissa Brown

The city of London (UK) has asked residents to plant nine million wildflowers, one per resident. Indiana has almost seven million residents and about eight million acres that are not farmed. What if a proportionate number of native plants and wildflowers could be planted in the 35% of Indiana that is urban?

INPAWS' Grow Indiana Natives certification program is one way to pursue such a goal. (See "Grow natives? Get certified!" at right). Here are some other opportunities to have a hands-on impact on the spread of native plants and wildflowers in Indiana.

Planting days

June 16	Spring Mill State Park
Sept. 8	Kankakee Sands Nursery
Sept. 8	National Planting Day
Sept 29	Brown County State Park
Oct. 10	Weed Patch Hill

On June 16, 10 a.m. to 2 p.m. (Eastern) at Spring Mill State Park, join Lawrence County Keep Invasives in Check (KIC) members to learn about control of invasive Johnson grass (*Sorghum halepense*). See *www.sicim.info/news* for more information and events.

Around Aug. 1, check the DNR web page at *www.in.gov/dnr/forestry/8303.htm* for the announcement of this year's cycle for Urban Forestry Assistance Grants. Last year, the announcement came three months before the Oct. 31 due date. DNR and federal monies are granted to improve, protect, maintain and increase the number of trees in Indiana communities.

The Nature Conservancy will have seed-collecting days at Kankakee Sands Nursery (1492 W 250 N, Morocco, IN, 47963) Sept. 8, 9 a.m. to noon (Central) and again in October and November. Find dates and details at *www.nature.org/ourinitiatives/regions/northamerica/unitedstates/indiana/events/index.htm*. The seed will be used in restoration at Conrad Station Savanna.

Keep America Beautiful invites us to create events for National Planting Day Sept. 8. You can register an event that celebrates native plants and trees at *www.kab.org/our-programs/national-planting-day*.

On Sept. 29 from 10 a.m. to 2 p.m. (Eastern), you can help with wildflower seeding at Brown County State Park (1405 S.R. 46 W, Nashville, 47448). DNR will host volunteers. Meet in the wildflower meadow on top of Weed Patch Hill, across from the fire tower. Information is at *www.in.gov/activecalendar_dnr.*

To tour the Weed Patch Hill meadow with David Mow Oct. 10, 1 to 2 p.m., meet by the Hoosiers Nest. Contact Patrick Haulter at 812-988-5240 or *phaulter@dnr.in.gov* for either event.

Melissa Brown is a member of INPAWS Central Chapter.

Terrestrial Plant Rule update

By Dawn Slack

After completion of the official Indiana invasive plant list, the Indiana Invasive Species Council asked the DNR division of entomology and plant pathology to draft a proposed rule to address the sale of highly invasive terrestrial plants in Indiana. In 2013, DNR drafted such a rule that includes most of the terrestrial plant species from the official Indiana invasive plant list that are ranked "highly invasive."

The proposed Terrestrial Plant Rule was submitted to the Rules Moratorium Committee in the Office of Management and Business (OMB) in October, 2017, for initial review and exemption from the rules moratorium.

The OMB requested several changes to the draft rule, none of which, thus far, has included removal of any species from the proposed rule. DNR has submitted all the requested changes to OMB for review. If OMB is satisfied, the proposed rule will be included on a future Natural Resource Commission (NRC) agenda and be considered for preliminary adoption. The NRC meets every other month.

To get on a Listserv email list to receive updates about the Terrestrial Plant Rule, contact me at *dawn.slack@tnc.org*.

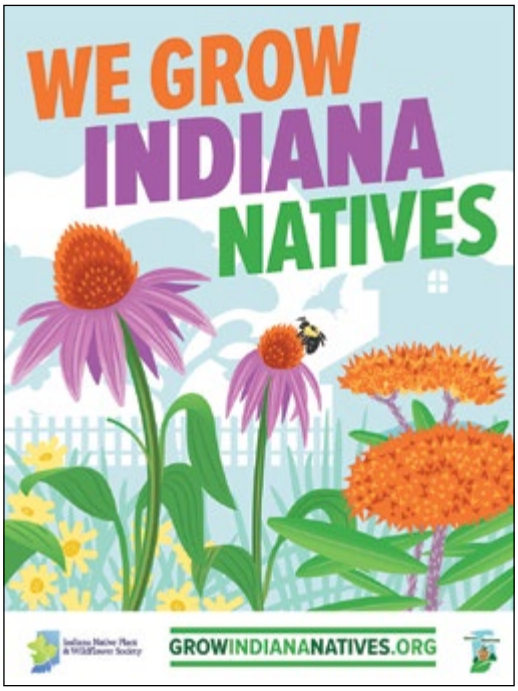
Dawn Slack is southern Indiana land steward with The Nature Conservancy's Blue River field office in Laconia and chair of the Invasive Plant Advisory Committee.

Grow natives? Get certified!

By Ellen Jacquart

INPAWS has expanded its Grow Indiana Natives program to allow home gardeners to certify their native gardens. If you are growing native plants and working to get rid of invasive plants, you can apply for certification.

Initially, Grow Indiana Natives was aimed at certifying native plant sellers and connecting them with customers looking for native plants. The plant seller certification has two levels, "Basic" certification for those who sell native plants, but still sell some invasives, and "Invasive-Free" certification for those who not only sell native plants but agree not to sell invasive plants.



The sellers program continues to grow, with over 40 businesses certified. The program expanded in January to include landscape designers who specialize in native plants and do not design with invasive plants. All businesses in the Grow Indiana Natives program can be found at *growindianananatives.org/buy-native*.

The most recent expansion to include certification for native plant gardeners in Indiana fills a niche that has been empty until now. Programs such as National Wildlife Federation's (NWF) Certified Wildlife Habitat program, while valuable, do little to decrease the use of invasive plants in landscaping. NWF does suggest that "sustainable practices" be used and that "exotic species" be controlled. However, no mention is made of invasive plants or the difference between exotic species (non-natives) and invasive plants (both non-native *and* spread by landscaping practices, causing economic or environmental harm or harm to human health). Nor does the NWF program identify which commonly used species are invasive.

To address this gap, the Grow Indiana Natives certification program for native gardens provides applicants with information on which common landscaping plants are invasive here in Indiana (e.g., purple winter-creeper, burning bush, Callery pear, Japanese barberry, Norway maple) and requires that the applicant is not only growing Indiana natives but also working to get rid of invasive plants on their property.

Certification is free. An application form is at *http://growindianananatives.org/native-garden*. Applicants who are certified will receive a window cling with the Grow Indiana Natives logo and will be eligible to purchase the new "We Grow Indiana Natives" 9" x 12" metal yard sign. The sign is $25 for INPAWS members, $35 for non-members (including shipping).

Proudly declare your support for native plants – certify your native garden!

Ellen Jacquart is a member of INPAWS South Central Chapter and chair of INPAWS' Grow Indiana Natives program.

Guided hikes set

DNR's Division of Nature Preserves announces three upcoming guided hikes. Participation is free, but registration is required at *www.in.gov/dnr/naturepreserve*.

July 25 – Tefft Savanna, Jasper County
Sept. 8 – Bluffs of Beaver Bend, Martin County
Sept. 15 – MCCloskey's Burr Oak Savanna, Lake County

25 years of INPAWS:

By Ruth Ann Ingraham

While Carolyn Harstad served as president of INPAWS from 1996 to 1998, she also authored *Go Native!* In this guide to landscaping with native plants, the Minnesota native writes of her hope that INPAWS would lead the way to a sound environmental future for her adopted Hoosier state.

Ruth Ann Ingraham

The late Donovan Miller was the first leader of the youth outreach effort.

As co-founders, Carolyn and I have watched INPAWS grow during its 25-year history. Paid memberships now approach 1,000; Facebook followers exceed 10,000, and seven active chapters cover Indiana from Lake Michigan to the Ohio River. Each of us lends a hand, or a shovel, one way or another to fulfill Carolyn's vision and help Hoosiers understand the vital role native plants play in the web of life.

With a virtually all-volunteer crew, INPAWS uses many "tools" to span the gap between appreciation of our natural environment and a commitment to its preservation. We rescue plants, write for the *Journal*, attack invasive species, coordinate annual conferences, run book sales, open our gardens to visitors, staff booths, develop ground-breaking projects such as *Grow Indiana Natives*, organize engaging programs and field trips, lead strategic planning sessions, donate and price thousands of plants at our annual sale, evaluate grant proposals, track membership data, serve as officers and committee chairs. INPAWS is a complex organism, but volunteers make an enormous difference.

Dedicated presidents have led the way, beginning with Jeffrey Maddox and followed (in chronological order) by Carolyn Harstad, Ruth Ann Ingraham, Carolyn Bryson, Linda Oxenrider, Becky Dolan, Nancy Hill, Karen Bird, Tom Hohman, Art Hopkins, Jeff Pitts and now Mike Homoya. Though never president, Wendy Ford has worked tirelessly behind the scenes, lending her organizational and technical skills to nearly every facet of our organization.

With guidance from these leaders, INPAWS has surpassed Becky Dolan's early expectations that we might "get together" in members' homes to talk about gardening with native plants and perhaps show slides. It's impossible to fully document our work, but I've chosen a few highlights.

Invasives

One of INPAWS' most important efforts is the focus on learning about and controlling non-native invasive plant species such as garlic mustard, Asian bush honeysuckle and Callery pear. Education is key, coupled with hands-on work.

"In the 1990s, the general public really wasn't aware of the issue of invasives," recalls Ellen Jacquart. "INPAWS had no educational materials on the topic so a group of us, including Ken Collins from the Natural Resources Conservation Service and Lee Casebere from DNR's Division of Nature Preserves, created a brochure. 'Invasive Plants in Indiana' debuted in November, 1999. Many reprints followed and members handed out over 100,000 of them at events. In 2015, an updated version came out – 'Invasive Plants in Indiana: Pretty Awful.'"

Before Ellen retired from The Nature Conservancy, while continuing to chair INPAWS' invasives education committee, she headed DNR's Invasive Plant Species Assessment Working Group (IPSAWG).

"That (IPSAWG) project," Ellen explains, "eventually produced the official Indiana Invasive Plant List *(http://indianainvasivespecies.org)*, which has now been used to draft a rule that will make it illegal to buy or sell highly invasive plants in Indiana."

Growing like wild

In 2009, Ellen co-founded MC-IRIS, a Cooperative Invasive Species Management Area, in her home county of Monroe. MC-IRIS initiated Go Green, Grow Native in 2011 to encourage vendors to identify native plants and discourage the sale of invasives. That program has grown into the statewide Grow Indiana Natives program sponsored by INPAWS.

"INPAWS hopes that someday highly invasive plants will be banned from sale in Indiana," Ellen notes, "but until that happens, the Grow Indiana Natives certification program is our initiative to encourage plant sellers to voluntarily stop selling invasive plants and sell more native plants. Grow Indiana Natives recently added native plant (landscape) designers and native garden certification categories."

Grants

Thanks to our donors and to proceeds from book sales and our annual plant sale/auction, INPAWS has discretionary funds to make grants to projects small and large. Our first award of $50 supported the first annual "Wildflower Foray" in Brown County in 1995, a 3-day series of hikes and nature programs that continues to this day. In 1998, INPAWS helped fund ongoing research into biocontrol of garlic mustard at Cornell University with a $1,000 grant.

Close to $60,000 has been awarded over the years for requests of $1,000 or more. With our financial assistance, land trusts and DNR's Division of Nature Preserves have purchased and protected valuable natural properties. In Indianapolis, we supported creation of the linear Bill Brink Memorial Garden along the hiking/biking Monon Trail in Indianapolis in honor of late INPAWS co-founder Brink. We helped fund the planting of a large wildflower meadow at Brown County State Park and the eradication of kudzu in southwestern Indiana.

The grants committee has evaluated dozens of requests for amounts under $1,000. Awards total close to $30,000, benefitting all parts of the state. Grants include funds for educational gardens at nature centers, zoos and schools and for a graduate student's research into mycorrhizal fungi in the sand prairie in northwest Indiana.

Letha's Fund

In 2009 Letha's Fund for Youth Outdoors awarded its first grants to enable school children to spend quality time in natural settings. With these funds, teachers introduce children to the wonders of the outdoor world and extend Letha Queisser's passion for wildflowers and Indiana's native plants to a new generation.

Memorial contributions came to INPAWS following Letha's death in 2007. Council member Tom Hohman proposed that we use these funds to bring children into contact with nature. Because of those initial gifts, additional donations from individuals and annual allotments from INPAWS, close to $57,000 has enabled more than 15,000 students to make day trips to Merry Lea Environmental Education Center, Sycamore Land Trust properties, Marian College EcoLab and other high-quality destinations.

Photos, handwritten thank-you letters and drawings from the children energize committee members who evaluate grant applications. Recently, a large anonymous donation to the fund in honor of Dan and Sophie Anderson has stimulated the committee to give even greater attention to children in underserved communities.

The late Donovan Miller was the first leader of the youth outreach effort. In summer, 2008, he wrote in *INPAWS Journal*, "What we're aiming for at this stage of a child's life is to hook 'em on nature and wild places, to get them interested in even the simplest things."

Footnote: I followed Letha on guided walks in Indianapolis parks. Down on hands and knees one day, Letha pointed out differences and similarities between squirrel corn and Dutchman's breeches, and so my appreciation for spring wildflowers began – long before the creation of INPAWS.

Donovan Miller was the first leader of the INPAWS youth outreach effort that enabled these sixth-graders from St. Richard's Episcopal School, Indianapolis, along with 15,000 other kids, to spend quality time in nature in the past ten years.

This overview of INPAWS' first 25 years will continue in the fall, 2018, issue of INPAWS Journal.

Ruth Ann Ingraham is a co-founder of INPAWS and its official historian.

New threat – from page 1

The plant, an herbaceous annual with a taproot, has a slight stickiness because of fine hairs on the stem and leaves. This enables the seeds to spread even farther by clinging.

Like all non-natives, without the checks from its natural environment, this exotic invader has nothing in our environment – other than human effort – to stop its destructive establishment. Hand pulling is the easiest way to eradicate the species. It is necessary to discard the plants in a sealed trash bag. Large infestations can require pre-emergence herbicides like Dimension 2EW or post-emergence herbicides such as Round-up.

Wikimedia

Mulberry weed resembles the seedlings of mulberry trees as well as lemon balm and false nettle.

The triangular leaves of mulberry weed are alternate, with an elongated heart shape. The teeth on the margins are rounded. The light green, papery leaves are hairy on their upper sides and have long petioles, or leaf stalks. Flowers and then fruit appear on a stalk that grows from the leaf axil, where the petiole meets the main stem; this is a key to distinguishing this plant from similar ones. The flowers have no petals and grow in an aggregate; the pistils become fleshy as they ripen and take on a berry-like appearance.

At first glance, mulberry weed looks rather like a mulberry tree seedling, hence the name. This is true for either the non-native, but more common, white mulberry (*Morus alba*) or the native red mulberry (*M. rubra*). These tree species have elongated, heart-shaped leaves with serrated edges and conspicuous berries. Although white mulberry has leaves similar to mulberry weed, its clusters of berries growing on very short stalks differentiate it from mulberry weed. Like mulberry weed, white mulberry is also invasive. Red mulberry is differentiated from mulberry weed because its leaves have pointed serrate edges, not rounded, and its single fruit grows from the stem, not the leaf axil.

Mulberry weed also resembles lemon balm (*Melissa officinalis*) and false nettle (*Boehmeria cylindrica*). However, lemon balm's leaves are opposite instead of alternate, thicker and more convoluted. False nettle's leaves are also opposite, and the teeth on its leaves are pointed, not rounded. Neither lemon balm nor false nettle has fruit on a stalk.

This summer, if you see a strange plant in your yard that has heart-shaped, serrated leaves, take a second look. It might be invasive mulberry weed.

* GLEDN – Great Lakes Early Detection Network, a network of states including Indiana that works to locate newly arrived invasives. You can report any invasive plant to GLEDN by using a phone app. Once the ID is confirmed, GLEDN has a warning system to alert state DNRs and nature preserves. Go to *apps.bugwood.org* or download the app from the App Store for Apple for iphones or Google Play for android phones.

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Yatskievych, Kay. 2004. "What's New". Spring, 2004, *INPAWS News*

Invasive.org. Center for Invasive Species and Ecosystem Health. *www.invasiveplantatlas.org/index.html*. Mulberry weed, *Fatoua villosa* (Thunb.) Nakai

Judith Lieberman is a member of INPAWS Central Chapter.

Wetland – from back page

Managed wetland preserves are excellent places to encounter some of Indiana's most striking wetland flowers and graminoids. DNR's Division of Nature Preserves manages about a dozen such preserves throughout the state, including Pipewort Pond Nature Preserve in Elkhart County, Tippecanoe River Nature Preserve in Pulaski County and Beanblossom Bottoms Nature Preserve (owned by Sycamore Land Trust) in Monroe County.

Among wetland species, some of this author's personal favorites are cardinal flower (*Lobelia cardinalis*), giant bur-reed (*Sparganium eurycarpum*) and fringed sedge (*Carex crinita*).

A basic familiarity with wetlands and the fascinating plants to which they are home can add value to any outdoor experience. Stumbling upon one's favorite wetland flower or graminoid adds a delightful bonus to a birding, hiking, fishing, hunting or photography expedition. For those who take the time to notice, wetlands can provide a great deal of enchantment and wonder.

Landon Vine is a member of INPAWS Central Chapter and a wetland ecologist with V3 Companies in Indianapolis.

Botany – from page 4

and carbon dioxide, into organic ones that other organisms can use. Plants quite literally build the backbone of life on earth. If that wasn't amazing enough, the whole process is solar-powered. This bit of chemistry and cell biology is a mere sketch of photosynthesis, but even a basic understanding of the process can help us gain a deeper appreciation for the botanical world.

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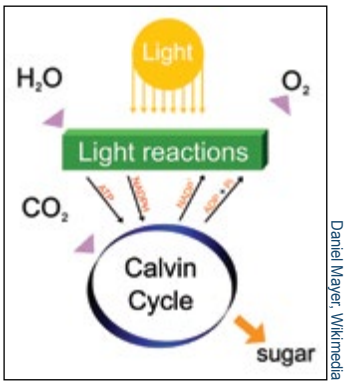
Adrienne Funderburg graduated with a degree in biology from Huntington University in May and is now working as research coordinator for Lilly Center for Lakes & Streams at Grace College in Winona, IN. This is Adrienne's last "Botany Basics" column. We wish her well.

Mahala Wilson, a conservation/ecology major at Franklin College, will begin writing the column starting with our fall issue.



Daniel Mayer, Wikimedia

Simplified overview of photosynthesis

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Wetland plants charm the careful observer

By Landon Vine

Wetlands offer a frequently under-appreciated opportunity for native plant viewing. Swamps, bogs and the fringes of ponds, rivers and lakes are home to a surprisingly diverse world of forbs (herbaceous plants), graminoids (grass-like plants), trees and shrubs. These places offer intrigue and beauty for the native plant enthusiast who knows what to look for. But what exactly distinguishes a wetland plant from its counterparts on drier land?

Christian Fischer – Wikimedia

Smartweed, a denizen of wetlands, was reportedly used by some native Americans as medicine and occasionally for food.

A plant is considered a wetland plant, or *hydrophyte*, when it is adapted to life in soils that are at least partially deficient in oxygen due to excessive water. While for many of us, the term "wetland" conjures an image of a knee-deep pond, wetland conditions can actually exist anywhere there is enough water to suppress oxygen in the soil.

Survival in an oxygen-suppressed soil is difficult. Plants cannot access oxygen using the means employed by their peers on dry land, and soil nutrients can become scarce. To survive in these conditions, wetland plants are equipped with fascinating anatomical features. *Aerenchyma* are special tissues that allow wetland plants to convey oxygen from their leaves above water to their roots. Some wetland plants grow elongated stems in order to reach above the level of the water. Many wetland trees and shrubs use adventitious roots, which allow plants to sprout new roots from parts of the plant other than the actual root system, in order to spread their root systems laterally rather than downward into the oxygen-suppressed soil.

The fringe of a pond, lake or stream can be an excellent place to make one's first acquaintance with wetland plants. Native smartweeds (*Persicaria* spp.), horsetails (*Equisetum* spp.) and various grasses (family Poaceae) and sedges (family Cyperaceae) are common in these areas.

In the woods, a thick, densely-packed layer of leaves covering a depression in the ground in an otherwise dry area is a strong indicator of wetland conditions. Such leaf layers will typically be much darker in color than the adjacent leaf litter, having been "stained" by incessantly wet conditions. An oak (*Quercus* spp.) wetland populated by mature pin oaks (*Q. palustris*) in a quiet woods can be quite pleasant to behold.

Wetland – *continued on page 19*