



On The Fringe

Journal of the Native Plant Society of Northeastern Ohio

Spring 2009 Wildflower Events

Ohio Botanical Symposium – April 3, 2009, 8 am to 4 pm

The annual Ohio Botanical Symposium brings together people of various backgrounds who share an interest in Ohio's native plants and natural history. It is presented by the ODNR Division of Natural Areas & Preserves.

Location : Villa Milano, 1630 Schrock Road,
Columbus, OH 43229, (614) 882-2058
www.villamilano.com

The 2009 Ohio Botanical Symposium is supported by the Arc of Appalachia Preserve System, Cincinnati Wildflower Preservation Society, Cleveland Museum of Natural History, Flora-Quest, Mohican Native Plant

Society, **Native Plant Society of Northeastern Ohio**, Naturally Native Nursery, Ohio Prairie Nursery, Scioto Gardens and The Nature Conservancy.

The Symposium is presented by the Ohio Division of Natural Areas and Preserves, in conjunction with the Cleveland Museum of Natural History, The Nature Conservancy and The Ohio State University Herbarium.

To learn more, visit www.ohiodnr.com/dnap
To reserve space, please contact Rick Gardner at (614) 265-6419 or email: rick.gardner@dnr.state.oh.us.

Arc of Appalachia Preserve System

Southern Ohio Wildflower Pilgrimage, Thurs eve thru Sun, April 16-19 2009

In all the world, there is nothing that quite compares to the verdant beauty of an Appalachian Forest in the spring. Join us in celebrating the return of the wildflowers in the five-county Arc of Appalachia Preserve Region of southern Ohio.

Over 36 tours led by experienced naturalists & botanists, with all-day field trips on Friday and Saturday, half-day tours on Sunday. Three nights of evening presentations. Trips to botanical hotspots including: Shawnee State Park & Forest, Cave Canyon, Ohio River Bluffs Preserve, Whipple State Nature Preserve, Edge of Appalachia Preserve, Rocky Fork Gorge, Miller State Nature Preserve, Chalet Nivale, Davis Memorial, Ka-ma-ma Prairie Preserve, & Rock Run Preserve
(continued on page 3)

Call For Editors

Ann Malmquist and I have started our tenth years putting together On The Fringe. It has been a satisfying and interesting tenure, but we both think it is time for a change in order for the Journal to maintain its quality and timeliness. We hope that among our members there are some who would like to take over our jobs and continue the quarterly publication of On The Fringe. Ann and I will finish out this year, and we would like to share our experience and knowledge with our successors, perhaps by collaborating on the September and December issues.

If you are interested or would like to talk about this opportunity further, Please call or email
Judy Barnhart at (W) 440-286-9516 ext 2011 (H) 440-564-9151,
bunchberry1@windstream.net,

or me, Jane McCullam, at

440-338-3253, cattermole@windstream.net.

We thank all those who have remembered to renew their memberships for 2009, and we remind those who have not yet done so that this will be your last issue of **On The Fringe**.

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The Journal of the Native Plant Society of Northeastern Ohio is published 4 times a year at Novelty, Ohio. ISSN 8756-6087. Questions or comments are welcome and may be addressed to Jane McCullam, 9880 Fairmount Rd., Newbury, OH 44065; 440-338-3253, cattermole@windstream.net; or to Ann Malmquist, 6 Louise Drive, Chagrin Falls, Ohio 44022; 440-338-6622, inky5@juno.com

Program Schedule - Spring 2009

Sunday, April 19, 1:00 p.m. Babcock Preserve, Lorain County. Join Friends of Wetlands and Western Reserve Land Conservancy, Firelands Division for a special visit to the 1000-acre Babcock farm in southern Lorain County. 1/3 of the property is wooded with creeks and streams, and there is a magnificent display of wildflowers including a large spread of dwarf ginseng and stupendous amphibian fauna. Take I-480 west to Rt. 10 which merges with Rt. 20 toward Oberlin/Norwalk. Turn left (south) on Rt. 58. Meet at Huntington Township Hall, 26309 Rt. 58, at the SE corner of Rt. 162 and Rt. 58. Carpool from there. Expect a wetlands walk. Call Tom to register: 216-371-4454.

Saturday, May 9, 9:00 a.m. Grand River Terraces, Ashtabula County. Jim Bissell, Curator of Botany at Cleveland Museum of Natural History, leads this joint trip with NEON to the 877-acre natural area along the Grand River, where a spectacular display of wildflowers, including Virginia bluebells, purple bittercress, Steward's Jack-in-the-pulpit, orange Turk's-cap lily, Solomon's seal, trillium and hepatica is expected. The hemlock swamp harbors the state's largest population of dewdrop, threatened in Ohio, along with wild calla and hobblebush. Directions: Exit I-90 at Ohio Rt. 534. Travel south 2 miles, crossing the Grand River bridge, to Cork Cold Springs Rd. Turn left (east) onto Cork Cold Springs Rd. Travel east 4 miles to Tote Rd. Turn right (south). Tote Rd. ends at Schweitzer Rd. The Terraces is located at the T-intersection of Tote Rd. and Schweitzer Rd. Call Diane to register: (H) 216-691-1929 (Cell) 440-666-4870.

Saturday, May 16, 9:00 a.m. Morgan Swamp, Ashtabula County. Karen Adair, Nature Conservancy Land Steward, leads this trip into one of the largest privately-protected wetlands in Ohio. It is significant for its size, its proximity to the Grand River, and its dynamic and self-sustaining swamp ecosystem. A faunal survey in the 1980s revealed 108 bird species, 24 fishes, 26

reptiles, and 24 mammals. There are numerous rare species recorded from the swamp, many of which are associated with boreal habitats. Karen will also share her ongoing battle with treating invasive species at Morgan Swamp. Directions: Take Rt. 90 east to St. Rt. 534. Head south 7 miles to its junction with Rt. 166/Footville-Richmond Rd. Travel east on Footville-Richmond Rd. for 3.4 miles to the Morgan Swamp parking lot. Call Judy to register: (W) 440-286-9516 ext 2011 (H) 440-564-9151.

Saturday, June 13, 9:00 a.m. Plant Survey of Stracola Preserve, Ashtabula County. Join us for our annual plant survey for the Western Reserve Land Conservancy as we explore the Stracola property, with mixed hardwood and swamp forests, button bush marshes and 30 acres of high quality wetlands containing a variety of sedges. Be sure to bring your boots! Potential wildlife encounters include otter, beaver, snowshoe hare, blue heron, and black bear. Directions: Take Rt. 322 east to Orwell. Turn left (north) on Rt. 45. Travel 1.9 miles to Montgomery Rd. Turn left (west) 1.3 miles. There are two 90 degree curves; once you pass them, go beyond the next house (brown ranch) on the North to the parking area in the gas well drive. Carpooling recommended. Call Judy to register: (W) 440-286-9516 ext 2011 (H) 440-564-9151.

Saturday, June 27, 9:00 a.m. The Aliens Have Landed: Invasive Plant Workshop, The West Woods Nature Center, Geauga County. Jennifer Hilmer works battling invasive plants in northeast Ohio. Learn some of the common species she deals with along with new species lurking on the fringes. Indoor talk with plant samples followed by a hike to see the impact of invasives on the forest landscape. Directions: Take Rt. 87 east from Rt. 306 in Russell Township 2 miles to the park entrance on south side of the road. 9465 Kinsman Rd. (Rt 87)

*(continued from page 1)***Spring 2009 Wildflower Events**

Cost: \$35 per day, with a discount for all three days. Space is limited to 250 people. Each field trip has a maximum of 10-15 people with one or two guides per group. For more information see <http://www.highlandssanctuary.org/Wildflower/Pilgrimage.htm> or call (937) 365-1935

Sponsored by: The Arc of Appalachia Preserve System in cooperation with The Nature Conservancy Ohio Chapter, Cincinnati Museum Center, Cincinnati Nature Center, Cincinnati Zoo & Botanical Garden, Ohio Division of Natural Areas and Preserves, Ross County Park District, Shawnee State Park & State Forest, Southern State Community College, Ohio Historical Society.

Great Smoky Mountains Spring Wildflower Pilgrimage, April 22-26, 2009

The Spring Wildflower Pilgrimage is an annual five-day event in Great Smoky Mountains National Park consisting of a variety of wildflower, fauna, and natural history walks, motorcades, photographic tours, art classes, and indoor seminars. Most programs are outdoors in Great Smoky Mountains National Park, while indoor offerings are held in various venues throughout Gatlinburg, TN. Over 150 different programs are offered.

Observe Park Issues In the Field: Great Smoky Mountains National Park is currently under attack from many different threats. Hemlock woolly adelgid, southern pine beetle, mimosa trees, chestnut blight, kudzu, and the European wild

boar are some of the non-native infestations that are invading the park. Pollution from coal-powered plants is taking its toll on the park's air quality as well. Through management and monitoring, the National Park Service is exercising active control measures against the "exotics" and using collected data to help inform legislators and promote initiatives to improve air quality.

Online registration at www.springwildflowerpilgrimage.org will begin on **03/09/2009** at 9 AM Eastern Time (ET) and will close on **04/13/2009** at 4 PM ET. To register by phone, call (865) 436-7318 x 222.

FLORA-QUEST, May 1-3, 2009: Connecting With Natural Ohio

Established in 2007, Flora-Quest is a hands-on learning adventure focusing on plants and natural areas. We are fortunate to have some of Ohio's most gifted botanists and naturalists returning once again to lead Flora-Quest expeditions. With more to offer than ever, workshops, three educational speakers, and the most spectacular views this side of the Great Smoky Mountains, our limited spaces will book early in 2009.

One of Ohio's foremost naturalists, Paul Knoop, will begin our weekend with an introduction to the fantastic floristic diversity of Adams County, and lead one of the Saturday quests to his private preserve. Ian Adams' photography will speak for itself during a "Photo Tour of Ohio's Natural Areas." Ian will also be offering a photography and flora workshop as part of the event. As an added bonus, Past Chief of Ohio's Division of Natural Areas and Preserves, Guy Denny, will ably address conservation of native plants and natural areas. Other special field trips are scheduled, including "Moonlight Moth Madness" with Dr Jaret Daniels, author of *Butterflies of Ohio*.

Centered at the lodge within beautiful Shawnee State Park, a mind-boggling array of plants is at our fingertips within the surrounding 65,000-acre forest. The lodge facilities are top-notch and nearby cabins and camping are also

available for those who so choose. Special discounted rates are available for attendees.

Just to the west of Shawnee is the sprawling 14,000 acre Edge of Appalachia Preserve System. Filled with unusual habitats and one of the state's densest concentrations of rare plants, the Edge is a botanical paradise. Flora-Quest trips are split between Shawnee and the Edge, and these packages offer participants the greatest botanical adventure to be had in Ohio, at the best time of year to explore this region. Upwards of 1,000 species of native plants are found in this region – there are only about 1,900 natives in all of Ohio.

In addition to learning about plants, Shawnee is well known for its fabulous butterflies and Jaret Daniels' special workshop: "Butterflies and Botany" will be seeking them out in the field. All trips will find an ENORMOUS array of flora and fliers, far beyond what brief descriptions can convey, and choosing between the Quest offerings will be a challenge!

Please visit our website at www.flora-quest.com for more information. May is a time of rebirth in the natural world, and there is no better place to be than in the wildlands of Adams and Scioto counties to experience spring. We hope to see you at Flora-Quest May 1-3, 2009!

Ohio State University Extension has endorsed credit hours for participating in Flora-Quest for Master Gardener Volunteers and Ohio Certified Volunteer Naturalists.

West Virginia Wildflower Pilgrimage, May 7-10, 2009

48th Annual West Virginia Wildflower Pilgrimage at Blackwater Falls State Park, Davis, WV. An interpretative weekend packed with bird walks, wildflower tours, nature programs, beginner wildflower and bird identification workshops, craft exhibits and sales.

Advance reservations required. Contact: Blackwater Falls State Park 304-259-5216. Participants will choose one tour a day. For more information please call Emily Fleming or Vicki Hash at (304) 559-2754 or write WV Division of Natural Resources, State Capitol Complex, Building 3, Room 669, Charleston, WV 25305.

| FRIDAY, MAY 8, 2009 | |
|---------------------|--|
| TOUR | NAME |
| 1. | Smoke Hole |
| 2. | Dolly Sods Wilderness Hike |
| 3. | Germany Valley |
| 4. | Dolly Sods |
| 5. | Smith Mountain Road |
| 6. | Plants, Animals and Geology of Canaan Valley |
| 7. | Blackwater Canyon Hike |
| 8. | Fernow Forest |
| 9. | Jenningston - Gladwin |
| 10. | Ferns & Birds |
| 11. | Natural History of WV Wildflowers |
| 12. | Wildflower Identification Workshop |

| SATURDAY, MAY 9, 2009 | |
|-----------------------|--|
| TOUR | NAME |
| 1. | Seneca Rocks Birding Tour |
| 2. | Sinks of Gandy & Spruce Knob |
| 3. | Lower Smoke Hole |
| 4. | Stuart Knob Hike |
| 5. | Upper Dry Fork - Southern Canaan Valley |
| 6. | Dolly Sods |
| 7. | Bear Haven - Bickle Knob Tower |
| 8. | Fernow Forest |
| 9. | McGowen Mountain Walking Tour |
| 10. | Hands Lens Exploration of Trees, Ferns and Mosses of Cathedral |
| 11. | Red Creek Trail for Wildflowers & Birds |
| 12. | Tree/Vine/Shrub Workshop |

Bats: Winged Wonders

Lori Totman, Conservation Director, Dawes Arboretum

Bats, the only mammals that fly, truly are winged wonders. Bats are of the Order Chiroptera (meaning hand-wing). At close examination, one observes the wing is actually the forelimb. It consists of an upper arm (humerus), elbow, forearm (radius) and wrist. The bottom half of the wing is actually the "hand" (metacarpals and phalanges) complete with thumb (the only digit with a claw), and very elongated second, third, fourth and fifth fingers connected with wing membrane.

Ohio bat species rely solely on insects for food. Bats find insect prey by echolocation, short sound waves sent from nose and mouth and received by the ears. The sound waves "bounce" off insect prey, and the bat's brain interprets where to find the prey. Bats echolocate while way-finding also. They are able to maneuver around buildings in cities, around trees in forests, and around other obstacles in their flight path by using echolocation. Most of these high-pitched, high frequency sound waves are out of a human's hearing range.

Bats are either crepuscular or nocturnal in habit. Contrary to popular belief, although bats are insectivores, very little of their prey is actually mosquitoes. A single bat species eats many different insects, and most bats must eat their body weight every night. A colony of big brown bats (50-100 individuals) eats 150-200 tons of insects per season. Some bat

species hawk insects (taking them out of the air) while other bats are gleaners (taking insects off foliage).

All Ohio bats mate in late summer or fall and have delayed fertilization, which means the bats mate in fall and the female over-winters with sperm stored. They don't ovulate until spring. In spring, 1 to 4 pups are born (depending on species). Most Ohio bat species are long-lived, 20 plus years is not out of the ordinary.

Management strategies to help conserve bats include: retaining multiple snags (standing dead trees) within a woodlot; retaining trees with suitable bat roosting characteristics (ones with deeply furrowed or loose bark) such as American elm, oaks, shag-bark hickory, sassafras and redbud; managing for even-aged and uneven-aged stands of trees; and retaining mature trees and snags within a half-mile of water.

Bats truly are winged wonders of the animal kingdom! The next time you observe a bat in your yard, marvel at this creature that is incredibly adapted to its habitat and helps keep insects under control around your house, yard and garden.

Reprinted from *Happenings*, the Dawes Arboretum newsletter, June 2007.



Little Brown Bat

Degenerate Wildflowers

by Marcia Bonta

During our first 13 years on the mountain [PA] I found only one so-called parasitic wildflower, the waxy-white Indian pipe that thrives in the dense shade of an August woods. Then in 1984 my luck changed. Over the next six years I discovered four more parasitic species and watched their fortunes wax and wane according to both the imponderability of nature and change wrought by humans. Unlike most plants, parasitic plants do not have any chlorophyll. They can't photosynthesize, using the sun's energy along with water and carbon dioxide to make carbohydrates. Instead, they take their energy from a host plant that they penetrate with modified roots or stems. Then they suck out and absorb their host's nutrient-rich sap, causing severe harm and sometimes even death to the host plant.

My first discovery occurred during early September on the moss-covered Guest House Trail. One day the trail was an unbroken green carpet. The next it was covered with what looked like red and gold Indian pipes, only instead of one pipe to a stem there were several. I counted 63 individual plants in that one patch. But although I searched through the rest of the woods, I couldn't find another colony. What were they and where had they come from?

Later, I consulted my trusty Peterson & McKenny *Field Guide to Wildflowers* and identified them as pinesaps (*Monotropa hypopitys*). As I suspected, they were closely related to the Indian pipes (*Monotropa uniflora*) of midsummer's dark woods. Some botanists have even put the two species in their own family—*Monotropaceae*—while others place them in the wintergreen family, Pyroloaceae, along with pipsissewa and pyrola.

Monotropa is derived from the Greek meaning "having a single turn." The name is appropriate because the stems of pinesaps and Indian pipes are turned to one side, causing the pipes to nod.

The *uniflora* of Indian pipes means "one flower," referring to the single-pipe, while the *hypopitys* of pinesaps is translated as "under a pine or fir." That is because pinesaps were first discovered, and named, in northern Europe where the forests are mostly coniferous. Here in the eastern United States, pinesaps

are more likely to grow in the humus of hardwood forests.

Like pinesaps, Indian pipes are not unique to North America either. They can be found in eastern Asia as well. Once both species are pollinated, the pipes turn skyward and the plants blacken.

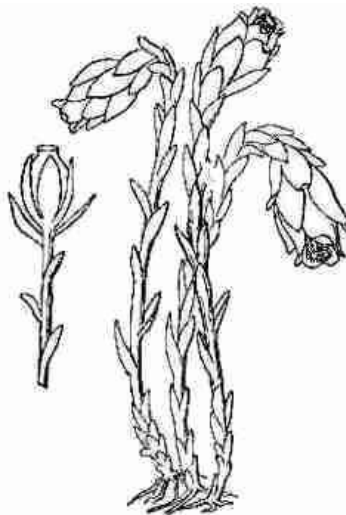
Because they lack chlorophyll, both species had long been considered parasitic, and all plants of such ill repute were thoroughly maligned by earlier naturalists, such as Neltje Blanchan, who equated their lazy ways with "sin."

In her 1916 *Wild Flowers* volume for the New Nature Library, Blanchan called them "degenerates" and "sinners," and she claimed that "among their race [they were] branded with the mark of crime as surely as was Cain" because they "live by piracy, to drain the already digested food of its neighbors....No wonder this degenerate hangs its head; no wonder it grows black with shame on being picked, as if its wickedness were only just then discovered."

Such purple prose, while entertaining, later proved inaccurate when botanists upgraded both species to saprophytes. Instead of sapping nutrients from living plants as parasites do, saprophytes live on dead or decaying matter, absorbing carbohydrates directly from the soil just as certain fungi and bacteria do.

Then scientists noticed that the roots of pinesaps are encased in a layer of fungus. Perhaps, they thought, the plants were using the fungus to help them absorb the carbohydrates. Although pinesap seeds will germinate, they will not grow until the fungus is on their roots.

But Erik Bjorkman of the Royal School of Forestry in Stockholm questioned that theory. He knew that that particular species of fungus is not able to absorb the kinds of nutrients pine-saps need to grow as rapidly as they do from underground corms (similar to buds or bulbs) to full development within a week. He also noticed nearby trees have their roots encased in the same fungus that encases the pinesaps. He wondered whether there was a connection between pinesap roots and those of the trees.



Indian Pipes *Monotropa uniflora*

To find out, he put cylinders of sheet metal around clumps of pinesaps. He pounded the cylinders deep into the earth, severing the pinesap roots from those of the neighboring trees.

The following year the isolated pine-saps had very weak growth, compared to the vigorous growth of those that had not been disturbed. Bjorkman then injected nearby spruce and pine trees with glucose containing radioactive carbon¹⁴ as a tracer. Five days later the stems of the undisturbed pinesaps also had radioactive glucose.

Further experiments demonstrated that the roots of pinesaps and nearby tree roots are not directly connected, but rather the fungus is a nutrient bridge over which carbohydrates in the trees travel to pinesaps.

Other nutrients, such as phosphorous, use the same bridge to travel from pinesaps to tree roots. So Bjorkman now calls pinesaps, along with Indian pipes, "epiparasites" on trees. Other botanists say they are probably symbiotic plants—plants that give as well as receive food from other plants.

Having discovered such an unusual wildflower, I eagerly looked for its return the following year, but I was rewarded with only a few plants. Since then there have been none, neither in that spot or any other place on the mountain.

I can only conclude, based on Bjorkman's experiments, that for two years the fungus had created the proper nutrient bridge between pinesaps and nearby trees, but some natural occurrence destroyed it. Presuming that the corms still lurk underneath the soil, waiting for the right fungus connection, someday they may reappear.

In the meantime, though, I have nurtured my interest in the other "degenerate" wildflowers I have found, all of which are true parasites and members of the Broomrape family.

My next discovery, in 1986, was a plant I had been searching for for years. Because we have several huge American beech trees growing along our stream, I was certain that we must also have the parasitic beechdrops—plants that feed directly on beech tree roots.

One late fall afternoon as I walked down the hollow road, the sun was shining brightly on the road bank. And suddenly I saw not one clump of beechdrops

but dozens, all growing beneath the spindly, beech saplings sprouting from the road bank, not underneath the streamside giants where I expected to find them.

Had they always been there or had they, like the pinesaps, emerged for the first time that autumn because of the right conditions? Unlike the pinesaps, I have found the beechdrops every autumn since then, although some years more than others.

I even located good stands beneath the venerable old trees once I was beechdrop-attuned. Fleshy-tan in color, they blend in well with the understory, so if you don't know what you are looking at, you might mistake them for tree sprouts—especially after they bloom and dry up for the year. Beechdrops, like jewelweed, violets, woodsorrel, and others, have both cleistogamous flowers that never open but produce many seeds, and small purplish-striped flowers above them that are sterile.

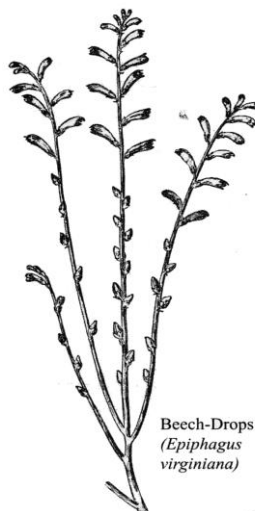
In early June 1989 I made my third discovery. Like the pinesaps, I stumbled on them without having any idea what they were. Also like pinesaps, they are natives of Europe and they too eventually disappeared after blooming three years underneath the young black locusts on the Far Field hill. They have the inelegant name of one-flowered cancer-root, but even Neltje Blanchan calls them a "beautiful" parasite.

The single, tubular, five-petaled flower is downy white, pale lavender or violet and is supported by a naked, sticky pale stalk. One-flowered cancer-roots grow in clumps of several dozen nestled in heavy undergrowth, and until they disappeared completely, I spent a lot of time trying to locate them each spring.

Again, like pinesaps, I imagine the natural conditions were right for several seasons, and then some change occurred that affected them. Perhaps they too will reappear when nature cooperates.

Not so my last discovery, at least not in my lifetime. The neighboring property, once protected by its tenant, had some of the oldest red oak trees on the mountain. In May 1991 I found growing there literally thousands of squaw-roots (*Conopholis americana*), parasitics on the roots of the old oak trees.

These unusual wildflowers have stalks and scaly leaves that look like upright yellow-brown pine cones, hence their genus name *Conopholis*, which is Greek for "cone scale." Each stalk supports an attractive spike of lipped and hooded yellowish flowers. I spent many hours and days admiring them and had my husband



Beech-Drops
(*Epiphagus
virginiana*)

take slides of what I was almost certain was the last spring of their lives.

And so it was. That autumn the owner of the property had all the trees cut, and the following spring not even one squawroot could be found. It will take more than what is left of my lifetime to grow another red oak forest and, presumably, another population of squawroots.

Instead, during August, I comfort myself with the ubiquitous, but intriguing Indian pipes, "colorless in every part, waxy, cold, and clammy, rising like a company of wraiths in the dim forest that suits them well," as Blanchan wrote.

Indian pipes have also been called "ice plant," "ghost flower," "convulsion-root," "fairy smoke" and "corpse plant." Early settlers used the clear juice



Squawroot
Conopholis americana

extracted from the crushed skin of Indian pipes to cure eye problems. Herbalist John Lust in *The Herb Book* claims their roots make "a good remedy for spasms, fainting spells, and various nervous conditions."

But even the Indian pipes failed me during the drought of 1988. As far as I could tell, not one germinated on our mountain that rainless summer. They were back the following year in larger numbers than ever, however, which gives me hope for all the other parasitics that have come

and gone over the years.

Reprinted from *Notes of the Pennsylvania Native Plant Society* with the Centre County Historical Society, Oct.-Dec. 2000

Harbingers

By George Ellison

As I write this, it is mid-February [2008]. This winter has been fairly cold and, at times, icy here on the North Carolina side of the Smokies where I reside. Before long, however, I'll be outside again working in the garden or taking woodland walks in search of spring wildflowers, migrating birds, and spawning trout.

How do I know that will be the case? Well, for one thing, it has always happened that way. Spring always follows winter, doesn't it? Yes, but certain early signs – harbingers of spring – also assure me that things are on track.

I thought I heard spring peepers during a warm spell several days ago. The little blue flowers with yellow centers sometimes called Persian speedwell (*Veronica persica*) now carpet lawns here in the Bryson City area. Dandelions, purple deadnettle, and various species of bittercress are here and there.

Song sparrows are working on their songs for mating and territorial purposes. It's a little comical to listen to their first efforts, which come out as an incoherent jumble of notes. Before long, however, they'll have the notes down pat.

Eastern towhees are just as amusing. Their full song by mid-March or earlier will be "drink-your-tea!" Now you only hear a tentative "drink" or "tea" - never



the full song. One would assume that much involving bird song for each species is genetic, but much is also obviously "relearned" from year to year. Or maybe a better analogy is that birds in early spring are like fine musicians or professional baseball players who have had a long layoff. They're a little rusty at first.

Red-winged blackbirds haven't made an appearance as yet that I've noticed, but they will before long. It's curious that the males come first with their bright red-and-yellow epaulettes flashing. Then the females, which resemble large streaked sparrows,

appear. The males are, I suppose, scouting out the terrain so as to make sure things are shipshape. Then in late summer and fall the males will depart southward followed a little later by the females and young birds.

Ruby-throated hummingbirds and other species also utilize the same separate male-female migration strategy. Most notable are the purple martins, which arrive almost every year on March 15 here in Bryson City. The all-dark males will fly over residences to which they have returned for years, complaining if the homeowners don't have their gourds or houses properly situated. Then the females with their dark backs and white bellies will arrive and set up house.

One of the earliest natural events in the southern mountains is the movement of rainbow trout to spawning beds in the smaller streams. This behavior takes place so early because of the genetic memory left by the original McCloud River, California, rainbow trout eggs that were placed in the region's streams. Generations ago, the instincts of these trout were timed to that of their ancestral river on the West Coast. Before long I'll set aside a morning to walk the creeks in the Great Smoky Mountains National Park so as to locate their spawning beds (redds). They'll be located in gravel scoured free of algae by the active pair of fish.

Among my favorite harbingers of spring are the tassel-like catkins that dangle from the tag alder (*Alnus serrulata*) shrubs that grow along creeks or in wet meadows. These structures are normally two to three inches in length, but they can sometimes be five or so

inches long. Catkins are a very ancient invention for pollinating flowers by wind to make seed.

In early spring they expand and display the bright yellow pollen that had been sealed inside the structure through the long winter. In *The Natural History of Wild Shrubs* (1989), Donald Stokes described what happens next: "The pollen matures a little at a time, and instead of falling directly out of the catkin, collects in little cup-like sections of the flowers. When there is sufficient wind, the pollen is blown out and, with a little luck, carried to a female flower. The female catkins are very different in appearance. They are small and shaped like miniature pine cones."

These yellow-shimmering catkins, dangling in great numbers over a meadow or stream, are a delight when they catch your eye, sure harbingers of spring.

Reprinted from Chinquapin, newsletter of the Southern Appalachian Botanical Society, Spring 2007

Sumac: A Shrub For All Seasons

Larry Hodgson

It's strange how we rarely appreciate the beauty of the commoner things that grow around us. Our gardens are filled with lovely imported plants, but very few of our native wildflowers are among them in spite of their great beauty. Goldenrod, for example, is highly ornamental, and its value as a garden perennial is amply demonstrated by its great popularity in Europe, yet we treat it as a bothersome weed. And we likewise tend to ignore our native trees. In my neighbourhood, for example probably five maples out of six are Norway maples, while native maples, such as the sugar maple and the red maple, at least as easy to grow and far more colourful in the fall, are ignored. Another example of an exotic and beautiful native which gets no attention and yet which is highly prized elsewhere throughout the world is the staghorn sumac. Maybe it is time to right an old wrong and to give the sumac its rightful place in our gardens.

Old ideas die hard and our present disdain for sumacs probably stems from our farmer ancestors. A colonizing plant in sunny areas, it quickly invades untended fields and is, in those circumstances, perhaps rightly considered a weed tree. I know about this from first-hand experience, for, when I was a teenager and had begun the unlikely (and not too successful) project of growing an arboretum in the backyard, I got no



Staghorn Sumac *Rhus typhina*

objection from my father about planting oaks, spruces, pines, ashes or any other tree, but when I wanted to plant a sumac, he put his foot down. He had lived many years on a farm and couldn't see any use for what was to him a hated weed.

Perhaps another factor in the sumac's popularity is the difficulty in deciding exactly where to classify it. Is it a tree or is it a shrub? Most tree-oriented books treat it briefly as a shrub which occasionally reaches tree size, while books about shrubs ignore it on the basis that it is more a small tree than a shrub! Of course, both are right, and part of the appeal of the sumac should

actually be that it is, at least visually, neither one nor the other. We expect trees to grow straight upwards with single trunks and to reach great heights relatively quickly, while the sumac branches readily at the base, naturally produces clumps, and spreads at least as much in width as in height, only becoming tree-like at a relatively advanced age. On the other hand, we expect shrubs to produce dense branches from ground level up while the branching habit of the sumac is anything but dense: when the leaves fall off in the fall, what looked like a thick, impenetrable mound of intertwined twigs turns out to contain only a very few thick branches, widely spaced and most unbushlike.

If we can put aside our prejudices, it is easy to find attributes for this underused landscape plant. First of all is its foliage. The long palmate leaves, attractive enough on their own throughout the summer, turn a bright red in the fall, making this, along with certain euonymuses and maples, the most spectacular of plants for fall colour. Even the way the compound leaves are clustered atop very thick, relatively unbranching stems is attractive: probably no hardy shrub better captures the image of the swaying palms of the south. Although the yellowish green flowers are of only minor value, the clusters of fuzzy red berries that follow are quite spectacular and, better yet, last all winter. The branches are attractive in their own right, the younger ones being covered with reddish hairs. When seen without leaves, the resemblance to the velvety antlers of a deer in its early summer phase is obvious: this plant didn't get its common name of staghorn sumac for nothing. Older shrubs turn into true specimen plants: perfect parasols of greenery over open branches in the summer and exotic, almost ghostlike silhouettes in the winter. All in all, it would be hard to imagine a more unusual and spectacular 'tree' for your yard. Even better, unlike most trees, the sumac never gets too big for a city lot.

Care

One of the great advantages of growing a 'weed tree' is that there is little work to be done. Sumacs will grow just about anywhere but in constantly moist soil or deep shade, although the most beautiful specimens are grown in full sun. The shoots that spring up, at quite a distance from the main shrub, are not nearly as bothersome as in a farmer's field and are eliminated by simple mowing. Any that show up in unmowed places can be dug out and composted or planted elsewhere. You'll probably find that they are actually less of a nuisance than the numerous unwanted seedlings that spring up from most other ornamental trees. The sumac can also make a beautiful ground cover by eliminating older branches in the spring and encouraging young

shoots to grow, creating deep mounds of thick foliage. Sumacs don't seem to be particularly bothered by insects but they do attract birds to the garden, especially in winter when their berries are often the only food around.

Unlike most shrubs and trees, where propagation is almost necessarily handled by an expert, the sumac is easy to multiply. Young volunteer shoots can be dug up and replanted in the spring or fall and even sections of roots will sprout and produce new trees. Growing them from seed is more difficult, as they require a long period of stratification. On the other hand, since they are so easily propagated vegetatively, there is little reason to bother trying seed-growing. If you are getting yours from the wild, remember that sumacs usually bear male and female flowers on separate plants. Take most of your divisions from shrubs having clusters of red berries (females), but one or two from those which did not (males). This will assure that the female flowers are pollinated and that you (and the birds in your neighbourhood) will enjoy the beauty of the red berries all winter.

Varieties

The staghorn sumac (*Rhus typhina*) is the most commonly available sumac in Canada, especially in the form of a most attractive variety, *Rhus typhina laciniata*, the cutleaf sumac, whose already-compound leaves are further cut into segments. Since this variety is female, it would be wise to plant a male sumac in the same area for pollination. The wild staghorn is native to eastern North America and can grow to a height of thirty feet, although 12 feet is more normal. The cutleaf variety is much shorter and rarely grows beyond the shrub stage. Both are quite hardy and thrive into hardiness zone 3.



Poison Sumac *Rhus vernix*



Poison Ivy *Rhus radicans*

Of course, it would be hard to talk about sumac without mentioning their two less appealing brothers, poison ivy (*Rhus radicans*) and poison sumac (*Rhus vernix*). Both cause severe skin irritations through mere touch, although some people and most birds and animals seem to be immune. Poison ivy, with its three shiny leaflets and creeping habit, could never be

mistaken for any other plant, but it is possible that the poison sumac could be confused with a harmless variety. Fortunately, it is very rare even within its range in southeastern Canada and can easily be distinguished from the others by its smooth leaf edges (the others have toothed leaves) and white, not red berries. Also, where other sumacs grow in dry soil, it is only found in humid areas.

Interestingly, poison sumac and poison ivy excepted, sumacs have long been used as sources of

food by various Indian tribes. Fresh leaves and young stalks of some varieties were eaten like salad and the sour fruits were made into a delicious lemonade-like drink. Many were also used to tan leather. Even the poison sumac has its use: as its Latin name, *vernix*, suggests, it was used by early pioneers as a source of varnish (I assume they wore thick gloves!). I can't think of a single nice thing to say about poison ivy, however!

Reprinted from Wildflower, Autumn 1986

A Brief History of the Cincinnati Wild Flower Preservation Society

Victor G. Soukup

In early spring of 1917, Dr. E. Lucy Braun persuaded several interested individuals from the Cincinnati area to join the Wild Flower Preservation Society of America. To form a local chapter, five members in good standing were required to act together. Thus on April 16, Dr. Braun and the other new members of the National Society issued a call for all wild flower lovers in the Cincinnati area to attend an organizational meeting on April 25 in the Botany Department of the University of Cincinnati. Seventy two enthusiastic individuals responded to the call and the Cincinnati Wild Flower Preservation Society was born. It was the first Wild Flower Preservation Society in Ohio. Dr. Randall J. Condon was elected president, Dr. E. Lucy Braun, secretary and chapter representative to the National Society, and Dr. Harris M. Benedict, treasurer. Dr. Condon was the Superintendent of the Cincinnati Public Schools, Dr. Benedict was a professor and chairman of the Botany Department at U.C., while Dr. Braun was a professor, destined to become a world acclaimed plant ecologist.

The following are some who were either charter members or joined very soon after founding: Alice Betts, Dr. Annette Braun, Dr. Lucy Braun, Elizabeth Brockschiager, Elizabeth Braunecker, Myrtle Buhnnan, Louise M. Burtis, Genevieve Caldwell, Mrs. Stephen E. Cone, Mrs. Irene D. Cornwell, Mrs. L. D. Drewry, Mrs. Charles Hanauer, Mrs. Michael G. Heintz, Mrs. E. Lawrence Jones, Carlos P. Long, Florence Murdoch, Mrs. Lyman Perin, Mrs. William S. Rowe, Mrs. Frank Seinsheimer, Jr., Robert Senior, and John Zettel. These and many other devoted members were responsible for the great success of the organization in its very early years. By 1927 the membership of the Society had swelled to over 700 adult members.

The first president, Dr. Condon, was followed by Walter B. Hofer, Mrs. Silas B. Waters, Dr. H. W. Felter, Julius Geisler, and Robert Senior. Morten Carlisle served as treasurer for many of those early years. Later, in the 1950s and 1960s, Dr. E. Bridge Cooke, mycologist with the U.S. government, also served a long tenure as treasurer.

Regular meetings, sometimes only bimonthly, were started in 1920 with either local or out-of-town speakers. The subjects of the talks at these meetings were centered on the local flora, the influences of geology on its distribution and origins, and the birds and animals which lived in it. Occasionally the subject was the flora of some distant part of America, such as the Rocky Mountains of Colorado, where Dr. Braun carried out many botanical explorations, or even to far flung places such as Australia. Right from the beginning and continuing to this day, these talks have always directly or indirectly stressed the need for conservation. The early meetings were held at a number of locations including the Walnut Hills Library, the Botany Department of the University of Cincinnati, and Hughes High School, and were often held jointly with the Audubon Society.

The Society enjoyed an almost unique relationship with the local newspapers during this time. Its every meeting was announced with short articles and occasionally further reminders came forth. In addition, apart from the announcements, speakers of renown were often featured in substantial articles describing their backgrounds, fields of expertise, and the importance of their presentations. This is a far cry from the situation which exists at the present time when it is difficult to get even a few lines about the activities of the Society.

The earliest field trips consisted of visits to private wild flower gardens or to preserves. The first real field trips went to Clifty Falls State Park in Indiana in May 1927 and again in 1928. Subsequent trips went to Shawnee Forest, Pike Lake, Lake Grant, Clifton Gorge, and other nearby areas. Weekend trips went to Natural Bridge State Park, Carter Caves State Park, and Cumberland Falls State Park, all in Kentucky. What are now two or three hour automobile trips over good roads were then real adventures, undertaken, I'm sure, with some trepidation, occasionally by railroad. Since the early 1950s, the scope and number per year of field trips has been much expanded. The Society has visited the Upper Peninsula of Michigan, the Indiana Dunes, the Preserves of southern Illinois, and the Cranberry Glades of West Virginia on weekend or extended field trips. One-day trips go to many of the best wild flower viewing sites in the tri-state area, and there are now 12 to 14 trips per year.

Another strong principle of the fledgling Society was education. On March 15, 1923, the Society, with the permission of Public School Superintendent Condon, began a program to educate the school children in the elementary grades about wild flowers. Elizabeth Braunecker was the first teacher. The program continued for several years with various teachers and was able to reach students in all grades of all but two of the 58 public schools in the city. The Norwood schools were included in subsequent years and eventually the local parochial schools and many of the nearby Kentucky schools also. The expenses of this program to the Society were almost balanced by the receipts from the students who paid five cents to join the Society as junior members. As members they received a dime-sized white pin, with the Shooting Star emblem of the Society. At its height the program had more than 25,000 school age children as members. The school program was phased out in the early thirties. However, some members continued to work with the Boy Scouts in developing wild flower education programs and a few others gave lectures on local flora to advanced biology classes of some schools up to the mid-eighties. The Society still maintains a student member category to encourage young people to become members and invites any interested persons to attend any of the lecture or field trip meetings, whether they are members or not.

On January 1, 1924, the Society began publishing a quarterly magazine, *Wildflower*, the official National

Organ of the Wild Flower Preservation Society, Inc., Washington, D.C., with Dr. H. W. Felter as editor. On his death in 1928, Dr. E. Lucy Braun took the reins and served as editor until 1933. She was followed by Mrs. Delbert Swartz (Sylvia Geisler) as editor until October 1936 when the magazine was turned over to the National Society under Dr Edgar Wherry as editor. During its Cincinnati lifetime *Wildflower* was supplied at publication cost to other societies, especially to the very large Illinois chapter.

Wildflower carried accounts of botanical and other natural history subjects from individual flower species, to discussions of regional floras and always stressed conservation, either directly or by inference.

It was illustrated with photographs and drawings. The quality was similar to that of the early 20th century versions of *The Book of Knowledge* series, or of the *Encyclopedia Britannica*.

In the area of preservation, the Society's third watchword, the membership has provided financial support toward the purchase and/or maintenance of wild flower-rich tracts. This practice started early in the life of the Society when the opportunity arose to purchase the tract of land now known as the Harris M. Benedict Preserve (Hazelwood Preserve) on the northeast side of Cincinnati. That property is now a registered national Natural Landmark. Subsequent donations, starting in the 1950s, were made toward the purchase of Lynx Prairie and Buzzards' Roost Rock in Adams County, property for the Highland Nature Sanctuary in Highland County, and for the Oxbow (together with Audubon Society) in Hamilton County. Smaller donations have been aimed at fostering nature study programs in the greater Cincinnati area. Both as a Society and through its individual members, efforts are made to keep our elected representatives aware of the needs of the local citizenry to have the opportunity to experience unpolluted, untrammelled nature. To this end efforts of members have helped lead to the founding of major State Parks such as Cumberland Falls and historical areas like Fort Hill. Members of the Society have conducted major inventories of the floras of local areas such as East Fork State Park and the Oxbow.

In 2008 the Society remains a vibrant entity, responsive to the needs of its members, the natural history community, and true to its motto "Conservation, Preservation, and Education."



Fringed Gentian: A Rare *Gentianopsis*

Gordon Mitchell

Due to their highly attractive flowers, many Gentian species have fallen victim to flower pickers and are becoming scarce in their natural habitats. One such species that is especially becoming increasingly scarce is the Fringed Gentian (*Gentianopsis crinita* [Froelich] Ma).

The Fringed Gentian is a member of the Gentian Family (*Gentianaceae*). The generic name, *Gentianopsis*, refers to King Gentius of Illyria (along the eastern coast of the Adriatic Sea), during the 2nd Century B.C. According to the ancient Roman naturalist, Pliny the Elder, in the 1st Century A.D., King Gentius used an Old World relative as a medicinal plant. The suffix to the generic name, *opsis*, means “like”, as in “like a Gentian”. The specific epithet, *crinata*, is Latin for “hairy” or “with long hairs or fringes”.

Other common names for this plant are Fringed Blue Gentian, Greater Fringed Gentian, and Oval-leaf Gentian. Previous scientific names for this plant were

Anthopogon crinitum (Froelich) Rafinesque, *Gentiana crinita* Froelich, *Gentiana nevadensis* Gilg, *Gentiana ventricosa* Grisebach, and *Gentianella crinita* (Froelich) G. Don.

The Fringed Gentian is considered to be a very attractive flower. A survey taken in the 1940's listed the Fringed Gentian as the 8th most beautiful wildflower. Unfortunately, too many of these flowers have been picked in the wilds, which helped make this beautiful plant a rarity.

The Fringed Gentian has played a role in American culture. Some of our early American authors and poets wrote about this plant. In 1832, American poet William Cullen Bryant wrote his poem, *To the Fringed Gentian*. Emily Dickinson's poem *Fringed Gentian* was published in 1891. Because of this plant's rarity, American poet and essayist Henry David Thoreau once said, “It came very near not being an inhabitant of our latitude, perhaps our globe, at all.”

Description

Annual or biennial

Height: 4-40 inches.

Stem: Erect. Slender. Smooth.

Leaves: Simple. Opposite. Sessile. Each leaf is about 1-2 inches long, about 3/8 inch wide, broadly lanceolate or ovate, and has a rounded base and a pointed tip. The leaf margins are entire.

Flowers: Violet-blue. The flowers are located at the tips of the terminal branches. Each flower is about 1-3 inches long, about 1 inch wide, and is radially symmetrical. The calyx consists of 4 green lobes. The corolla is tubular and consists of 4 flared and rounded petals. Each petal is fringed or toothed at the tip with long hairs. (These unique petals keep certain insect species away from the flower's nectar. The flared petals would collapse under the weight of larger insects species and the petal's hairs would impede the movement other insect species.) There are 4 stamens and 1 pistil with 2 stigmas. The anthers of each flower mature before the pistil of that flower. When the pistil finally matures the anthers would have wilted. This timing system is called protandry and encourages only cross-fertilization. These flowers open only in direct sunlight and close at night or on cloudy days. This closure helps keep the rain out of the flower's nectar. One single plant is capable of producing up to 100 flowers. Flowering season is usually August to November.

Fruit: Pod. The spindled pod opens into 2 sections to release their brown, hairy, windborne seeds. This plant only grows from seed. These seeds require just the right amount of soil moisture to germinate. Because of that requirement, the Fringed Gentian is a very difficult plant to cultivate.

Habitat: Calcareous slopes, moist woodlands, wet meadows, stream banks, and wetlands.

Gordon Mitchell works for the Columbus OH Metroparks and is a member of the Columbus Native Plant Society.



Fringed Gentian - *Gentiana crinita*
Illustration by Mary Vaux Walcott



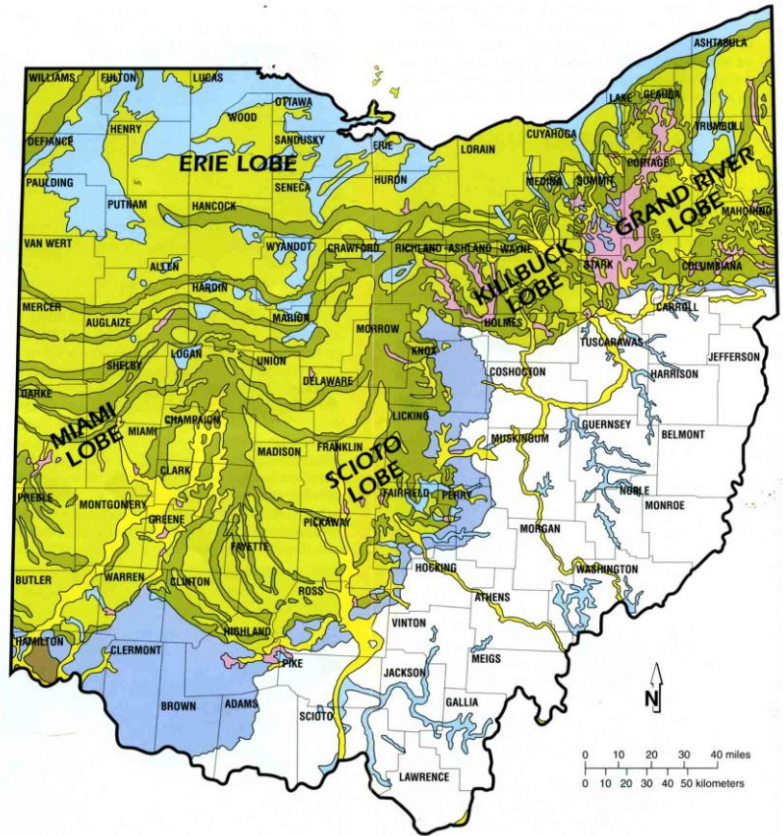
The Ice Age in Ohio – Part 1 of 2

By Michael C. Hanson

The Pleistocene Epoch, commonly known as the Ice Age, is a small segment of geologic time spanning most of the last 2 million years of the Quaternary Period. The Pleistocene ended about 10,000 years ago, which was the beginning of the Holocene or Recent Epoch. The sediments deposited by or in association with the glaciers of the Pleistocene represent the first well-documented deposits in Ohio since the early Permian Period, about 280 million years ago. Erosion and non-deposition during the latter part of the Permian, all of the Mesozoic Era, and most of the Tertiary Period resulted in no preserved rock record in Ohio for this immense span of time. Despite the comparatively short length of the Pleistocene, it has been one of the most influential geologic episodes in the cultural and economic development of Ohio. Sediments deposited during the Pleistocene, especially in the latter portion of this epoch, cover all but the southeastern third of the state and have been only slightly modified by erosion since melting of the last glacier. These sediments constitute the rich agricultural soils of Ohio, furnish raw materials for construction such as clay and sand and gravel, and form extensive aquifers. Pleistocene deposits are environmentally important as sites for landfills, as source material for some landslides, and as a medium that enhances ground motion during earthquakes. The configuration of the glaciated landscape has directly influenced settlement and development patterns across the state.

The Pleistocene Epoch began when the climate cooled and ice and snow accumulated in northern Canada to a depth sufficient to form a great ice sheet that spread outward under its own weight. Eventually the ice pushed into the northern United States. It is estimated that the ice may have been a mile thick in the Erie basin and 1,000 feet thick in the central part of Ohio. The buildup, spread, and melting of an ice sheet occurred several times during the Pleistocene Epoch. Each glaciation was followed by an interval of warmer climate known as an inter-glaciation.

The cause of the climatic fluctuations of the Pleistocene that led to the development of huge continental glaciers is poorly understood, and many theories have been advanced to explain these



perturbations. It is probable that glaciations result from natural, long-term variations in the amount of solar radiation that reaches the Earth's surface, especially in the northern hemisphere. Three factors—the tilt of the Earth's axis, its wobble, and the path of the Earth around the Sun—all vary slightly, yet periodically, through time in what are called Milankovitch cycles. When the cycles of these three factors coincide to give the northern hemisphere less than average solar radiation, the Earth's climate becomes cooler and glaciation eventually results.

The earliest series of ice advances in North America were formerly referred to as the Nebraskan and Kansan Stages, but now are referred to as pre-Illinoian glaciations. These advances are named for the states where their deposits were first studied and described. Early glaciers greatly disrupted drainage patterns and modified the landscape; however, their deposits are poorly known in Ohio. Deeply weathered pre-Illinoian glacial deposits have been recognized in southwestern Ohio near Cincinnati and in a few isolated exposures in northeastern Ohio.

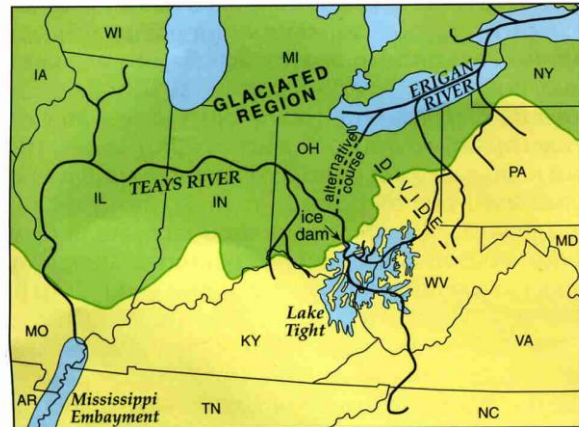
Following a relatively warm inter-glaciation, perhaps warmer than our present climate, ice of the Illinoian glaciation advanced far into Ohio, reaching into northern Kentucky. This event began about 300,000 years ago. The Illinoian ice caused further drainage modifications and left distinctive morainic deposits extending from southwestern Ohio to north-central Ohio and into northeastern Ohio. Outwash deposits presumed to be of Illinoian age are preserved as high terraces along the valley walls of major rivers such as the Hocking, Great and Little Miami, Muskingum, Ohio, and Scioto.

After a long inter-glaciation, during which extensive weathering of Illinoian glacial deposits occurred, the most recent ice sheet, the Wisconsinan, began to form in Canada about 70,000 years ago. However, radiocarbon dates suggest that Wisconsinan ice did not reach northern Ohio until about 24,000 years ago. The Wisconsinan glaciation (and probably also the earlier glaciations) was marked by several major fluctuations of the ice margin. Wisconsinan glacial deposits blanket the surface throughout the northern, central, and western portions of the state. The last of the ice was gone from Ohio by about 14,000 years ago. Wisconsinan deposits are well preserved because of the relatively short interval of erosion and weathering since their deposition. Events that occurred during the last 50,000 years, which includes much of the Wisconsinan, can be accurately dated by measuring the amount of radioactive carbon (C^{14}) in organic material such as wood, shell, and bone collected from glacial deposits. The glacial map shows the types and distribution of these deposits in Ohio. The changes of the Ohio landscape that were wrought by the ice sheets greatly influence our modern culture and economy. Some of the major modifications are presented below.

Drainage Changes

Prior to glaciation, the western and southern portion of Ohio was drained by a major river system known as the Teays, which had its headwaters in the Appalachian highlands of North Carolina and Virginia. The northeastern third of Ohio was drained by the Eriegan River, which flowed northeasterly through the basins now occupied by Lake Erie and Lake Ontario. From its source, the Teays River flowed northwestward across West Virginia and entered Ohio near Portsmouth. The Teays River took a northward route across southern Ohio and, in a classic interpretation, swung westward across central Ohio into Indiana.

Pre-glacial Teays River in north-central U.S.



Continuing its westward path across Indiana and Illinois, the Teays eventually joined the ancestral Mississippi River in western Illinois. Some geologists suggest that the deep, buried valley in western Ohio represents an ice-front stream formed in association with the earliest glacier and that the Teays River actually continued northward and joined the Eriegan River. Multiple glaciations have greatly eroded and deeply buried these river valleys, making interpretations difficult.

Arrival of the earliest glacier blocked the northwestward-flowing Teays River and its numerous tributaries, creating a 7,000-square-mile lake in southern Ohio and adjacent parts of Kentucky and West Virginia. This lake, named Lake Tight after William G. Tight, a geologist who first studied the Teays River, was partially filled with lake clays, called the Minford clay. The lake eventually spilled over low drainage divides and established new drainage systems. These new drainage channels cut below the elevation of the Teays, forming a drainage system known as Deep Stage. The modern Ohio River was formed as a result of these complex drainage changes.

Abundant evidence of drainage changes can be seen in Ohio. In the glaciated portion of the state the old Teays River system is represented by deep valleys cut into the bedrock. The valleys now are filled with glacial sediments. In unglaciated southern Ohio the Teays River valley and the valleys of its tributaries can be seen as broad flat valleys at an elevation higher than that of modern stream valleys.

Ohio Department of Natural Resources, Division of Geological Survey, Educational Leaflet No. 7, 1997.

Flowering Dogwood—*Cornus florida*. Linnaeus

By Robert Tener

The Flowering Dogwood is one of my favorite trees here at High Hawk. Along the edges of our woods I see several wild ones, and in our main yard I have planted two whose spring blossoming I look forward to. But it does have competition from close relatives, *Cornus kousa*, *Cornus mas*, and *Cornus nuttallii*. The Kousa dogwood, native to Japan and China, produces magnificent four-starred white blossoms in late May and early June. The early queen, however, is *Cornus mas*, the Cornelian Cherry, native to Europe; it produces a delicate yellow blossom to color a dull February. *Cornus nuttallii*, native to western United States, is the giant and can reach up to 80 feet in height. Wow! In the end, however, the most popular dogwood seems to be *Cornus florida*.

I discovered this tree is also called Dogwood, American Dogwood, Virginia Dogwood, Florida Dogwood, New England Boxwood, American Boxwood, False Boxwood, American Cornelian, Flowering Cornel, Florida Cornel, White Cornel, Cornel, Boxwood, Indian Arrow Wood, and Nature's Mistake. The species name *florida* means full of flowers. There are some 40 to 50 species of Dogwood in the Northern Hemisphere's temperate and subtropical zones. Some 16 or 17 are in the United States, of which 4 are considered trees. The genus name *Cornus* comes from the Latin *cornu* meaning horn and refers to the hardness of the wood. The common name comes from the fact that the bark of the European species used to be boiled in water to produce a strong decoction used as a wash for many dogs. In England the wood was used for skewers or dags. Thus, according to some people, the tree came to be called the Dagwood Tree and thence corrupted into Dogwood.

This is a small deciduous tree from 30' to 40' tall and 6" to 18" in diameter. Because the trunk seldom divides, it tends to be short with wide horizontally spreading branches forming a flat crown with the branches near the tips. The leaves are opposite, simple, 3" to 5" long, 2" to 3" wide, pointed with entire margins, thick, firm, with secondary veins paralleling the margin, bright green on top and paler green beneath, turning a wine red in the fall. The flowers are small, green-yellow, perfect, with 4 sepals, 4 petals, 4 stamens, and 1 pistil all crowded closely at the base of the large white petal scales which are often mistaken as the flowers. They appear in May. The flower buds are quite striking, being larger than the leaf buds. Forming late in the summer at the ends of twigs between the two upper

leaf buds, they become flat, round, thick tapering buttons held stiffly erect. When they open in late April or May, they produce 4 gray-green bracts or scales which soon spread, becoming wider and longer until they reach 2" to 4" and turn white. These are the beautiful Dogwood blossoms. The fruits are small, oblong, red, glossy berries 1/2" in diameter, closely packed at the end of a stalk and containing a hard nutlet in which are 1 to 2 pale brown seeds. They mature from September to November.

The Flowering Dogwood is a slow grower which likes acid soils. While it prefers openings in the forest and the edges of woods and fence rows, it will accommodate itself to the shade of larger trees. It ranges from Maine south to Florida and west to Michigan then south to Texas. In Ohio it grows in almost every county. Because its leaves have a supply of calcium, they tend to improve the soil. It requires 2 years to germinate from seeds and will not flower until it is from 6 to 12 years old. For germination, however, the seeds require cold. It will also sprout from its roots. As a flowering tree it makes a fine ornamental plant.

Its wood is close-grained, hard, heavy, strong, brown-red, weighing 51 lbs. per cu. ft. It is used for machinery bearings, wheel hubs, barrel hoops, tool handles, engraver's blocks, turnery, weaver's shuttles, spool and bobbin leads, pulleys, skewers, golf club heads, mallet heads, jewelers' blocks. The wood does not shrink and it takes a high polish. It is the state flower of Virginia. Its inner bark is bitter, especially that of its roots, yielding a drug like quinine. From this Indians made a drink which was used to cure fevers. Pioneers added whiskey to the drink and took the resulting concoction for the shakes. In Ohio and Indiana an infusion of Dogwood bark has been used for chills and fever. From its bark Indians also made a red dye, and from the split ends of branchlets, toothbrushes. The fruits supply food for birds, such as ruffed grouse, Bob White, turkey, as well as for squirrels.

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Old Woman Creek National Estuarine Research Reserve and State Nature Preserve

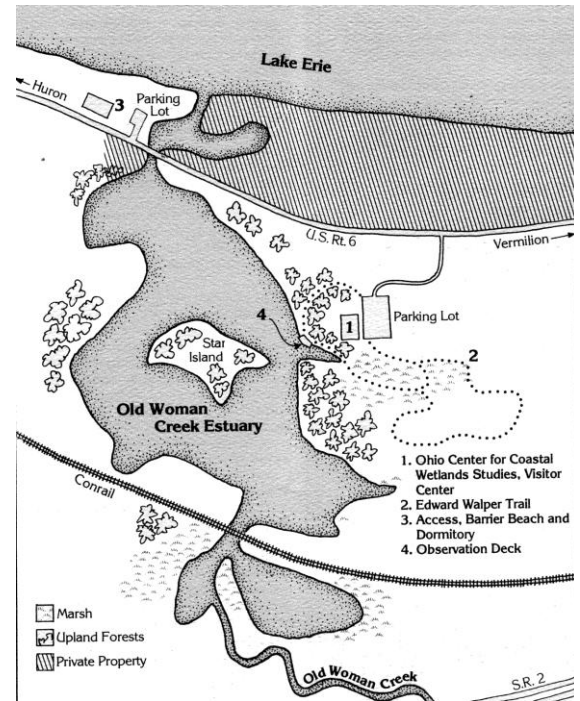
Lake Erie and its coastal zone are among Ohio's most valuable natural resources. As the state's once expansive coastal wetlands continue to disappear in the face of encroaching development, the preservation of these natural features becomes more critical. Old Woman Creek is now protected as a National Estuarine Reserve and State Nature Preserve because it is one of Ohio's best remaining examples of a natural estuary. This 571-acre reserve is located in Erie County, two miles east of Huron on U.S. Route 6. The estuary serves as a field laboratory where scientists can study this naturally functioning system and as a place where students and the general public can learn about estuarine ecology in a natural setting.

An estuary is traditionally defined as that place where the land's fresh waters meet and mix with the saltwater of the sea and where water levels are affected by tides. Lake Erie is actually a freshwater inland sea. Although salt concentration or salinity is not a factor here, the waters of the lake and Old Woman Creek combine in the estuary to form a third type of water, chemically different from that of either the creek or lake. Furthermore, even though the lunar tidal effect on Lake Erie is extremely small, lake levels are affected by weather conditions which, in turn, do influence the water levels of the estuary.

Old Woman Creek Reserve contains a variety of aquatic and terrestrial habitats: marshlands, open water, a barrier sand beach, upland forests, and old crop fields in early plant succession. As a transition zone between land and water, the estuary brings together many kinds of life. Attracted by the water supply and abundance of food and shelter, birds, mammals, fish, reptiles, amphibians, and insects are drawn here.

Separating the estuary from Lake Erie, the wind-swept barrier beach is a dynamic environment, continually being altered by pounding waves and shifting sand. Although harsh and unstable, the beach habitat is always beautiful. Shorebirds and migratory waterfowl are common visitors to this portion of the sanctuary.

The waters of the estuary are rich in floating microscopic plants and animals called plankton, which are basic to the estuarine food chain. Many other tiny organisms cling to the underwater stems of water lotus, cattails, sedges, and other aquatic vegetation. The estuarine waters provide excellent spawning and rearing habitat for many kinds of fish because here they find protection from predators and a ready supply of food. The fish of the estuary include such species as large-mouth bass, sunfish, perch, shiners, and gizzard shad. Bird life in the estuary is equally diverse. Ducks, herons, shorebirds, and songbirds can be seen throughout most of the year.



The uplands surrounding the estuary offer a mixture of terrestrial habitats that are also important components of the estuarine environment. Oak-hickory forests covering the steep banks provide valuable habitat for untold numbers of wildflowers, woodland birds, and other creatures.

Much of the reserve's uplands are former crop fields in various stages of reversion to natural conditions. Goldenrod, asters, and grasses are present here. These and other wild plants provide food and cover for wildlife.

Attracted by insects and weed seeds, great numbers of birds come to feed. Hawks, owls, and foxes hunt for small rodents, insects, and other prey species that inhabit this old field community.

As you walk the woodland trail, visit the barrier beach, or stop by the research center, we ask you to do your part to protect and preserve these fragile habitats of the estuary by observing the special rules and regulations posted on the bulletin boards.

Reprinted from a leaflet published by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves, 1998.

Book Review:

Sara Stein. **Noah's Garden: Restoring the Ecology of Our Own Back Yards**

Houghton Mifflin, 1995, 304 pp.

\$14.00 paperback. ISBN 0395709407

Reviewed by Greg Tillman

Noah's Garden is a web of questions and ideas, of gardening and ecology, gentle and provocative. Shortly after I read it, I sought out a hard-cover copy for my own. I like it because it is a practical answer to the eternal question, "Well, what can I do?" Stein answers: you can garden. "This is not someone else's problem. We – you and I and everyone who has a yard of any size – own a big chunk of this country." Let us all plant our little half-acres and quarter-acres, Stein argues, or multiple acres if you are lucky enough to have them, with a little less lawn, and more wildflower. A little less yew, and more viburnum and serviceberry. Less hybrid rhododendron, but perhaps some native roses.

Already our understanding of wildlife is based mostly on such presentations as National Geographic Specials; as a result, we are likely to have more sympathy for rhinoceroses in Africa than for the toad on our own doorstep.

Noah's Garden is not a quick read, because it is chock full of information. But it is very well written, and each chapter is fairly self-contained, so it is easy to put down and pick up again. It charms in part because Stein traces her own mistakes, and her own dawning realization of them, as she and her family began to transform their own 6 acres. She banished the grouse from her meadow and the toad from her doorstep as she mowed and paved and neatened to create a beautiful and barren manicured estate; and only gradually did she realize what she had done, and begin the slow process of undoing it.

Throughout, Stein weaves a tapestry of ecological information. She tells of the microsystem responsible for composting, whose services we use without understanding. Of the origin of the lawn, that grassland whose fragility is mocked by the robust grasses of the native prairie, yet which would in fact flourish were it but in its proper place. Of the sweet gum tree, whose early-turning autumn leaves are a curious deception that is mentioned in some field guides, but not explained. ("...spots of shining scarlet against a dark green foliage as though it were in berry. And indeed it is - but the actual fruit is dull blue... the author didn't get the joke of this arboreal illusion.")

She tells of the interdependence of squirrel and bird, nut and fruit, and why plants that bloom in April and plants that bloom in August both produce in September. We as gardeners cannot understand and reproduce interdependencies that took a million years to weave together. If we plant nectar for the hummingbird, have we also planted what they need for their nest-building, or their fledglings? Yet, she says, "paradoxically, the Plan may not be so hard to follow. The general outlines are before us in the woodlands, thickets, meadows, marshes... As for the fine details, I think we needn't worry. This is a picture that, well started, will fill in itself..."

Stein is a pragmatist, not a purist. Kansans, she acknowledges, cannot now graze buffalo in their front yards, nor Yankees welcome black bears to the suburbs. We cannot eliminate the non-native daylilies from our roadsides, nor is there much need, though perhaps we should try to eliminate the more invasive Japanese honeysuckle or purple loosestrife. ("My pluralistic argument respects exotics that have naturalized as responsible citizens.") But we can, each of us, anytime we wish, improve our own stark and barren lawns, one bush, one tiny flower at a time. We can garden with a new perspective. "...if I could buy only one tree, I'd have to favor a rarer native over a commoner exotic. There's no other way to repopulate the land. The trees must come from us, our gift." And the animals will follow.

Stein has convinced me. If one person in each neighborhood did it, it would be an unrivalled genetic repository. If a quarter of every neighborhood took part, it would be a revolution, and perhaps advance the cause of conservation further than any other single act we can undertake.

"...for if we don't grow milkweeds in our gardens, we'll have to tell our grandchildren, 'We used to see monarch butterflies long ago.'"

© 1995, Greg Tillman.

Reprinted from Grand Prairie Friends of Illinois.

<http://www.prairienet.org/gpf/bookreviews/noahsgarden.html>

Alternatives to Invasive Plants

Beautiful shrub alternatives

By Cheryl Lowe

Choosing alternatives to invasive plants is not always a matter of substituting equivalents, such as blueberry for barberry, fothergilla for burning bush, or joe-pye weed for purple loosestrife. It's important to consider how the plant will be used. Will it screen the view of the neighbor's new garage? Offer bright fall color? Provide food for songbirds? To get you started, here are a few suggestions for native plants that are easy to grow; excellent for screening, fall color, and spring flowers; and also provide food for songbirds, pollinators, or people. What more could you ask for?

Aronia arbutifolia (*Photinia pyrifolia*) **Red**

Chokeberry

Shrub for four-season interest, fragrant flowers, wildlife value. NE native. Zones: 4-9. Ht: 6-8 ft. (taller in shady or moist sites).

Alternative to barberry, winged euonymus (burning bush), buckthorn, Russian olive, shrubby honeysuckles, or privet

Red chokeberry is valued for its scarlet fall color, red berries that hold into winter, fragrant flowers in spring, and ability to adapt to wet or moderately dry soils. Vase-shaped, with arching stems, it is also drought-tolerant, salt-tolerant, and pest-free; a great plant for mass plantings and hedges in sunny to partly shady sites. Stems can grow leggy with age, but it is easily pruned to keep it more compact. The fruits are slightly astringent (the basis for the common name), so birds tend to ignore them until winter, when their food choices are more limited. This means retaining sustenance for overwintering and returning migrants, as well as bright color in the garden after the first snows. The cultivar 'Brilliantissima' bears larger fruits and has more lustrous foliage.

TIP: *Aronia melanocarpa* (*Photinia melanocarpa*), is a slightly smaller species with glossy leaves and black fruits.

Cornus sericeo (*Cornus stolonifera*) **Red-osier**

Dogwood

Shrub for four-season interest, wildlife value. NE native. Zones: 3-7. Ht: 6-10 ft.

Alternative to barberry, winged euonymus (burning bush), buckthorn, Russian olive, shrubby honeysuckles, privet, or Japanese knotweed

Red-osier dogwood is a native shrubby dogwood that has been available in nurseries for years. Suited to both

sunny and partly shady sites, it prefers moist soils, but tolerates moderately dry ones. Its stems turn bright red in fall and winter, changing to green in the spring, then dark red during the growing season, as the concentrations of chlorophyll pigments shift with the seasons. Consider pruning out the older stems to intensify the red winter color of younger stems. Flowers are self-sterile, so plant genetically distinct individuals to produce fruit. The white to pale-blue berries linger on the shrubs into winter, consumed by over-wintering and migrating birds. Many cultivars are available, including variegated, dwarf, and yellow-stemmed varieties, but be aware that some cultivars are susceptible to stem canker and leaf blight diseases.

TIP: For a bigger space, try *Cornus racemosa* (gray or red-panicked dogwood).

Itea virginica **Virginia Sweetspire**

Shrub for three-season interest, fragrant flowers, pollinators. SE native. Zones: 5-9. Ht: 3-6 ft.

Alternative to barberry, winged euonymus (burning bush), shrubby honeysuckles, or privet

The flowers of Virginia sweet-spire, appearing in early summer, resemble long white candles with a lovely fragrance, borne on the ends of graceful arching branches. The leaves, long and narrow, inspire the alternate common name "Virginia-willow," but unlike willows, become orange to rich burgundy-red late in November. These shrubs grow well in wet to somewhat dry garden soils (once established), and are happy in both sun and part-shade. With the ability to tolerate a range of conditions, they are well-suited to shrub borders, drainage swales, pond edges, and places where it is seasonally wet.

TIP: Consider the more compact *Itea virginiana* 'Little Henry' when space is limited.

Fothergilla gardenia **Dwarf Fothergilla**

Shrub for three-season interest, fragrant flowers, compact growth. SE native. Zones: 5-9. Ht: 3-5 ft.

Alternative to barberry, winged euonymus (burning bush), Russian olive, shrubby honeysuckles, or privet

For a smaller, more compact plant, try dwarf fothergilla, a rounded, multi-stemmed shrub with fragrant white bottlebrush flowers in May. It prefers moist, but well-

drained, slightly acidic soils, and grows best in sun to light shade. The leaves, which unfold as the flowers wither, are dark-green to blue-green, with scalloped edges and soft felt underneath. Fall foliage ranges from yellow to orange to red-burgundy, and fluctuates from showy to disappointing, depending on site conditions, weather, and cultivar selection. For example, *Fothergilla agardenia* 'Blue Mist' is prized for the beautiful blue tint of its leaves, but is less colorful in the fall. Basically pest-free and drought-tolerant, dwarf fothergillas are well-suited to foundation and massed shrub plantings. **TIP:** Consider *F. major* (large fothergilla), a taller species, and *Fothergilla* 'Mt Airy,' a hybrid between *F. gardenia* and *F. major*.

Lindera benzoin. **Spicebush**

Shrub for three-season interest wildlife value. NE native. Zones: 4-7. Ht: 8-15 ft.

Alternative to barberry, winged euonymus (burning bush), buckthorn, Russian olive, shrubby honeysuckle, or privet

It's hard to decide if the best part of the spicebush is the bright yellow flowers of early spring, the way the golden leaves light up the woods in fall, or finding the miniature dragon larvae of the spicebush swallowtail butterfly hidden in its leaves every summer. Spicebush is a wonderful choice for sites with part to full shade, and wet to moderately moist garden soils. It is also tolerant of some salt in the soil, and thus good for roadside plantings. Rub the leaves to smell their spicy fragrance, caused by a substance also found in the flowers, twigs, and fruit. Spicebush is dioecious (meaning that the flowers are either male or female and only one sex is found on any one plant), so you will need both male and female plants to produce the glossy, bright red fruits. The fruit has a high fat content, supplying high energy food to migratory birds.

Vaccinium corymbosum **Highbush Blueberry**

Shrub for four-season interest, edible fruit, wildlife value. NE native. Zones: 3-8. Ht: 3-8 ft.

Alternative to barberry, winged euonymus (burning bush), buckthorn, Russian olive, shrubby honeysuckles, or privet

Everyone knows the luscious fruits of the native New England highbush blueberry, but consider also the delicate pattern of its reddish twigs and twisting stems in winter, the lovely clusters of its white bell-like blossoms in spring, and its glorious fall color, which ranges from burgundy to fire-red. It grows well in moist to average soils, and prefers sun or just a little shade (more sun leads to more flowers and fruit, as well as a denser growth habit). It is happiest with organic mulch

over its somewhat shallow roots, to keep them cool and moist. Be sure to plant at least two different individuals or cultivars to get a good fruit crop.

TIP: For shorter plants, consider cultivars and hybrids of *Vaccinium angustifolium* (lowbush blueberry) or *Vaccinium myrtilloides* (velvetleaf blueberry).

Viburnum nudum (including var. *cassinoides*)

Witherod

Shrub for three-season interest, edible fruit, wildlife value. NE native. Zones: 3-9. Ht: 6-10 ft. *Alternative to barberry, winged euonymus (burning bush), buckthorn, Russian olive, shrubby honeysuckles, or privet*

Witherod is one of several wonderful native viburnums. Although it prefers moist soils, it is fine in moderately dry, well-drained soils. The flat-topped clusters of creamy white flowers appear in late spring, followed in late summer by a generous helping of berries that slowly ripen from soft green to rich pink to deep blue, often at different rates in the same cluster. As with the blueberry, plant two genetically different plants to get fruit. A good choice for sun to light shade, witherod has clean, simple leaves. A little organic mulch to keep the roots moist is always helpful, but this is an easy plant to grow.

TIP: Best choices are nannyberry (*Viburnum lentago*), hobblebush (*Viburnum lantanoides*, aka *V. alnifolium*) and black-haw viburnum (*V. prunifolium*), especially if viburnum leaf beetle is present in your area.

Resources

These alternatives to invasive plants represent only a small sampling of the many possibilities. Use your imagination, books and online resources, or the advice of local nursery staff to select other beautiful plants that add diversity to the landscape. New England Wild Flower Society collaborates with many regional agencies to provide extensive information about the control of non-native invasive plants in New England, and organizes management activities in the field to protect rare species and unusual habitats. More extensive lists of native alternatives to invasive plants and links to state-by-state information about invasive plants are found at www.newfs.org.

Cheryl Lowe is coauthor of Peterson Field Guide: *Ferns of Northeastern and Central North America*, author of New England Wild Flower Society's *Butterfly Gardening in New England*, and former New England Wild Flower Society Horticulture Director.

Reprinted from New England Wildflower, Spring/Summer 2006

Worm Warfare

How Exotic Earthworms Are Wreaking Havoc in North American Forests

By Niall Dunne

Charles Darwin was an earthworm freak. He spent more than 40 years, on and off, observing, experimenting on, and thinking about these artful annelids. It got a little weird sometimes, like when he had his son play the bassoon to an audience of worms in the billiard room.

Darwin published his findings in a slim volume entitled *The Formation of Vegetable Mould through the Action of Worms with Observations on their Habits* (1881). In it, he outlined the monumental importance of earthworms to the development of soils, describing how they help plow, aerate, hydrate, and fertilize the earth. "They mingle the whole intimately together," he wrote, "like a gardener who prepares fine soil for his choicest plants."

Darwin's "vermiphilia" lives on today in the hearts of gardeners and farmers who embrace a biologically integrated approach to plant cultivation. But, regrettably, his idea that all earthworms are fundamentally beneficial is a bust. Some species, when placed in the wrong context, can become outright pests.

Indeed, a number of nonnative earthworm species have established themselves in North America and been implicated in a range of undesirable activities, including the extirpation of at least one rare plant species. Gardeners need to pay special attention, as they have been identified as one possible source of introduction for some of these troublesome interlopers.

In Darwin's defense, he was aware that earthworm activity could cause problems, such as soil erosion due to washed-away castings. Moreover, his study was limited to mainly pastoral lands in England and probably to a narrow range of earthworm species. There are, however, thousands of earthworm species worldwide, adapted to many different environments. North America has roughly 100 native species. While this doesn't seem like a mind-blowing number, it's pretty impressive when you consider that Pleistocene glaciation killed most worm species in the northern half of the continent.

Because earthworms are extremely slow moving, colonization of the formerly frozen areas has been negligible. Our native earthworm fauna is still confined mostly to the Southeast and Pacific Northwest.

Since Colonial times, though, about 45 exotic earthworm species have made a home for themselves in North America. These include hardy European and Asian species that can survive the cold, unforgiving

winters of our higher latitudes, many of them introduced through the importation of potted plant material for horticulture and land management. Today, there are strict laws prohibiting soil imports, but exotic earthworms are still gaining access to the country via the vermiculture industry, which imports worms for fish bait, bioremediation, and composting.

Exotic earthworm populations are now established in many of our urban, suburban, and agricultural soils. They've also managed to hunker down in wild areas—thanks in large part to the misguided dumping of bait by fishermen. And this is the crux of the problem: the addition of worms to forests and grasslands that have evolved for millennia without them.

Hardwood forests in the North are being hardest hit by the pest-earthworm invasions. The most immediate threat is from "epigeic" earthworms, which inhabit and feed on leaf litter on the soil's surface.

In healthy, undisturbed forests, a rich layer of litter covers the forest floor and is held together by webs of fungal filaments. The fungi, along with other decomposers, slowly break down the litter and release nutrients to forest plants, the key word here being "slowly." Soil pH is low, and the native plants are generally adapted to acidic conditions. The leaf litter is not just a nutrient bank; it's the medium in which forest plant seeds germinate. It also acts as a mulch, insulating the soil and protecting plants from disease and competition with weeds. In addition, it provides habitat for many small forest animals.

Invading earthworms feed voraciously on the leaf litter, breaking it down too fast and flooding the soil with nutrients, especially nitrogen. (Much of this valuable stored nitrogen may eventually be lost via runoff.) Some worm species can also neutralize the soil pH with special calciferous glands to create a more favorable environment for themselves. Both actions dramatically change the soil chemistry in the forest and interfere with plant growth. Also, as the leaf litter is consumed, bare patches appear on the forest floor, making it vulnerable to erosion and to invasion by nitrogen-craving weed plants. Leaf-litter animals are deprived of their habitat. If burrowing worms are present, a harmful mixing of soil strata can occur.

Some of the most compelling evidence of this phenomenon has come out of the Chippewa National Forest in Minnesota. Back in 1996, researchers discovered a link between the absence of tree seedlings

and spring wildflowers in the forest and the presence of six or seven exotic earthworm species in the soil, and they've been studying it ever since.

Cindy Hale of the University of Minnesota-Duluth has spearheaded the research and even set up a web site called Minnesota Worm Watch (www.nrri.umn.edu/worms) to raise public awareness about the invasion problem. The site contains dramatic images of the damaging effects that European worms like *Dendrobaena octaedra* and *Lumbricus terrestris* can have on the leaf litter, soil profile, and plant health of the forest.

In 2002, Michael Gundale of Michigan Technological University published a report detailing how the epigeic bait and compost worm *Lumbricus rubellus* may be wiping out populations of the rare goblin fern, *Botrychium mormo*, and possibly other rare native plants too, in the Chippewa National Forest. Gundale credits the epigeic worm's destruction of mycorrhizal fungi in the soil as a reason for the goblin fern's decline.

John C. Maerz and colleagues from Cornell University have found strong evidence linking salamander decline in the hardwood forests of central New York and southeastern Pennsylvania to invasions by *L. rubellus* and Asian *Amyntas* species, among others. Maerz says that by eroding forest leaf litter and humus layers, the earthworms are driving down arthropod numbers and depriving juvenile salamanders of a key food supply. The Cornell team has also found strong links between exotic earthworm infestations and the invasion of forests by pest plants such as Japanese barberry (*Berberis thunbergii*). This possibly symbiotic connection has also been noted in New Jersey by researchers from Rutgers University.

Scientists, land managers, and conservationists are in a quandary over how to address the invasive earthworm issue. Experiments to find viable means of controlling earthworm invasions are under way. Dennis Burton, director of land restoration at the Schuylkill Center for Environmental Education in Pennsylvania, has had some success excluding *Amyntas* species from test plots using sulfur and pine needle mulch (which lower soil pH) and black walnuts (which are high in phytotoxins). But it remains to be seen if any control methods can be developed for viable large-scale forest restoration, restoration that doesn't threaten collateral damage to other organisms.

Given the slow migration of earthworms in soil, however, most experts agree that containing them is of lower priority than preventing new introductions. This means developing stricter laws regulating the importation of worms (which the USDA is considering) and getting the word out to the public.

"If you fish, do not dump your extra worms out on the ground," urges Burton. "Throw them entirely in the water or take them home. If you plant new trees and shrubs on your property, examine the root balls for worms and destroy any you find."

His advice to gardeners makes sense (especially to those who live near forested areas) because, although there might be controls on the importation of contaminated soils from outside the U.S., there are few regulations addressing the movement of soils within the country. It's conceivable that potted ornamental plants from nurseries in earthworm-infested areas are acting as vectors for new invasions.

Niall Dunne is the associate editor of *Plants & Gardens News*.

Reprinted from *Plants & Gardens News*, Brooklyn Botanic Garden, Spring 2004

Garlic Mustard Pesto

4 cloves garlic, peeled
3 tablespoons garlic mustard taproots
3/4 cups parsley
1 cup garlic mustard leaves
1 cup basil
1 1/2 cups low-sodium olives, pitted
2 cups walnuts
1 cup pine nuts
1/2 cup mellow miso
1 1/4 cups olive oil or as needed

Chop the garlic and garlic mustard roots in a food processor. Add the parsley, garlic mustard leaves, and basil and chop. Add the nuts and chop coarsely. Add the olive oil and miso and process until you've created a coarse paste. Makes 4 cups.

This recipe is taken from *The Wild Vegetarian Cookbook* by Steve Brill, Harvard Common Press, 2002. The book may be purchased in stores or on Steve Brill's web site, www.wildmanstevebrill.com

How Do You Tell the Native from Non-Native *Euonymus* Species?

by Ellen Jacquart

Euonymus is an enormously popular genus in the horticulture industry, but we also have three native species of this genus in Indiana. Fortunately, they are easy to tell apart.

Most of the available *Euonymus* cultivars are based on two Asian species, a shrub called winged burning bush (*Euonymus alatus*) and a climbing vine called winter creeper or Chinese spindle-tree (*Euonymus fortunei*). Winged burning bush is popular with landscapers because of its bright red fall foliage and loads of berries in the fall. Winter creeper is popular because this vine is a very vigorous evergreen groundcover.

The problem with both of these Asian species is their ability to spread through natural areas. Winged burning bush spreads by seed into the understory of nearby forests. For example, winged burning bush used in the parking lot landscaping at Pioneer Mothers Memorial Forest south of Paoli has moved into the understory of that old-growth forest. Even an undisturbed, high-quality forest like this old-growth tract can become dominated in time by this invasive shrub. If you live in central Indiana, you needn't go far to see examples of forests overtaken by winter creeper. Marrott Park, like many of the city parks in Indianapolis, has been overtaken, as a hike at this time of year will clearly reveal. While the native plants are changing color and going dormant, winter creeper covers the ground and tree trunks with green all winter.

There are two native shrubs and one native vine in the *Euonymus* genus in Indiana. It is very simple to distinguish the native shrubs from the non-native winged burning bush – the natives are not winged. That is, there are no corky wings along the twigs of the

native species. Wahoo (*E. atropurpureus*) is a large shrub (up to 6 m tall) with purple, 4-merous (tetramerous) flowers. These develop into smooth, reddish-purple fruits which enclose seeds covered with scarlet pulp. Another characteristic which separates wahoo from other *Euonymus* species is that the petioles of the terminal pair of leaves are over 4 mm long. Wahoo is found in moist woods throughout the state.

Strawberry-bush or brook euonymus (*E. americana*) is a smaller shrub (to 2 m) with greenish-purple, 5-merous (pentamerous) flowers. The fruits are scarlet and very warty, somewhat like small strawberries-hence the name. The distribution of this shrub in Indiana is limited to low, flat woods in the southern counties.

The native *Euonymus* vine is running strawberry-bush (*E. obovatus*). It is really a prostrate shrub, with the slender stems often taking root where they touch the ground. Its flowers are 5-merous and develop into warty red fruits (again, explaining the “strawberry” part of the name). It does not grow nearly as vigorously as the Asian winter creeper, and it is deciduous rather than evergreen – two strikes against using this native as a replacement for the non-native. Running strawberry-bush is found in rich forests throughout Indiana.

Interestingly, Deam did not note any of the non-native *Euonymus* species in his 1940 *Flora of Indiana*. The Asian species are a relatively recent introduction to Indiana, but appear to be making up for lost time in their invasion of our natural areas. Let's hope our native *Euonymus* species are able to hold their own into the future.

Reprinted from the *Indiana Native Plant and Wildflower Society News*, Winter 2000



Euonymus alatus, Burning bush



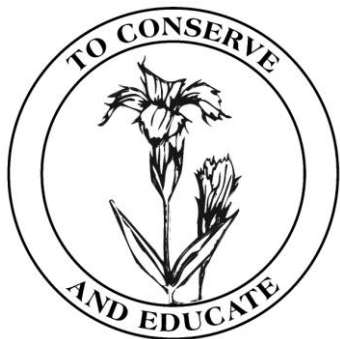
Strawberry bush
(*Euonymus americana*)



Euonymus obovatus. Running strawberry-bush



Wahoo
(*Euonymus atropurpureus*)



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On The Fringe

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