On The Fringe

Journal of the Native Plant Society of Northeastern Ohio

Advance Notice Of Special Field Trip.

On August 5th we will visit Naturally Native Nursery, run by two members of the Society. Beginning at 10 AM we will have a guided tour of the gardens and see how they propagate and harvest seeds and plants. I think tour members will be able to purchase things they might be interested in. Around noon they will provide us with a sandwich and drink. I you require more please pack a snack bag. In the afternoon our own Guy Denny will take us on an exploration of the extremely interesting Oak Openings with its plethora of rare plants. No matter how many times you have been there, there are always new discoveries to be made.

For those of you who can stay overnight, on Sunday morning we will be guided by Bob Jacksy at Kitty Todd Preserve and at other special preserves. Bob is one of the leading experts of the area and this is a very special botanical ecosystem

We may invite other chapters to join us for the weekend, and if that works out it will be an opportunity to get to know plant enthusiasts from different areas.

We need to know who can come on this trip; who can stay overnight and accompany us on Sunday; and should we try to get a block of rooms at a nearby motel. Consequently, we ask that you call Diane Police and indicate your preferences by **July 21st**: (H) 216-691-1929) (W)440-603-7195.

Annual Dinner October 27th

At our Annual Dinner on the 27th of October we are going to have a very different sort of presentation. Rachel Carson, whose *Silent Spring* fomented the ecological movement, will grace the stage at the Cleveland Museum of Natural History. Kaiulani Lee will portray Carson in a singular performance. Those who have heard her say that there is not a dry eye in the audience at the end of her act. Join us for "A Sense of Wonder" on October 27th. You will not be disappointed. Miss Lee is a veteran of Broadway and TV. Details in the September issue of the Journal.

The Natural Landscape Movement

Perpetually green lawns, like plastic trees, implicitly reduce the entities they portray to terms of serviceability, utility, and adornment, reinforcing the belief that the depicted objects exist not for themselves but to service superior needs. As such, mono-turf yards are the most obvious example of humankind's disregard for Nature and its failure to recognize and practice the Land Ethic. Lawns are imposed on the landscape without regard for local geography, climate, or history. True gardening, by contrast, is the natural give and take between the gardener and a piece of land - the essence of the Land Ethic. Putting in an exotic lawn represents instead a process of conquest and obliteration, an imposition of an alien idea and even a set of alien species (for the grasses in our lawns are all imported). The lesson of Aldo Leopold's Land Ethic is that humans must change their role from conqueror of the land to member and citizen.

In the Northeast, Natural Landscapers are re-creating the dense layers of the native American deciduous forest; they replace lawns with understory species like dogwood, wild azaleas and native shrubs, ferns and woodland wildflowers. Midwesterners are re-creating tallgrass and shortgrass prairies. Arizonians are landscaping with Sonoran desert native species. They all share a common goal – to harmonize gardening and landscaping practices with Nature.

With the publication of Rachel Carson's *Silent Spring* and the attendant growth of environmental awareness in the 1960s, homeowners began to cultivate natural landscapes. These practices collided directly with the establishment's wooden view of what was proper groundcover for a house. The history of suburban natural landscaping and its conflict with local weed laws is a story about people and organizations. Leopold firmly believed that if the Land Ethic was to ever succeed it must be practiced by private citizens, not just government. With the natural landscape movement, a dedicated few are trying to change society's attitudes, and in turn its laws, for the better.

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

Summer Program Schedule

June 10, Sat: CHAGRIN RIVER LAND CONSERVANCY PLANT SURVEY – 9:00 AM Assist the Chagrin River Land Conversancy in a plant survey of the 75 acre West Preserve in Waite Hill at the confluence of the Chagrin River and the East Branch. Call Judy for reservations and directions: **440-564-9151 (H) or 440-286-9516 Ext 2011 (W).**

July 8, Sat: VIRGINIA KENDALL LEDGES and PICNIC, **Cuyahoga Valley National Park** - 10:00 AM. Tom Sampliner leads this excursion to discover the diversity of plants found on the Sharon Conglomerate ledges. A great spot to keep cool on a warm day! Afterwards, join us for a picnic. Hotdogs and beverages provided. Bring a side to share if you wish. Call Diane for directions and to register: **(H) 216-691-1929) (W)440-603-7195**

Aug 5 & 6, Sat & Sun: PRAIRIE WEEKEND – 10:00 AM. Naturally Native Nursery, the area's largest supplier of native plants, will be our host for the first part of this 2 day botanizing excursion. See their gardens, seedbeds, a dune, bog and wet bed and be their guest for lunch. Please bring dessert. Afterwards, Guy Denny leads us to the Oak Opening Preserve. Overnight accommodations are available nearby- call for list. Sunday, head to Kitty Todd and Erie Sand Barrens State Nature Preserve, a closed scientific preserve. More details at a later date. Directions: Take Interstate 80 west to Toledo, to St. Rt. 25 south to St. Rt. 582. Head west to the nursery at 13737 Middleton Pike. Call Diane to register: **216-691-1929 (H) 440-603-7195 (W)**

Aug 26, Sat: PLANT ID SERIES: FERNS – 2:00 PM (*Part of our ongoing Plant Identification Series)* The ravines of Geauga Park District's Whitlam Woods in Chardon Township harbor a great diversity of ferns along the tributary streams. Learn to identify the many ferns found in our area on this off-trail excursion. Wear sturdy hiking shoes. Directions: Take Rt. 90 east to Rt. 44. Head south to Clark Rd. Turn left and head east to Robinson Road. Turn right and head east to Pearl Road. Turn left ½ mile to parking area on left. Call Judy to register: **440-564-9151 (H) or 440-286-9516 Ext 2011 (W).**

Sep 17, Sun: PLANT ID SERIES: AQUATIC PLANTS – 9:00 AM *(Plant Identification Series),* Bob Bartolatta of Cleveland Museum of Natural History will lead this trip to explore several glacial lakes of Geauga County by canoe, including Lake Kelso and Punderson Lake, as we look at the diversity of aquatic plants found growing in their depths.. Directions: Take St. Rt. 44 south past Punderson Lake to Pond Rd. Head east approx 1 mile to Old Rider Road. Turn left and park at Burton Wetlands on east side of road. Call Judy to register: **(H) 440-564-9151 or (W) 440-286-9516 Ext 2011.**

President's Corner

Spring sprang quickly this year and many of the flowers we normally expect the first weeks of May were open in April. As we look forward to summer, we have several exciting excursions planned and we hope you can join us. Everyone is welcome to a summer picnic planned for July 8th after the 10:00 a.m. Virginia Kendall hike at the Cuyahoga Valley National Park. We will provide hotdogs and cold beverages. Any donations of side dishes or chips would be greatly appreciated. See the Program Schedule above for registration information.

We are also looking for members who would like to have a more active role in the Native Plant Society. If you have an interest in sharing your love of native plants with others, contact Judy at bunchberry1@netzero.net.

See you in the field.

Judy Barnhart

A Land Ethic

Charles Smith

"A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It's wrong when it tends to be otherwise." – Aldo Leopold

In his book *Consilience*, E. 0. Wilson discusses how the human brain developed to produce amongst other things "language and its symbol-based product, culture. The result," he says, "was the capacity to take possession of the planet." This occurred "to the grief of most preexisting life forms." (p. 98). We humans now directly or indirectly affect the entire planet with our actions. Although I might live in Amissville, Virginia, because of the global economy, the choices I make affect ecosystems and people in China (where my shoes were made), British Columbia (where the wood for my house was harvested and milled), Brazil (where my coffee was grown), the South Pacific (where the fish I'm having for dinner was caught), and California (source of the citrus fruit I had for breakfast).

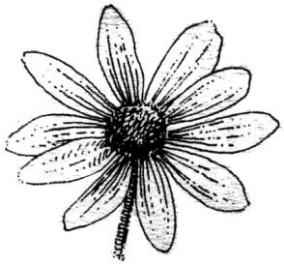
Most people are either ignorant of, or choose not to see, the impacts their actions have on the local and global environment. But if you care for the health of the earth and the people that live on it, then propriety insists that you consider all of your actions in the context of what effect they have. In short, we must each develop a land ethic. This land ethic is a definition of what we believe and what we consider acceptable in human behavior as it affects other things and other people. Our land ethic should act as a litmus test with which we measure the soundness of our actions.

Your land ethic must be true to you. It must have the power of conviction. In turn, committing to a land ethic requires you to be honest and informed about the impacts of your actions. Some people might think this is a call for people to live guilty lives, anguishing over every detail. That is not my intent. The truth CAN be depressing, but that doesn't make it less true. We can choose not to acknowledge the effects our actions have, but that is at best dishonesty and at worst hypocrisy.

Developing a land ethic may be easy for some and difficult for others. Many of us already live by a moral code that governs many of our actions. We subconsciously measure what we do against the impacts we can foresee. But the application of this moral code is usually limited to our immediate surroundings -- the people and places with which we come in direct contact. The challenge is to broaden the application of this code to all of our actions, to be aware that things are complicated and try to make the best choices. What did it take to get my cup of coffee to the local convenience store? What effect does my choice of transportation have on the cleanliness of the air in my region or the average temperature globally? What is happening downstream of my yard when I apply fertilizer to my lawn?

I hope that individuals, communities, organizations, companies and governments will adopt sound land ethics that will guide their actions. In lieu of an existing land ethic, I propose that we each begin with the simple but powerful words of Aldo Leopold which appear at the beginning of this article: "A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It's wrong when it tends to be otherwise." That is hard to improve on, but it can be expanded to include human communities and the systems of the earth that support our lives.

Reprinted from the *Bulletin of the Virginia Native Plant Society,* August, 2001



Marion Jackson's Favorite Native Trees

Butternut *Juglans cinerea L.*

by Marion Jackson

Butternut trees are notable in that you almost always remember when and where you encountered a lone tree or a small grove. Seldom common or abundant, they enrich your outdoor experiences much like the chance meeting of an old friend from years past.

The ranges of butternut and its sister species, black walnut, overlap greatly; butternut occurs farther north (into southeastern Canada), but not as far south or west as does black walnut. Extending from Maine to Minnesota, and southward to Tennessee, Virginia and North Carolina, butternut occurs only as scattered disjuncts in the Piedmont Sections of the southern states. Such isolated outlier populations at its southern range margin suggest that the species is still advancing northward, as it likely has since Pleistocene deglaciation. It most likely occurs throughout Indiana, except in Prairie counties. We reported its presence or past occurrence in 68 of Indiana's 92 counties in *101 Trees of Indiana.*

Although found on a variety of upland sites from mesic ravines to slope forests, butternut seems to thrive best in deep, fertile, moist, loamy soils bordering streams, or benches and terraces adjacent to infrequently flooded bottoms. Being intolerant of shade, apparently it is uncommon in American beech-sugar maple dominated forests.

Today, it is usually a small to medium-sized tree of 1-2 feet diameter maximum, 50-75 feet tall, and short lived at 50 to 60 years. Charles Deam, however, reported that older pioneers told him of large butternut trees in the original forest. The largest tree I have encountered was a freshly felled tree cut for logs in a forest at Kirchhayn, Wisconsin. The cut stump at 34 inches diameter revealed 120 growth rings. The tree yielded 56 feet of logs, with a crown of almost equal length.

Butternut is easily separated from black walnut by having oblong, thin-husked sticky nuts, and their compound leaves being terminated by a single leaflet, instead of two. The platy, ash-gray ridges of butternut bark and its much paler heart wood color are the source of its specific name, *Juglans cinerea* (from cinereous, meaning ashy), and also the common name white walnut, used frequently by lumbermen, many foresters, and our pioneer ancestors.

Butternut wood has qualities similar to black walnut except for being much lighter in color and also in weight (25 versus 35 lbs/ft^3). Neither species shrinks or warps after thorough drying. The easily worked, very pretty wood was favored in years past as a carving wood (decoys, bowls, etc.), for furniture, cabinets, and for fancy paneling. Early cabinetmakers believed that silver flatware would not tarnish if housed in chests of butternut wood.

Native Americans avidly sought butternuts, which they cracked on stone anvils, then boiled the nut-meats in leather vessels by adding heated stones to the water. This process extracted the abundant oils which congealed on the water surface upon cooling. The "butter" thus obtained was a prized food, trade item, and emollient, an "Oyle good especially for annoynting their heads," in the words of Roger Williams of the Rhode Island Colony.

Butternuts are a wonderful nutmeat. Speaking from experience, once you have tasted butternut fudge or cookies, none other will quite measure up. The very oily nutmeats (hence "butternuts") confer a taste never to be forgotten, but freshly harvested nuts should be used, as the oils soon become rancid and the nutmeats almost inedible unless kept frozen. A quite good flavor can be imparted to beer by butternut wood chips; likewise a good quality sugar can be made from the tree's sap, although the yield is much less than from sugar maple.

Both black walnut and butternut fruit husks produce a stain that blackens one's hands

indelibly, until it wears off. A practical use of butternut's ability to stain was a yellow or brown dye from the tree's inner bark that was used by southern mountaineers for dyeing their homespuns. During the Civil War, many backwoods Confederate troops dressed in homespun "uniforms" of butternut-dyed cloth, whereupon they became known as "Butternuts."

Both Native Americans and Colonists used an extract from butternut bark or roots for its cathartic properties. Not only was it an efficacious laxative, it was also believed to support healthy liver function, and was used for eliminating internal parasites, especially to expel intestinal worms.

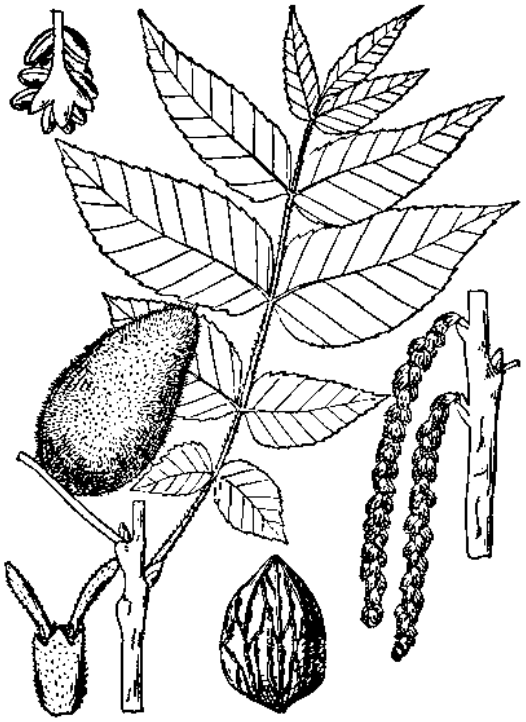
Both black walnut and butternut produce juglone, a brownish-red crystalline compound that can be extracted by leaching from both the bark and unripe fruits. Rainwater also leaches this organic naptho-quinone ($C_{10}H_60_3$) from both species, causing this selectively toxic material to build up in the soils under trees of this genus, thereby killing or stunting the growth of many herbaceous plants, especially potatoes or tomatoes.

The already widely scattered and sparse populations of butternut have undergone precipitous declines in recent years throughout most of the species' geographic range. A fungal disease, *Sirococcus clavigignenti-juglandacerum,* which causes stem cankers that eventually girdle and kill infected trees, is the major pathogen, although the tree species is also host to other fungal diseases and insect parasites. Collectively, these problems have contributed to as much as an 80% decline in living butternuts in some states.

Apparently butternut stem canker was first reported in 1967 from southwestern Wisconsin, but it has likely been around much longer, based on examinations of killed trees in the southern part of the species' range. I personally observed canker-killed trees in Versailles State Park in 1966, when I was doing forest inventories there.

The fungus initially infests trees by spores entering through buds, leaf scars, insect wounds, or other bark openings, rapidly killing young branches. The infection is soon spread down-trunk by stemflow during rains, where girdling cankers then form, thereby killing the tree. Since the pathogen is most likely an introduced species, no known canker-resistant strains of butternut have been found, although healthy trees are sometimes found growing among those diseased and dying.

Marion Jackson is author of 101 Trees of Indiana: A Field Guide, *just published by Indiana University Press.*
Reprinted from the Indiana Native Plant and Wildlife Society News, Winter 2004.



Parts of the Butternut

From Britton & Brown

Butternut tree

Butternut bark

Rare Plants on Presque Isle

Jim Bissell, a botanist with the Cleveland Museum of Natural History, has explored the sandy plains of Presque Isle State Park for decades, but in the past few years, he found a wild plant bonanza. Emerging from the palustrine sand plains were hundreds of plants that were rarely seen. One species had never been spotted before at the park; another hadn't been reported in decades.

In 2001, Bissell, who had been studying the park's plants for the Wild Resource Conservatory since the 1980s, and his colleagues found 52 new locations with rare plants at Presque Isle.

The record sightings of rare plants there were related to Lake Erie's recent near-record low water levels, which dramatically affect the park's palustrine sand plain community—one of the rarest types of plant communities in Pennsylvania.

Lake levels rise and fall, and as this happens, the texture of the sand plains behind the ridge changes too. The shallow groundwater rises and falls with the lake level changing the moisture of the sand. Ponds in the sand plain fill with water as the lake rises, then nearly dry up when the lake level is low.

While the palustrine sand plain plant community is always present, the types of plants change with the water level. When Lake Erie is low, a number of plant species that survive by their ability to "seed bank" begin to pop up in the ponds.

These plants compete poorly with other, more aggressive species, but when the pond begins to dry, seeds that have been dormant for decades burst forth. For a year or two, they rule the site until other plants move in, or the pond water rises. During that time, they will produce a new crop of seeds which will be deposited in the moist sand and will survive while those of other plants die.

"If you could somehow stabilize Lake Erie, you would destroy that system," Bissell said, "it is driven by the rise and fall of the lake."

In 2001, when the lake dropped to its lowest level in decades, Bissell and colleagues discovered the first western Pennsylvania occurrence of the long-lobed arrowhead *(Sagittaria calycina),* an endangered plant in the state, which was discovered in a small, dry inlet on Presque Isle's west side.

As the water receded, the "seed-banked" plants sprang to life, and by August, more than 1,000 long-lobed arrowhead plants covered a quarter-acre of the inlet's moist bottom.

Similarly, Smith's bulrush *(Schoemoplectus smithii),* another endangered plant, abounded in the same inlet. Unlike long-lobed arrowhead, Smith's bulrush had been seen at the inlet before, but no more than 17 plants; but this time botanists counted more than 1,000. As water levels dropped at other ponds, Smith's bulrush popped up at 10 other widely scattered sites along the peninsula.

Three years earlier, Bissell found dwarf spikerush *(Eleocharis parvula)* at a site which had been under water for 15 years. The only other place that the state-endangered plant had been seen previously was along the Delaware River near Philadelphia.

Presque Isle has been studied intensively for more than a century. Botanist Otto Jennings published the first analysis of its vegetation in 1909. Since then, there have been only a few periods when water levels have dipped as low as in recent years, which left great potential for new plant discoveries— but only a short window of opportunity to make them.

Frank Felbaum, director of the Department of Conservation and Natural Resources' Office of Wild Resource Conservation, suggested that people take a lesson from the "seed-banked" Presque Isle plants. With nearly a third of the state's native plants considered to be endangered, he said their long-term survival may hinge on development of "seed bank" technologies. Then those plants could be returned in the future when threats to their habitats, such as invasive species, pollution or other problems, had been reduced.

In the meantime, Mother Nature's own seed bank will stay in place for rare species at Presque Isle. Bissell plans to be ready the next time Lake Erie takes a dip. "I love these dry years," he said. "It's great for us."

Reprinted from *Keystone Wild Notes*, the Pennsylvania Department of Conservation and Natural Resources, Summer/Fall 2002

The First 250 Years of Natural History in North America – Part 2

George Beatty

[Introduction to Part 1, printed in *On The Fringe*, March 2006.] *In order to divide the chronology of early natural history in North American into periods – primitive and advanced, for instance – it is necessary to choose a significant event to mark a time when a whole array of new attitudes and values were emerging and coming into focus. I have chosen 1824, the publication date of the first volume of Thomas Say's* American Entomology.

Help, encouragement, and stimulation from Logan, Franklin and Collinson set John Bartram on fire as a natural history investigator. He traveled as widely and as often as his many obligations permitted, collected thousands of plants and specimens for Collinson, who sent many to Linnaeus for description, and for dozens of other people in England and Europe, and sent charming reports to Collinson who had them published in the *Philosophical Transactions* of the Royal Society. He was squeamish about insects, but Collinson stressed their importance, so he studied them extensively and the results were published in the *Philosophical Transactions.* He wrote a paper on wasp nests; another on dragon flies; one on mayflies (which he may have confused with dragonflies, or vice versa); and another on the great black wasp of Pennsylvania. There is also a paper on the teeth of rattlesnakes, an animal in which everybody was inordinately interested.

John Bartram was a man exceptionally favored by friends and circumstances. His 34 years of correspondence with Peter Collinson, published by Darlington in 1849, show that Collinson was incessantly urging him on to collect, observe, record, and ship specimens. All this brought out his great talents and made him our first native naturalist of importance. Collinson corresponded with many other Americans (he was an indefatigable letter-writer) but Bartram towers above them all. It seems strange that a modest Quaker farmer, whose name has no status in taxonomy because he never published any formal botanical descriptions, should be the pivot of early American natural history. It is incredible that Linnaeus didn't name a plant for him, while calling him the greatest natural botanist in the world. The moss, *Bartramia,* was not named by Linnaeus, but by Hedwig about 1812. The now vanishing Upland Plover was named *Tringa bartramiana* by Alexander Wilson in his *American Ornithology* in honor of his illustrious protegé. When rules of nomenclature caused this to be corrected, it was changed to *Bartramia longicauda.*

Our estimate of the importance of the two Bartrams fails to jibe with the lack of plants and animals named for them, and with the dearth of portraits. Linnaeus was so famous, both in and out of Sweden, that 515 portraits, paintings, engravings, sculpture, medallions, ceramic plaques, etc., have been catalogued in a published book. His fame and importance in Scandinavia resembles that of George Washington in this country. The one portrait of John Bartram may not be authentic, and there is only one of William, which was engraved to go with his biography by George Ord. Both Bartrams' portraits were painted by Charles Willson Peale, their close friend and a well known naturalist, as well as the leading American painter, and founder of Peak's Museum, the first real museum in America.

John Bartram, with his coat of arms and engraved bookplate, appears not without some egotism (a flaw not visible in William), a quality that should have caused him to have his portrait painted. The story in Crevecoeur's *Letters from an American Farmer* about a visit to John Bartram by a traveling Russian lacks the ring of truth when he has the Russian say "Mr. Bartram, you are such a simple, modest person; isn't it inconsistent for you to have that elegant coat of arms on the wall?" And he has Bartram reply "My father was a Frenchman and brought the coat of arms with him; I keep it as a piece of furniture." At the center of the coat of arms is a stone-mason's mallet — not a proper element in heraldry, and John's ancestors included no stonecutters. But John himself was a mason — he built three solid stone houses which are still standing in good condition, and he was proud of his ability to split off building stones from large rock-ledges, drilling rows of holes in which he drove wedges to split the stone evenly. He wrote about this technique to several correspondents, and it is appropriate that he should have an indication of this specialty in a coat of arms designed by him. The baroque elegance of the bookplate design is inconsistent with John's simplicity; perhaps he was the victim of a fast-talking bookplate salesman.

John Bartram's cousin, Humphry Marshall, had his own commercial botanic garden, or nursery, a few miles away. Marshall's portrait, like Catesby's and Kalm's, does not exist. While having nothing

comparable to Bartram's wide range of accomplishments, Marshall did write the first truly American botanical book: by an American, on an American subject, and published in America. The *Arbustum Americanum* (Philadelphia, 1785) does contain the original botanical descriptions of many species, and includes 134 tree species and 140 species of shrubs. It also includes the original description of the Franklin Tree, written by John Bartram and first published here; and the original description of our American Chestnut, now lost — not gone altogether, but for practical purposes lost.

There were intrigues among our early naturalists. William Young was a young plant enthusiast, something of a scalawag, who hung around both Bartram's and Marshall's gardens. Possibly getting wind of Marshall's forthcoming *Arbustum Americanum*, Young may have decided to scoop him, and published a rival catalogue in Paris. It didn't detract from Marshall's glory in publishing the first indigenous botanical book, because Young's book was not published in America; he wouldn't have dared publish it in Philadelphia, for he had a bad reputation there. Marshall's "glory" didn't emerge until long after his death, and only five copies of Young's book survive in witness of his failure to make a respectable contribution.

John Bartram's son William (he had other sons who were also naturalists) made as great a contribution as his father to American natural history, but of quite a different nature. Though talented in art and natural history, and a sturdy traveler, William found it hard to settle down to anything and this distressed his practical father, who discussed it in letters to Peter Collinson. In 1773, Dr. Fothergill, a close friend of Collinson and correspondent of father Bartram, subsidized William on a collecting trip to Florida, from which he was to send his sponsor drawings and paintings of plants and animals. This was a conspiracy of John Bartram, Collinson, and Fothergill to put Billy up to something worthwhile. The trip lasted for four years (during some of which William was given up for lost) and yielded numerous pictures for Fothergill's collection, but, withal, the sponsor was less than fully satisfied. Produced from this trip was William's lovely painting of the Franklin Tree, a composite with a snake-eating snake, accurate renditions of specific plants and insects, precisely identifiable today, and the Green Heron in a characteristic, lifelike pose, so different from the awkward artificial arrangements in William's early work.

Returning finally to Philadelphia in 1777, William settled down in the old garden his father (now deceased) had built and made famous, and painstakingly worked up the results of his southern trip. In 1791, after some difficulty finding a publisher, Bartram's *Travels* was published, and it at once took its place in the world's immortal literature. It made William world-famous, and many naturalists came to him for information, instruction, and inspiration. Incidentally, *Bartram's Travels* is an abbreviation of the real title: *No other book written in English is half so wonderful as "Bartram's Travels."*

Inasmuch as Bartram's *Travels* in which he often refers to Catesby's *Natural History of Carolina*, included the first scientific faunistic study of American birds (including a list specifically for Pennsylvania), it was natural that William was sought out by those with ornithological interests. He lists all the birds he knows and then indicates in the margin whether they are year-round in Pennsylvania, birds of passage, or another category. Incidentally, the Passenger Pigeon was so called because it was a bird of passage, a migrant; not because it was a passenger or carried passengers. There is a whole page of woodpeckers, with paragraph marks indicating those found year-round in Pennsylvania. He produced remarkably accurate work. Alexander Wilson, an ideological refugee from Scotland and already a published poet, left Scotland because he was in trouble for publishing a poem slandering the establishment. Rather than risk the restriction of a prison cell, he came to America to become a school teacher in Philadelphia. Becoming interested in birds, he went to William Bartram, who taught him in ornithology, drawing, and painting. A romantic engraved portrait shows him with birds he has shot to make illustrations for his transcendental book.

Wilson's *American Ornithology* (1808-1813 [when he died with it unfinished]) is the first great work on American birds, and a proper sequel to William Bartram's earlier work. Wilson's work, in its way, is every bit as monumental as *Bartram's Travels*, and, because both are the epitome of pioneer works, nothing that came later, even the marvelous work of Audubon, has comparable significance. Being an accomplished artist, and a flamboyant, romantic figure who loved to bask in public acclaim, Audubon won most of the glory that should have been Wilson's. It is often asserted that he plagiarized Wilson's work.

Wilson, like so many eighteenth century naturalists, relied heavily on Catesby's *Natural History of Carolina*, but his illustrations, while possibly inferior to William Bartram's best work (the Green Heron, for example), were much better than Catesby's, whose veracity, however, remains unchallenged. Wilson's first illustrations, which he engraved himself, were naturally less polished than those that came later, when several excellent Philadelphia engravers produced the copper plates. Wilson did much of the coloring himself, however, as indicated in notes referring to William Bartram's own copy of Wilson's book.

In *American Ornithology* the bird which was known as Wilson's snipe is now officially called the Common Snipe. The Heath Hen once inhabited Pennsylvania and was slaughtered by market hunters and sent to the large cities in barrels, much as the Passenger Pigeon was. It has been extinct for more than 50 years. The Carolina Parrot is famous mainly because it is extinct. It was numerous enough in colonial Pennsylvania to have figured greatly in the fraktur motifs of Pennsylvania Dutch folk art. Frances Lichten says here:

> *"the appearance of exotic parrots among every-day Pennsylvania German motifs seems strange until one realizes that the Carolina Paroquet, the only parrot of eastern North America, once flaunted its red and yellow head and green body in Pennsylvania fields. Farmers, enraged at their nibbling of young corn shoots, killed them in great quantities. They are no longer seen."*

The disappearance of the Passenger Pigeon is fertile subject matter for speculative folklore, and much that has been written is by no means accurate. Pictures of enormous flocks abounded in old sporting literature.

Benjamin Smith Barton (b. 1766), nephew of David Rittenhouse and trained in medicine and botany, spent a great deal of time picking William Bartram's brain to enrich his own publications. But he was an investigator, it appears, and published in 1791 his findings on the ability of the ever-popular rattlesnake to "fascinate" its prey by staring at it so as to mesmerize or paralyze the victim prior to devouring it. He concluded that this does not really happen. Barton is thought to have appropriated William Bartram's information in composing a prize-winning essay on the noxious insects of the United States.

Francois Andre Michaux (b. 1770), botanist son of Andre Michaux, an eminent French botanist, traveled widely in America with his father in the late eighteenth century. He, too, wrote an absorbing book of travels, though it was hardly in a class with Bartram's, and he spent a long time living at Bartram's Garden and conferring with William Bartram about American trees, which were his great passion. This led to the pioneer comprehensive treatise on American trees, Michaux's *North American Sylva*, (1817-1819), exquisitely illustrated by Redoute. This incomparable book was later augmented by Thomas Nuttall, another disciple of William Bartram. Nuttall (b. 1786) came from England to America as a young man and worked in Philadelphia as a printer. Becoming interested in plants, he was tutored by Benjamin Smith Barton, and later he lived and studied with William Bartram. His quarters at Bartram's Garden were remembered for many years as "Nuttall's Room." Nuttall developed into one of America's preeminent botanists and ornithologists, traveling to California over the Oregon Trail, and coming back later, in 1836, "around the Horn" on the same ship with Richard Henry Dana, author of *Two Years Before the Mast.* Nuttall later resettled in England to comply with the terms of a legacy, and did no further work in American botany.

Thomas Say, with whom we began, was William Bartram's great-nephew, and spent much time with William studying insects. William was so interested in entomology that he compiled an extensive manuscript-book on insects, now in the University of Pennsylvania Library. Though not a brain-picking opportunist like B. S. Barton, Say went on to earn the title of "father of American entomology" because his work, in contrast to Melsheimer's, was properly descriptive. His *American Entomology*, furthermore was superbly illustrated, many of the plates being by one of the talented sons of Charles Willson Peale. Say's was the most important work on American insects during the first half of the nineteenth century, and during that period, and for some time later, he described and named more new species of American insects than did anyone else. His work, though based in the pioneering tradition of William Bartram and Alexander Wilson, is a lasting monument marking the beginning of a new approach to natural history investigation and documentation.

Reprinted from *Notes of the Pennsylvania Native Plant Society*, Apr-Jun 2006
This article was adapted from a slide program by George Beatty

Erie Sand Barrens State Nature Preserve

Ohio Division of Natural Areas and Preserves

A blast of cold air roared off the sloping face of the melting glacier, raising whitecaps on the lake of frigid water at its foot. Pushed by the wind, the waves broke against the southern shore, piling sand winnowed from the melting ice against the beach.

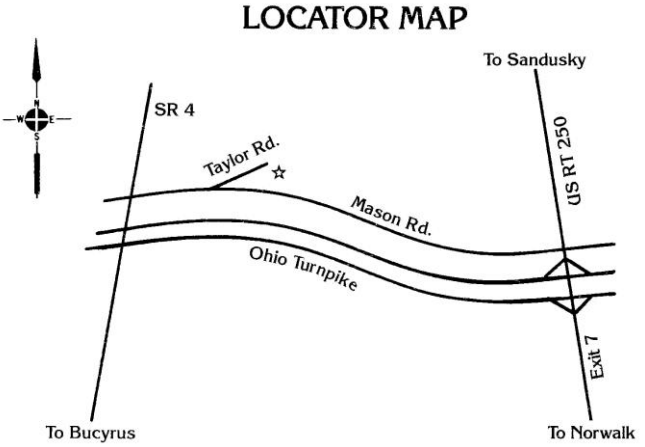
This was the view across much of northwestern Ohio during the retreat of the Wisconsinan ice sheet approximately 13,000 years ago. North-flowing drainage ponded against the great expanse of ice, rising until it reached a gap in the low walls of its basin. Through this outlet the captured waters escaped. As long as the amount of water leaving the lake roughly equaled that coming in, the lake level remained stable. During this time, waves and off-shore currents distributed sand and gravel washed from the melting glacier and the lake shore into beaches, bars, and sand spits similar to those being formed today in Lake Erie. As the glacier melted back farther to the north, lower outlets were uncovered and the lake level dropped. The old beaches and sand bars were left high and dry, and new ones formed at lower levels.

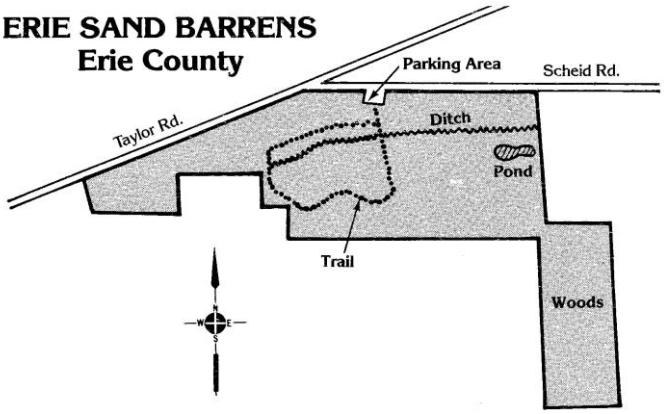
At least seven such lakes formed before the ice finally retreated from the Erie Basin, leaving behind Lake Erie and a series of abandoned beaches like concentric bathtub rings around its western end. Erie Sand Barrens State Nature Preserve occupies a small portion of the remnant beach of Lake Warren, the fifth ancestral Lake Erie.

Cool conditions at the edge of the great ice sheet and on the shores of its vast meltwater lakes supported vegetation similar to the spruce forest now found in Canada. With the retreat of the glacier and return of a milder climate, deciduous forest much like that now found across Ohio replaced most of the northern vegetation.

Then, about 4,000 years ago, Ohio entered the Xerothermic Period, a time of warmer, drier climate than at present. The forest retreated and tallgrass prairie expanded from the west into Ohio. In time, the climate cooled once again and the forest returned, shading out the prairie. Only in places where conditions made it difficult for trees to sprout and survive was the prairie able to hold its own.

Erie Sand Barrens is such a place. Early settlers found here a large area of prairie grasses and stunted oak and hickory trees. To them, such places were "barrens," third-rate land hardly fit for agriculture.





Even such barrens eventually were plowed and farmed, however, as better soils were exhausted by inefficient cultivation.

E.L. Moseley, a local botanist living at the turn of the twentieth century, studied this area which he called Oxford Prairie. He realized that many of the rarer plants found in Erie County grew on the sand ridges of the prairie. His studies played an important part in bringing attention to this interesting place.

During World War II, the United States Army purchased much of Oxford Prairie, then largely cultivated, as a site for the production of high explosives. In 1958, the National Aeronautics and Space Administration (NASA) took over the 6,000 acre tract and established Plum Brook Station, a research facility. In the early 1980's, 1,600 acres of the station's buffer zone was declared surplus. Recognizing the botanical importance of the area, the Department of Defense, with assistance of The Nature

Conservancy, transferred 32 acres to the Division of Natural Areas and Preserves as Erie Sand Barrens State Nature Preserve.

The sandy soil of the preserve is well-drained. Plants which survive here are adapted to its dry conditions. On the highest, driest ridges and knolls, prairie plants such as prairie milkweed (*Asclepias hirtella*), partridge-pea (*Chamaecrista fasciculata*) and sand panicgrass (*Panicum oligosanthes*) thrive. Wet depressions between the rises hold wet meadow communities where plants more commonly found along the Atlantic and Gulf coasts occur. These include lance-leaved violet (*Viola lanceolata*), Virginia meadow-beauty (*Rhexia virginica*), twisted yellow-eyed-grass (*Xyris torta*) and the only known Ohio population of least St. John's wort (*Hypericum gymnanthum*).

Many of the preserve's rare plant species thrive in open, wind-swept conditions such as those found on the sand barrens. The Division actively manages the preserve to ensure that such disturbed areas remain open. Removal of invading woody species, mechanical disturbance of the soil, and controlled burns all are used to maintain the preserve in a condition approximating that found by Moseley.

Erie Sand Barrens State Nature Preserve is open daily from sunrise to sunset. Regulations for its use and protection are posted and all visitors are expected to follow them.

Additional information on this and other preserves and activities of the Division can be obtained by contacting: Division of Natural Areas and Preserves 1889 Fountain Square, Bldg. F-I Columbus, OH. 43224 (614)265-6453 Visit our Web site at http://www.dnr.state.oh.us./odnr/dnap/dnap.htm/

Wipe Your Feet!

Ellen Jacquart, Indiana Chapter The Nature Conservancy

Most of you are aware of what invasive species are doing to natural areas around Indiana. Many of you are actively fighting back in various ways from pulling garlic mustard to planting only non-invasive plants in your garden.

Want to know one more very simple thing you can do to help? Wipe your feet!

Invasive plants move around in many ways—fruits that are carried away by birds, seeds that catch on animals' fur, seeds designed to be spread by wind or water. Some of our invasive plants, though, are moved primarily by—you.

Invasive plants that have small seeds—like garlic mustard, Japanese stilt grass, dame's rocket, and even purple loosestrife—can be picked up and carried in boot treads, bike or car tires, and horse hooves. It is no secret that the first places we find invasives like these are by parking lots and trail heads. From there, the invasives use unwitting visitors to move their progeny further and further into the area.

To make sure you are not spreading these species, use a stiff brush to get the dirt off your boots before hiking in a natural area. Preferably, do this brushing in an area nowhere near the natural area, but if you're going to brush your boots at the site, try to do it over a parking lot where plants have less chance of establishing. Anything that sprouts around the parking lot will be seen and removed by the natural area manager before it can spread.

To help visitors remember to brush their boots, this summer about 30 "Wipe Your Feet!" boot brush stations will be put in at trailheads on Indiana preserves owned by The Nature Conservancy, Department of Natural Resources, U.S. Forest Service, Central Indiana Land Trust, and Sycamore Land Trust. These stations, partially funded by the IPALCO (Indianapolis Power and Light Company) Golden Eagle Grant program, will feature a sign with information on invasive species in Indiana. A boot brush mounted at the base will make it easy for you to "wipe your feet" while you read.

Reprinted from the Indiana Native Plant and Wildflower Society *INPAWS Journal*, Summer 2005

Botany 101-22:
Common Plant Families

Poaceae = Grass Family = Gramineae

by *Dr.* Rebecca Dolan

620 genera and ca. 10,000 species. Found in almost every habitat with vegetation worldwide. Indiana: 75 genera and 230 species.

Characteristics

Monocots

Stems round; internodes hollow; leaves 2-ranked, alternate, parallel-veined; a ligule ("little tongue"), an appendage at the junction of the leaf blade and its sheath is usually present; bracts of glumes, lemma and paleas (see below). Annual or perennial herbs, rarely shrub or tree-like. Fruit or grain, rarely a nut or berry.

Economically important members of the family

The most important family for humans, the Poaceae provide:

- food crops: rice, wheat, corn, barley, millet, rye, oats, milo, and sugar cane
- range forage, in North American prairies: big bluestem, little bluestem, Indian grass
- shelter: bamboo, thatch
- soil conservation
- turf: Bermuda grass, bluegrasses, fescues, ryegrass
- ornamentals

Plant Products

Grains, flours, starch, ethyl alcohol, citronella, clarinet reeds.

Flower Details

Flowers in the grass family are highly modified. Grasses are wind-pollinated and do not invest energy in producing colorful petals. These are not needed and would get in the way of pollen flow. Because grasses rely on the wind to carry pollen for cross fertilization, they produce copious amounts of pollen. This is why they are hayfever triggers.

Grass flowers have basically only the reproductive parts, **stamens** to produce pollen and **stigmas** to catch it. **Styles** are short. **Ovaries** where the eggs are produced are surrounded by **lodicules,** reduced structures analogous to the petals and sepals.

These flowers are arranged in florets, a structure consisting of a flower and two bracts, the outer called the **lemma,** the inner called the palea (see figure below). Multiple florets are often linked together in **spikelets,** or inflorescences. The "stalk" linking them together is the **rachilla.** Now, if that were not enough, each spikelet is subtended by two additional bracts called the **first** and **second glume.**

Many folks never appreciated grass flowers and spikelets until the use of ornamental grasses (many non-native) in landscaping became popular a decade or so ago. We mow our lawn grass before it blooms. Grass, being forage food for large animals, was pre-adapted to be mowed, which is very much like being grazed by a herd of herbivores. Grasses have **meristems,** or growing points, at ground level, so being bitten or bladed off at three inches of height does no harm and the plant can easily regrow.

Common Grasses

In prairies:
Big bluestem *(Andropogon gerardii)*
Indian grass *(Sorghastrum nutans)*
Little bluestem *(Schizachyrium scoparium)*
Switch grass *(Panicum vlrgatum)*
In woods:
White grass *(Leersia virginica)*
Virginia wild rye *(Elymus virginicus)*

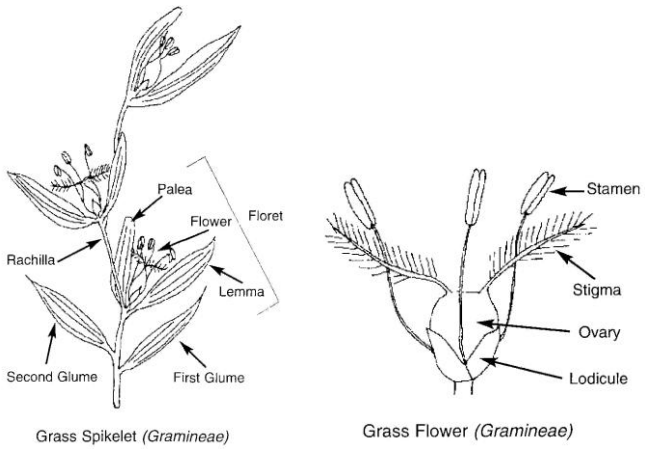


Figure from: Jones, S.B. and A.E. Luchsinger. 1979. *Plant Systematics.* McGraw-Hill, Inc. New York, NY. 388 pp.
Becky Dolan is the Director of Friesner Herbarium at Butler University.

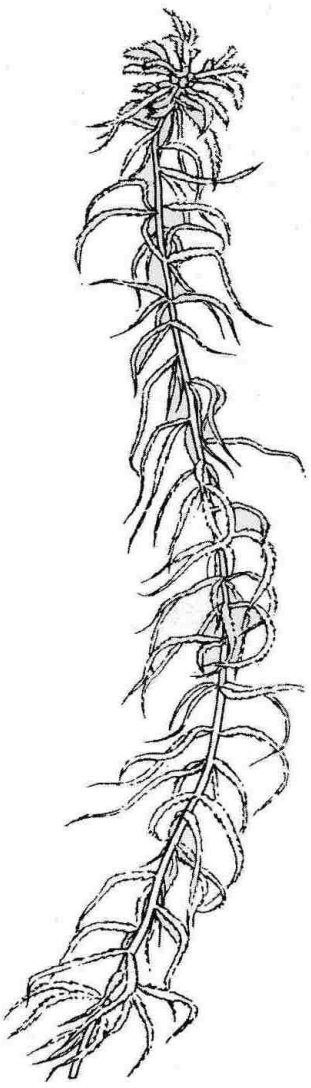
Mosses

by Joan Crowe

The word moss has been used in the past to denote anything small, green and insignificant. In modern terms mosses are defined as green plants with no water-conducting tissue or roots. This automatically limits their size. Water-conducting tissue in vascular plants not only enables them to raise water some distance above ground level but also stiffens the stems so they can grow much taller.

Mosses may be small but they are green and photosynthetic. Every moss plant absorbs carbon dioxide and contributes its mite of oxygen to the atmosphere. Soil covered in moss is much more productive than the bare soil between plants which is so beloved of conventional gardeners.

Mosses almost certainly evolved long before vascular plants, but exactly how or when is not clear because they do not fossilize well. As Darwin said, "The fossil record is like a book with most of the pages torn out." In the case of mosses, you could say that the first volume has been lost.



Sphagnum moss

The early evolution of mosses has resulted in many species being widespread throughout the world. In the northern hemisphere a large number are found on both sides of the Atlantic and a significant proportion are circumpolar or circumboreal. A few are even found in both hemispheres – survivors of continental drift.

Mosses do retain one advantage over vascular plants and that is the ability to absorb water very rapidly over their whole surface. Allow a vascular plant to wilt beyond a certain point and it will never recover. A specimen of moss preserved in an herbarium for 100 years will reconstitute itself when water is poured on it, the leaves will immediately regain their original shape. That is not to say that it would grow, but many mosses that become dehydrated in their natural habitat can survive weeks or even months without water. This enables them to exploit habitats not available to vascular plants. Rocks, tree trunks, rotting logs and bare inorganic soil all have moss species adapted to them.

The term moss is still a catch-all for plants which may not be all that closely related. In this respect the peat mosses or *Sphagnums* stand out. Their structure is quite different and their spore capsules much simpler than in most mosses. In the computer-generated tree diagrams produced by modern scientists to illustrate the evolutionary relationships between plant groups, the links between most groups of mosses and even liverworts and ferns are clear but the *Sphagnums* stand alone. They are enormously important in wetland areas where they are the dominant species, especially in the northern hemisphere where they extend far north beyond the tree line. Many of them have the ability to grow in shallow water. The active shoot grows on the decaying remains of previous generations. This is how peat is formed. This also gradually acidifies the area as the decayed remains of sphagnum accumulate. This process has been going on since the ice and postglacial lakes retreated and left huge areas of shallow water. Thus, the peat used by the horticultural industry in North America today has been accumulating for hundreds or even thousands of years.

Sphagnums in general are very easy to recognize but are divided into numerous species all occupying different habitats such as tops or

bottoms of hummocks, open pools or the swampy forest floor. Some are red-tinged, such as the robust *Sphagnum magellanicum* of open peat bogs, or they may be yellow-green like *Sphagnum girgensohnii* found in swampy forest, or green flecked with red or purplish like the fen species *Sphagnum warnstorfii.* None of them have common names!

The *Polytrichums* are another small group of mosses that are easy to recognize. They are known as hair cap mosses. The name is derived from the many hairs that felt or coat the calyptra which protects the capsule until the spores are ready for dispersal. Plants in this group have ridges called lamellae running down the leaf; these considerably increase the photosynthetic area. They are also much stiffer and more erect than the average moss.

One of the commonest of these mosses, found in a variety of exposed habitats, is *Polytrichum juniperinum,* juniper moss, with sharp-pointed leaves that have red tips. Closely related to it is *Polytrichum piliferum.* Its long silvery hairs at the leaf tips make it easy to distinguish. *Polytrichum commune* (common hair cap moss) is characteristic of wet habitats. Mosses in this group tend to be coarse and robust, the leaves rigid and erect when dry, spreading to recurved when moist. They have some primitive water-conducting tissue that accounts for their more rigid nature and enables them to grow a little taller than the average moss. Some species may form turfs several centimetres high.

That leaves all the rest of the mosses! For convenience, botanists divide these into two artificial groups. Acrocarpous mosses are erect like the *Polytrichums* but not so rigid and without the leaf lamellae. The *Dicranums,* sometimes called broom mosses, are a good example of this type of growth. They may be found on forest floors or rotting logs, and also on hummocks in wetlands.

The pincushion moss, *Leucobryum glaucum*, is another acrocarpous moss that grows on forest floors and is easy to spot. As its Latin name indicates, it is whitish-green and looks exactly like a domed pincushion with the pins sticking out. In contrast, small black cushions of species of *Grimmia* are often seen on exposed rock.

Pleurocarpous mosses are sprawling and form mats rather than turfs. One of the commonest of these is *Brachythedum salebrosum,* often found forming golden-green masses in lawns where, for some reason, the grass is reluctant to grow. One newly created soil bank in my lawn refused to grow grass for some years, so the moss moved in and stabilized it and now moss and grass are fraternizing quite happily.

Also in the pleurocarpous group are the showy feather mosses. In the boreal forest they dominate the forest floor. *Hylocomium splendens* with its layers of sprays is known as stair step moss.

Another very common forest species is *Rhytidiadelphus triquetrus,* known to foresters as electrified cat's tail! Commonest of all, however, is *Pleurozium schreberi,* easily identified by its red stems and golden-green branches. Less common, but very beautiful, with tightly curled leaves and fronds that could almost be mistaken for tiny ferns are *Ptilium crista-castrensis* and *Hypnum curvifolium.* Further south where I live in Grey County, the commonest feather moss is *Thuidium delicatulum.*

The study of mosses is challenging and really requires a microscope. Mosses are generally despised, especially by gardeners, as annoying plants that grow in places where they are not wanted. But in the natural environment mosses are extremely important. They prevent erosion, retain water, oxygenate the atmosphere and modify habitats, creating seedbeds for vascular plants. Start looking at them and you will be surprised at how many different kinds there are. You will develop a whole new perspective on the plant world.

Joan Crowe is a naturalist with a special interest in mosses and liverworts. She recommends Howard Crum's Mosses of the Great Lakes Forest *(published by University of Michigan at Ann Arbor) and Robert Ireland's* Mosses of the Maritimes *(National Museum of Canada) to anyone embarking on a serious study.*

Reprinted from *The Blazing Star*, Newsletter of the North American Native Plant Society, Fall, 2004.

The Roots Of The Prairies

Gordon Mitchell

Whenever you visit a tallgrass prairie, you are probably amazed at the great heights to which these plants, especially the grasses, can reach. You may have also wondered about its root system and have asked yourself these questions: How deep do the roots travel? How wide an area does the root's system cover?

The prairies' root systems are quite extensive in both depth and area. Some prairie species, especially the forbs, have roots that go as deep as 14 feet or more. Some species may have their entire root systems stretching up to 2-3 miles. This would include the roots, the rootlets, and the root's hairs.

Prairie plant root growth is usually adapted for reaching the maximum depth of moisture penetration. Most absorption of water and nutrients, especially nitrates, takes place at the lowest or the farthest end of the root's system.

Most of the root's biomass is located within the top 12 inches of the soil. In some prairies a single square yard of 4-inch deep prairie sod (a total volume of 3 cubic feet or of 5184 cubic inches) may have up to 20 miles of root systems. And in some prairies a single acre of prairie with 6 inches of soil depth (a total volume of 2420 cubic yards or of 21,780 cubic feet) may have up to 6,000 to 7,000 pounds of roots.

Over 50% of the prairie plant's biomass is in its root system. (In contrast, less than 10% of an oak's *(Quercus)* biomass is in its root system.)

Most prairie plants actually have two root systems: the primary (or seminal) root system and the secondary (or nodal) root system.

The primary roots develop directly from the seed shortly after seed germination, but before anything else develops. Their function is to seek out moisture for the future development of the rest of the plant. These roots are fine-textured and may have up to 3 main roots, along with their accompanying branches. Most of the rapid growth takes place the first 2 months. (Some roots may grow up to ½-inch a day.) However, primary roots are usually short-lived.

The secondary roots develop at the basal nodes (Latin: *nodus,* knot)(part of stem with leaves) of the young culms (Latin: *culmus,* stalk)(grass stems), rhizomes (Latin: *rhizoma,* root)(underground horizontal stem), stolons (Latin: *stolo,* shoot)(above ground horizontal stem), or tillers (Old English: *telgor,* shoot)(shoot from base of stem), but never from any of the internodes (Latin: *internodium,* between the knot). Unlike primary roots, these roots are tough and dense. Secondary roots are usually long-lived.

Most prairie areas are occupied by many plant species from many different families and genera. Because of this, there is much interspecific competition for the soil's water and nutrients. Therefore, the root systems of all of these different species vary greatly in their sizes and shapes in order to minimize competition amongst them.

There are actually three water and nutrient absorbing layers within the prairie's underground rooting systems. The shallow-rooted species usually absorb up to 2 feet below the ground. (Shallow-rooted species usually grow during the spring or fall, when more moisture is available.) The intermediate root species usually absorb from 2 to 5 feet below the ground, and the deep-rooted species usually absorb below 5 feet. The deeper-rooted species may have few or no absorbing roots near the soil's surface.

Attached to the roots of most of the prairie species are fungi. This close association between the roots and the fungi is termed mycorrhizae (Greek: *mykes,* fungi*; rhiza,* root), which is literally "fungus-root". Because the fungi do not have the green pigment, chlorophyll (Greek: *chloros, green; phyllon*, leaf), needed for photosynthesis (Greek: *phos*, light, *syn,* together; *tithenai*, to place or put), they must obtain their nutrients from their host plants. In return, the mycelia (Greek: *mykes,* fungi), which are composed of thread-like hyphae (Greek: *hyphe,* web), of the fungi penetrate the soil. With their increased length and surface area, the hyphae will increase the amount of nutrient and water absorption for the host plant. (Some fungus species may also protect the root from diseases.) This type of relationship is called a mutual symbiotic relationship because both the host plant and the fungi benefit from it.

Root systems of most of the members of the Bean, Legume, or Pea Family *(Fabaceae* or *Leguminosae)* have nitrogen-fixing bacteria of the Genus *Rhizobium* living within the roots' nodules, or small knots or tumors. The bacteria enter the root systems through the root hairs. The bacteria's function is to convert the atmospheric nitrogen into usable nitrogen compounds for the plant. The roots provide the bacteria with habitat and nutrients. This is another example of a mutual symbiotic relationship because both the plant and the bacteria benefit from each other.

Having such an enormous root system gives prairie plants major advantages over many non-prairie plants. The extensive root systems help anchor the plant into the soil. Prairie plants can easily survive surface stresses, such as fires, droughts, grazing and mowing, because both their roots and their growing points are underground. (However, repeated close-cropped grazing or mowing can impede root development.) Prairie roots also help bind the soil and protect it from the erosive forces of the wind and the rain. Prairie roots are able store much of their energy and nutrients, such as nitrogen and photosynthates (carbohydrates), which are needed by the rest of the plant. (In contrast, trees store most of their energy in their wood.) And finally, when the older roots do die off, the stored nutrients are then recycled back into the soil.

The dead and decaying roots form the dark-colored, organic humus of the prairie's soils. Unlike the non-prairie soils, where the humus is near the soil's surface, the humus of the prairie soils is more evenly distributed throughout the soil's vertical layers.

It is the humus that cements the soil particles into soil aggregates. These soil aggregates are subsequently broken up by the mechanical actions of the penetration of the soil by the living roots. The breaking up of the soil aggregates increases the porosity of the soil to facilitate soil air and water movements.

The soluble organic substances will decay first. Also, the younger roots usually decay faster than the older roots because they still have more nitrogen. The pentosans (carbohydrates) and the celluloses (carbohydrates) are the next organic substances to decay. Finally, the lignins (carbohydrates) are the last of the organic substances to decay. The stele (Latin: *stela;* Greek*: stele,* stalk) (central cylinder of the root) may persist longer because it contains much lignin. It is the lignin that gives the prairie soils their rich, dark color.

Because these prairie roots are tough, the early farmers experienced great difficulty in plowing the prairie soils. It was the introduction of John Deere's polished steel plow in 1837 that greatly simplified prairie soil plowing. Unfortunately, it also brought about the demise of most of North America's native prairies.

Here are some examples of some prairie root depths:

Grasses *(Graminae* or *Poaceae)*

Switchgrass *(Panicum virgatum* L.) 6-12 Feet
Big Bluestem *(Andropogon Gerardi(i)* Vitman) 5-9 Feet
Little Bluestem *(,Andropogon scoparius* Michx. or *Schizochyrium scoparium* (Michx.) Nash) 4-7 Feet
Indian Grass *(Sorghastrum nutans* (L.) Nash) 5-9 Feet
Prairie Dropseed *(Sporobolus heterolepis* Gray) 3-6 Feet
Prairie Cordgrass(*Spartina pectinata* Link) 8-13 Feet
Side-Oats Grama *(Bouteloua curtipendula* (Michx.) Torr.) 2-8 Feet
Canada Wild Rye *(Elymus canadensis* L.) 2 Feet

Asters, Daisies, Composites, or Sunflowers *(Asteraceae* or *Compositae)*

Purple Coneflower *(Echinacea purpurea* (L.) Moench) 8 Feet
Ashy Sunflower *(Helianthus mollis* Lam) 6 Feet
Cup Plant *(Silphium perfoliatum* L.) 12-14 Feet
Compass Plant *(Silphium laciniatum* L.) 12-14 Feet
Prairie Dock *(Silphium terebinthinaceum* L.) 12-14 Feet
Stiff Goldenrod *(Solidago rigida* L.) 5-16 Feet

REFERENCES

Grasslands. Lauren Brown
Manual Of The Grasses Of The United States. Albert Spear Hitchcock
The Changing Prairie: North American Grasslands. Anthony Joern And Kathleen H. Keeler
Eastern Forests. John C. Kricher And Gordon Morrison
Where The Sky Began. John Madson
Grassland: The History, Biology, Politics, And Promise Of The American Prairie. Richard Manning
Pasture And Range Plants. Phillips Petroleum Company
How To Know The Grasses. Richard W. Pohl
Prairie Frontier www.prairiefrontier.com
Sharp Brothers Seed Company www.sharpbro.com
The Prairie Garden. J. Robert Smith and Beatrice S. Smith
Vascular Plant Families. James Payne Smith Jr.
Grasslands and Tundra. Time-Life
Grasslands Of The Great Plains. John Ernest Weaver and Frederick William Albertson
North American Prairie. John Ernest Weaver
Prairie Plants And Their Environment. John Ernest Weaver

Reprinted from *The Catchfly*, Vol 16, No. 3, 2002

Understanding Seed Dormancy

by Barbara Hallett

Growing native plants from seed can be either a fascinating and rewarding experience or a frustrating experience, depending on one's success. Many native plant gardeners began as traditional gardeners and have considerable experience starting from seed. Every year, seed catalogs introduce new varieties of flower and vegetable developed by plant breeders through selection and hybridization. It is of little consequence for a plant in cultivation that seed dormancy has often been lost in the process. However, the seeds of most plants native to a temperate climate are dormant and this dormancy is necessary for the survival of the species. Consider what would happen if a seed released from a pod of common milkweed *(Asclepias syriaca)* in mid-October settled to the ground and germinated during a warm, sunny week of Indian summer. Chances are the combination of progressively shorter days and colder temperatures that follow would prevent that tiny seedling from developing an adequate root system and sufficient reserves to survive winter and reestablish in the spring. Generally, seeds that germinate at inopportune times don't survive long enough to flower and set seed, but those with an appropriate dormancy have the potential to do so.

With a little thought, one can develop an intuitive approach to dormancy-breaking that is effective for seeds of most species. If you can answer the following questions, you are off to a good start. At what time of year do the seeds mature? When are they naturally dispersed? When do they normally germinate? What are the environmental conditions between the time of dispersal and the time of germination? Let's use common milkweed as an example again. Since I know from experience that milkweed seeds collected when they are naturally dispersed in mid-October do not readily germinate, I can deduce that the several months of cold temperatures characteristic of our winter are somehow connected to breaking their dormancy. You have probably recognized this as "cold stratification," but what is not always appreciated is the simultaneous requirement for moisture. The fall rains and the melting snow in late winter and early spring keep the soil damp. Cold stratification, then, is a cold, moist incubation.

And, if these same questions are asked about bloodroot *(Sanguinaria canadensis)*, the seeds of which mature in late spring to early summer, but do not germinate until the following spring, a somewhat different picture emerges. Here, a period of "warm stratification" (a warm, moist incubation) must precede a period of cold stratification. Warning: seeds that require this dormancy-breaking strategy usually have the additional complexity of being intolerant of dry storage and are described as "recalcitrant" or "hydrophilic." Ideally, these seeds should be sown immediately after collecting, but often retain viability for up to a year of storage if kept cool and moist.

These are the basic strategies for dormancy breaking, but it is also useful to know that some seeds have impermeable seed coats, e.g. New Jersey tea (*Ceanothus americanus)*, and require "scarification," a brief roughening with fine sandpaper. Others, usually very small seeds, such as cardinal flower or *Lobelia cardinalis*, require exposure to light after they are fully imbibed (hydrated) in order to germinate; these are surface-sown so that the tiny seedlings can reach light before exhausting the reserves stored in their endosperm. Those seeds enclosed within a fleshy fruit, e.g. elderberry *(Sambucus canadensis)*, are often dormant due to the presence of chemical inhibitors within the fruit; in order to germinate these seeds, they must be cleaned from the pulp soon after collecting. Lastly, it is not at all uncommon for seeds of some species to require two or sometimes three dormancy-breaking treatments! For example, seeds from white turtlehead (*Chelone glabra)* must be surface-sown to satisfy a light requirement and then cold-stratified; seeds of eastern prickly pear *(Opuntia humifusa)* must first be separated from the gelatinous fruit which contains chemical inhibitors, followed by scarification and cold stratification of the cleaned seed.

Cold stratification is a common dormancy-breaking strategy. Here are a few helpful tips:

- Begin with a sterilized, soil-less mix as your growing medium, e.g. Pro-mix. It is light and fluffy even when moist and thus perfect for seed germination and seedling growth.
- Small batches of Pro-mix can be moistened in a dishpan by gradually adding water while stirring with a fork until the Pro-mix is moist, but not soggy. Care at this step will save time later, as you won't need to re-moisten.
- If you have sown seed in a flat, wrap it in a large plastic bag to prevent drying and store it in a fruit cellar or an unheated garage until May. It is a good idea to check the moistness occasionally. If

the seeds should dry out, re-moisten and try again. You have another chance if dormancy has not yet been broken.

- If space that is reliably cold for 6-12 weeks is not available to you, consider dedicating some shelf space or a crisper bin in your refrigerator; the steady 4-5ºC temperature is ideal for cold stratification. Medium to large seeds can be cold-stratified on moist paper toweling in a plastic sandwich bag, using a minimum of space; when it is time to germinate, transfer the seeds to containers of Pro-mix. Zip-loc freezer bags will accommodate a four-pack or two four-inch (10-centimetre) pots; this is a good choice if the seeds are very small.
- If the seeds need light to germinate and must be surface-sown, the Zip-loc freezer bag will minimize moisture loss. A good indicator of adequate moisture is the presence of condensation on the inside surface of the plastic bag. Remember that if the surface dries out, so have the seeds. If necessary, moisture can be replenished by gentle misting and/or bottom watering. Once germination is obvious, remove the bag to prevent damping off.
- Finally, the length of cold stratification for optimal germination varies with the species. In seeds with a shallow dormancy, e.g. butterfly weed *(Asclepias tuberosa)*, a six-week, cold, moist incubation is adequate. On the other hand, common milkweed has a deeper dormancy and requires a full 12-week stratification to give comparable results. Sometimes a compromise is necessary in order to get an early start on the growing season; the cold stratification period can be shortened if you are willing to accept the likelihood that a smaller percentage of seeds will complete germination.

Barbara Hallett is the past-president of the Waterloo-Wellington Wildflower Society and co-author of a paper on seed dormancy recently published in the journal Seed Science Research. *This article was originally published in* Dogtooth, *the WWWS newsletter.*

Reprinted from *The Blazing Star*, Newsletter of the North American Native Plant Society, Fall, 2004.

Doubles in the Wild

by Anna Leggatt

Where would our gardens be without double flowers? Imagine a garden without lush *Clematis*, blowsy *Paeonia*, rainbow-coloured *Dahlia* and purple, pink, blue and white fall-blooming *Aster*. Some of you may shudder, preferring the simplicity and grace of single blooms. After all, these are as Nature intended and what we find in the wild, aren't they?

Double flowers are rare in the wild. However, they do occur and many of our wildflowers have developed extra petals, producing showy plants. These appear to be spontaneous mutations. Some, or all, of the stamens have become petaloid meaning they have a structure that looks like petals. In many double flowers, the stamens have developed into petals. Often the carpels (the female parts of the flower consisting of stigma, style and ovary) turn into petals as well.

Sanguinaria canadensis forma multiplex, the double bloodroot, is one of my favourite flowers. The almost grey-white petals appear from inside a furled crenulated leaf. The flowers last for a week

Double bloodroot

or more, unlike the delicate single that is only there for a couple of days. The double lasts because it has not been pollinated. Pollination is impossible because there are no carpels. In a single plant the petals drop after pollination. Their work is done - they have attracted an insect so there is no need to waste resources maintaining petals.

The original *S. canadensis* forma multiplex was found in the wild near Dayton, Ohio, in 1916. Most of the bloodroots in cultivation are direct clonal descendants of a plant sent to Montreal Botanic Garden. (See *Cuttings from a Rock Garden* by H. Lincoln and Laura Louise Foster, Atlantic Monthly Press, 1990.) Others have appeared and are listed in Europe. There are also pink forms, both double and single, in North America.

The plants often die inexplicably every few years. Perhaps the soil is exhausted. It's possible that this happens in the wild too and we do not notice since there are so many plants. Dividing and replanting prevents it from happening in the garden.

I keep looking for *Trillium grandiflorum* 'Flore Pleno' as I walk in the spring woods. I once found an unripe berry with six fading sepals, instead of three. However, I suspect they were infected with mycoplasma organisms as I had seen green streaked flowers in that area. (Mycoplasma organisms are microscopic in size; they are the smallest known free-living life forms. They can cause bizarre flower patterns with green streaks and distortion in trilliums. They are spread by leafhoppers. Affected plants should be removed and leafhoppers controlled with a non-toxic insecticide.)

I have heard of several types of this trillium just north of Stouffville, Ontario, and I have seen pictures of some in a woodlot near Owen Sound. There are at least 12 separate plants there. Doubles found in the wild fall into two main types: one looks very like a miniature peony, the other still shows the three-fold arrangement of petals with rows one on top of the other, becoming progressively smaller. I once had a plant of the latter: it was never strong and it dwindled, eventually dying.

Double trilliums are reported frequently in the wild, while double bloodroots are very, very rare. The reverse is true in cultivation due to the ease of bloodroot propagation.

Anemonella thalktroides, the rue anemone, is a delicate small plant, often overlooked in our woodlands. It can be white to dirty white through to pink. Apparently some pinks are quite bright. The single pink plant in my garden is a pale shade. Several doubles, either with different colour or different petal sizes, have been found in the wild. Again, as there are no stamens, these flowers persist for a long time. However, sometimes an occasional petal or carpel persists so seeds are possible.

'Betty Blake' is a delicate green rue anemone, a little smaller than some of the normal wild forms. I visited Betty (for whom the mutation is named) at her home in Michigan several years ago. She had found several different forms in her woods. 'Betty Blake'' was the best. There were semi-doubles as well. These are fertile and may have multi-petaloid offspring. Several double pink forms have been discovered. 'Oscar Schoaff' ('Schoaff's Double Pink') is one of the best. It was originally found in Minnesota. Oscar Schoaff had a pink border of these plants, all of which were offspring of the original collection and are more vigorous than the common form. They make an excellent garden plant as individual blooms will last several weeks.

I have found several *Hepatica triloba* plants with multiple petals as well as stamens and carpels. These were pleasant but not spectacular.

Caltha palustris (marsh marigold) has double forms as does *Aster novae-angliae* (New England aster). I have seen asters with extra petals in meadows. However, many doubles in cultivation are, I believe, from careful selection in the garden.

I encourage you to keep your eyes open for unusual forms when looking at flowers in the wild. Rescue any that are threatened by development, making sure you obtain all the proper approvals first. Never dig plants from the wild unless they are under threat. (When collecting seeds of wild plants, take no more than 10%.) That said, the *Sanguinaria canadensis* forma multiplex grew far better in a garden and would probably have been lost if not dug from the wild.

Anna Leggatt writes and lectures on horticulture, conservation and natural history. She has a B.Sc. in Botany. Anna is a Nature Interpreter at the Kortright Centre for Conservation in Woodbridge, Ontario.
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Aquatic Nuisance Plants

Ohio's Nuisance Plant Species

Aquatic Species

Eurasian water-milfoil	*Myriophyllum spicatum*
Curly pondweed	*Potamogeton crispus*
Lesser naiad	*Najas minor*

Wetland Species

Glossy buckthorn	*Rhamnus frangula*
Purple loosestrife	*Lythrum salicaria*
Narrow-leaved cattail	*Typha angustifolia*
Hybrid cattail	*Typha Xglauca*
Reed grass	*Phragmites australis*
Reed canary grass	*Phalaris arundinacea*
Flowering-rush	*Butomus umbellatus*
Yellow flag	*Iris pseudacoras*
Hairy willow-herb	*Epilobium hirsutum*
Small-flowered hairy willow herb	*Epilobium parviflorum*

Eurasian Water-milfoil

Myriophyllum Spicatum

This submersed aquatic species has spread rapidly into ponds and lakes throughout the state. it is essentially replacing the native species of water-milfoil, as well as many other native aquatic species, The plant tends to grow in dense colonies that choke waterways and impact boating, fishing, and swimming. It is often spread from lake to lake on motorboats, This non-native species can be recognized by its whorled and deeply dissected leaves that often grow on very long stems.

Curly Pondweed and Lesser Naiad

Potamogeton crispusan and *Najas minor*

These submersed aquatic species are common in ponds and lakes throughout most of Ohio. They are especially abundant in eutrophic water where an over- abundance of nutrients, usually from fertilizer runoff or sewage waste, has altered the natural ecology, Pondweeds and naiads are easily distinguished because pondweeds have alternate leaves and ' naiads have opposite leaves, Curly pond- weed is the only non-native pondweed in Ohio, It can easily be distinguished from native pondweeds by the wavy, margins and conspicuous teeth along its leaves, Lesser naiad can be distinguished from other species of naiads by its minutely-toothed, linear leaves that are crowded toward the ends of the branches.

Glossy Buckthorn

Rhamnus frangula

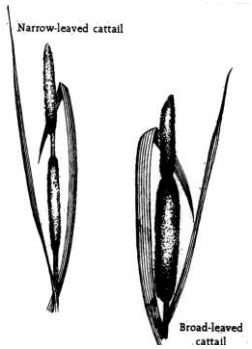
This shrub has become a serious problem in several important wetland plant communities in Ohio. In bogs, fens, and wet prairies, this invasive species can completely displace native species over large areas. Glossy buckthorn can be identified by its shiny leaves, yellow pith, abundant lenticels and red to purple berries, Birds distribute the berries widely, which has enabled the species to spread into virtually every bog and fen in northern Ohio.

Purple Loosestrife

Lythrum salicaria

Purple loosestrife produces a brilliant spike of lavender flowers making it a popular garden plant, However, this species has become a major pest in natural wetlands throughout much of the United States. In Ohio it is especially abundant in the marshes at the western end of Lake Erie, although it is also spreading rapidly throughout most of the state, The species can be easily identified by its tall and bushy growth habit, its flower spikes, and its opposite leaves and square stem.

Narrow-leaved and Hybrid Cattails



Narrow leaved cattail (*Typha angustifolia)* and its hybrid *(Typha x glauca)* with the native broad-leaved cattail *(Typha latifolia)* are aggressively-spreading plants which tend to form dense colonies that can crowd out a diversity of native emergent marsh species, Both plants can be distinguished from broad-leaved cattail by a gap of 1-4 inches that separates the male from the female flowers of the inflorescence as well as narrower leaves, Cattails spread aggressively from rhizomes and airborne seeds,

Reed Grass

Phragmites australis

Reed grass has become a tremendous problem in Lake Erie coastal marshes and other wetland habitats throughout northern Ohio, The grass forms extensive colonies with individual stalks often reaching 10-15 feet in height, The plant spreads aggressively by sending out runners on or beneath the surface that can extend 50 feet or more, The

species is easily recognized by its gigantic size, its large terminal flowering stalk, its hollow stem, as well as its broad (1.5 to 2 inch) leaves.

Reed Canary Grass

Phalaris arundinacea

This grass forms dense populations that virtually eliminate all other plants. The species has become a serious problem in several native plant communities including marshes and fens where it can comprise nearly 100 percent of all plant matter. Reed canary grass can be recognized by its long broad leaves, a dense inflorescence with a purplish hue when fresh, and a large ligule at the summit of its sheath.

Flowering-rush

Butomus umbellatus

Flowering-rush has narrow, sword-like leaves beneath multiple, long-stalked, pink flowers on a tall, naked stem, The species can spread by seeds, rhizomes, or bulblets that break off the rhizome. In recent decades, flowering-rush has spread rapidly in the western Lake Erie marshes where it is now the dominant species.

Yellow Flag

Iris pseudacoras

Yellow flag is the only wild yellow-flowered iris in Ohio. It has longer leaves and grows in larger clumps than our native irises. Although it seldom dominates areas completely, yellow flag has become widespread in emergent marshes and other wetland communities.

Hairy Willow-herbs

Epilobium hirsutum and *Epilobium parviflorum*

Both species of willow-herb are becoming common in northeastern Ohio where they invade emergent marshes and fens, These plants can be separated from the native species of willow-herbs by their densely hairy stems, The flowers of hairy willow-herb *(E. hirsutum)* are much larger than those of small-flowered hairy willow-herb *(E. parviflorum).*

You can help prevent and control the spread of these invasive plant species:

- Check and clean your watercraft thoroughly before you move from one water body to another,
- Avoid using these aquatic and wetland invasive plants on your property,
- Volunteer with your local park district or land management agency to take part in eradication efforts of these species,
- Spread the word about the threats that aquatic, nuisance species pose to Ohio's wetlands and water bodies.

Reprinted from the Ohio Department of Natural Resources Division of Natural Areas and Preserves

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Memo from Minnesota

Battle of the Buckthorn

by Carolyn Harstad

In Indianapolis, Garlic Mustard and Amur Honeysuckle are the premier alien invaders. If left unchecked they will eventually destroy pristine wildflower woods. Here in our new home in Minnesota, we fight the Battle of the Buckthorn.

In Lakeville, a southern suburb of Minneapolis, developers are required to leave a wide conservation easement behind new houses. Behind our 9-year-old home, the easement holds towering red and white oak trees, mature black cherry, shimmering poplars, and a huge old cottonwood. However, the "children" of these original denizens of the forest stand leafless and dead, victims of an unwelcome invader that now dominates the easement. Its name? Buckthorn.

Originally recommended as "a fast growing hedge or privacy barrier," Buckthorn has now escaped to the wild. Like Amur Honeysuckle, it is early to leaf out in spring and late to lose its leaves in the fall. This berry-producing exotic invasive spreads uncontrollably, quickly overtaking and crowding out native plants. Taller than Amur Honeysuckle, Buckthorn sends up multiple thin stalks. These 2-3 inch stalks grow straight and tall like bamboo, and in our woods rise as high as 15-20 feet and more.

I once photographed an immense bamboo forest in Japan. Our Buckthorn woods with the blank soil beneath remind me of that sterile landscape. Birds and wildlife are denied safe haven because of the lack of low foliage, and rain seldom penetrates the heavy canopy of leaves above. As a result, the soil beneath is dry and inhospitable – a veritable

buckthorn desert. Seedlings that dare to germinate do not survive to maturity.

Our wild conservation easement should be teeming with wildflowers, yet I found only a few brave Jack-in-the-Pulpits growing on the forest floor. Young native trees – still standing – lost their fight for survival. Was it the aggressive competition of the Buckthorn, lack of light and moisture, or does Buckthorn emit an allelopathic substance similar to the juglone of Black Walnut? Whatever the answer, this exotic invasive definitely creates a buckthorn desert wherever it is allowed to get a foothold. Yes, it provides a privacy barrier between our home and the neighbor down the hill, but at what price?

Our daughter Karen lives four doors up the street from us. She and her family moved into their newly built home eight years ago. Since that time she and Jim have been doggedly digging and weeding out every Buckthorn seedling that appears. Now, new little seedlings of sugar maple, ash, cherry, red oak, white oak and other native trees and shrubs pop up in her woods.

Wildflowers have begun to reappear. Yes, my grandchildren can find Jack-in-the-Pulpit behind their home, but now there are also patches of thalictrum, true rue anemone, wild ginger, columbine, ferns, and Dutchman's Breeches. It is a joy to see the woods heal and reclaim itself.

Heartened by Karen's success, last fall we decided to begin the Battle of the Buckthorn in our own woods.

We cut down every Buckthorn we could find in the conservation easement behind our house, leaving 4-6inch-tall stumps so we could identify them later. I knew that, if left untreated, these stumps would vigorously resprout in the spring. In an article entitled *Controlling Invasive Species* (September 2005, p.11-13) Ellen Jacquart reported that Garlon 4 penetrates into the stem, killing and thus eradicating woody plants and was the most effective chemical when using either the cut stem or basal bark treatment method. I called Ellen at The Nature Conservancy in Indianapolis, and she recommended a pre-mixed product containing Garlon 4 dubbed "Pathfinder." I ordered a gallon jug of it and liberally sprayed the chemical on each small stump. I also sprayed the bottom six inches of the trunks of several Buckthorns that we left standing as an experiment, to determine which method is more effective. Next spring we plan to dig out any stray Buckthorn seedlings, and destroy any plants that survived the Garlon 4 treatment.

In October, I planted Amelanchier, Gray Dogwood, viburnum, native hemlocks and a few other native shrubs. With constant vigilance, we may be able to reclaim our woods. But it will be a constant battle, because the wooded properties surrounding us are full of buckthorn. I wish I could just sneak over and spray the trunks of my neighbors' offending trees. Instead, my next challenge must be to convince all the property owners in our neighborhood association to join me in fighting the Battle of the Buckthorn. Stay tuned!

Carolyn Harstad, author of Got Shade? *and* Go Native!*, is a new resident of Lakeville, Minnesota.*
Contact Carolyn: pharstad@iupui.edu
To order her books, published by Indiana University Press, call 1-800-842-6796 or log on to www.indiana.edu/~iupress.

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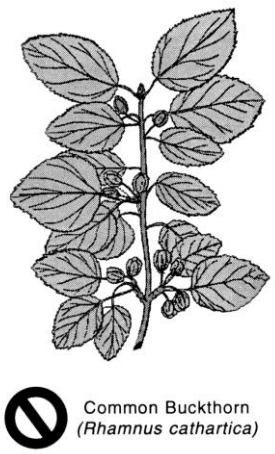
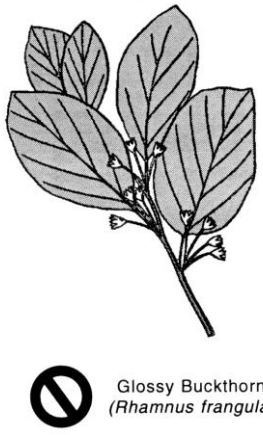
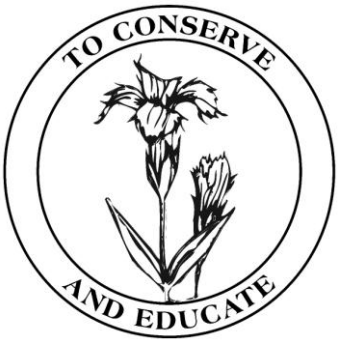

Common Buckthorn
(Rhamnus cathartica)


Lanceleaf Buckthorn
(Rhamnus lanceolata)


Glossy Buckthorn
(Rhamnus frangula)



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On The Fringe

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