On The Fringe

Journal of the Native Plant Society of Northeastern Ohio

Summer Programs

Saturday, July 28th
OLD WOMAN'S CREEK and **ERIE SAND BARRENS** with Guy Obermiller. In the morning canoe and see water lotus, egrets and herons. In the afternoon go to a closed scientific preserve to see prairie plants. Meet at Old Woman's Creek off Old Rte 2 in Huron at **9:00am**

Sunday, August 12th
FERN FORAY & PROPAGATION WORKSHOP with Judy Barnhart and Dawn Gerlica at the Donald Meyer Center, Big Creek Park, Chardon. A hands-on fern propagation workshop on raising ferns from spores. From spore collection to soil mixture and transplanting, discover the steps to successful fern propagation at home. Afterwards, explore the shaded glens and wetlands of the park in search of the wide diversity of ferns occurring there. $10 fee includes Fern Finder booklet and propagation materials. Maximum: 20 people. For reservations, call the Geauga Park District at 440-285-2222 ext. 5420. **1:00pm**

Saturday, September 8th
RAVENNA ARSENAL HIKE
Tim Morgan, RTLS Environmental Supervisor, will lead us on this special excursion into the 16,000-acre Ravenna Arsenal in Portage County. We'll visit habitats including a mature maple-beech forest, hemlock-white pine-northern hardwood forest, and remnant shrub bog where we can see round-leaf sundew. Group will meet at the main gate on SR 5 east of Ravenna and west of the Rt. 5 exit of the Ohio Turnpike and carpool to sites. Maximum 25 people. All must be US citizens. Background checks will be done for all participants as we are going on government property. Please provide address and phone number and register by August 24. for reservations: call Judy at 440-564-9151 (h) or 440-286-9504 (w). **8:00am to noon.**

Dinner with the Dinosaurs

The Annual Dinner will be held at the Cleveland Museum of Natural History on November 16. Michael Homoya's talk afterward is co-sponsored by the Museum as part of their Explorer Series. He is the author of *Orchids of Indiana* and an excellent speaker and photographer.

Tickets for both the dinner and the talk will be $15.00. If you wish to attend only the talk, tickets are available through the Natural History Museum at $8.00 each.

Final Wild Plant Weekend Reminders

NPS Society members interested in the special field trips with the Rhode Island Wild Plant Society June 22 through June 25, should make reservations as soon as possible. Reservations are REQUIRED for each field trip.

Reservations must be made by JUNE 15TH and can be guaranteed by calling Brian Gilbert (216) 486-8765. Checks to guarantee meal reservations should be received by Brian no later June 15th. Early reservations can be canceled or changed at anytime. Refunds will be provided for meal reservations only if cancellation is received on or before the June 15th deadline. For trip details see the March issue of the Journal, call Brian Gilbert or Tom Sampliner (216) 371-4454.

Wild Plants Weekend

June 22nd–24th: Please see enclosed flyer for details, or go to our web site: http://www.communities.msn.com/NativePlantSocietyofNortheastOhio/.

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 the Editor, 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

Building a Sphagnum Bog Garden

by Roberta and Fred Case

Sphagnum moss makes an ideal substrate in which to grow some of the showy and more difficult bog and swamp plants, especially carnivorous plants and certain native orchids. And sphagnum moss is attractive in itself.

Sphagnum moss requires a constant source of suitable water. Chlorinated or very limey water kills it. However, placing it in a bog next to a pond can solve the water problem. Growing it on neutral or acid sand is a suitable substrate.

LOCATION:

1. Full sun, if possible. The sphagnum doesn't need it but many of the showier bog plants do.
2. Area should not collect run off from lawn or other areas. You want only the pond water to enter the bog.
3. A long and narrow bog garden is easier to maintain than one that is too wide: 2 arm's lengths is a good width. It facilitates weeding! One arm's length if you do not like to wade and weed from the pond side.

MATERIALS:

1. Plastic or rubber liner for the bog or the pond and bog. Swimming pool liners can be used but do not last. 45 mil butyl rubber is very good. It is durable (20 years plus) and yet molds well to the sides. It is readily available from roofing companies. However, their stock may kill fish for a few months.
2. Sand. The bog needs to be only 6 to 8 inches deep. the sand fill should be 1 to 3 inches above the usual water level. Limey sand should not be used. No organic material is needed in the sand.
3. Retention wall. I use thicker 4 x 8 sheets of styrofoam. It is durable and easily cut to the right height and to make the inlet dips. Its fault is that it that it floats. I use reinforcement rods (as used in concrete) to keep it upright, and u-shaped wires into the side walls to keep it from floating up.
4. To keep sand from filtering into the pond and yet let the water seep in, place a log across the openings in the retaining wall but on the bog side of the wall.
5. Sphagnum. Most species seem to adapt. If you can collect your own, take it from deep shade where there are few other plants (weeds). Then ROLL up the green moss. This allows you to unroll it and keep all the "heads" at the same height. If the little "heads" stick up above the surrounding moss, they dry out and die. If you obtain small bits of sphagnum, then plant just the "heads" at the surface of the wet sand. They will fill in fairly quickly.

PLANTS:

Plants that do well in a sphagnum bog include:

CARNIVOROUS PLANTS:

- Sundews - *Drosera* species
- Pitcher plants - *Sarracenia* species esp. *S. purpurea*; all the southern ones are actually reasonably winter hardy.
- Venus's Flytrap - *Dionaea* has wintered 5 winters for us in USDA zone 5.

NATIVE ORCHIDS; DO NOT USE ENDANGERED SPECIES!

- White-fringed Orchid - *Platanthera blephariglottis*
- Orange-fringed Orchid - *P. ciliaris*
- Club-spur Orchid - *P. clavellata*
- Grass Pink Orchid - *Calopogon tuberosus*
- Rose *Pogonia* - *Pogonia ophioglossoides*
- Pink Lady's Slipper - *Cypripedim acaule*

NOTE: All orchids in Michigan are protected from collection without permit by state law. Those listed above, however, may be collected from private lands with written permission of the landowner. To collect ANY PLANT LEGALLY on state and federal lands requires a permit from the particular area authority. THREATENED AND ENDANGERED PLANTS MAY NOT BE COLLECTED WITHOUT A PERMIT ON MICHIGAN LANDS REGARDLESS OF WHETHER IT IS PRIVATE OR PUBLIC LAND!!!

Even if collected legally, the above plants should be collected with great restraint. One or two, if happy will multiply, and if unhappy will die. Go very easy.

Many of the above orchids are sold by southern nurseries in areas where they are far more common than here. Rose Pogonia may be propagated by root cuttings. You do not need an entire plant. If it takes, it will become a lovely weed.

OTHER BOG PLANTS WORTH GROWING:

- Wild Calla - *Calla palustris*
- Bog-Bean - *Menyanthes trifolia*
- Cotton-grass - *Eriophorum species*
- White Water-lily - *Nymphaea odorata*
- Spatterdock - *Nuphar* species

WOODY PLANTS FOR THE BOG:

- Bog Laurel - *Kalmia polifolia* (best grown from cuttings)
- Large cranberry - *Vaccinium macrocarpon*
- Labrador Tea - *Ledum* (Rhododendron) *groenlandicum*
- Andromeda - *Andromeda polifolia*

Plants that do well -- too well -- and must be controlled include: cranberries, bog laurel, bog rosemary, sedges, cotton grass, bog bean horsetails, etc.

Trees: I no longer put any in for the roots can penetrate the liners. If you do put a spruce or tamarack in, then make the bog deeper and try to contain the roots of the tree in a heavy plastic bucket.

Reprinted from The Orchid Mall Reading Room, www.orchidmall.com

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Seventh Catalog of the Vascular Plants of Ohio

Edited by Tom S. Cooperrider, Allison W. Cusick, and John T. Kartesz

June 2001, 256pp, $29.95 paper, 0-8142-5061-0; $65.00 cloth, 0-8142-0858-4

Press release by the Ohio State University Press

This is a carefully done, accurate, up-to-date catalog of the vascular flora of Ohio, an excellent contribution to the systematic botany of Ohio (as well as of eastern North America):--Jerry M. Baskin, University of Kentucky

Scientific study of Ohio's plant life began in the late eighteenth century, and the first catalog of Ohio's vascular plants was published in 1860. The most recent catalog, published in 1932, has understandably become outdated.

Now Tom S. Cooperrider and his co-authors, Barbara K. Andreas, Allison W. Cusick, Guy L Denny, John V. Freudenstein, and John J. Furlow, provide a comprehensive, modern reference covering the Ohio vascular flora. Including two thorough indexes-one to scientific names, one to common names--this user-friendly book will be invaluable for conservation and environmental workers in Ohio and surrounding states.

Tom S. Cooperrider is professor emeritus of biological sciences at Kent State University. His many publications include *The Dicotyledoneae of Ohio: Part 2, Linaceae through Campanulaceae* (Ohio State University Press). Allison W. Cusick is chief botanist of the Division of Natural Areas and Preserves of the Ohio Department of Natural Resources. He has collected more than 30,000 specimens of Ohio plants. John T. Kartesz is director of the Biota of North America Program at the University of North Carolina and the author of two volumes on the plants of North America.

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Wildflowers of Pennsylvania

Available June 2001, ***Wildflowers of Pennsylvania*** by Mary Joy Haywood, RSM, Ph.D. and Phyllis Testal Monk, M. Ed. Spiral bound, 385pp, with 618 photographs by members of the Botanical Society of Western Pennsylvania (BSWP). $20.00 plus $1.75 shipping. Please make checks payable to BSWP.

For information or to order, mail to: Dr. Mary Joy Haywood, Carlow College, 3333 Fifth Avenue, Pittsburgh, PA 15213-3165

Black Carp and Sick Cows

Donald Kennedy, Editor-in Chief, ***Science***

The tragedy befalling livestock and those who raise them in the United Kingdom and Europe is so gripping that it's hard to relate it to the story on p. 203 in this issue, which reports that a new and potentially invasive fish, black carp, is now being cultured in the southern United States. Yet the two--infectious disease epidemics in agriculture and the invasion of ecosystems by alien species-are linked phenomena. Each is driven by social and economic forces that are almost certain to generate future crises.

As humans have grown in numbers and mobility, we have become the agents of a biogeographic diaspora. The early European navigators traveled with what Alfred Crosby has called the "portmanteau biota": livestock, grain seeds, Norway rats-and pathogens such as smallpox, which devastated indigenous populations in the "neo-Europes." More recent international translocations brought the chestnut blight to North America, rabbits to Australia, and zebra mussels to the Great Lakes. The contemporary explosion of economic globalization has brought us a new and even more troubling array of problems, exemplified by the 230 species of alien marine invertebrates established in San Francisco Bay through ballast water pumped out by ships from distant ports.

It may seem odd to equate epidemics of infectious disease with the problem of invasive species. But in the complex distribution chains we humans have created, they become interdependent. Consider the following skein of circumstances. Rubber seedlings, brought in the 19th century from Brazil to Kew Gardens in England and then used to establish plantations in South Asia, came unaccompanied by the South American leaf blight fungus. Those plantations now supply most of the world's natural rubber and fuel several national economics. So if you arrive at Kuala Lumpur airport having visited South America on the same itinerary, you walk in on fungicide-soaked carpet and have your luggage irradiated. Meanwhile, the globalizing trade in radial auto tires, powered by natural rubber from Asia, brought the Asian tiger mosquito *(Aedes albopictus)* to the United States from Japan as a stowaway in used tire casings. It is well established as a nuisance in its new homeland, and because it is a competent vector for dengue fever, it worries public health officials as well.

The global economy of rubber has thus created an unusual ecosystem that includes the Amazonian rain forest, Malaysian plantations, Japanese tire factories, and New Jersey marshes. In East Africa, Tony Sinclair has described an equally complex linkage that began with the introduction of rinderpest virus in the late 1800s, probably from Asian cattle brought in to feed the Anglo-Egyptian army of the Sudan. In the Serengeti, it decimated the wildebeeste and other grazing herds, contributing to the conversion of grassland to dense acacia savanna. That provided new breeding grounds for tsetse flies, the vector responsible for nagana in cattle and, in the early 20th century, for epidemics of sleeping sickness in people. The costs have been heavy. Were a careless tourist or an agroterrorist to loose leaf blight fungal spores in Malaysia, the costs could be even heavier.

We know that international commerce and domestic economic forces were involved in the reemergence of foot-and-mouth disease in the United Kingdom - as they were, less directly, in the story of rubber above. We also know that the animals we tend and the plants we cultivate inhabit a world fall of mobile pathogens, capable of unexpected emergence; sometimes, as in the Serengeti, through invasions that led to secondary ecological changes. The Law of Unintended Consequences is alive and well here, and we have amplified it by artificial selection regimes that favor yield, often at the expense of decreased resistance. We doubt whether agencies such as the Animal and Plant Health Inspection Service in the United States have the capacity to prevent these epidemics, just as the Malaysian government may not be able to interdict every spore of the fungus it dreads. Are there policy solutions? Modest gestures have already been made, such as special laws regarding ballast pumping and used tire inspection. But there is neither a general strategy for dealing with these invaders nor a widespread awareness of our vulnerability. We have made the globe a biological Cuisinart, and we will either have to deal with the consequences or use our scientific capacity to improve forecasting and monitoring.

Donald Kennedy

Kent Bog

A LIVING RELICT

Tom S. Cooperrider-Kent Bog State Nature Preserve is a remarkable, almost timeless place. Walking through it is like stepping back 10,000 years to visit a landscape that today is more commonly found hundreds of miles north of Ohio. Eventually the bog, too, will disappear as did the glacier. Yet today and for generations to come, it will remain as a part of our living natural heritage to protect, study, and enjoy.

In glacial times, the boreal forest, including tamarack, dominated the landscape far south of northern Ohio. Today, however, Kent Bog supports the largest, southernmost stand of tamarack (*Larix laricina*) in the continental United States. There are over 3500 tamaracks in the population with many robust seedlings growing among the larger trees. Here, too, is a fine population of gray birch *(Betula populifolia*), also a tree of more northern distribution. Gray birch and tamarack are both potentially threatened species in Ohio.

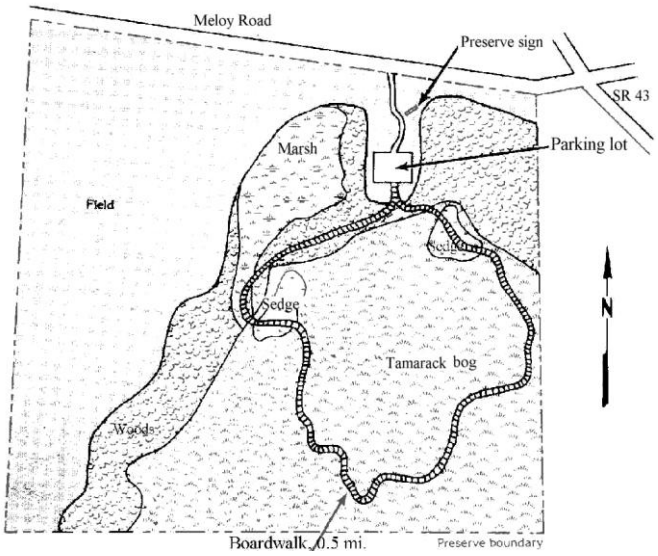
The entire basin is blanketed with a lush carpet of sphagnum moss. Ten species of sphagnum have been identified in the preserve. Dense thickets of bog shrubs are abundant here. Included are: catberry (*Nemopanthus mucronata*), highbush blueberry (*Vaccinium corymbosum*), and winterberry (*Ilex verticillata*). Scattered among the trees and shrub thickets are small openings dominated by leatherfeaf (*Chamaedaphne calyculata*). Here we find several rare species including small cranberry (*Vaccinium oxycoccos*) and few-seeded sedge (*Carex oligosperma*), both state endangered species. Other significant bog species include three-seeded sedge (*Carex trisperma*), tawny cottongrass.(*Eriophorum virginicum*), yellow bartonia (*Bartonia virginica*), and Virginia chainfern (*Woodwardia virginica*).

GEOLOGY

For thousands of years northeast Ohio lay buried beneath a thick mantle of ice. The continental ice sheet was hundreds of feet thick and covered an enormous area of eastern North America. The glacier began to melt and shrink northwards about 12,000 years ago. Braided streams of meltwater, choked with pebbles and boulders, laced their way across a nearly barren landscape. The was a chill in the air and the land was inhospitable. Yet a few hardy plant species sprang up along the streams, colonizing the freshly exposed earth. Mastodons and musk-oxen grazed upon the plants and drank from cold streams which flowed into a newly-formed lake of meltwater.

FORMATION OF THE BOG

As the glacier melted, a huge block of ice was gradually buried by silt, sands, and gravel which continued to wash



out of the retreating glacier. Eventually the ice block melted and the resulting depression filled with water. Thus, a deep kettle-hole lake about 50 acres in size was formed. The lake was surrounded by coniferous forest dominated by spruce, fir, and tamarack.

As the climate warmed, plants colonized the shoreline encroaching upon the open waters. A floating mat of sphagnum moss and other bog plants began to cover the lake. Although it would take thousands of years, this was the beginning of a natural process by which the basin eventually would fill in with peat until bog meadow replaced glacial lake. Twelve thousand summers have come and gone since the close of the Ice Age. The huge glacier has long since disappeared. Gone, too, are the Ice Age animals that roamed the shoreline of our lake. The boreal forest has been replaced by hardwood forest. Only seconds ago, in geological time, the city of Kent has sprung up just north of this site. And what has become of the glacial take? The natural process of filling with peat has finally been realized. No longer a lake, the kettle-hole has been transformed into a lovely bog meadow. Fortunately, unusual environmental conditions have enabled most of the boreal vegetation to survive.

In 1985 the Division of Natural Areas & Preserves purchased almost 42 acres of this excellent site. It is located just south of Kent and west of S.R. 43. This was the first state nature preserve to be purchased with funds donated by the citizens of Ohio through the State Income Tax Refund Checkoff Program.

VISITING THE PRESERVE

The preserve is open only by permit from the Division or by special arrangement. Naturalist-led tours are con- ducted throughout the year. Guided tours are available upon request by calling the area manager at 330/527- 5118.

Book Review

By Michael Homoya

The Illustrated Companion to Gleason and Cronquist's Manual.
Edited by Noel H. Holmgren and Collaborators, 1998. The New York Botanical Garden. 937 pp. 827 Plates. Hardcover. $125.00. ISBN 0-89327-399-6.

I have always cherished my three-volume set of *The New Britton and Brown Illustrated Flora* (Gleason, 1952). It was the sole publication that possessed illustrations of every species of vascular plant known to occur in northeastern North America, including Indiana. Unfortunately, it went out of print over a decade ago. Now I am pleased to say that the work is available again, albeit in a different format.

Bloodroot
(Sanguinaria canadensis)

The single volume companion book of illustrations (hereafter the "Companion") contains virtually every species treated in the 1991 publication of Gleason and Cronquist's *Manual of Vascular Plants of Northeastern United States and Adjacent Canada.* That manual (hereafter the "Manual") is a field book which contains, in an updated and abbreviated form, the keys and text of the previously mentioned Britton and Brown set (but no illustrations).

The Companion is 8" x 11" x 2" and weighs around six pounds, so a hiking companion it is not. But it is a handsome book, with sharp pen and ink illustrations on high-quality paper. Although most of the illustrations are the identical ones used in the Britton and Brown set, the printing in the Companion is clearly superior, making them appear as if new.

As much as there is nice to say about the Companion, in many respects its printing was an opportunity lost. The editor apparently chose to do the work in-house rather than solicit assistance from outside the New York Botanical Garden (at least there are no such acknowledgments). Perhaps that can account for the carry-over of illustrations from the Britton and Brown set that should have been redrawn.

Illustrations of running buffalo clover *(Trifolium stoloniferum),* bog bluegrass *(Poa paludigena),* Wolf's spikerush *(Eleocharis wolfii),* and Louisiana sedge *(Carex louisianica),* to name a few, have been known for years to be misleading or wrong. Solicitation of comments from various botanical specialists during the early production of the book would have made it much better.

It's not as if there was a policy of using only the original Britton and Brown artwork. Several new illustrations showing diagnostic details were added - many of which are helpful additions - although some of these leave something to be desired (the perigynium of *Carex socialis is* very odd looking). And I fail to understand why the reasonably good illustrations of some species, e.g., bloodroot *(Sanguinaria canadensis),* were completely redrawn, while others in need of improvement were not. At least five species were not included because it was stated that no specimens of them were housed in the Garden's herbarium. It is amazing that one of the most active botanical institutions in the world, exchanging with other herbaria thousands of specimens on a frequent basis, couldn't have requested loans of five specimens for this project.

But these are minor criticisms considering the Companion's overall content and value. I highly recommend the Companion (and Manual) to every person interested in taking his or her knowledge of plants beyond that offered in wildflower guides. "A picture is worth a thousand words," and there can be no denying that, in this, the Companion is unmatched.

Michael Homoya is author of Orchids of Indiana, *published by the Indiana Academy of Science in 1993, and a botanist with the Indiana Department of Natural Resources.*

Reprinted from the Indiana Native Plant and Wildflower Society News

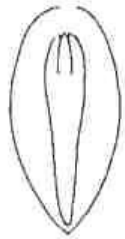
Botany 101 - third in a series

Anatomy of a Seed

by Dr. Rebecca Dolan

Dicot
Phaseolus
Bean

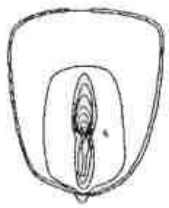
Consider the seed a life-support "pod" for a tiny plant. The "pod" is designed to carry the infant from cozy mother plant out to colonize a cold cruel world full of herbivores and extremes of environment. These "pods" have been designed by nature to ensure survival for a few weeks or months up to hundreds of years, depending on the species.



Conifer
Pinus
Pine

Let's look at a longitudinal section of a generalized seed to see how it helps the embryo survive and establish. The tiny young plant can be seen as a "y"-shaped embryo in the center of the seed. The arms of the "y" are the young stem with the first leaves, called cotyledons or seed leaves. The bottom of the "y" will develop into the root.

Surrounding the embryo is endosperm tissue that provides nutrients to the embryo while it is dormant and, more importantly, while it is germinating, but before it can photosynthesize on its own. Endosperm is often composed largely of starch, a form in which energy is stored in plants. As needed, this starch is broken down into sugar that is transported to the embryo. On the outside of the seed is an important protective layer called the seed coat. It is derived from tissue that was part of the seed mother's ovary. Some species' seed coats are thick and waterproof to protect the seed until it has landed in an appropriate habitat in which to germinate. When we scarify seeds, we mechanically wear away the seed coat to promote germination on the schedule we want.



Monocot
Zea
Corn

Many seeds also have specialized additional parts that aid in dispersal, such as hairs, wings or tasty berries that encourage animals to carry seeds away from their mothers via a ride through the animal's digestive tract (germination in some species is enhanced by this process). Also, seeds are often clustered into many-seeded fruits. There are even some species, whose fruits ripen in time for the fall migration of birds, which "advertise" their seeds by means of brightly colored foliage.

Becky Dolan is Director of the Friesner Herbarium at Butler University.

Illustrations by Jan Glimn Lacy, botanical illustrator.

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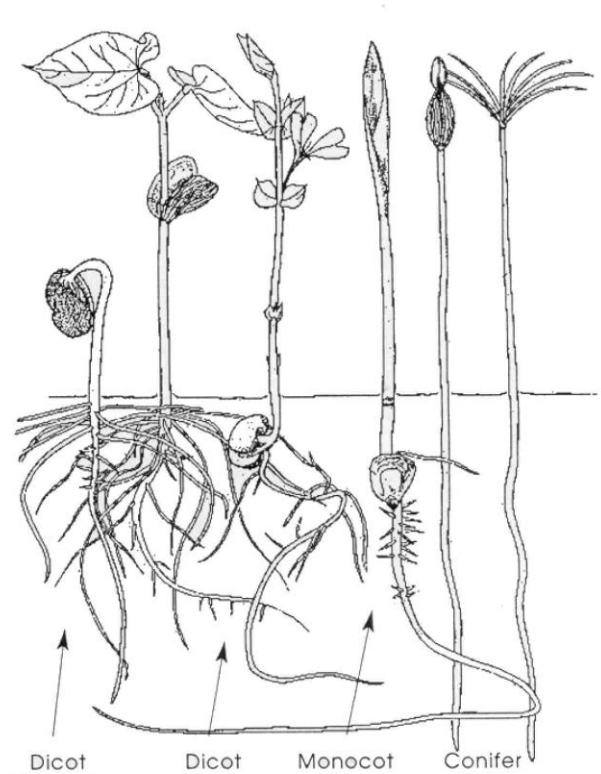


Cotyledons in different plants. Some stay below ground.

Singer Lake

Jim Bissell

Summary Of The Project

Starting in 1990, staff asked several statewide conservation groups, the State of Ohio, and the Summit County Park District to make an effort to acquire and protect Singer Lake Basin. During February 1998, the Museum asked the Huntington District Corps of Engineers to designate Singer Lake as an "in lieu" fee project and authorize the Museum to accept money from developers to purchase parcels at Singer Lake. The Huntington District Office initially told the Museum they do not do "in lieu' in their district. Museum staff then prepared a Case for Protection of Singer Lake in March 1998 and sent a copy to the Huntington District Office. The Huntington District staff examined the report and in June 1998 authorized designation of Singer lake for "in lieu" fee funds for Singer Lake. In December 1998, the full Board of Trustees approved the project and the owners of the critical 80-acre Littleton-Dodson tract agreed to sell their property to the Museum. The Museum successfully raised $320,000 from foundations, individuals, and the Corps "in lieu" fee program. The 80-acre Littleton-Dodson tract was purchased at the end of June 1999. Ten-percent interest in an adjacent 23-acre parcel was donated to the Museum at the same time the Littleton-Dodson parcel was purchased.

A fifteen-acre section of a subdivision, Deer Pines Estates, was purchased by the Museum in May 2000. Eleven lots were plotted on the 15 acres purchased and the lots were positioned on slopes above the high-quality wetlands. One failed septic tank could have permanently damaged the rare wetlands downslope from the lots. Foundations, the City of Green, and individuals contributed $552,000 to purchase the subdivision.

Bailey, Holsworth, Willowdale, and Hoffman are proposed for purchase in fiscal 2000-01 and acquisition of the remaining two parcels will be completed by June 30, 2002.

Potamogeton gramineus
Grass-leaved pondweed

Significance Of Singer Lake

Lake Singer Lake basin and its surrounding hills are comparable in significance to the Cuyahoga Wetlands bog complex southwest of Burton in Geauga County. The Nature Conservancy chose the Cuyahoga Wetlands as a campaign project in 1984 because the inventories conducted by The Cleveland Museum of Natural History during the late 1970s and early 1980s identified dozens of rare plants within the Cuyahoga Wetlands. Museum inventories conducted at Singer Lake from 1989 through 1991 documented that Singer Lake was as significant as the Cuyahoga Wetlands. The three-year Museum survey added 17 plants on the current Ohio Rare Plant List to the list compiled by previous investigations. Seven plants on the 1998-99 Ohio Rare Plant List were reported by researchers from regional universities prior to the Museum survey. During the 1998- 99 field season, Museum staff found eight additional rare plants.

Several of the rare plant discoveries at Singer Lake by the Museum had not previously been reported for Summit County. Two of the Summit County records, sharp-glumed manna grass and northern St. John's-wort, were listed as Extirpated from Ohio when they were found at Singer Lake.

Museum staff found the largest Ohio population of the State-Endangered small cranberry within Singer Lake basins. The basins have huge populations of the more common large cranberry. On their first visit to Singer Lake, Botany Department staff collected a moth, sharp-lined powder moth (*Eufidonia disropilata*), that was later identified as the first collected in Ohio. One of the food plants for the caterpillar stage of the rare moth is cranberry, The large cranberry population may also support a rare butterfly, the bog copper. No population of bog copper is known to occur in Ohio, but they may occur at Singer Lake because bog copper caterpillars feed exclusively on cranberry.

In 1999, 21 dragonflies were found in the basin, including racket-tailed emerald (*Dorocordulia libera*), last reported in Ohio in 1924 from Lake Kelso, Geauga County. On June 1, 2000, two more rare dragonflies were found at Singer Lake. The State-Endangered elfin skimmer (*Nannothemis bella*) occurs at one other site in Ohio, Cedar Bog in southwestern Ohio. The other dragonfly, the chalk-fronted corporal (*Libellia julia*), was reported for Portage County 100 years ago and is only extant at one site in Ohio, Mud Lake Bog in Williams County.

Singer Lake harbors the largest leatherleaf bog in Ohio. Thirty-one plants on the 1998-99 Ohio Rare Plant List, of the Ohio Department of Natural Resources, occur at Singer Lake and most of the rare plants are within the leatherleaf bogs. In addition to more than 50 acres of leatherleaf bog, the basin has a five-acre deep kettle lake surrounded by tamarack, cranberries and sphagnum. Other wetland communities in the basin are buttonbush shrub

swamp, blueberry/huckleberry shrub swamps, pond lily marshes and aquatic beds.

In 1998, the only extant 0hio location of grass-leaved pondweed (*Potamogeton gramineus*) was found in an aquatic bed community just south of Koons Road. The northernmost leatherleaf bog on the Littleton Tract, just south of Koons Road, is the only northern Ohio population of spotted pondweed. Other historical northern Ohio records for spotted pondweed are from bogs that have been degraded and the rare pondweed no longer grows at any of them.

Another rare community, the sand barren community, is widely scattered on the sandy glacial ridges surrounding the basins. Five of the 31 rare plants at Singer Lake grow within the dry sand barren openings. This community was once rather common in northeastern Ohio but has been nearly eliminated from the region by gravel quarry operations and development.

The main basin at Singer Lake is more than one mile in length with an average width of half a mile. Located seven miles southeast of Akron suburbs and eight miles northwest of Canton suburbs, the main Singer Lake basin is still surrounded by relatively undeveloped upland. To adequately protect the basins, 200 to 300 acres of forest-covered uplands surrounding the basins should be protected through fee simple purchase or conservation easements.

Acquisition of eleven separate parcels, Littleton, Dodson-Rose, Bailey, Lockhart, Weinsz, Willowdale, Hoffman, Stolicny, Geer, Dodson, and Holsworth, would protect all 31 rare plant species found to date within Singer Lake.

Value Of Singer Lake To The Community

Museum staff plan to provide limited public access to the rare natural area. A foot trail will be accessible from the north end of a subdivision off Mount Pleasant Road and a look-out is planned at the north end of the basin off Koons Road. The rare wetland will be made available to regional schools. School children from Canton and Akron have already participated in guided field trips to the bog.

Museum preserves raise the value of surrounding properties and contribute to the quality of life for everyone in the region. Wildlife from the mile-long basin regularly travel outside the preserve. Herons from the 69-nest rookery travel miles from the basin on a daily basis. The forest provides nesting habitat for many forest-area-dependent birds, and the wetlands support large numbers of waterfowl. The forests surrounding the bog provide flyway protection for spring and fall migratory birds.

Benefit Of Singer Lake Conservation To Tuscarawas River Water Quality And Regional Ground Water Recharge

The massive deposits of sand and gravel surrounding the Singer Lake Basin slowly release an even flow of filtered, clear, clean water into a major headwater stream of the Tuscarawas River and the regional ground water system of southern Summit County and northern Stark County. Based upon the size of the watershed at Singer Lake, the stream draining the basin should have a fairly heavy silt load; however, a lake owned by the YMCA downstream from the basin has a very low sedimentation rate due to the retention capacity of the mile-long Singer Lake Basin.

The large water-holding capacity of the peat-laden basin serves as a major feeder to the regional ground water system. Depth of saturated peats in the basin range from 20 to 40 feet. The basin's water level rises several feet during heavy precipitation and the level falls very slowly during long periods with little precipitation. The large reservoir of water in the basin enters the ground water during periods of drought. Several of the rare plants found at Singer Lake are restricted to glacial wetlands that undergo the extreme fluctuations that are normal for Singer Lake.

Value Of Proposed Preserve To Museum Education Program

The scenic wetlands and forest covered slopes surrounding the basin at Singer Lake have become a favorite field trip destination for Museum members. School groups and special field trips for teachers have traveled to the bog to study the rare wetlands. Several non-profit groups from the Akron-Canton region have made arrangements with the Museum to access the portion of the basin that has been protected by the Museum.

Jim Bissell is Curator of Botany and Coordinator of Natural Areas for the Cleveland Museum of Natural History.

Help preserve Singer Lake. Send donations to the Cleveland Museum of Natural History, 1 Wade Oval, Cleveland OH 44106. Mark your check “Singer Lake Protection Program.” If your gift is received before Dec. 31, 2001, it will be matched by the 1525 Foundation of Cleveland. The Museum plans to protect another 200 acres at a cost of over $1 million.

Hypericum boreale
Northern St. John’s-wort

The Cup Half Full

by Brian J. Armitage, Ph.D. Ohio Biological Survey

"The same cup was viewed by a group of philosophers. Some concluded that the cup was half full. The others declared that the cup was half empty."

In previous versions of this column, I have attacked the notion that the world should be viewed in "black" and "white" terms. Most field biologists know better. Our earth is an interplay among gradients and continua, some chemical, some physical, and some biological. However, in philosophy, a purely human construct based on natural rules of logic, we often find polarized issues offering minimal choices, such as the "cup" example above. When the philosophical constructs leave the theoretical realm and enter the applied realm, gradients and continua reassert themselves, if only in an abbreviated manner. Unfortunately, many feel that the polarized choices are less confusing and more comfortable, supporting how they see (or want to see) the world around them.

Garlic mustard *(Alliariapetiolata)* is a very sly plant. I first became aware of it when taking a walk with John Wilson on the Aullwood Audubon property east of Englewood, Ohio. John was volunteering for the Survey by light-trapping aquatic insects in some of Aullwood's streams and wetland areas. He pointed out the plants to me as we went to the various collection sites. Up to that time, I was ignorant of garlic mustard's existence and tenacity. It was serendipitous that a mailing from the Ohio Division of Natural Areas and Preserves on invasive, non-native plants in Ohio came just as I was formulating this column in my mind. As you'll see, I've got my own story to tell about garlic mustard.

Garlic mustard, as the name implies, is in the mustard or crucifer family and is native to Eurasia. A biennial herb, it is a small, unassuming rosette of leaves the first year and a tall, tooth-leafed plant that flowers and fruits the second year. It flowers and fruits regardless of the size of the plant and produces large quantities of seeds. The really bad news is that the seeds remain viable in the soil for seven years (or more). It outcompetes many native plants, particularly shorter forms, by shading, crowding, depleting nutrients, and persisting.

I've recently moved to some property west of State Route 315 in Columbus. It has 2.74 acres of mostly wooded landscape (but more than enough open areas for those fond of mowing grass). It also "had" some extensive patches of garlic mustard. I mean extensive. As I gloried in the greening and flowering of herbaceous (too many to count) and woody (47 different species) plants during the spring, my heart sank when the garlic mustard became apparent. What could I do? Burning was out of the question and there were too many native plants (Solomon's Seal, columbines, violets, mints, ferns, *etc.)* to use herbicides (not really a choice anyway). I tend to be an optimist (= cup half full philosophy above) for most things, so I began attacking these waves of invaders by the most effective and least impactive method: pulling. Then, when fatigue hit, I began attacking with a weed-whacker. Halfway through a rather large patch, I paused, bespattered with green spittle from the bedstraw *(Gallium aparine)* mixed in with the garlic mustard. I wondered if the plants had some way of completing their seed production even as they lay disconnected on the ground? You can be a cynic or suspicious to varying degrees (a whole continuum of cynicism awaits your choice and mood) and still be an optimist. Well then, I decided, I will have to rake the casualties and place them in a pile elsewhere. And so, I pulled and whacked and felt rather proud of myself as I made considerable progress. A week later I looked out over my first battleground and saw ferns and other plants rising majestically. And then, I cast my eyes to the property next door and saw rank upon rank of maturing garlic mustard seed pods (siliques to the cognoscenti). I don't have time to do their weeding too, I thought, I wonder how far the seeds travel? I wonder if the owners even care or would give me permission to take action? New positions upon multiple gradients of suspicion, cynicism, distrust, and helplessness were immediately assumed. Optimism retreated. Maybe the cup was half empty. Then the final blow (I thought) came two weeks ago when I noticed that the plants which I had weed-whacked had sprouted new shoots, all of which bore new flowers and fruits. A very sneaky plant. I didn't know what else to do, so I began pulling again and the more I pulled, the more optimistic I became. I might not defeat this plant this year (remember its seed viability), but I put a mighty dent in its advance. And next year I will start earlier and do a little pulling every day (the bending and stooping are good for the old solar plexus). I suppose I could have gathered some friends about me and criticized the garlic mustard's diabolical ways, expressed my cynical thoughts and fears, and sought sympathy for my plight. But, the pulling was a form of doing, and doing is always the best medicine. Only by doing can you learn how much is possible and what other opportunities exist.

Postscript: In two days I must leave for Minnesota. The fruits are maturing rapidly and the pulling never ends. My best rear guard actions came to a sudden halt when the plants moved to a new strategy. They've become allied with the thistle and poison ivy, growing in amongst the other "favored" plants. Thicker gloves, that's what I need. Don't scratch your nose. Wash your hands. It can be done.
"For the cup half full often fills and sometimes over flows, but the cup half empty never does."

Reprinted from the newsletter of the Ohio Biological Survey

INVASIVE PLANTS OF OHIO

Fact Sheet 1

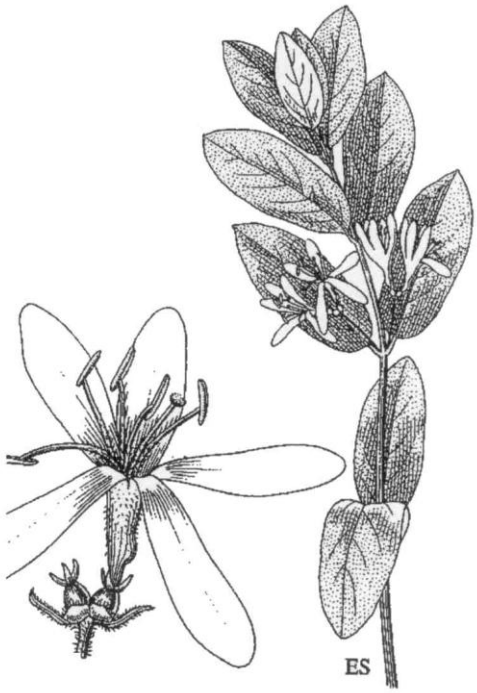
Amur, Morrow & Tatarian Honeysuckle

Lonicera maackii, L. morrowii, L. tatarica

Lonicera maackii

DESCRIPTION:

Amur, Morrow and Tatarian honeysuckles are non-native, upright, deciduous shrubs that grow to be 6-15 feet tall. The best way to distinguish these three species is by their leaves and flowers/fruits. Amur honeysuckle has dark green leaves that end in a sharp point at the tip, and the underside of the leaf has hair along the veins. Morrow and Tatarian both have oval, egg-shaped leaves. By contrast, the leaf of Tatarian honeysuckle lacks hair on the underside, while Morrow is consistently hairy on the underside. Amur and Morrow both have white, paired flowers that turn yellow with age while Tatarian is pale pink. The flower peduncles (stems) are also descriptive: Amur has very short, pubescent peduncles (2-4mm), Morrow's are long and pubescent (10- 12mm), and Tatarian's are long and glabrous (10-15mm) and all three exhibit a hollow stem in cross-section which can be used to distinguish them from some native honeysuckles. The fruits are yellow to dark-red berries. Showy pink honeysuckle *(L. xbella)* is an invasive hybrid of Morrow and Tatarian honeysuckle with showy pink flowers. Shrub bush-honeysuckle *(Diervilla lonicera)* is native to Ohio and can be distinguished from these non-native species by the solid pith of the stem and yellow to reddish flowers.



Lonicera morrowii

HABITAT:

These bush honeysuckles are adaptable to a wide range of habitats. They are most commonly found in the understory of woodlands as well as the edges of marshes.

DISTRIBUTION:

Amur, Morrow and Tatarian honeysuckles are native to China, Korea and Japan. Introduced into the United States in 1846 as ornamental plants, they have escaped cultivation due to high seed production and to the fact their seeds are readily eaten and dispersed by birds. These honeysuckles are distributed throughout Ohio with Amur being more problematic in southwestern Ohio, Morrow in northern Ohio, and Tatarian throughout the state.

PROBLEM:

These vigorous shrubs shade out native vegetation, particularly in the woodland understory. They are able to out-compete native wildflowers for light and other resources. Bush honeysuckles green up earlier in the spring than most other plants, giving them an advantage over other species. Each produces abundant amounts of seed which are spread by birds and other animals.

CONTROL:

Mechanical: The bush honeysuckles in less dense populations can be pulled, making sure that all the roots have been removed. Any remaining roots in the ground are likely to re-sprout. A pulaski, Weed Wrench, or other similar tool may be used to remove the plant from the ground.

Chemical: For more dense populations, systemic herbicides, such as Roundup®, Glypro® and Garlon 4®, are the most effective control. The best methods of application are foliar spray for large populations when there are no desirable species in the vicinity, cut stump treatment for areas with desirable non-target species, and basal bark applications which are effective throughout the year whenever the ground is not frozen. Foliar spray should only be used when the outside temperature is above 65°F to allow for complete absorption of the chemical. It should also be applied to re-sprouts after cutting. Cut stump treatment with Garlon 4® can be applied year-round as long as the ground is not frozen. Stumps should be cut low to the ground followed by the application of the chemical to the exposed stump.

Biological: There are currently no biological control methods for these honeysuckles.

ADDITIONAL INFORMATION SOURCES

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Converse, Carmen K. 1984. Element Stewardship Abstract for *Lonicera* spp., Bushy Honeysuckles. The Nature Conservancy.

May 2000

FOR MORE INFORMATION:
Ohio Division of Natural Areas and Preserves
1889 Fountain Square Dr., Bldg. F-1
Columbus, Ohio 43224
(614) 265-6453
www.dnr.state.oh.us/odnr/dnap/dnap.html

Lonicera tatarica

OHIO WETLANDS: THE PEATLANDS – Part I

(Sphagnum-dominated kettle-hole bogs)

by Barbara Andreas, Ph.D.

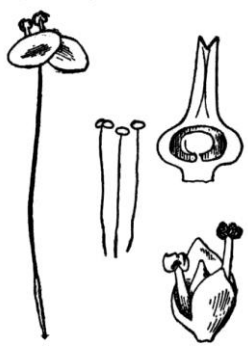
The passage of the Clean Water Act brought into focus the alarming rate of the degradation of U.S. wetlands. Organizations like Ducks Unlimited, The Nature Conservancy, Trust for Public Lands, the Division of Wildlife and the Division of Natural Areas and Preserves of the Ohio Department of Natural Resources, to mention a few, recently concentrated their efforts on the preservation of wetlands. Two problems that complicate wetland preservation are defining what constitutes a wetlands and what boundaries are necessary in order to protect the hydrology of the area. The classical definition of a wetland is provided by the U.S. Fish and Wildlife Service, Environmental Protection Agency and Army Corps of Engineers: "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetland ecologists are now concentrating on identifying the physical parameters that keep a wetland "healthy." Developing a classification system for wetlands based on vegetation type is critical so that scientists can use a common terminology when communicating, much like the need for a scientific name of an organism so that one knows more clearly to what a reference is made.

The type of plant community and the degree of vascular plant diversity occurring in a wetland is determined by 1) rate of water movement, 2) depth of water, 3) chemistry of water and surrounding substrate, 4) source of water entering the wetlands 5) the impact of run off from the surrounding upland, and 6) the amount of disturbance. Wetlands generally are open areas where tree species may be present, but the trees are usually stunted and not part of the dominant vegetation. An exception to this last criterion is swamp and floodplain forests. These are closed canopy wetlands and will not be discussed in this article.

Wetlands, in a broad sense, include the following types of communities: rivers, streams, ponds, lakes, marshes, shrub swamps, bogs, fens, swamp forests, and floodplain forests. These communities represent a continuum and it is often difficult to classify even a small geographical area as one community type. More often than not, a natural area represents an integration of two or more plant communities. Wetlands are frequent within glaciated Ohio where there is less local relief than in the unglaciated portions of the state, In addition, wetlands typically occur near a major divide (for instance, the divide between the St. Lawrence and Ohio River drainage systems that occurs across northern Ohio) where water can accumulate and form wetlands.

Rivers, streams, lakes and ponds, although not always "protected," are recognized by the presence of open water which clearly defines them as wetlands. Generally, rivers and streams do not contain a high diversity of vascular plants. Shade and a strong current deter plant growth in woodland streams. Where oxbows form and the waters are quiet, numerous plants become established. Plants typical of partially shaded to sunny streams and rivers include water willow (*Justicia americana*) and twisted sedge (*Carox torta*).

Glacial lakes and ponds and well-established artificial lakes are frequent throughout northern Ohio. These are also open water communities. Waters with a low pH, deep water and strong waves deter vascular plant growth. Conversely, shallow, quiet, neutral to alkaline waters are rich in species diversity. Typical vascular plants associated with lakes and ponds include coontail (*Ceratophyllum demersum*), Canada waterweed (*Elodea canadensis*), duckweed (*Lemna minor*), spatter-dock (*Nuphar advena*), water lily (*Nymphaea odorata*) water-milfoil (*Myriophyllum spicatum*) and a variety of pondweeds belonging to the genus Potamogeton. With the exception of a few kettle lakes surrounded by extensive peatlands, most lakes in Ohio have been greatly disturbed, primarily from changes in nutrient levels from surrounding dwellings, changes in turbidity from the introduction of carp and nutrients, and from muddy run-off from the uplands.

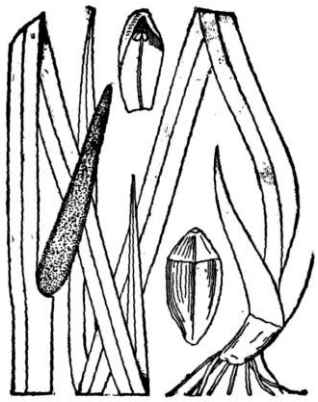


Lemna minor
Lesser pondweed

Marshes are the wettest of the closed water communities. A marsh is an open (no canopy) community with an abundance of herbaceous vegetation that is made up of grasses and. grass-like plants, including rushes, reeds, grasses, sedges, and cattails. The variety of different types of species found in a marsh is limited. Marshes tend to be dominated by a particular species, most often cattails **(***Typha sp***.).** Waters of a marsh are usually standing or slow moving. Surface water level may fluctuate, but the rooting zone remains saturated. The water in marshes is circumneutral to alkaline. Some plants

found in marshes include sweet-flag **(***Acorus calamus***),** sedges **(***Carex spp***.),** bur-reed **(***Sparganium americana***),** manna grasses **(***Glyceria spp.***),** cut rice-grass (*Leersia oryzoides)* and reed canary grass (*Phalaris arundinacea*). Ironically, few species found in marshes are restricted to this community. Soils of marshes occasionally contain decayed plant material, but also have a high mineral content and are not classified as a muck.

Shrub swamps are communities where the soil is saturated for part of the year and dry, or at least portions are dry, for the remainder of the year. Shrubs found in this community are taller than breast height, grow in clumps, and include willows, meadow-sweet, buttonbush, alder, arrow-woods, roses, and dogwoods. Low growing shrubs and herbaceous species are not common under the tall shrubs. Some of the species that do grow in this community include cinnamon fern (*Osmunda cinnamomea*), sedges (*Carex spp.*)**,** smartweeds (*Polygonum spp*.), false nettle (*Boehmeria cylindrica*)**,** swamp milkweed (*Ascelepias incarnata*), marsh marigold (*Caltha palustris*) and beggarticks (*Bidens spp***.).** Because of the distribution of the shrubs by clumps, the ground surface is undulating and tussocky. The soils tend to be circumneutral to slightly acidic and are mineral in content. Ponds and channels are common in shrub swamps, especially those dominated by buttonbush.



Acorus calamus
Sweet flag

PEATLANDS

Peatlands are characterized by soils made up of partially decayed organic matter of plant origin. This matter may be herbaceous vascular plants such as cattails, sedges, or grasses, or may be mosses, specifically members of the genus Sphagnum. Peat growth is initiated by the presence and retention of water, and peat has the ability to hold water against drainage. Peatlands are sometimes confused with marshes and shrub swamps.

The occurrence of peatlands in Ohio is somewhat predictable. First, with the exception of a few peatlands that occur in glacial alluvium at the border of Wisconsinan and Illinoian glacial boundaries, all Ohio peatlands occur in the area of Wisconsinan glaciation. Secondly, these peatlands are associated with glacial features such as kame and esker complexes (ridges of glacial drip deposited by subglacial streams or ponded deposits); outwash deposits (sand and other material deposited by glacial meltwater in front of the end moraine); and lacastrine (glacial lake) deposits. Third, approximately 9596 of the peatlands mapped to date occur on buried river valleys that were obliterated with the advance of Pleistocene glaciation: Fourth, most peatlands formed in the headwaters of drainage systems, about 2 million years ago. Fifth, Ohio's peatlands vary in elevation from 110 to 218 m above sea level. Finally, acidic peatlands generally occur in depressions, but otherwise there is no distinctive relief pattern for more alkaline peatlands.

Peatlands frequently are associated with a muck soil type (Carlise muck) or another organic soil association. However, there are numerous areas mapped which indicate an organic soil that no longer supports peatland vegetation. In addition, some peatlands are so small in area covered that the soil maps do not distinguish soil types at that level.

Alfred Dachnowski investigated the distribution of Ohio peatlands and published his results in 1912. He estimated that less than 1% of Ohio's land surface was in peat deposits at the time of the arrival of the early European settlers. I estimate that close to 75% of the areas discussed in Dachnowski are now completely gone, or have been disturbed to the point where peatland vegetation is no longer the dominant flora. Today few floristically intact peatlands remain. For that reason, taxa confined to peatlands are locally "rare", and numerous peatland taxa are on the Ohio rare plant list.

Peatlands have disappeared because of some of the following reasons:

1) Drainage. Peatlands were drained and converted to truck farms and other types of agriculture. Large areas of muck soil that are presently farmed are located around the towns of Carey, in Crawford County, and Hartville, in Stark County.

2) Recreation. Peatland depressions were flooded and cottages built along the shores. Many of these summer cottages eventually became full-time residences. The communities of Myers Lake and Congress Lake in Stark County, and Twin Lakes and Brady Lake in Portage County, are examples of this.

3) Mining. Peat has been mined in Ohio primarily for horticultural use. Today, at least four active peat mines report their tonnage extracted to the Division of Geological Survey, ODNR. Many other smaller operations exist. McCraken Cemetery Bog in Champaign County is an example of an active peat mine. In addition, numerous peatlands have been destroyed in the process of extracting sand and gravel. The disappearance of Laborador tea (*Ledum groenlandicum*), one of two locations ever known in Ohio, occurred when Way Swamp, Portage County, was mined for sand and gravel.

4) Agricultural and Sewage Run-Off. Agricultural run-off increases the nutrient load of peatlands and changes the community in such a way that non-peatland species

can now out-compete the typical peatland flora which is adapted to a nutrient-poor environment. Singer Lake and Caston Road Bog in Summit County are examples of this effect. In addition, turbidity of the open water changes with run-off due to the increase in growth of phytoplankton. Numerous sandy-bottomed glacial lakes have succumbed to this effect.

5) Canal Building. The water levels of glacial lakes were changed so that the lake could be used as feeder lakes for the Ohio canals. Buckeye Lake, Licking County, St. Mary's Lake, Auglaize County, and Summit Lake, Summit County, once had a peatland flora growing along their margins.

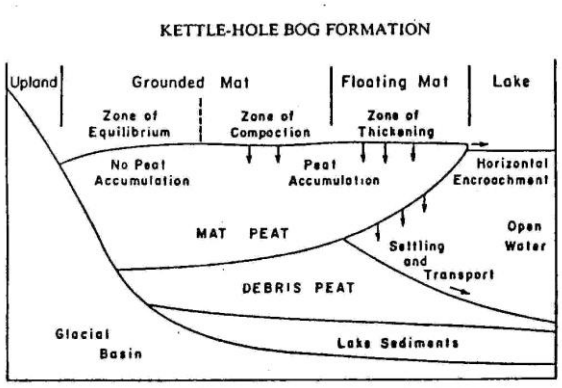
6) Road Building. When the natural drainage in a peatland is blocked, the area upstream often becomes flooded while the area downstream becomes dry. In both cases, the vegetation changes. The building of I-76 on the west side of Akron drastically altered the peatland where Norton Bog is located.

7) Power Boats. Wave action formed from the wake of power boats breaks up the peatland mat. This has been well-documented at Buckeye Lake in Licking Country. It has also occurred at Aurora Lake, near the junction of Summit, Cuyahoga, and Portage Counties.

On a broad scale, peatlands can be divided into two categories, bogs and fens. A sphagnous bog is considered to be a habitat that 1)develops in an area where drainage is blocked and there is little or no circulation water, 2) contains a sphagnum-dominated ground layer which accumulates to form a more or less continuous mat, 3) has a shrubby vegetation dominated by members of the heath family (*Ericaceae*) and a depauperate (poorly developed) herbaceous layer primarily dominated by members of the sedge family (*Cyperaceae*) and 4) has a water pH between 3.5 and 5.5.

Bog waters are brown due to an accumulation of organic material. In Ohio, plant communities with the above characteristics are referred to as sphagnum bogs, leatherleaf bogs, ericaceous shrub bogs, tamarack bogs, and more recently, ombrotrophic to weakly minerotrophic peatlands. Ombrotrophic water originates from rain and minerotrophic water is mineral-nourished from surrounding soil.

A fen is characterized by having: 1)relatively clear water coming from an artesian source which surfaces as springs or seeps, 2)a wet, springy calcareous substrate which supports minerotrophic species of mosses with little Sphagnum, 3)vegetation dominated by members of the sedge family (*Cyperaceae*), sunflower family (*Compositae*), rose family (*Rosaceae*) and grass family (*Gramineae*), with shrubby cinquefoil (*Potentilla fruticosa*) usually present, and 4)water pH between 5.5 and 8.0. In Ohio, plant communities with the above characteristics are meadow-like and are referred to as sedge meadows, wet prairies, shrubby cinquefoil bogs, 'fen' bogs, and more recently, moderately minerotrophic to strongly minerotrophic swamps.



Conceptual model of the way small peatlands form around lakes in north temperate latitudes.

Kratz and DeWitt, 1986

SPHAGNUM-DOMINATED KETTLE-HOLE BOGS

Among the rarest type of Ohio peatland is the kettle-hole bog that exhibits concentric vegetational zonation containing tamarack (*Larix laricina*). Kettle-hole bogs are basin-type wetlands that are underlaid by peat and have a Sphagnum mat, surrounding a lake in a glacial kettle-hole or similar depression. A good example of this type of community is Fern Lake Bog in Geauga County or Triangle Lake Bog in Portage County. The occurrence of kettle-hole bogs in Ohio is noteworthy because these sites are at the southernmost edge of glacially-created kettle-hole bogs in eastern North America. Overall, these communities are similar in latitude, geologic age and flora to ones found in New York and New Jersey. Based on pollen studies and radiocarbon dating, Linda Shane (1987) from the University of Minnesota estimated that some of these areas in northeastern Ohio have been ice-free, and available to vegetation growth since 15,700 B.P. (before present). Peatlands in northern lower Michigan have been subject to peatland development for about 10,000 years (Schwintzer, 1978), and those around the Red Lake peatland area in Minnesota, from about 1,950 ±65 years B.P. (Glaser, et al, 1981).

Kettle-hole bog formation at these sites appears to be similar to the model proposed by Kratz and DeWitt (1986) where the organic soil of the depression can be separated into a floating mat, which encroaches upon the open lake, and a grounded mat. The grounded mat may be divided into a zone of compaction where there is active peat accumulation, and a zone of equilibrium where there is no peat accumulation. Between the zone of equilibrium and the upland is a region referred to as the marginal moat, lagg or marginal fen. From the marginal moat to the open lake, there is a swamp thicket - tall shrub zone, a treed bog zone, a tall shrub zone, and a low shrub zone. Theoretically, it is thought that the kettle-hole will eventually be filled with organic material and eventually become solid. This may or may not happen, depending on

Lysimachia terrestris
Swamp candles

several factors. A major one is changes in water level that may open up an area that was once closed. Fires in peat deposits in kettle-hole bogs destroy accumulated peat. A fire, at least according to Dachnowski, changes the vegetation to include more species not typically found in peatlands.

The marginal moat has standing water at least part of the growing season and is primarily open with few trees. The water table tends to be lower from mid-August to early March. Hummocks form around the bases of shrubs within the moat, but Sphagnum seldom forms a continuous cover. There is some discussion as to what keeps the moat from filling in with "bog" species. The interaction of the mineral soil washing into the depression keeping it more nutrient-rich undoubtedly influences its vegetation. The width of the moat and dominant taxa vary from area to area, but species composition remains relatively constant. Some of the species found in this zone are: wild calla (*Calla palustris*), sedges (*Carex spp.*), three-way sedge (*Dulichium arudinaceum*), buttonbush (*Cephalanthus occidentalis*), winterberry (*Ilex verticillata*), rushes (*juncus spp.*), swamp candles (*Lysimachia terrestris*), and many of the tree and shrub species typically found in the grounded mat.

The swamp thicket - tall shrub area occupies the largest percentage of the vegetated surface area of the depressions. This area is dominated by the same taxa that occur within the "ring" of tamaracks (see below), especially northern highbush blueberry (*Vaccinium corymbosum*). Winterberry (*Ilex verticillata*) is frequent within this region. Many shallow-water Ohio peatlands may be vegetated completely with plants typical of the swamp thicket - tall shrub area. Trees are scattered throughout this zone, and in some cases many of the trees are dead, probably due to flooding from cyclic water table fluctuations.

A "bog forest", in the context of more northern latitudes, is not well developed in Ohio Sphagnum-dominated bogs. However, a narrow, more or less concentric zone of trees may extend from 10 to 30 m from the open lake. Within this zone, tamarack (*Larix laricina*), yellow birch (*Betula alleghaniensis*), and black gum (*Nyssa sylvatica*) are prevalent. At Fern Lake Bog, in Geauga County, the hardwood species in this region were removed by beaver. Beaver have also cut tamarack, and those remaining show signs of stress from girdling and many crowns of the remaining tamarack are depauperate. From field inventories in 1984 and 1985, tamarack seedlings appeared in only 2% of the plots sampled at Fern Lake Bog. Medve, then a graduate student at Kent State University, studied Fern Lake Bog in the late 1950s. He noted a 41% decline in *Larix* between 1939 and 1958, but he did not offer an explanation.

Black gum is frequent in the tree zone of Ohio Sphagnum-dominated bogs. It is also found as a component of the tree layer of bogs in southern Michigan, but the taxon is rare above the 44th parallel and is not found in the lush bogs of northern Michigan. John T. Curtis, in the ***Vegetation of Wisconsin*** (1959), makes no mention of black gum associated with wetlands. Black gum, apparently, is not a component of New York bogs.

Black spruce (*Picea Mariana*) is present in basin-type bogs in more northern latitudes, such as Michigan, Wisconsin and New York, but is not found in Ohio peatlands, nor elsewhere in the state. Although no historical records for this taxon are known from Ohio, Dr. Shane listed spruce in pollen profiles for northeastern Ohio.

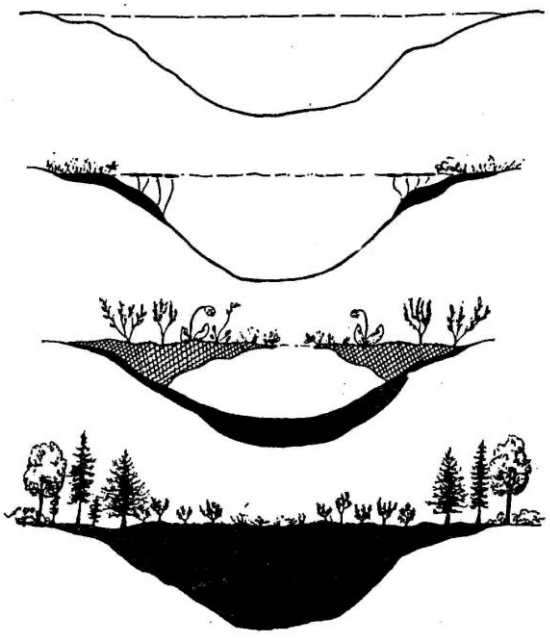
The tall shrub bog zone within the "ring" of tamaracks is dominated by northern highbush blueberry, huckleberry (*Gaylussacia baccata*), mountain-holly (*Nemopanthus mucronata*), tamarack and red maple (*Acer rubrum*). Northern highbush blueberry is most frequent in the open sun, and as tamaracks reach tree size, huckleberry and mountain-holly become prominent within the shade of the tamaracks.

The floating, unconsolidated mat in open-lake kettle-hole bogs usually range from 1 to 5 m in width. Dominant taxa in this area are swamp loosestrife (*Decodon verticillatus*) and leatherleaf (*Chamaedaphne calyculata*). These species act as purchases, or forerunner taxon, which arch out into the open water. Leatherleaf is found in the low shrub zone in peatlands throughout glaciated Eastern North America. In addition, there are several kettle-hole bogs in Ohio that are almost homogenous stands of leatherleaf (Barnacle Bog in Portage County is an example). Bog rosemary (*Andromeda glaucophylla*) and bog laurel (*Kalmia polifolia*),

Nemopanthus mucronata
Mountain-holly

typically present in northern bogs, are absent from bogs and the modern Ohio flora; bog rosemary is known from historical Ohio records, but bog laurel has never been documented from the state.

At the interface between the floating mat and the grounded mat is the area where most herbaceous species typically associated with bog mats are found. Few areas in Ohio Sphagnum-dominated kettle-hole bogs contain large areas of open Sphagnum mat. Taxa in the open mat include cranberries (*Vaccinium macrocarpon*) round-leaved sundew (*Drosera rotundifolia*), marsh St. John's wort (*Hypericum virginicum*) white beak rush (*Rhynchospora alba*), pitcher plant (*Sarracenia purpurea*), wild calla and sedges. Virginia chain fern (*Woodwardia virginica*) is common in this region and is frequent throughout the entire depression to the marginal moat.



The development of a typical kettlehole bog through lakefill (Johnson, 1985).

Unlike bog formation in more northern latitudes, sedges play little to no role in the formation of the floating mat in Ohio peatlands. Here that role is performed by swamp loosestrife and/or leatherleaf. Howard Crum (1988) considered sedges to be more important in mat formation in alkaline lakes than in acidic lakes, although some lakes in Northern Michigan and Wisconsin, with a range of pH close to those of Ohio lakes, have sedges as the invading species. Another distinction between Ohio bogs and those of more northern latitudes is that Ohio bogs typically do form a hummock-hollow topography. This is primarily due to climatic conditions that promote evaporation-transpiration so that, in Ohio, Sphagnum hummocks dry out as they rise above the water level. Ohio has no truly raised Sphagnum bogs. Here the mat is a more or less flat lawn, dominated by *Sphagnum recurvum*. In the floating mat (from 1 to 5 meters from the open water), Sphagnum becomes established around the bases of swamp loosestrife and leatherleaf, and the moss layer reaches its best development in the shaded grounded mat under tall shrubs and under trees. We are often led to believe that the Sphagnum mat exists right out to the open water, but that is not the case. Other species of Sphagnum are present, including *Sphagnum magellanicum, Sphagnum capillifolium and Sphagnum fimbriatum.* Other moss genera present in the mat include *Aulacomnium, Dicranum, Leucobryum* and *Polytrichum*.

WATER CHEMISTRY

Factors affecting water chemistry of a wetland include: 1) the chemical composition of rain, 2) the bedrock geology of the catchment, especially for all surface and subsurface water movement, 3) the topography of the catchment and its drainage systems, 4) the climate of the region as it affects physical weathering, and 5) biotic components such as aquatic and terrestrial plants and their rate of decomposition (Moore and Bellamy, 1974).

Based on pH, conductivity, calcium and magnesium ions, there exists a continuum within peatlands. It is possible to separate peatlands into five broad categories, based on the four characteristics listed above. In ombrotrophic peatlands, nutrients and water primarily are brought into the system through rain, and values for the above characteristics are at the low end of the continuum. An ombrotrophic bog is often described as a "domed" bog or "raised" bog since the peat is elevated above contact with ground water. Semi-ombrotrophic bogs have low values for the characteristics mentioned above and have low species numbers, but water entering the system includes ground water and run-off. In weakly, moderately, and strongly minerotrophic peatlands, nutrients and water enter the system primarily through ground water and run-off, and values for the above parameters range to the high end of the continuum. Ombrotrophic, semi-ombrotrophic, and weakly minerotrophic peatlands are often called "bogs," whereas moderately to strongly minerotrophic peatlands are called "fens." Using this system, Triangle Lake Bog is semi-ombrotrophic; Fern Lake Bog and Browns Lake Bog (Wayne County), weakly minerotrophic; and Jackson Fen (Stark County), Cedar Bog (Champaign County), and Prairie Road Fen (Clark County), strongly minerotrophic.

Sphagnum-dominated kettle-hole bogs are low in species numbers. Less than forty taxa occur within the ring of tamaracks at Triangle Lake Bog, and less than 60 taxa occur within the ring at Fern Lake Bog. When one eliminates the "flashy" species, such as pitcher plants and sundews, there are actually few taxa common to both ombrotrophic and minerotrophic communities.

Dr. Barbara Andreas, a charter member of Native Plant Society, is Professor of Biology at Cuyahoga Community College, adjunct Professor at Kent State University, and received the National Stewardship Cup for her work with the Native Conservancy.

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Wildflower Magazine

North America's Magazine of Wild Flora, is published in Ontario, but is devoted to the flora of all North America. It is issued four times a year by editor James L. Hodgins, who is well-known for his erudition in the field of botany. Subscriptions are $35 (US funds) and may be sent to: Subscriptions - Wildflower, Box 335, Postal Station F, Toronto, Ontario Canada M4Y 2L7. No credit cards accepted.
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Books

Three old favorites to feed the mind and comfort the soul on your summer travels. If you haven't got them already, try your library, your local, independent, out-of-print bookseller, or the internet at *www.bookfinder.com*.

A Natural History of Trees. Donald Culross Peattie (1948). A survey of the trees of eastern North America presented in Peattie's wonderful essays.

Deciduous Forests of Eastern North America. E. Lucy Braun (1950). An in-depth study of the forests and forest types.

This Green World. Rutherford Platt (1942). A collection of essays on plants, written with passion and wonder.

Wildflower Seed Sources

1. 2000 Seed & Book Catalogue, please send $2.50 to
   Seeds, New England Wild Flower Society,
   Garden in the Woods,
   180 Hemenway Road,
   Framingham, MA 01701

2. American Fern Society (Fern Spores)
   Cindy Johnson-Groh
   Dept. of Biology
   Gustavus Adophus College
   800 W. College Ave
   St. Peter, MN 56082-1498
   E-mail: CJGROH@GAC.EDU

3. Oak Park Landscape & Water Garden (Plants and Seeds)
   (Tim Walters)
   3131 Wilkins Road
   Swanton, OH 43559
   419-825-1438

4. Richters (Plants and Seeds)
   The Herb Specialists
   Goodwood, Ontario, L0C 1A0 Canada
   www.richters.com
   E-mail: admin@richters.Com
   1.905.640.6677

5. Toadshade Wildflower Farm
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   Frenchtown, NJ 08825
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Web Sites of Interest

The New England Wildflower Society has **a list of botanical clubs and native plant societi**es of the United States and Canada, with web links wherever possible.
http://www.newfs.org/nps.htm

Barry Glick's Sunfarm has an extensive site with photos, information, and a listing of 10,000 plants hardy to zone 5, including perennials, bulbs, trees, and shrubs offered for sale. Not confined to native plants.
http://www.sunfarm.com

The Orchid Mall has a wonderful reading room, with links to relevant articles at many other web sites.
http://www.orchidmall.com

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Sanctuary Forest: Luna Lives!

Luna, an ancient redwood tree known internationally following Julia Butterfly Hill's historic two-year tree-sit protest against unsustainable logging, was victimized by a cruel chainsaw attack sometime around last Thanksgiving. An unknown number of attackers cut nearly 60 percent of the way through the majestic tree. Sanctuary Forest sprang into action in its role as the designated trustee of the Luna Covenant that concluded Julia Butterfly's tree-sit and saved Luna from a timber harvest plan.

The Luna stabilization effort had two phases: diagnosing the damage to Luna and installing a series of braces on her trunk and then engineering and installing cables to anchor Luna to the ground.

Luna has withstood the ravages of wind, fire, earthquake, and electrical storms for the better part of a millennium. Although the stabilizing systems that her human friends have installed never could equal the strength of her own holding wood, the prognosis is good. With the help of the metal sutures and cables, Luna has withstood several significant storms this season. As long as Luna remains standing, there is sufficient biological functioning in the surviving connection between root and branch to sustain a substantial live crown. However, significant dieback in the crown is likely because the chainsaw cut was so severe.

The successful Luna stabilization effort, like the tree-sit, was overwhelmingly volunteer-powered. The organizations and individuals that contributed are too numerous to list here, but it is through their spirit that Luna lives!

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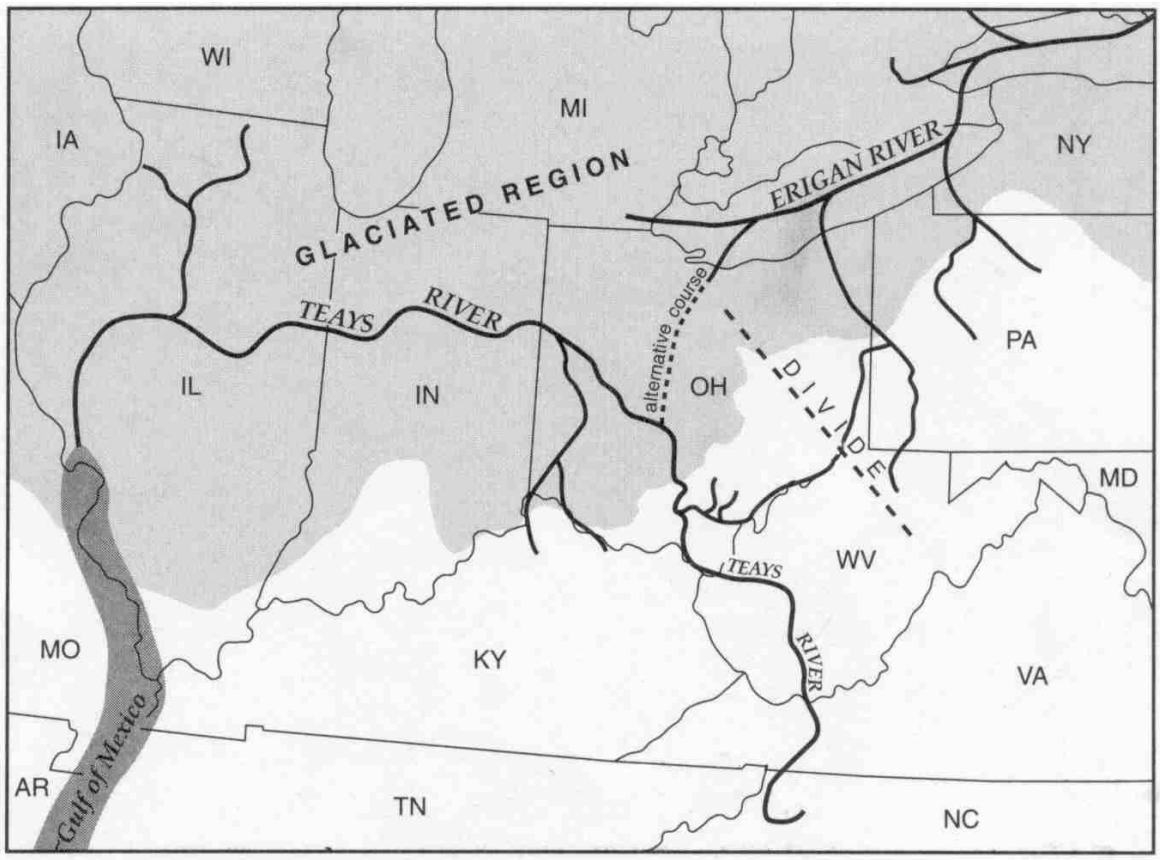
THE TEAYS RIVER

Michael C. Hansen
The Division of Geological Survey GeoFacts Series, November 1995



The Teays River was an ancient stream, comparable in size to the modern Ohio River, that once drained much of the east-central U.S., including nearly two-thirds of Ohio. It was destroyed by the glaciers of the Pleistocene Ice Age about 2 million years ago. Remnants of the valley of the Teays River are preserved as flat bottomed valleys in hilly, unglaciated southern Ohio and as deep valleys now filled with sediment in the glaciated portion of the state.

The Teays River system originated long before 2 million years ago, in the Tertiary Period, and had its headwaters in western North Carolina near Blowing Rock. It flowed northward across Virginia and West Virginia, where its course is marked by the valleys of the modern New River (a misnomer, as it is actually very old) and the Kanawha River. From St. Albans, West Virginia, the Teays flowed west ward to Wheelersburg, Scioto County, Ohio, and then northward to Chillicothe, Ross County. This valley segment is dramatically visible on satellite imagery.

Chillicothe marks the southward limit of glaciation in central Ohio, and the valley of the Teays disappears beneath glacial sediments (drift) at this point. However, by means of water wells and other data, the buried Teays valley has been traced beneath the glacial drift northwestward across Pickaway, Fayette, Madison, Clark, Champaign, Shelby, Auglaize, and Mercer Counties to the Ohio-Indiana border. At the Ohio-Indiana border the valley of the Teays appears to be continuous with a buried valley that has been traced westward across Indiana and Illinois, where it emptied into an embayment of the ocean, now occupied by the Mississippi River. In Ohio, this buried valley is up to 2 miles wide and in some areas lies beneath more than 500 feet of glacial drift.

The End Of The Teays And Creation Of The Ohio River

The earliest of three or more major glacial advances destroyed the Teays River system in western Ohio. The edge of the glacier created a massive dam that blocked the northward-flowing Teays and created a major lake in southern Ohio. The lake waters rose to an elevation of nearly 900 feet, creating an intricate pattern of long finger lakes in tributary valleys. Numerous ridge tops poked above the waters as islands.

This lake is estimated to have covered an area of nearly 7,000 square miles (modern Lake Erie has an area of 9,910 square miles) in southern Ohio and parts of West Virginia and Kentucky. It is named Lake Tight in honor of the pioneering study of the Teays system by Denison University professor William George Tight (1865-1910). Lake Tight is estimated to have existed for more than 6,500 years as interpreted from seasonal layers in the sediment deposited on the lake bottom. This lake clay is known as the Minford clay, named for a Scioto County community. It is mined in some areas as a raw material for making brick and other ceramic products. Eventually the waters of Lake Tight rose to an elevation sufficient to breach drainage divides and create new drainage channels, which in some cases were opposite in direction to the original Teays drainage. These new drainage channels cut below the elevation of the Teays, forming a new drainage system known as Deep Stage. This event marked the beginning of the modern Ohio River drainage system, although it would require many further modifications from later glaciations to finally shape the present course of the modern Ohio River. In recent years there has been debate among geologists as to the course of the Teays across the glaciated portion of Ohio. Some suggest that the deep buried valley in western Ohio that is interpreted to be the valley of the Teays was formed by a meltwater stream flowing along the ice front of an early glacier. These geologists prefer the explanation that the actual course of the preglacial Teays River was northward through the central part of the state, where it connected with a now vanished ancestral system, known to geologists as the Erigan River, in what is now the Lake Erie basin.

This question of the course of the Teays is not easily answered because the valleys of the Teays and other drainage systems were greatly modified by the erosive action of several Pleistocene glaciers. These valleys either have been destroyed or are now deeply buried beneath thick glacial deposits. Part of the answer may be determined from maps of the bedrock surface beneath the glacial drift, which show the course of preglacial valleys. Such maps, known as bedrock-topography maps, depict the configuration of the bedrock surface as if all overlying unconsolidated sediment had been removed. Bedrock-topography maps for many Ohio counties and 7.5-minute quadrangles are available from the Division of Geological Survey.

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The Division of Geological Survey GeoFacts Series is available at http://www.dnr.state.oh.us/odnr/geo_survey/

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MAN, LOOK AT THAT DOLL'S EYES

By: Barry Glick

Actaea alba
Dolls eyes

Plants have eyes. Well, some of them do. You don't have to stretch your imagination too far to understand why *Actea pachypoda* is referred to as Doll's Eyes. The fluffy-white fragrant flowers of early spring, are magically metamorphosed by early autumn into huge alabaster white berries with black dots at each end. Each berry sits proudly on a thick red pedicel or stem. They're displayed at the terminus of each stem in erect clusters of about 30-40 berries and really do look like a dolls eyes. Another common name for these easy to grow woodland treasures is baneberry. That moniker refers to the fact that they, like so many other plants in the buttercup family, are extremely poisonous if ingested.

If you happen to get Excedrin headache number 33 while you are out for a hike in the wilderness and you forgot your over-the-counter pain reliever, worry not! For you may be right smack dab in the middle of nature's pharmacy. *Gaultheria procumbens,* commonly known as wintergreen or teaberry, is a natural source of salicylic acid or the compound from which aspirin is derived. Just chewing a few of its tasty, supple leaves will not only remind you of wintergreen lifesavers, but will take your headache away post haste. If you like to drink tea, collect a pocketful of leaves and let them dry. They make a great tasting tea and impart their medicinal benefits to you for years to come, if stored in a tightly sealed jar after drying.

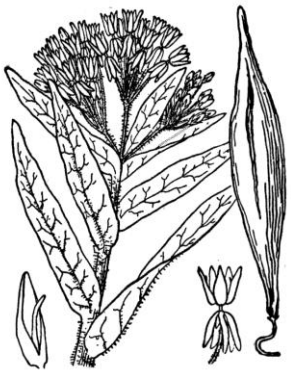
Now that all of the spring and summer plants have died back and there is little to see on the forest floor, a few outstanding plants stand out in full view. *Chimaphila maculata* (spotted wintergreen) has wildly silvered evergreen foliage that has deep serrations on the edges. It can be found emerging from leaf litter in dry woods. The name comes from the Greek words "cheima" meaning winter and "philein" meaning to love.

Look for big dark purple berries on *Caulophylium thalictroides* or blue cohosh. They are about the same size and shape as the edible cultivated high bush blueberry that you buy in the store. They are not edible but they will produce a charming woodland plant if you sow them in a pot.

Reddish-orange fruits can mean that you have stumbled across a specimen of *Disporum languinosum,* an interesting plant in the lily family, an easy plant to grow from seed. It can grow up to 36 inches and makes an outstanding specimen plant in the garden. I've heard it referred to as nodding mandarin due to the pendulous nature of the flowers.

Medeola virginiana berries are looking black as they form a nice contrast with the yellowing leaves. The roots of Indian cucumber root really do taste like cucumbers. However, it is a very labor-intensive activity as the roots are so small. It is much better to leave them in the ground and enjoy looking at them.

Stumbled across something quite interesting on the road home on Sunday. As I was scouring the roadbank for *Asclepias tuberosa* (butterfly weed) seed pods, I found an interesting small tree about six feet tall. There was nothing really remarkable about the bark or the yellowing leaves, but hanging pendulously from every branch were the coolest pink four-winged seed capsules with red berries. I collected the capsules and called my friend Peter as soon as I got home. Due to my inherent lazy side, he saves me the trouble of having to try and look new finds up in the books. Well, I struck out there as he, like myself, is more attuned to herbaceous perennials. So I called in the world famous plant explorer and naturalist, Fred Fromhart of Green Bank, WV. Fred was out changing the water in his bird baths when my call came in, but his lovely wife, Joanne, pulled him away from his arduous task. Before I could get halfway through the description, Freddie exclaimed WAHOO! I mistook his seeming excitement as a sign that I had discovered something really rare that he had been looking for all of his life but what he was exclaiming was the common name for *Euonymus atropurpureaus.* Looks like a plant with a lot of promise as a garden shrub, I'll keep you posted



Asclepias tuberosa
Butterfly weed

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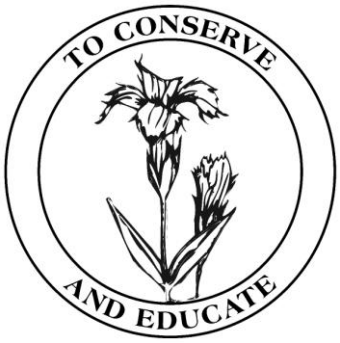

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