On The Fringe

Journal of the Native Plant Society of Northeastern Ohio

ANNUAL DINNER

Friday, October 22 2004

At the Cleveland Museum of Natural History

Socializing and dinner: 5:30

Lecture by Dr. Kathryn Kennedy at 7:30

"Twenty Years of Recovering America's Vanishing Flora"

This speaker is co-sponsored by the Cleveland Museum of Natural History Explorer Series.

Tickets: Dinner and lecture: $20.00.

Send checks to Ann Malmquist, 6 Louise Drive., Chagrin Falls, OH 44022; 440-338-6622

Tickets for the lecture only: $8.00, purchased through the Museum

TICKETS ARE LIMITED, SO MAKE YOUR RESERVATIONS EARLY

Annual Dinner Speaker

Dr. Kathryn Kennedy, President of the Center for Plant Conservation, will speak at the Annual Dinner on *Twenty Years of Recovering America's Vanishing Flora.*

The CPC was begun because our native plants are declining at an alarming rate. Among them are some of the most beautiful and useful species on earth. The implications of this trend are stunning. The importance of plants to life on Earth is immeasurable. The landscapes we cherish, the food we eat, even the very air we breathe is connected to plant life.

The CPC's home is at the Missouri Botanical Garden and it has 33 participating institutions located throughout the country. Our own Holden Arboretum is working with some 26 species. In 1989 the Native Plant Society raised funds to endow Royal Catchfly, which has been very successfully propagated.

The sad truth is, our own flora is ranked as one of the most imperiled in the world. However, these species are by no means doomed. The National Collection of Endangered Plants is a backup in case a species becomes extinct or no longer reproduces in the wild. The Collection provides the material needed for restoration work for the species and is an important resource for the scientific study of plant rarity, rare plant life cycles and rare plant storage and germination requirements. Parts of the Collection are stored and maintained at the USDA's National Center for Genetic Resources Preservation.

Mark your calendars now! Come and enjoy hearing about the detective work that goes into finding and identifying rare plants and the exciting experimentation of reproducing them for posterity. Remember: **Extinction is forever.**

Ohio Botanical Garden

On July 12th Jane Rogers and I were privileged to be guests of Ohio's First Lady, Hope Taft, at the Governor's Residence in Columbus. Mrs. Taft, an NPSNEO member, was giving us a guided tour of the Residence Ohio Botanical Garden of which she is the founder. The Gardens will be a true celebration of Ohio and its great diversity. The Landscape Master plan features over 20 unique gardens. These gardens will demonstrate the residential use of native plant materials and will recreate eco-systems from all over the state. They will demonstrate Ohio's diverse climates and rich geologic history. They have already had an overwhelming response from some of the prominent garden clubs and plant nurseries throughout Ohio who want to participate. Some of the gardens include a Cranberry Bog, an Orchard and Vine Garden, Appalachian Garden, a Lake Erie Dune Garden, and a Prairie Garden. This is a 501c3 project and is so structured that it will be a permanent part of the grounds regardless of who is in office in the future. Hope Taft is a charming

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and able First Lady and we are grateful to have her as a member.

Member Ruth Schwartz has donated a number of books concerning native plants, and we took some of the ones that deal with the propagation and uses of native plants in the garden and gave them to Mrs. Taft for the Garden library. She was thrilled to get them and has already put them to good use in her project. Scenic Ohio, part of the campaign for the Garden, has a "mission to preserve and enhance the scenic character of Ohio's communities and countryside by promoting Scenic Byways, protect open space, support highway beautification and encourage billboard control". Membership starts at $30 for an individual. Scenic Ohio may be reached at www.scenicohio.org. I highly recommend these two organizations.

Ann Malmquist

Important program date correction: **Late Orchids and Mushrooms field trip will take place on ※ SUNDAY Sept. 26 ✳ at 10 am**

Fall Field Trip

SEP 26, Sun: Late Orchids and Mushrooms and The Wilds. Expect to see coral roots in both open and closed form, *Goodyera pubescens* probably past prime but with the famous colorful leaves, both *Liparis* orchids in seed pod, and *Spiranthes tuberosa* still good, i.e. the potential of 5 species in various conditions. An added bonus is the spectacular fungi found in the area. Meet at Spitlers Restaurant in Coshocton. **10:00 am**

After a quick lunch in the area, we will visit **The Wilds**, a conservation and education facility in Cumberland, OH where we will have the opportunity to see the animal management centers, and to meet and talk with Wilds' animal management staff. Cost $11 per person and $2 for parking.

Eavesdropping

The Fitness Consequences Of Interspecific Eavesdropping Between Plants

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Abstract

Although many ecologists have discounted the possibility of communication between plants, recent work demonstrates that wild tobacco plants (*Nicotiana attenuata*) with experimentally clipped sagebrush (*Artemisia tridentata*) neighbors suffer less leaf herbivory than tobacco controls with unclipped neighbors. In this report, we examine the fitness consequences of resistance induced by eavesdropping. Annual tobacco plants with clipped sagebrush neighbors produced more flowers and seed-bearing capsules than plants with unclipped neighbors although these performance measures varied considerably over the five years of the study. Tobacco plants with clipped neighbors also suffered more frost damage than controls in one year. There was no indication that eavesdropping was more beneficial to tobacco in years with high risk of herbivore damage. The potential adaptive benefits of eavesdropping remain unclear based on five years of data. However, the fact that eavesdropping had strong effects on herbivory and plant performance suggests that interactions between plant species may be richer than we previously suspected.

Reprinted from ***Ecology***: Vol. 83, No. 5, pp. 1209–1213.

Color photo courtesy of a special gift from a friend of Kent Bog

KENT BOG STATE NATURE PRESERVE

By Tom Cooperrider

"You are about to enter a very special place where time has virtually stood still since the Ice Age
– *plaque at the entry to Kent Bog State Nature Preserve*.

A Natural Container Garden

Located in Portage County, in northeastern Ohio, Kent Bog can be likened to a large, natural container garden in a deep clay bowl. The bowl is chock-full of water and peat. The garden, about 45 acres in size, consists of the tens of thousands of individual plants growing on the peat substrate.

Aerial photographs show the bog to be roughly diamond-shaped. Along most of its periphery, and visible when on foot, are two usually well marked zones. The outermost is a low bank, the rim of the clay bowl. Growing on the bank are trees of a few species of hardwoods common in this region, mostly red maple, red oak, sour-gum, and wild black cherry. The next zone, on the inner side of the bank, is an irregular shallow moat – also called by the Swedish term *lagg* – in which there is standing water much of the year. Inside the moat is Kent Bog.

The Major Plants

Across the entire bog, growing directly on the peat, is a thick carpet of sphagnum moss. Here and there are patches of a low rare plant, small cranberry, and several species – some also rare – of slender grass-like sedges. A taller plant, Virginia chain fern, grows in extensive colonies throughout the bog.

There are four main woody plant species. Leather-leaf, a low shrub, grows near the moat. Highbush blueberry, a taller shrub, occurs in dense stands across the bog. Gray birch trees are scattered here and there, growing singly or in clumps of a few individuals. Towering over the other plants, and mostly congregated in the large central core of the bog, are the tamarack trees. With more than 2,000 individuals, this is the largest stand of tamaracks in Ohio. It is also an actively reproducing population with many tamarack seedlings.

Kettle Lakes and Kettle Bogs

At first the clay bowl, or basin, held only water, a small lake derived from glacial ice. In 19th century Ohio, large iron and copper kettles were a part of everyday life. These more or less circular glacial lakes came to be called "kettle lakes" or "kettle hole lakes." The bogs, such as Kent Bog, that formed in the sites later were called "kettle bogs" or "kettle hole bogs." These terms are still in use today.

A Large Chunk of Ice

Sixteen explanatory plaques have been placed along the loop trail that runs through the Preserve. The first three are devoted to the bog's geological and botanical history. This is the story they tell.

At the end of the Ice Age, about 12,000 years ago, a large chunk of ice became separated from the glacier that covered this region. It came to rest at a site just south of what is now Meloy Road, in western Portage County. The huge ice block was quickly buried under enormous amounts of clay, silt, sand, and gravel newly released from the melting glacier. These materials had become incorporated into the glacier as it scoured the bedrock on its southward journey into Ohio. When the buried ice eventually melted, its water formed a large kettle hole lake.

Boreal (northern) plants, such as tamarack and leather-leaf, that had moved southward in front of the advancing glacier now colonized the area around the new lake. Following the Ice Age, the boreal plants were in most areas displaced by plants more typical of northeastern Ohio today. But in the bog that formed around the lake, the northern plants survived.

As individual plants in the bog died, they did not decay completely. Fungi and bacteria, the principal decomposers, were unable to function effectively in the bog conditions. Little by little the partially decomposed plant material, called peat, accumulated, slowly choking off the lake. Eventually the basin holding the lake was completely filled with peat, much of it peat derived from sphagnum moss.

The last vestige of an open lake at the Kent Bog site probably disappeared prior to European settlement. Meanwhile, the bog plants had taken up residence on the peat substrate, producing the kettle hole bog we see today.

Botanical Specimens

On July 30, 1961, I visited Kent Bog for the first time. I was accompanied by Thomas Zavortink, a Kent State University biology major from Ravenna. We entered the bog from the north, at the Stark family residence on Meloy Road, and went in only a short way. I collected specimens of Small Cranberry (*Vaccinium oxycoccos*), Three-seeded Sedge (*Carex trisperma*), and another sedge Tawny Cotton-grass (*Eriophorum virginicum*). On the specimen labels, I described the habitat and location as: "Dense tamarack-sphagnum bog, 1 mile south of Kent." These were evidently the first herbarium specimens collected from Kent Bog, the first scientific documentation of the plant life there.

Several years later, on April 21, 1968, I visited Kent Bog with another KSU student, Robert Hoffman. Bob had discovered the bog while hiking near his apartment on Sunnybrook Road. We entered from the west and, here also, went in only a short distance. I made a collection of Gray Birch (*Betula populifolia*) and on the label wrote: "Sphagnum bog, two miles south of Kent." It was not until sometime later that I realized this site was a different part of the same bog I had visited with Tom Zavortink in 1961.

On June 20, 1978, Barbara Andreas, also a KSU student, made collections of Tamarack (*Larix laricina*) and Leather-leaf (*Chamaedaphne calyculata*) at Kent Bog. Barb later collected specimens of several species of Sphagnum Moss (*Sphagnum* spp.) there.

The plants named above are all still present in good number at Kent Bog today. The specimens are housed in the Kent State University Herbarium.

State Nature Preserve

On the Ohio Individual Income Tax Return form for 1983, a new line appeared. Those who had overpaid their tax and were entitled to a refund could indicate the amount they wished to donate "to nature preserves, scenic rivers, and endangered species habitat protection." The response was generous.

On February 12, 1985, a large part of Kent Bog was purchased by the State of Ohio, Department of Natural Resources (ODNR). This was the first purchase anywhere in the state under the new Ohio program. On February 27, 1987, the Articles of Dedication were signed. The acquisition was officially designated the Kent Bog State Nature Preserve, and placed under the management of the ODNR's Division of Natural Areas & Preserves (DNAP). My name was added to the Preserve at a ceremony on June 3, 1995.

The Boardwalk

In 1993, DNAP staff members and volunteers constructed a boardwalk, a 2600-foot loop trail, that enables visitors to see all parts of the Preserve without getting their feet wet or suddenly sinking up to their knees in wet peat. The boardwalk is constructed from planks of plastic lumber, the plastic having been recycled from such items as plastic bags and milk and soft drink containers. Emliss Ricks, Jr., Preserve Manager for DNAP/ODNR, described the walk in these words: "Dyed gray to resemble weathered wood, the recycled plastic boardwalk is not only visually and structurally acceptable, it is also aesthetically pleasing." Names of contributors who supported the boardwalk, or of persons the contributors wished to honor, are carved in planks spaced at regular intervals.

The boardwalk is wheelchair accessible and has several turnouts allowing chairs to pass. Benches along the way provide for rest and relaxing views of the bog.

The boardwalk starts from the parking lot. Going clockwise on the loop trail, it crosses the wooded bank that surrounds the bog, goes down a small slope, crosses the moat, and enters the bog proper. For a short distance it runs parallel to the moat, passing sedges, leather-leaf shrubs, blueberry shrubs, gray birch trees, and an occasional tamarack. A right turn takes the boardwalk through the central core of tamarack trees. At places, a 360° sweep of the sky shows nothing but tamaracks. Emerging from the trees, the walk goes through an extensive stand of blueberry shrubs. On the right it passes a clearing in the blueberry thicket, cut to promote growth of small cranberry. Farther along, the walk passes through a stand of leather-leaf, then crosses the moat and ascends a short rise to the bank. It proceeds along the bank through the hardwood trees and returns to the parking lot.

Visitors

This area was purchased and preserved because of its scientific value and its role in Ohio's natural history. Today, students and researchers come to study the bog and to learn from seeing it firsthand. Hundreds of miles to the north, this bog community is common, but in Ohio it is rare. Many of its members are, in Ohio, at or near the southern boundary of their range.

A visit to Kent Bog State Nature Preserve is a botanical trip to the north country. Tamarack, leather-leaf, small cranberry, tawny cotton-grass, and three-seeded sedge, mentioned earlier, also grow in Labrador and Newfoundland.

Because of the bog's suburban location, the public is given greater access than is the case at most state-owned nature preserves. It is open to visitors daily. The explanatory plaques describe the highlights of the bog's natural history and make possible an informative self-guided tour.

Mastodons and Turtles

On the first plaque, at the start of the boardwalk, an artist's sketch shows two mastodons roaming in front of a glacier. Distant relatives of modern elephants, mastodons are now extinct worldwide. But in the past, such an event may actually have occurred here, the animals having come to the lake for water. Mastodon skeletons have been found at several Ohio sites similar to this, the most recent skeleton dated at about 8,000 years ago.

Plaque no. 11 (here lightly edited) describes some of the bog's present wildlife that visitors may occasionally see. "Kent Bog is home to a small population of spotted turtles. Named for their bright yellow spots, these secretive, palm-sized turtles are scarce in Ohio. To ensure that this boardwalk does not impair free movement of the turtles, "turtle tunnels" fashioned from six inch plastic pipe are placed at various intervals under the boardwalk. Other animals that may be encountered along the trail include green frogs, garter snakes, and the elusive smooth green snake. Kent Bog is also home to deer, foxes, raccoons, skunks, opossums, and cottontail rabbits. During the summer a number of birds including rufous-sided towhees, cedar waxwings, yellowthroats, and veeries are commonly heard and seen throughout the bog." Veeries are rare in Ohio, nesting mostly in a few northern counties. Like the bogs they frequent, veeries are more northerly still in their general distribution.

Although I have been to the bog many times, I have seen the shy spotted turtle only once. A few years ago, Emliss Ricks came upon a rare sight, a group of turtle hatchlings scrambling over clumps of small cranberry plants in the clearing mentioned above.

Patterns and Colors

Visitors come to the bog also for the contact with nature it provides, and especially to see the boreal and other native plants in this contained and relaxed situation.

Some visitors find satisfaction in observing the plant life's patterns and colors. The bog plants tend to be freely branched and the bog community dense, producing an endless variety of structural patterns. Peak displays of color in the plants are transitory, lasting at most a few days. No less enjoyable, however, are the long periods of subdued color leading to the peak times.

The Seasons

In winter the bog has little color. Most of the woody plants are bare, and the sedges and ferns and other soft plants are fallen and brown. The general aspect of the bog is dense, quiet, and dark. Yet the bark on the upper trunks of the gray birch trees is at its whitest in winter. The upper branches of the blueberry shrubs are dark red, and there is a greenish cast to the persisting leaves on the leather-leaf shrubs. When not covered by snow, the wet sphagnum moss is bright green across the bog floor.

In late April or May the leather-leaf shrubs blow with thousands of tiny, dull white flowers. At about the same time, a scattering of small serviceberry trees bloom, each of their flowers with five narrow white petals. Later, the blueberries produce whitish flowers similar to those of leather-leaf, fellow members of the same plant family. Then the chokeberry shrubs send out their flowers, each with five nearly circular white petals. The chokeberries are as tall as the blueberries, but less plentiful.

Tamarack trees, although part of the pine family, shed their needles each year. In spring, the tamarack buds open slowly and pale green clusters of soft, short needles emerge. New cones appear in early summer, each about half an inch long. Young tamarack cones on most trees are red, but on some trees all the cones are green, presumably a genetic distinction. In summer the cones turn to a pale brown color. They remain attached to the tree for several years.

In summer the blueberries ripen, covering their shrubs with small, bluish-purple fruits. But the dominant summer colors of the bog are various shades of green. In most years the mosquito population is small, probably because the standing water is too acid for their larvae to survive. In a wet summer, however, the acid is diluted and mosquitoes prosper.

On a sunny day about the 20th of October, the bog reaches its peak of fall color. The leaves of the hardwood trees on the encircling bank have turned to various shades of red, yellow, and orange. In the bog, the leaves of the gray birch trees are yellow. The blueberry leaves are red, as are those of the few stunted red maples that have moved into the bog.

Toward the end of October the tamarack forest becomes a sea of gold. After two or three days of bright gold color, the needles turn brown and fall. Those landing on the boardwalk collect in temporary windrows on the gray planks. The others drift into the peat substrate or settle on the green sphagnum moss.

Acknowledgments

–With help from Robert Climes, Mix Cooperrider, Sue Cooperrider, Guy Denny, Heidi Hetzel-Evans, Linda Matz, and Emliss Ricks. Aerial photograph, from November 7, 1984, courtesy of the Ohio Division of Natural Areas and Preserves. More information about Kent Bog State Nature Preserve is available at www.ohiodnr.com/dnap, and in the book *60 Hikes within 60 Miles: Cleveland* by Diane Stresing.

Tom Cooperrider was a biology professor at Kent State University from 1958-1993. He was senior editor of Seventh Catalog of the Vascular Plants of Ohio *published by The Ohio State University Press in 2001. This reference book lists the scientific and common names of all the plants that grow wild in Ohio, including those mentioned in this article.*

BECK FEN BECKONS

By Tom Sampliner

A loose wet necklace of specialized wetlands lies softly against the brown skin of mother earth adjacent to Tinker's Creek in Portage County. Here at Beck Fen on Saturday July 17th a dozen members of the Native Plant Society of N.E. Ohio were to be led by the Nature Conservancy's Rick Gardner. What a special 10 acres this turned out to be.

The weather forecasts were not so promising with threats of showers, some embedded with electrical components. None materialized; perhaps frightened away by our wet weather gear.

We accessed the parcel by treading timidly along the railroad right of way before descending into the fen. We could only wonder what would have happened had the train with passenger cars we later saw while in the fen reached the narrow trestle bridge across Tinker's Creek while we were crossing.

My first impression upon entering was of a thicket of native broad leaved cat tails (*Typha latifolia*). Identification was made upon the lack of gap between male and female portions of the fruit. At shrub level, we encountered a formerly state-listed species, the alder leaved buckthorn (*Rhamus alnifolia*). Egg-shaped compound leaflets help identify this resident of wetlands ranging from swamp to bog and fen.

Footing can be treacherous here. Hidden from view are deep watery holes, branches, and even the unexpected sphagnum hummock. Preferably you do not

seek to regain your balance by grabbing for the grey barked compound leaves with red stems of poison sumac (*Rhus vernix*). Even without the tell-tale white berries, the exposure of powerful oils to your skin will cause in most folks an unpleasant reaction. Easy to state the warning; but when falling, it may be academic. More tourist-friendly was the giant angelica (*Angelica purpurea*). Tall stout purple blotched stems with conspicuous sheathing and umbels of rounded off-white florets identify this species.

With no trails here, Rick blazed a path. With our herd it became rather wide swath and I feared for the destruction we were causing. Rick said that these places recover well after a short time – I sure hope he is right. One benefit was the uncovering of the tiny round leaved sundews (*Drosera rotundifolia*) hugging tight to sphagnum mounds.

A sprawling growth habit featuring weak stems, whorls of small ovate leaves, and tiny white florets signaled the rough bedstraw (*Galium asprellum*). This madder family member was joined by the not much larger but far more handsome march bellflower (*Campanula asparinoides*).

Ferns present included the strongly ascending fronds tapering at the tip of marsh fern (*Thelypteris palustris*). Also frequent were the coarser broader fronds of the dimorphic sensitive fern (*Onoclea sensibilis*). Surprising to me was the relative lack of much royal fern (*Osmunda regalis*) with egg-shaped pinnae and tawny fertile fronds.

I don't recall having seen porcupine sedge (*Carex histricina*) on prior occasion. It was both attractive and distinctive with thin rough-textured culms holding aloft a couple of plump tight female spikelets and usually one thin male spikelet at the very top of each stalk. Quite different was one of the brome grasses (*Bromus ciliatus*). Each lemma was delicately perimetered by straw-colored hairs. Bulrushes were present but mentioned merely in passing.

Perhaps the showiest of the flowering plants we were to see this day was the chest high great St. John's Wort (*Hypericum pyramidatum*). Checking in with flowers 1-2 inches across and prominent stamens all in bright yellow attracting many insect visitors, this was a show. Pink was a popular bloom color this day. Swamp milkweed (*Asclepias incarnata*) and the eastern joe pye weed (*Eupatorium dubium*) qualified. Mostly in bud but plentiful was Indian hemp (*Apocynum cannabinum*). Any bruise would disclose its milky juice. For those preferring white, boneset (*Eupatorium perfoliatum*) filled the bill. If you just couldn't make up your mind for color preference, take the genus spirea, which appeared in white in *Spirea alba*, the narrow leaved meadowsweet, or pink for steeplebush (*S. tomentosa*). Believe it or not, meadowsweets are in the rose family.

I regretted that neither of two goldenrod species were yet doing their thing; the rough *Solidago patula* and the swamp *S. uliginosa*; this latter showing off bright maroon stems.

Our timing must have been slightly off for cowbane (*Oxypolis rigidior*) since we found only one flowering umbel. Flawed timing applied also to the showy or queen lady slipper orchids (*Cypripedium reginae*) seen in several healthy leafy clusters but flowers gone by some 3-4 weeks.

In climbing mode, we saw pea family member the ground nut (*Apios americana*). Tight clusters of maroon flowers offering fragrance were of great interest to visiting ant species.

Many sphagnum hummocks were well-endowed with petioled glossy green basal leaves of grass of Parnassus (*Parnassia glauca*). A month later those single stalked white flowers will show off delicate green lines on each petal. Not so impressive was the tiny yellow bartonia (*Bartonia virginica*) cowering way down on the sphagnum mounds.

You may be impressed as was I at the vegetative reproduction capability of the spike rush (*Eleochris rostellata*). Rick explained that when a tip bends over to earth it can grow a new plantlet. Swamp loosestrife in bogs does much the same.

This is a fen but a curious phenomenon occurs. When sphagnum accumulates, the acidity it brings creates a mini bog atop the fen. In one such spot we encountered the acid loving heath, leatherleaf (*Chamaedaphne calyculata*).

I sure appreciate a distinctive sedge. The state-listed slender sedge (*Carex lasiocarpa*) is found here and at Brown's Lake Bog. Look for perigynea which are plumpish ovoid, short-beaked and densely pubescent as if wearing a fur coat. Now why can't all sedges and grasses be so distinctive?

For those needing an aromatic fix, try crushing one of the bayberry leaves (*Myrica pensylvanica*). Now I've done it, odor makes me think of food and it's lunch time. Gotta run.

Many thanks to Rick for a great walk in a special jewel in this wet necklace.

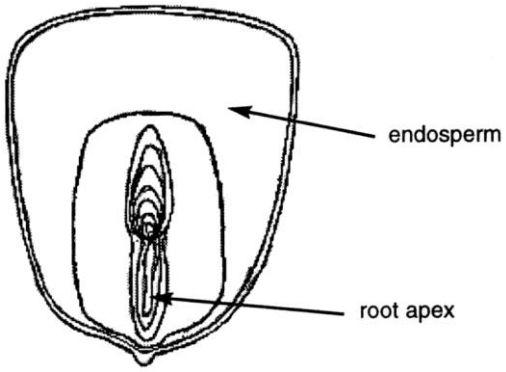
Botany 101 – sixteenth in a series

Plant Hormones II

by Dr. Rebecca Dolan

In the last column I introduced plant hormones and detailed the functions of auxin, the first plant hormone discovered. In this issue I will cover two more hormones, **cytokinins** and **gibberellins.**

Cytokinins are involved in cell division or cytokinesis. They are found in a variety of tissues that are actively dividing like seeds, roots and fruits. They travel up from roots to buds to trigger cell division in lateral buds released from the inhibition of auxin. Cytokinins have a practical application in plant tissue culture, where they are used trigger bud growth. A lot of houseplants are propagated using this technology.



Gibberellins are found in all parts of a plant, but in highest concentration in developing seeds. They promote cell division and stem elongation. In the seed, gibberellins help to break dormancy by promoting root growth through the seed coat. External applications of purified gibberellins, such as gibberellic acid, can induce otherwise dormant seeds to germinate, even if they would normally require a period of cold. It is believed they trigger the production of enzymes that convert starchy endosperm, the energy storage material in seeds, into sugars and amino acids that are then readily available to fuel embryo growth.

Have you ever noticed that leaves on young bean plants are entire, while leaves on mature plants have the characteristic three-parted leaves of a legume? Or that only young English ivy branches will root as cuttings? Gibberellins are thought to be responsible for the juvenile characteristics of young leaves. Dwarf varieties of some plants are individuals that have a mutation that prevents gibberellin production.

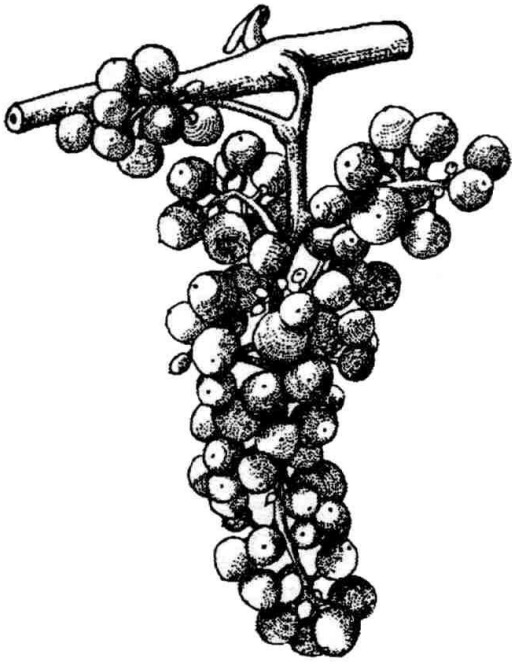
Bolting, when a flowering stalk grows from a rosette of leaves (a stem with very short internodes) is triggered by gibberellins.

Gibberellins promote pollen germination and fruit development.

Treatment with gibberellins helps make table grapes, like Thompson Seedless, larger.

This information comes from my favorite botany text: *Biology of Plants* by Raven, Evert, Eichorn, and Evert, 6th edition. It is published by W.H. Freeman & Co. (ISBN: 1572590416) and is available through Amazon.com for about $100. It is a great reference and has a beautiful cover!

Becky Dolan is Director of the Friesner Herbarium at Butler University.
Illustrations by Jan Glimn Lacy, botanical illustrator, from her book Botany Illustrated.



The Mysteries of Mosses

Part II. Observations on Mosses

By Barbara Andreas

When I started my botanical career I spent hours walking through Ohio's forests, studying the diversity of trees and herbaceous plants, and observing birds and small mammals. Now that I concentrate on mosses and spend many hours looking through a dissecting scope, I see a different type of "forest" made up of a mixture of stems from a diversity of mosses, and the various invertebrates crawling among them. In practically all aspects, mosses and vascular plants are the same in terms of their role in an ecosystem, just at a different scale.

Fig. 1
Polytrichum commune

Fig. 2
Dicranum scoparium

(from Crum & Anderson, 1981)

Where Mosses Grow

Mosses are only centimeters in height because they lack a support system made up of xylem and lignin. They occupy microhabitats in microclimatic niches where vascular plants aren't successful, such as rocks, tree bark, house roofs, sidewalk cracks, and cement walls. Within the Ravenna Arsenal there is a healthy population of *Polytrichum commune* (hairy-cap moss) (Fig. 1) growing out of a rusty crack in a downspout. They grow in unpolluted water attached to rocks and logs in swift flowing streams. The only habitat they haven't invaded is the ocean.

In general, mosses are not as community specific as vascular plants, and more than half the of the moss species growing in Ohio can be found in a variety of habitats— for example, *Dicranum scoparium* (Fig. 2) grows equally well on shaded roadside banks as in mature forests. However, even though a specific species may be found in different habitats, it is usually associated with the same substrate. Mosses that live attached to branches, logs, and bark are referred to as epiphytic; those on rocks, saxicolous.

In Ohio, forested communities have the best growth of mosses, but life in deciduous forests is precarious. Whereas fallen needles from conifers rarely cover the forest floor, deciduous leaves provide a dense layer through which light cannot penetrate. Some mosses in deciduous forests do survive in the humic layer, but most taxa move to spots where leaves don't accumulate such as tree bark, limbs and branches, fallen logs, and boulder surfaces.

The importance of bryophytes in primary succession has long been recognized. Mosses have adaptations which enable them to colonize bare rock surfaces. These adaptations include longevity, tolerance of desiccation and temperature extremes, and slow growth rates that coincide with the slow release of mineral nutrients from the rock substrate. Once established, mosses promote soil formation by accelerating physical and chemical weathering, by trapping wind-blown organic and inorganic materials, and by contributing directly to the accumulation of organic matter.

When abundant, mosses play a key role in the structure and function of ecosystems. They have an effect on nutrient cycling, soil temperature, soil moisture, soil structure, and vascular plant productivity. Moss carpets may facilitate seed germination by providing a damp surface, while in other circumstances they may interfere with the seedling roots reaching necessary mineral soil. Moss carpets may intercept atmospheric nutrients and thus reduce their availability to the roots of vascular plants.

Mosses are particularly important in certain ecosystems. They make up a key component of the peatlands and northern coniferous forests. In southern latitudes and extremely humid climates, they drape over both branches and logs of tropical and temperate forests.

Requirements of Mosses

Mosses have the same requirements as other plants: light, nutrients, and water. According to Schofield (1985), mosses seem to have the right combination of light-harvesting chlorophyll a and chlorophyll b that give them the ability to thrive in dense shade. This is

especially advantageous to living under the dense forest canopy. Mosses have specialized alar cells, found at the base of the leaf where it attaches to the stem, that are often thin-walled, allowing rapid absorption of water that can bend the leaf into a better position for photosynthesis. These same cells help the leaf fold up against the stem when water availability is low and photosynthesis stops.

Mosses require water to provide shape and to conduct nutrients. Mosses need the same minerals as other plants. Without conducting tissue, water that carries minerals is absorbed directly into cells by osmosis. Some species have thread-like structures (visually similar to rhizoids) called paraphyllia that help wick-up water. Another water conservation strategy of mosses is to grow in dense colonies. These crowded plants create a "sponge-like" effect where water is held in the spaces along leaves and plants.

Although water is needed to survive and sexually reproduce, mosses can recover after many years of nearly complete dehydration. Kimmerer (2003) uses the term "poikilohydry" to describe their ability to go through wide swings of hydration. When mosses are full of water they photosynthesize and grow. However, they are also immune to death by drying. Kimmerer reports that some mosses can lose up to 98% of their moisture for as long as 40 years and still survive.

Establishment of Mosses

The production of spores and asexual propagules was discussed in the March issue of *On the Fringe*. It costs energy to reproduce, and when and by what means mosses reproduce is influenced by environmental factors such as moisture, temperature, and light. In unstable habitats, spore production (the result of sexual reproduction) is favored; in stable environments, asexual means are favored.

Some mosses increase in numbers by fragmentation that fall near the parent. There are also sexual propagules called brood bodies that move offspring further away from the parent. Spores, the result of sexual reproduction, are transported by wind and carry offspring even further.

The following are required for a new population to become established: 1) a method of getting there, 2) the ability to grow into a colony, and 3) time to reach a stage which will promote reproduction.

Mosses have evolved spore-size strategies that aid establishment. Some mosses produce large spores with low dispersal capacity but probably better chances of successful establishment and a longer life span in the spore bank. Other mosses produce small spores in large numbers which have the ability to be dispersed to greater distances.

Small spores are common in annual and ephemeral species found in unstable habitats that may exist for only a short time. Plants that produce small spores typically have a shorter life span, and may be present at the location for only a few years and then disappear. Some small spore producing taxa are perennials where they become established in more permanent habitats, but move around within that area.

Large spore species are found in long-lasting microsites such as tree branches and mature forest floors. These species take their time reaching sexual maturity. Until then, they increase their numbers by producing asexual propagules.

Herbivory

Consumption by herbivores appears to be low in mosses, perhaps because the leafy moss gametophytes have a lower caloric value than their angiosperm counterparts. Mosses are seldom eaten in quantity by large mammals such as caribou and deer. In Arctic and alpine regions, smaller animals including voles and lemmings frequently consume mosses. Birds eat the capsules and use the green plant to line their nests.

Mosses appear to be immune from infestations by bacteria and fungi. More than 50% of moss species tested are known to produce inhibitors to the growth of such organisms (Schofield 1985).

Distribution of Mosses

What restricts ranges of bryophytes? The main factors are availability of water and suitable conditions for growth and reproduction. Mosses tend to show wider geographic ranges than vascular terrestrial plants, and thus their native ranges are far more widespread, often covering several continents. The wider distribution of mosses is probably due to the vast numbers of spores produced and their wind dispersal. In terms of the moss flora of Eastern North America, only about 15% of the flora is endemic.

To date there are 10 species listed on the Ohio rare plant list (DNAP, 2002). These are not, however, rare throughout their total range. The Ohio mosses that are listed as rare are rare because of habitat destruction. All mosses found to date in Ohio are considered native (Snider and Andreas, 1996). Unlike vascular plants that have been accidentally or purposefully introduced, there are few examples of non-native or "exotic" mosses reported in the literature. The only one that comes to mind is a North American moss,

Rhytidiadelphus triquetrus that has been introduced to New Zealand.

Information for this article comes from several sources, including Schofield (1985) and Kimmerer (2003). For additional information consult the references below.

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4th Eastern Native Grass Symposium

Cooperative Extension Service
University of Kentucky – College of Agriculture
October 3-6, 2004
Four Points Sheraton Hotel, Lexington KY
For registration and information go to http://www.grassconference.com

Symposium Goals

Increased interest in the use of native grasses in the East has led to the organization of a regional symposium highlighting native grass uses, adaptations, and importance. The symposium goals are to share information, experiences, and research about recent projects involving native grasses. There will be many opportunities to coordinate efforts, form new partnerships, and further our common goals.

Topics

Restoration
Establishment
Forage
Wildlife
Genetics/local Ecotypes
Erosion Control/Reclamation
Biofuel
Roadsides and Rights-of-Way
Landscaping (golf courses, commercial, residential)
Southeastern Native Grasslands
Coastal Grasslands
Northern Grasslands
Exotic Plant Control in Native Grasses
Status of Native Warm Season Grasses in CRP Plantings

Field Trips

Cool-season Bluegrass Savannah Restoration Site
Prairie Peninsula Barrens
Dolomitic Limestone Glades & Prairies
Local Genotype Seed Production Facility

Workshops

Grass Identification
Seed Testing of Native Plant Species
Small Scale Seed Collecting and Cleaning
NWSG Drill Calibration, Operation, and Establishment Protocol

Ohio's Fairest and Rarest Plants - and How to Find Them
Part 2

By Perry Peskin

[Note from Part I: Plants marked E (for endangered) are confined to one habitat, found in very few counties, and have low populations. T plants (for threatened) are found in more than one habitat, and have a greater range with a few large populations. P (for potentially threatened), are found in a wider range of habitats, are even more widespread in Ohio, but seem to be losing numbers. X (for extirpated) applies to species undocumented for at least 20 years. If they are rediscovered, they will be returned to the E category.]

Next to the yellow-fringed orchid, the most beautiful and striking *Platanthera* in Ohio is the deep rose-colored purple fringeless orchid *(P. paramoena).* It is the fate of this species to bear a self-contradictory common name (How can a fringed orchid be fringeless?), but it actually has a lip petal with the tiniest fringe imaginable, to be seen only under magnification. Another oddity is its life style: it has adapted to disturbed areas more than most other Ohio fringed orchids, and thus it is found in man-made habitats, especially in wet spots along roads. So common that it is not on the Heritage List, the orchid has a range much more southern than the other Ohio fringed orchids. Very tall for its genus (over three feet in some specimens), it should be a candidate for the title "the orchid that everyone knows" – but it isn't.

The reason is simple: like the famous "purloined letter" of Poe's mystery story, it can't be found even though it is in the open where everyone can see it, namely, along well-traveled roads. Why not? Because it resembles something else very common, namely, spotted phlox *(Phlox maculata)* in color, shape, and size.

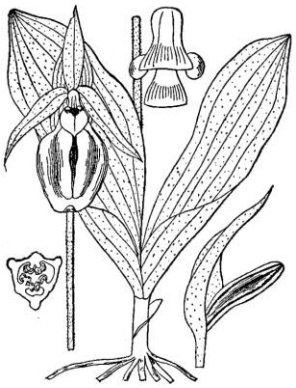
In late July of 1989, when I asked Jack and Florence Selby to join me in searching for this elusive species, I had heard from the grapevine that it favored roadsides, especially in a certain county of southern Ohio. However, I had forgotten to check out Lucy Braun's book on the close resemblance between the orchid and the phlox, and this is what we were learning the hard way as we drove down mile after mile of a narrow state road. Whenever we saw a rose-purple panicle of flowers, we stopped, got out, and examined the specimen. It was always spotted phlox. This was getting monotonous. Discouraged, we decided to stop at a lodge of a state park nearby, one of several occupying former strip mines, have a bite of lunch, and drive home.

As we got out of the car and were walking toward the lodge, Jack lagged behind us, and I heard him say, "Hey, wait a minute. Look at this!" He was pointing to another spotted phlox growing in a weedy strip next to the parking lot. But this time it was the real thing, the purple fringeless orchid, and so was the next one, and the next….the whole parking lot was loaded with them!

After many photographs, we were starved, so with mission accomplished, we entered the lodge's coffee shop to splurge on the best lunch special they had – only to be told by the manager that it was so late that they were not serving from the lunch menu any more "…but we have sandwiches." The reader can well believe that those sandwiches were some of the most delicious we had ever eaten.

There is one final group of plants that occupy such little-known habitats as shale banks and cliff tops, or have such very small populations that no general rule can apply, except RULE IV: KEEP ALERT; GREAT DISCOVERIES ARE MADE WHEN YOU ARE LOOKING FOR SOMETHING ELSE; AND DON'T RULE OUT PLAIN DUMB LUCK. Even if one tries to be scientific and systematic, field botany has so many variable factors that accidental discoveries are bound to happen. In Ohio they seem to happen more frequently in the southern counties involving Appalachian-type plants.

As a boy growing up in an Appalachian small town in western Maryland, I loved to climb around


Cypripedium acaule

the foothills of Haystack Mountain, looming up right behind the houses of my neighborhood. In summer my friends and I would go on Boy Scout hikes and gather crawfish (in the North pronounced "crayfish") from the mountain streams, chase gray fence lizards but never could catch them, and stop to admire the "moccasins," big purplish flowers, which we were told not to pick. (I later found out they were pink lady's-slipper orchids *(Cypripedium acaule)*, rare in Ohio at one time.)

But the early-spring wildflowers that everyone knew were "Johnny jump-ups," which grew especially on loose-shale slopes and riverbanks, as long as there was a bit of soil for their roots. No one connected them with violets. Violets were small with all five petals colored yellow, white, or pale purple and didn't lie flat. These had five large petals, two of which were a most unusual deep-purple color, and the other three were a more commonplace lavender. All five petals lay in the same plane, not twisted, and revealed an orange spot of color in the center, which I now know was the tip of the stamens, perhaps useful in attracting bees as pollinators. Lastly, violets had a round or heart-shaped leaf; these had a divided leaf, somewhat shaped like a bird's foot.


Viola pedata

One peculiarity of Johnny jump-ups was that they had two types of plants – one bearing the beautiful bi-colored flowers, and the other with conventional flowers, with all petals of the same color. Modern botanists now regard these two types of flowers as color forms of the same species and call the whole complex the bird's-foot violet *(Viola pedata*-T).

In Ohio the distribution of the bird's-foot violet – along the Ohio River, in the extreme northeast, and at the west end of Lake Erie – is perhaps determined by the species' preference for open sandy or rocky grasslands, or shale and sandstone banks and road cuts – and these habitats are localized in Ohio, as they were back home in Maryland. Many rare plants in Ohio follow the same pattern.

In mid-May of 1987, I joined an ODNR field trip through a part of Scioto County that was managed by Shawnee State Forest. Our guide was mainly interested in pointing out showy, pink-flowered azaleas, known as pinxter-flowers *(Rhododendron nudiflorum* var. *nudiflorum*-T), which were at the height of their blooming season. The roads were lined with them. One of the most beautiful shrubs of the heath family in the eastern US, the pinxter-flower likes the same acid-soil conditions, in bogs and edges of woods, as does its close relative, the northern rose azalea *(R. nudiflorum* var. *roseum*-*P).* The main difference is that the blossoms of the pinxter-flower lack the wonderful fragrance of its cousin, which I have seen lining the sphagnum bogs of northeast Ohio.

While everyone in the group was exclaiming over this great display, sort of a southern Ohio version of the famous cherry-blossom festival in Washington, D.C., I noticed clumps of smooth-edged, bright green, sword-like leaves beside the road. They looked like those of irises, but what kind? Our guide confirmed my guess by identifying them as the leaves of dwarf iris *(Iris verna*-T), a species I had never seen before, and one of three dwarf irises in the eastern US. It is mainly an Appalachian plant at the very edge of its range in Ohio in only two Ohio River counties, and it grows in woodlands, rather than in wetlands, as in the case of the typical irises.

Iris verna

Naturally I was disappointed that I didn't find *Iris verna* in bloom, but years later I saw its violet flowers, very large in comparison to the size of the plant, in an open woodland in northern Alabama. Of the two other dwarf irises, only the dwarf crested species *(I. cristata)* is common, occurring in many counties of northeast and south-central Ohio. I first saw it in one of the Cleveland metropolitan parks in a well-shaded creek bottom. The lake iris *(I. lacustris)* grows on sandy, peaty shorelines of the upper Great Lakes and doesn't extend into Ohio. I was lucky to find it growing with calypso orchids *(Calypso bulbosa)* on the tip of Michigan's Lower Peninsula in wet, sandy soil.

On the roadside in Shawnee State Forest, in the same vicinity as the leaves of *Iris verna* were clumps of another plant, one closer to the ground and with dissected leaves. Only when I got nearer and saw the bi-colored purple flowers did I realize that I had stumbled on the Johnny-jump-ups of my boyhood. This was the first time I had seen it in bloom in Ohio, and it was in the same type of habitat as in western Maryland – a clay or shale slope, in an unshaded area. What a great habitat this roadside turned out to be, with three rarities for the price of one!

In the case of finding two of the most famous **disjuncts** in Ohio extensively studied by Lucy Braun – golden-star and mountain lover – dumb luck needs to be followed up by a hunch or an educated guess. There won't be any guided tours or hot tips from friends to help find the places where these two species are lurking. The first **disjunct**, which is defined as a plant located far from the center of abundance for the species as a whole, is a type of adder's-tongue lily known as golden-star *(Erythronium rostratum-E).* Golden-star resembles the common spring wildflower, the yellow adder's-tongue *(E. americanum)* of every woodland in the eastern US north of Florida. The similarity is so great that the two species were never differentiated unti11963, when *rostratum* was first named and described as a Southern plant ranging from northern Louisiana and central Alabama, north to southeast Kansas, Missouri, and Tennessee. That same year Lucy Braun reported that she had discovered it in forests within the drainage of one creek in one county of southernmost Ohio and nowhere else in the state.

Although the two species are superficially look-alikes, with solitary yellow flowers and spotted leaves, the beaked seed capsule of *americanum,* when ripe, points downward, while the capsule of *rostratum* twists around and points upward. Likewise, the petals of *americanum* are reflexed, that is, they curve backward until they almost touch, while those of *rostratum* simply spread but do not recurve.

In the late 1980's an article in an ODNR *Newsletter* caught my eye. It stated that golden-star is still found in mixed hardwood forests sloping down to Hickory Creek but occurs in no other part of Ohio. Oddly enough, the adder's-tongue lily has never been found in this creek's drainage, although common everywhere else in the state except the western prairie counties. This may be due to a genetic antipathy between related pairs of species, or it may be purely accidental. To confuse the issue, neither of the two closely related species is found in the county to the east, although the adder's-tongue *(E. albidum)* is common there.

After reading the *Newsletter* article, I made plans to stop in southern Ohio on my way back from Tennessee the following spring and photograph golden-star. That spring I found myself following the state highway that parallels the Ohio River, and when the sign proclaiming Hickory Creek came into view, I turned north. A few miles from the intersection the small farmhouses dropped out of sight, and a fine forest appeared. After noting the

absence of "No Trespassing" signs, I judged this a good place to stop and explore.

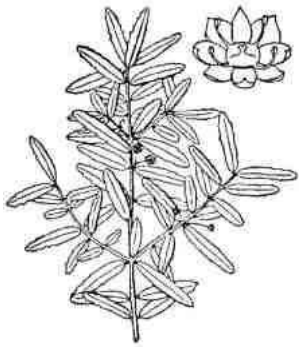
I could tell the place was loaded with *Erythroniums* because of the spotted leaves everywhere, but when I knelt down to examine the flowers, – oh, no! not one of the tapering buds was open! I then realized that it had been raining earlier that morning; the sky was still overcast; and adder's-tongue lilies and golden-stars open only under sunny skies. What a bummer!

On one of the buds I pushed away the petals and noted that the fruit, a capsule, was twisted so that its beak was pointed upward – a tell-tale sign that the species was really golden-star after all. I had found another Heritage species to report to ODNR, but I really had wanted to photograph it.

I got my second chance in late April of the following year. Same time of year, same place, but it was *"deja vu* all over again." The woodland was loaded with clumps of golden-star, but all the buds were tightly closed. Thinking that this situation could go on for years, unless I stuck around all day waiting for the sun to penetrate the thick canopy of trees, I decided to put into action a back-up plan, which I had recently heard about. I had a good hunch it would work.

I knelt down, bent over to a nearby plant, and started exhaling hot air on one of the buds that looked ready to open. This was going to be a slow process, I thought, but the petals actually started to roll back slightly. I kept at it, thinking if any people walking by saw me, they might think I was a crazy emergency medic giving CPR to a nonexistent patient. Fortunately no one came by, and soon the petals were fully open and ready to be photographed. In their final stage, the petals were spread but not reflexed, proving again that the species was golden-star.

Acting on hunches was the method I used when all else failed in hunting down the rarest woody plant in Ohio, a creeper called mountain lover *(Paxistima canbyi-E)* or cliff green, and named for William Canby, botanical explorer from the mid-nineteenth century. Mountain lover is an obscure member of a large family of trees, shrubs, and vines, called the bittersweets, sandwiched in between the hollies and maples and known for their ornamental red fruits. As its name implies, mountain lover is adapted to only one habitat: thin soil on top of cliffs in areas of very steep elevation, as commonly found in the Appalachian Mountains and Plateaus of the South. In Ohio the closest approach to these conditions occurs in Highland and Adams Counties, where the rugged Appalachian Plateau meets the gently rolling Bluegrass Region, extending into Ohio from Kentucky, in a series of dramatic escarpments that dominate the landscape. This line of cliffs in Adams County marks the Edge of Appalachia preserves, managed by TNC and has its counterpart in Highland County in a huge rock formation called Fort Hill. In places the visitor on these peaks can imagine himself standing on the Skyline Drive in Virginia and looking down into the Shenandoah Valley, although the difference in elevation is measured in hundreds of feet rather than thousands. To the mountain lover plant, however, there is no difference, as its total US distribution consists of sites scattered over only 6 states: eastern Kentucky, West Virginia, western Virginia, Tennessee, Pennsylvania, and southern Ohio (Adams and Highland Counties), where its ground-hugging habits adapt the plant to any altitude, as long as the substrate is a neutral soil associated with **dolomite** (a type of alkaline rock containing calcium and magnesium, and similar to limestone).

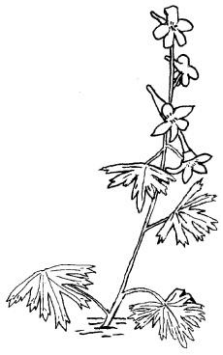


Paxistima canby

The mountain lover cannot be called a disjunct, because there is no center of abundance with a few outlying areas. All the known sites are small populations of plants, isolated from each other by

many miles of rocky terrain, and separated by thousands of miles from their nearest relative, the Oregon boxwood *(P. myrsinites)* of the Western mountains. (I saw Oregon boxwood on a trip out West in 1966. It was a bushier and larger plant than mountain lover, perched on a cliff overlooking a waterfall in Glacier National Park, Montana.) When a whole species suffers this type of isolation, plant evolutionists call it a **relict**, a species left over from more favorable times in the past, such as before the glacial period. Relict species are usually considered candidates for extinction in the near future, unless they develop adaptations to a variety of habitats.

Ever since I knew that Fort Hill was a site studied by Lucy Braun, I was anxious to see what Heritage plants may live there. In this, I was disappointed, but my first visit gave me at least some idea of the lay of the land. Basically the highlands of the Edge of Appalachia consist of what people in the Great Basin Desert of the West call **block mountains.** One side is a fairly gentle slope with easy walking, usually through a forest. The other side is a sheer drop down to the valley. The dolomite cliffs on the other side are bare of vegetation except for short, ground-hugging plants reminiscent of alpine tundra in the Rockies or Sierras. In southern Ohio these cliffs are called "hanging prairies."



Delphinium tricorne

My first visit was in spring of 1985, and many distinctive spring wildflowers were in bloom in the rich forest around the base of the rock, including quite a few that don't occur commonly in northeast Ohio. The beautiful dark-purple dwarf larkspur *(Delphinium tricorne);* the wood poppy *(Stylophorum diphyllum)* with its large yellow petals; and the valerian *(Valeriana pauciflora)* its pink flowers in tight clusters called **umbels** – all these were new to me. The biggest surprise was the huge field comprising many acres of moss phlox *(Phlox subulata)* in full bloom. I never even suspected that this springtime rock-garden flower planted so commonly around Cleveland was a native! Thinking back to the few times that I've tried to plant it in my own garden without success, perhaps I should have tried dolomite soil.

All the colorful plants disappeared as I took the path through a dense forest to what I thought was the top. The path started winding around large stone boulders, which some authorities claim are foundations of an Indian fortification. In the dim light, it was difficult to see if there was any pattern in the way they were arranged except that they all seemed about the same size. Eventually I thought I would reach the cliff side of Fort Hill, but the path seemed to be winding in circles, so I came down the way I started, before I got completely lost. Although Lucy Braun in her late 70's managed to find the cliffs of Fort Hill, I didn't have her luck and so decided to try Tanglewood instead.

In mid-May 1989 I was again at the Edge of Appalachia in a forested preserve full of hills and gullies, all by myself, and equipped with camera, compass, and a rather poor map that did not show any trails to the cliff-tops. However, I had been here many years before, and at that time I remember there definitely was a trail up to the top.

Since I had started late, it was already close to six o'clock, with the shadows lengthening, when I reached a point where many years before I had seen a signpost pointing to the cliffs. But the present signpost said nothing about cliffs, just the name of a trail. I followed it to where the path divided. The left fork was a narrow, rocky trail that looked abandoned, so I took the right fork, which was wide and well kept. This path slowly curved around through the woods and returned to the signpost again. It was just a loop and went nowhere, but I had lost valuable time. At this point I realized I hadn't taken a flashlight, but somehow I would have to go up to the top, come back down and find my way to the parking lot. Could I do all that in the dark?

Suspecting that TNC was protecting the cliff-top from being trampled by too many visitors, I started off again down the trail to where it divided and took the left fork this time. ("The road less traveled ...," I kept repeating.) It was 6:30 already and not relishing the idea of staying here overnight, I started to hurry when I noticed the woods had become strangely silent: no birds, no crickets, not even any deerflies buzzing around my head. Suddenly, as I started to climb the left-hand trail on hands and knees, trying to balance myself on the dolomite rocks jutting out into the path, a loud, raucous, two-note call filled the air. It seemed to say, "It's here! It's here! It's here!"

What in the blazes was this? Then I realized it could be the evening call of only one bird – the great crested flycatcher. No other squawk that I had ever heard in the woods sounds so comical and frantic at the same time, but now, instead of seeming merely hysterical, it had assumed a depth that I had never noticed before. Was it verifying my hunch that I was finally taking the right path? I would see in a few minutes. Reaching the top of the rise, I emerged into full, blazing sunlight, as intense as a hammer blow for anyone walking in semi-darkness all afternoon. The sun seemed at eye level, barely above the trees on the opposite ridge across the creek. Looking down, I saw that I had reached a hanging prairie, a cliff-top opening carpeted with odd, low-growing plants. I had better take some photos while the light was still good.

As it turned out, the flycatcher was right – my guardian spirit in bird form. In the patch of vegetation about 9 square feet in extent, I recognized a ground-hugging plant with narrow, glossy leaves, irregularly toothed and crowding the stems, as the long-sought mountain lover. I was a month too late to see the tiny, green-petaled flowers in bloom, but where were the seed capsules? I later found out that no Ohio specimens of *Paxistima* have been known to set fruit, and it is suspected that the two colonies are simply large clones, getting larger by sending out runners or underground stems – a dangerous genetic trait that may lead to extinction.

Since rare habitats yield rare plants, next to the mountain lover and scattered in crevices between the boulders was a tiny, low tundra-type plant with five-petaled white flowers, which proved to be rock sandwort *(Arenaria stricta-P)* of the pink family, once mistakenly thought to belong to a subspecies found mainly in Texas and the Southwest, a seldom-seen, limestone-tolerant plant with very narrow moss-like leaves.

A third plant was not in bloom, but I photographed the very distinctive twisted seed capsules. Later I found out that this was another Northern-type plant called wedge-leaf whitlow-grass *(Draba cuneifolia-*T), a small-flowered member of the crucifer or cabbage family with 14 related species in eastern North America, especially in remote Arctic or mountainous habitats.

Draba cuneifolia

It was seven o'clock now, but I had just enough light to see my way back to the parking lot. Returning to my motel in West Union, the "metropolis" of Adams County, and taking out my trusty ledger book to enter all the important sightings of the day, I felt that my time had been well spent. I had found the least common plant in the most inaccessible habitat in Ohio – truly the land of the fair and the home of the rare.

Overlooked Look-Alikes

By David Dister

How many of us enjoy hiking and botanizing without giving a second glance at plants such as wild leek, common plantain, Virginia creeper, or sugar maple? Well, on your next field excursion you may be surprised by what you find upon closer inspection – there are look-alikes for each of these plants that seldom receive the recognition they deserve.

I'll never look at wild leek *(Allium tricoccum tricoccum)* quite the same after botanist Dan Boone informed me of the similar variety, Burdick's wild leek *(Allium tricoccum burkdickii).* The typical variety is apparently much less frequent than Burdick's variety, at least locally at MetroParks' new Markey Parcel near Germantown. Common wild leek is distinguished by being larger overall, as its leaves are 5-8 cm wide (2-4 cm for Burdick's), the scape (inflorescence stalk) is 25-35 cm above the ground (13-16 cm for Burdick's), and the mature pedicels (single flower stalks) are 1.5-2.5 cm long (1-2 cm for Burdick's). Also, the common wild leek tends to have reddish petioles (leaf bases) and scapes.

Identifying weeds is typically not the most exciting aspect of field botany. Until recently, I hadn't the slightest notion that the non-native common plantain *(Plantago major)* had a native look-alike, American plantain *(Plantago rugelii).* The main distinction is in the fruit capsule, which naturally splits in half near the middle in common plantain but much below the middle in American plantain (a hand lens is needed here!). Also, American plantain tends to have a redder petiole and occurs in damper habitats.

Virginia creeper *(Parthenocissus quinquefolia)* would seem to be a unique-looking vine until one discovers it has a close relative, thicket creeper *(Parthenocissus vitacea).* The distinction is less definitive if the plants are trailing along the ground instead of climbing trees, Climbing vines of Virginia creeper have adhesive discs on the tendrils, while tendrils of thicket creeper do not. The inflorescence of Virginia creeper has a central axis while in thicket creeper the inflorescence is dichotomous *(e.g. it has two main axes).* Furthermore, thicket creeper usually has longer stalks on the leaflets and inhabits damper areas.

Sugar maples *(Acer saccharum)* are perhaps the most dominant tree in Ohio's upland deciduous forests. Yet along riparian and floodplain areas, the closely related black maple *(Acer nigrum)* is far more adapted to saturated soils. Morphologically, black maple leaves appear similar to sugar maple but they have drooping sides and conspicuous stipules (small leaf-like appendages) at the base petioles. Trees having leaves with intermediate characters are not uncommon, as black maple was formerly considered a variety of sugar maple.

Interestingly, three of the four above look-alikes are plants having a definitive preference for very moist or damp habitats. Most regional plant guides of course cannot include all the possible plants for every state they cover, and thus I highly recommend obtaining one or more of the technical botanical references that focus strictly on Ohio flora. The two most comprehensive works readily available do not include illustrations, but at least one, *The Vascular Plants of Ohio,* by Clara G. Weishaupt (1971) includes a detailed (though dated) dichotomous key for identification. The other text (hot off the press) is the *Seventh Catalog of the Vascular Plants of Ohio by* Cooperrider, Cusick, and Kartesz (2001). This new reference brings the Ohio flora up to date on known vascular plant diversity in the state (mosses, lichens, etc. excluded). It includes the most recent synonyms of various species and also provides common names for many obscure plants (notably grasses and sedges) that never had common names. Perhaps of greatest interest is the statistical summary that lists 2,292 species, of which 1,785 (78%) are native and 507 (22%) are established alien or non-native species. Another 424 species are known as occasional escapes from cultivation (e.g. daffodil, weeping willow, horseradish, etc.). So for now, these numbers are the accepted totals for vascular plant diversity – until Ohio's botanists analyze the flora of 2002, which no doubt will make these numbers obsolete!

In summation, the Peterson's and Newcomb's flower guides are only of marginal use in plant identification at the state level. This makes the discovery of look-alike varieties and species, not to mention unusual plants, a real challenge without the aid of more technical books. Whoever said identifying rare plants was easy?

Reprinted from *The Bark*, the newsletter of the native Plant Society of the Miami Valley, Winter 2002

Indiana Ferns and Their Haunts – Part I

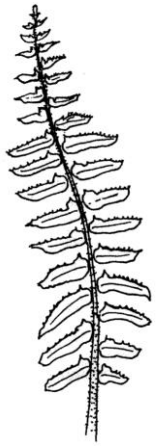
by Mike Homoya

From the very beginnings of my interest in the botanical world there have been few plants that have captivated me as much as ferns. There was a time when I thought of ferns much as I did orchids, that is, a trip to Florida or Hawaii was needed to see them in the wild. What a pleasant surprise it was, then, to learn that ferns not only grow in our latitude, but that several species are actually common. The variety is amazing, from tiny spikemosses (not an actual moss, but a fern ally) to the towering cinnamon fern. We'll begin this four-part series on Indiana ferns describing what makes a fern – a fern. You see, not all plants that appear as ferns are ferns, and conversely, not all ferns look like, well ... ferns!

The "typical" fern, if there is one, possesses leaves, or fronds, that are dissected (divided into many small, connected segments) and much longer than wide. The commonly cultivated house fern, the Boston Fern, is one such example of the typical. But other ferns are much more dissected, while others have no dissection at all. The common denominators of this multifamily group of ferns that botanists call **pteridophytes** are that they are nonflowering (producing spores instead of seeds), and have vascular tissue, the latter separating them from the true mosses. In addition, most ferns exhibit leaf buds that are coiled, commonly called fiddleheads. A related group of plants, known as fern allies, are similar to ferns but typically have much reduced leaves, either scale- or needlelike or grasslike, and possess specialized spore-containing structures. All have a life cycle known as alternation of generations.

Note: There is much to be said about fern reproduction and the associated spore-producing structures; discussion of such is not the purpose of this series. Readers are encouraged to investigate a good biology text or any number of books on ferns, to get the basics.

The intent of this series is to provide a brief overview of the diversity of fern families that occur in Indiana, just enough, it is hoped, to whet your appetite to learn more about these fascinating plants. In future installments of the series, the three major habitats where ferns can be found (forests, wetlands, and rock outcrops) will be described, including a more in-depth discussion of the particular ferns found there. For now, let's look at some of the fern families found in our state.



Christmas fern (*Polystichum acrostichiodes)*

I am currently aware of 78 species of ferns and fern allies occurring in Indiana, these representing 18 different plant families. The one with the greatest number of species (18) is the Dryopteridaceae, the wood fern family. Within this family are some of our largest and showiest ferns, such as Goldie's fern *(Dryopteris goldiana)* and ostrich fern *(Matteuccia struthiopteris).* One of our most common woodland ferns, the Christmas fern (*Polystichum acrostichoides*), is also in this family.

Climbing fern (*Lygodium palmatum*)

Some fern families in the state have but one species represented. Take, for example, the Lygodiaceae, with its climbing fern *(Lygodium palmatum).*

This fern is interesting in that it is the only fern in the state that is a climbing vine. Another single-species fern family is the Vittariaceae.

Our sole member, the Appalachian shoestring fern *(Vittaria appalachiana),* occurs with us only as an independent gametophyte. This means that the larger sporophyte phase of the plant that which we typically think of as the "fern" is not formed. Again, get that biology or fern book at the library.

One group of ferns that adds to the joy of winter botanizing is the grapeferns. These plants, of the genus Botrychium, are also known as bronze ferns, in that the fronds of some species attain a rust or bronze coloration in winter. They share a family (Ophioglossaceae) with the adder's tongue ferns (Ophioglossum), odd looking little ferns with simple, entire leaves shaped like a tongue.

Spleenwort is a common name that mostly refers to plants in the Aspleniaceae, but plants of other families have also been christened with the name, e.g., silvery spleenwort *(Deparia acrostichoides,* formerly *Athyrium thelypteroides),* in the Dryopteridaceae. Plants of the Aspleniaceae, in the genus Asplenium, are quite small, and more often than not grow on rock substrates.

The giants of the fern world, at least in Indiana, are the Osmunda ferns (Osmundaceae). These tropical looking ferns, under proper growing conditions, can possess fronds long enough to tower over one's head. This is especially true of the cinnamon fern*(0. cinnamomea).*

A full 20 species of our topic group constitute what are known as fern allies (Lycopodiaceae, Selaginellaceae, Isoetaceae, and Equisetaceae) – the clubmosses, spikemosses, quillworts, and horsetails, respectively.

None of these creates in our minds the image of a fern, but many are nonetheless quite attractive in their own right. Perhaps the most unusual of all are the quillworts, plants which look more like bunches of wild onions than ferns.

We're out of space in this installment for further discussion of our diversity of ferns, but you get the picture. More awaits. In Part II of this series we will look at the specific ferns that occur in one of our more common habitats – forests.

Mike Homoya is author of Orchids of Indiana, *published by the Indiana Academy of Science in 1993, and is a botanist with the Indiana Department of Natural Resources – Division of Nature Preserves. Illustration of Christmas fern by Jeanette Ming*

Ferns of Indiana

The following is a species list of fern and fern allies documented for occurrence in the state of Indiana. The list is not the result of an exhaustive herbarium search, but from literature and the author's familiarity with the flora, and thus it may not be complete. Not all of these listed are extant, and a few are extremely rare. Most, however, are not uncommon. The taxonomy and nomenclature follows Volume 2 of the *Flora of North America (1*993). I have tried to provide synonymy for those of which other names are still in common usage.

FAMILY
Genus
Species (and hybrids)

LYCOPODIACEAE
Huperzia (= Lycopodium)
H. lucidula
H. porophila
H. x bartleyi
Lycopodium
L. clavatum
L dendroideum
L. obscurum
L. hickeyi
Diphasiastrum (=Lycopodium)
D. digitatum
D. tristachyum
D. x habereri
Lycopodiella (=Lycopodium)
L. inundata
L. subappressa

SELAGINELLACEAE Selaginella
S. rupestris
S. apoda
S. eclipes

ISOETACEAE
Isoetes
I. engelmannii
I. melanopoda

EQUISETACEA
Equisetum
E. fluviatile
E. arvense
E. laevigatum
E. hyemale ssp. *affine*

E. variegatum ssp. *variegatum*
E. x litorale
E. x ferrissii
E. x mackaii
E. x nelsonii

OPHIOGLOSSACEA
Botrychium
B. virginianum
B. biternatum
B. dissectum
B. multifidum
B. oneidense
B. matricariifolium
B. simplex
Ophioglossum
0. engelmannii
0. pusillum
0. vulgatum

OSMUNDACEAE
Osmunda
0. cinnamomea
0. claytoniana
0. regalis var. *spectabilis*

LYGODIACEAE
Lygodium
L. palmatum

PTERIDACEAE
Adiantum
A. pedatum
Cheilanthes
C. lanosa
Pellaea
P. glabelia ssp. *glabella*
P. atropurpurea

VITTARIACEAE
Vittaria
*V.appalachiana (*gametophyte only*)*

HYMENOPHYLLACEAE
Trichomanes
T. boschianum
T. intricatum (gametophyte only)

DENNSTAEDTIACEAE
Dennstaedtia
D. punctilobula
Pteridium
P. aquilinum
*(*var *latiusculum* and var *pseudocaudatum)*

THELYPTERIDACEAE
Thelypteris
T noveboracensis
T palustris var *pubescens*
Phegopteris
P. hexagonoptera

BLECHNACEAE
Woodwardia
W. areolata
W. virginica

ASPLENIACEAE
Asplenium
A. pinnatifidum
A. rhizophyllum
A. platyneuron
A. resiliens
A. trichomanes ssp. *trichomanes*
A. bradleyi
A. montanum
A. ruta-muraria
A. x kentuckiense
A. x ebenoides

DRYOPTERIDACEAE
Matteuccia
M. struthiopteris var *pensylvanica*
Onoclea
0. sensibilis
Diplazium (=Athyrium)
D. pycnocarpon
Deparia (= Athyrium)
D. acrostichoides (=A. thelypteroides)
Athyrium
A. felix-femina (var *angustum* and var *asplenioides)*
Cystopteris
C. bulbifera
C. tennesseensis
C. protrusa
C. tenuis
Woodsia
W. obtusa ssp. *obtusa*
Dryopteris
D. marginalis
D. goldiana
D. celsa
D. clintoniana
D. cristata
D. intermedia
D. carthusiana
D. x bootii
D. x uliginosa
D. x neo-wherryi
Polystichum
P. acrostichoides

POLYPODIACEAE
Polypodium
P. virginianum
Pleopeltis (=Polypodium)
P. polypodioides var *michauxiana*

MARSILEACEAE
Marsilea
M. quadrifolia

AZOLLACEAE
Azolla
A. caroliniana

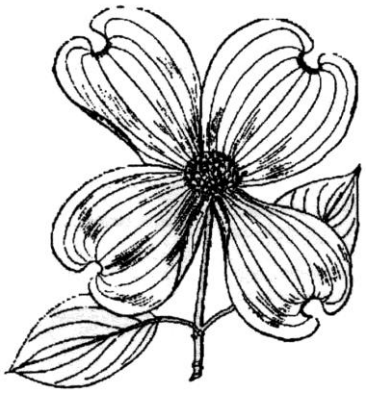
Compiled by
Michael Homoya, 2003

Gardens for the 21st Century

by Janet Marinelli

Used to be, gardeners bragged about their green thumbs. Today, brandishing mulching mowers and compost bins, we consider ourselves green to the core. But our gardens are ecological wastelands. Across a continent of breathtaking biological diversity we have planted the same 20 to 30 plants from around the world: a golf-course-quality lawn, some meticulously clipped yews, a rhododendron or two and a handful of specimen trees ringed by begonias and other annuals.

As wilderness shrinks and backyard acreage increases, the ecological impact of home gardeners grows ever greater. The U.S. Census Bureau calculates that the nation's inner suburbs have almost doubled in the past two decades and 400 square miles are added every year. It's no wonder that the Missouri-based Center for Plant Conservation is concerned about the long-term survival of 4,279 of America's 23,000 native plant species – plants that are critical habitat for countless other creatures.



According to conventional gardening wisdom, importing plants from around the globe increases an area's biological diversity. Yet biodiversity isn't a simple matter of numbers of species. Free of the checks and balances that controlled their reproduction in their original lands, many introduced plants have jumped the garden gate and choked out indigenous vegetation. Conversely, pampered exotics fail to flourish beyond the backyard because they can't forge the kinds of ecological relationships that enable them to prosper and evolve in their native habitats.

Home gardens have a potential as ecological sanctuaries that is just beginning to be explored. In ever-increasing numbers, gardeners are viewing their properties as potential habitats, not simply collections of pretty plants. They're restoring native plant communities, learning how to put back the pieces so that nature can heal itself and get on with evolution.

Northeast gardeners are re-creating the dense layers of North America's deciduous forest. Under towering canopy trees spared by the bulldozer they're replacing lawn with understory species such as the flowering dogwood, with exquisite wild azaleas and other native shrubs, with woodland wildflowers and ferns. Gardeners in the Midwest are re-creating native prairie. Arizonans are designing their gardens with such distinctive Sonoran Desert natives as the giant saguaro, the multi-stemmed ocotillo and the sculptural prickly pear.

Typically, these zones of natural landscape are planted toward the edges of the property; natives and well-behaved exotics mingle in more traditional plantings in the immediate vicinity of the house. Without exception, as gardeners restore native plant communities, they discover to their delight that wildlife find their way back and make themselves at home.

Imagine the possibilities: a new suburban landscape in which natural gardens link up to provide living space for beleaguered wildlife, forming a network of corridors that crisscross the continent. Imagine a new definition of rare and unusual plants (the kinds sophisticated gardeners covet) based on native species that require human help to thrive or even survive. Virtually everywhere there are species that have lost so much ground that they can no longer repopulate former habitat. Planting them can be a gardener's great gift to the planet.

For millions of years, birds and bees have been agents of biodiversity, scattering pollen and seed across the land. Now humans must play a similar role. Biologically, restored habitat is defective. But as ecologists struggle to heal the land, nature acquires, in author William Jordan's words, "an alternative mode of reproduction, one that is capable, if not of handling it to perfection, at least of making it compatible with the speeded-up pace of cultural evolution." He calls this a radical evolutionary metamorphosis.

Home gardeners are struggling to make this same evolutionary leap.

Janet Marinelli is an editor at the Brooklyn Botanic Garden and author of The Naturally Elegant Home, *published by Little, Brown in 1992, and* Stalking the Wild Amaranth: Gardening in the Age of Extinction *(Henry Holt, 1998).*

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On The Fringe

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