



On The Fringe

Journal of the Native Plant Society of Northeastern Ohio

My Favorite Prairie Recipe

Guy L. Denny

There are probably as many ways to establish tall grass prairies as there are recipes for making apple pies or remedies for treating symptoms of the common cold. All are basically the same, with only minor deviations based on personal preference. All produce reasonably good results. What I am going to share with you is my personal prairie recipe to which I have added my own modifications based on trial and error, and adjusted to address my specific needs. It is a recipe that has worked well for me, but is by no means the only recipe out there that works. This recipe works for the individual who is interested in establishing something larger than a butterfly garden and yet not as extensive as a 10+ acre restoration project. It is geared to individuals like myself who are planting 1/2 to 1 acre plots by hand.

Prairie plantings can be established anywhere in Ohio, regardless whether or not prairie historically occurred on the site. Prairie species do well in sandy, clay or loam soils. The only stringent requirement is that the site must be open since prairie plants tend to be shade intolerant. It is important to note, however, that individual prairie species may be more demanding than others as to the substrate in which they are placed. Soil moisture, nutrient levels, pH topography and competition levels can and do influence which species will do better, where. Consequently, it is very helpful to familiarize yourself with the needs of individual species either through literature searches or by studying natural prairie remnants around the state. This is extremely helpful when it comes to analyzing the site on which you plan to establish prairie, selecting seed, and in developing a planting plan for your site. As a rule of thumb, the drier the site, the longer it takes for prairie to become established. My experience is that soil moisture is far more important for fast establishment and vigorous plant growth than is fertilizer.

The first step is to select a site on which to establish your prairie. It is a very big job for most individuals to be able to collect enough seed and then hand plant more than 1/2 acre a season. If you want to establish a much larger prairie, you need to do so incrementally over several years. Or, you can purchase a large amount of seed and rent a seed drill to get it all in the ground at once. The latter approach is very expensive and makes it all but impossible to utilize seeds other than those purchased from out-of-state nursery sources.

Once you have your site selected, the next step is to develop a planting plan or design scheme. Based on the individual attributes of your site, you need to decide which

species will work best and where within your site. This needs to be based on such things as soil moisture availability, nutrient levels, competition tolerance, etc., and especially on the appearance you want to achieve. This is the written plan you will follow when you actually begin planting.

Now you are finally ready to begin preparing your site. I start off by mowing the site to a lawn-like appearance in May or June. Just as soon as there is sufficient re-growth, I apply my first application of a systemic herbicide with a backpack hand sprayer. That will kill most of what is growing on the site, but not everything. By August or September, some of the more persistent species like Goldenrod, Canada Thistle, and Smooth Brome Grass may be attempting a recovery, joined by a multitude of seedlings from the seed bank within the soil. Time for another application of herbicide. For those with an aversion to using herbicides, you should be able to get away without their use, but it may make it much more difficult to get prairie plants established and maintain them.

If you haven't already made the decision, now you have to determine whether you are going to purchase seed or collect your own. Purchasing seeds from an out-of-state source is OK if you don't mind not having Ohio genotype seeds, and you can incur the expense. Prairie grass seed can easily cost \$1,000 per 1/2 to 1 acre. That doesn't even include seeds for prairie wildflowers, or forbs as they are called. I collect my own grass and forb seeds from prairie remnants, mostly along roadsides, throughout Ohio. However, I have purchased some plants that are uncommon in Ohio, like Compass Plant and Queen-of-the-Prairie, from out-of-state nurseries to supplement my plantings. Most of my seed collecting takes place during October. The "art" of collecting and drying prairie seeds is well beyond the scope of this article. Suffice it to point out, seed collecting is hard, time consuming work that can leave your hands blistered and covered with festering wounds from plant splinters. It also pits you in a race against flocks of ravenously feeding Goldfinches and natural seed drop. I normally try to collect more seed than I think I will actually need. That way, I usually have enough seed since it always seems to take more seed than I think.

If prairie seeds that fall in late October immediately germinated, they would tend to freeze out with the coming of winter or be frost heaved before their roots could become well enough established to anchor them. But Mother Nature has that covered. Most prairie seeds have a built-in

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Annual Dinner

Annual Dinner - Oct. 25 - 5:30 PM

Speaker is William Cullina of the New England Wild Flower Society

Subject: "Why You Can't Buy a Forest In a Can – managing and restoring diversity in our wetlands and gardens".

FINAL RENEWAL NOTICE

This will be your LAST issue of the Journal if you have not renewed by June 1st. Your mailing label will be marked with an X to indicate non-renewal. Please send your check today. As I have said before, it is expensive and time-consuming to contact you all by phone. We really don't want to lose you.

DNAP Symposium

The Second Annual Botanical Symposium will be sponsored by the Ohio Division of Natural Areas and Preserves at the Museum of Biological Diversity, 1315 Kinnear Rd., Columbus. The date, to be determined, will be 3/30, 4/6 or 4/13, depending on which date is most convenient for the majority. Some of the subjects will include an overview of Ohio's Floristic Quality Assessment Index; an update of the rarest plants found in 2001; and other rare plant topics. Call Jim McCormac at 614-265-6440 or e-mail him at jm.mccormac@dnr.state.ohio.us if you are interested in attending.

Native Orchid Conference

A Native Orchid Conference will be held in Greensboro, North Carolina May 17-19, 2002. Some of the featured speakers will be Ron Coleman, author of the new *Wild Orchids of Arizona and New Mexico*, and *Wild Orchids of California*; Carl Slaughter, author of *Orchids of Arkansas*; Larry Mellinchamp on the subject of Bog Gardening with orchids; and other well-known experts in the field of Native North American Terrestrial Orchids. The Conference will take a field trip on Sunday to the Green Swamp Nature Conservancy Preserve on Sunday and on Monday go to Boone, NC to see mountain orchids. Fee is \$65.00. Call Ann Malmquist at 440-338-6622 if you are interested in attending.

Spring Programs

May 4, Sat.: Spring Ephemerals at Eagle Creek State Nature Preserve, led by Emliss Ricks. Spectacular display in a floodplain forest with sphagnum bog and observation tower. **9am**

May 19, Sun.: Sedges. Selected Carex species of Cuyahoga County. Starts with a brief laboratory workshop, led by George Wilder. Cleveland State U Biology lab & Parma's West Creek Preserve. Call George within 3 days of the trip if you wish to attend: 216-687-2395. **9am**

Jun. 8, Sat.: Kelley's Island. Joint trip with Northeast Ohio Naturalists (NEON) led by Jim Bissell, Curator of Botany, Cleveland Museum of Natural History. Bring lunch and ferry fare. Meet at Paladino ferry at **9am** Registration limited. Call 216-231-4600 ext 219

Jun. 15, Sat.: Assist in plant survey for the Chagrin River Land Conservancy on the east branch of the Chagrin River in Chesterland. Led by Bill Hudson. To register, call Judy Barnhart at 440-286-9504(W) or 440-564-9151(H). **9:30am**

CMNH Curator's Lecture

Jim Bissell will give a Curator's lecture at the Cleveland Museum of Natural History on Wednesday April 3rd at 7 pm, on the Native Orchids of Ohio. He will emphasize native orchids that can be found on Museum properties here in Northeast Ohio. Call 216-231-4600 for further details.

(Prairies – continued from page 1)

dormancy which is not broken until the seeds have gone through an extended period of cold and often wet conditions. This is known as seed stratification; Mother Nature calls it winter. Then, and only then, will they germinate which typically is not until the following May. Some prairie landscapers simply elect to store their seeds over winter in wet sand within a refrigerator. I, on the other hand, figure that prairies have been successfully replanting themselves for a very long time now without the use of a refrigerator. So, I follow their example by planting in late fall. The drawback is that you have to seed very heavily since a lot of the seed will be consumed over the winter months by rodents and birds. That, of course, is why in nature, many more seeds are produced than ever germinate. Some prairie landscapers recommend simply broadcasting seed on top of the soil and letting frost action in the soil bury them. That works as long as you don't have to contend with large hungry flocks of Sparrows and Goldfinches. Eventually, snow cover shields the seeds from the birds, but that is when meadow voles take over under the snow. So, I put a light covering of about 1/4 inch of soil over the seeds I plant in fall.

The ideal way to place prairie seeds into the soil without disturbing the soil and awakening its seed bank of a multitude of weedy species, is to use a seed drill that barely disturbs the soil. But we are planting by hand so that is not an option. That means no matter what we do, we are going to be disturbing the seed bank, releasing all kinds of native as well as non-native competition for our prairie seedlings. A lot of these will be winter annuals long gone by the time our prairie seeds start to germinate in May. However, we are going to have to deal with others. Keeping this in mind, I use a simple garden rototiller to prepare my seedbed. It is extremely hard work, equally as hard on my very small rototiller as it is on me, but we always get the job done. Preparing the seed bed can be accomplished anytime before the soil becomes too wet to work, or freezes up; usually November through early December.

This next step of actually planting seeds requires a lot of time on hands and knees. Now is when your need to pull out your planting plan. Although prairie grasses are slow to take off, once they do, they tend to squeeze other plants out. That is one of the reasons I tend to plant forbs in clumps of the same species. You get more color splash this way and a solid clump of Purple Coneflowers or Bergamot makes it more difficult for aggressive tall prairie grasses to invade and shade out. In your plan, you have to take such things into account as plant heights, aggressiveness, blooming sequence, soil moisture preference, etc. With the plan in mind, I begin along one of the edges of my site, using a soil rake to rake back a swath of soil about 4-5 feet wide the entire length of the site. I rake from the outside edge inward creating a low linear mound of soil. Next I start broadcasting my seeds according to my written plan. Before covering the seeds, I place surveyor flags every few

feet along the entire length of the mound so I will be able to see where to begin my next row. Now begins the back breaking work of tossing the soil from the mound back over the seeds by hand. The seeds need only be covered about 1/4 inch. You do not have to, nor is it a good idea to add fertilizer. Your prairie plants really don't need it, but the weeds will love it! Once covered, it is time to rake the next 4-5 foot wide swath. The flags help to determine where the previous swath was located. Keep repeating this process until the entire plot has been planted. The final step is to compact the surface of the plot with a yard roller. This step isn't essential but it helps firm up the seed bed and achieve better soil seed contact. It also makes seeds less accessible to birds and rodents. Now you are done, at least for now. Your prairie seeds won't germinate until next May. Unfortunately, all the other weed seeds you don't want will begin germinating much sooner. Some individuals plant a cover crop of annual rye or oats with their prairie seeds to provide less space for weeds to germinate. That is probably a good practice, but I haven't found it to be necessary. Regardless, by mid June your fledgling prairie will be a sea of weeds. Often species such as Queen Anne's Lace, Common Ragweed, and Daisy Fleabane dominate the site giving one the impression that some how the project has failed. Yet a close examination will reveal a plethora of seedling prairie plants beneath the weeds. During the first year or two following germination, prairie plants put most of their energy into growing long roots in order to be able to survive drought conditions, a normal occurrence west of the Mississippi. A 6 inch plant may have 6 foot long roots. Only after roots are well established do they "change gears" and make rapid above-ground growth. Our native species as well as alien species, which normally are not subject to drought conditions, put their energy into above ground growth quickly overtopping and shading out the prairie species. To compensate for this disparity in growth rates and in order to give your prairie seedlings a chance to compete, it is time to get back to work tending the prairie. Next step is to mow the site about 6-8 inches above ground level in order to expose the prairie seedlings to critical sunlight and slow the growth of non-prairie plants. One such mowing in late June should suffice. Mowing will not remove such perennials as Canada Thistle, but given enough time, these weedy species will be squeezed out by prairie plants. Once well established, prairie plants, especially grasses, can out-compete most other plants.

By the following March, if you have enough fuel on the site to carry a fire, you can do your first prairie burn. Often, there won't be enough fuel present until the second March following planting. You can get away without burning, but prairies do not develop as quickly, nor do the plants show as much vigor in the absence of fire as they do with burning. Fire recycles nutrients otherwise tied up in thatch, blackens the earth allowing ground temperatures to warm up faster, thus jump starting prairie growth, stimulates certain prairie species, and controls invading woody species. The "art of prescribed burning" is also

beyond the scope of this article, but should only be done by experienced individuals. Burning prairies requires permits from Ohio EPA, the ODNR Division of Forestry, and your local fire chief.

It will probably take 3-5 years for your prairie planting to begin looking like a real prairie; perhaps longer if you don't burn and you have dry, clay soil. Some species like Prairie Dock take 6-7 years from seed to blooming plants.

Just be patient and let Mother Nature do her thing. You will be rewarded for all your hard work as your prairie planting just gets better and better and attracts more and more wildlife with each passing year. Just hang in there, it will be worth the wait!

Guy Denny is the retired chief of the Division of Natural Areas and Preserves and has his own extensive prairie.



All Mixed Up: Prairie Seed Mixes

Michael P. Anderson

You're restoring the landscape on your back 40 and you're shopping for a seed mix. You can either buy Mix A with 45 species for \$600 or you can buy Mix B with 40 species for \$700. Which is the better deal? It must be Mix A because you get more species for less money – right? Maybe, maybe not.

In order to evaluate the quality of a seed mix, you need to know which species are in the mix, the proportions of the species in the mix, and something about the quality of the seeds.

Knowing which species are in the mix is important for several reasons. First, are the species in the mix appropriate for your site? If you have a sandy, dry site and the species in the mix are for a wet site, it doesn't matter how cheap the seeds are—you've wasted your money because they won't grow.

Second, some species are inexpensive while others are very expensive. For example, Black-eyed Susan (*Rudbeckia hirta*), Bee Balm (*Monarda fistulosa*), and Ox-Eye Sunflower (*Heliopsis helianthoides*) typically sell for around \$5 per ounce while Pale Spiked Lobelia (*Lobelia spicata*), Blue-eyed Grass (*Sisyrinchium campestre*), and Cream Wild Indigo (*Baptisia leucophaea*) sell for more than \$100 per ounce. Thus, Mix A might not be such a good deal if it's loaded with inexpensive species.

Knowing something about the ecological behavior of the species in the mix is also important. A site planted with a high proportion of annual, biennial, and short-lived perennial forbs, such as Black-eyed Susan, Dotted Mint (*Monarda punctata*), and Yellow Coneflower (*Ratibida pinnata*) is much more likely to become grass dominated once these short-lived species have died out than if it was planted with a higher proportion of perennial forbs. That's not to say short-lived species shouldn't be planted, just make sure they don't comprise the bulk of the mix and that you include long-lived species as well.

Be wary of mixes with a high proportion of rhizomatous species and species that grow aggressively because they can overwhelm and exclude the more subdued species. Examples include most of the Sunflowers (*Helianthus* spp.), Grass-leaved Goldenrod (*Solidago graminifolia*), Canada Tick Trefoil (*Desmodium canadense*), and Prairie Coreopsis (*Coreopsis palmata*). Again, that's not to say these species shouldn't be planted, just take care not to plant them at too high of a rate. Or you can do as I often do and individually spot-plant the aggressive species into discrete areas instead of including them in the mix.

It's also very important to consider the germination characteristics of the species in the mix. Species that germinate readily should be planted at a relatively light rate so they won't become overly abundant and suppress or extinguish the species that germinate and mature more slowly. Examples include Black-eyed Susan, Butterfly Milkweed (*Asclepias tuberosa*), Yellow

Coneflower, and Compass Plant (*Silphium laciniatum*). Many easily germinated seeds are relatively inexpensive, making it tempting to load up on them – a big mistake.

Conversely, species that don't germinate well from seed, such as New Jersey Tea (*Ceanothus americanus*), Wild Rose (*Rosa* spp.), and Canada Anemone (*Anemone canadensis*), will need to be sown at a higher rate in order to ensure their presence in your prairie. Very-small-seed species such as Shooting Star (*Dodecatheon media*), Culver's Root (*Veronicastrum virginicum*) and many of the lobelias (*Lobelia* spp.) are often planted too deeply to survive because they easily sift or wash deep down into the soil. Thus, small-seed species need to be planted at a slightly higher rate to account for their higher mortality.

You also need to consider the mix's grass-to-forb ratio. Most prairie seed mixes have a ratio of about 30 to 40 percent grass and 60 to 70 percent forbs. Mixes with more than about 65 percent grass will typically develop into a solid stand of grass. This is especially true if most of the grasses in your mix are Big Bluestem (*Andropogon gerardi*) or Switch Grass (*Panicum virgatum*). Mixes with more than about 70 percent forbs may be very showy, but are often difficult to maintain by burning because grasses provide most of the fuel for a burn. Also, seed mixes with a high proportion of forbs may be prohibitively expensive because forbs cost more than grasses.

It's also important to consider seed quality. A standardized measure of seed quality is *pure live seed* (PLS). PLS is determined by multiplying seed purity (cleanliness) by the proportion of live (viable) seeds.

Determining PLS requires laboratory testing. Buying seed on a PLS basis helps ensure the ounce of Big Bluestem you're buying actually contains an ounce of viable seeds. Most native plant nurseries sell grass seed by PLS, a few also sell forb and shrub seeds by PLS. If you're planting seeds you've collected, there will probably be more impurities (stems, leaves, pappus, etc.) than commercially purchased seed, and you need to plant more of it.

For most restorations, the cost of the seed is the most expensive part of the process. Designing a quality seed mix is part science, part art and should be based on site characteristics, species characteristics and your restoration goals. A well-designed mix will achieve your goals, a poorly designed mix will be a disappointment and a waste of your time and money.

Reprinted from Wild Ones Journal, September/October 2001. Michael P. Anderson operates BioLogic Environmental Consulting, LLC and is member of the Madison WI Chapter of Wild Ones.

Ohio Nature Preserves:

Miller Nature Sanctuary

Miller Nature Sanctuary, also known as Rocky Fork Gorge State Nature Preserve, consists of 85.8 acres of calcareous cliff community, hardwood forest and old field habitats. Also found here are unusual geological formations such as natural arches and waterfalls. Rocky Fork Gorge contains some of the best spring wildflower areas to be found in southern Ohio. Over two miles of hiking trails are maintained. **A written permit is necessary to visit this preserve and may be obtained from the Division's Columbus office. Guided tours can be arranged directly with the preserve manager.**

THE LANDSCAPE

Miller Nature Sanctuary is located in extreme eastern Highland County on the northwest bank of Rocky Fork Creek approximately four miles upstream from where it empties into Paint Creek. The geology of this region is very interesting and somewhat confusing as the area is located in a "busy intersection" of geological occurrences.

The Rocky Fork Gorge area is located at the borders of four major physiographic (landform) regions. The preserve lies within the Till Plains Region of glaciated Ohio. Covering most of western Ohio, the topography of the Till Plains Region was created by glacial deposits and subsequent erosion and is now Ohio's most productive farmland. Within the preserve can be found evidence of an early glacial period known as the Illinoian Glaciation which occurred approximately 200,000 years ago. The drift left behind by this ancient ice sheet indicates that the preserve was buried in glacial ice for at least a portion of the Illinoian glaciation.

The hills of the Unglaciated Appalachian Plateau are a few miles east of the preserve. Quite steep and high, these hills formed a barricade to the ice sheets, halting their southern advance. These hills are primarily made up of soft, Ohio Black Shale, capped by resistant sandstones. This combination produces a rugged terrain some call the foothills of the Appalachians.

The Glaciated Appalachian Plateau is northeast of the preserve. Here the glaciers overrode the hills for a short distance, producing a rolling countryside. A short distance to the south of the preserve is the Interior Low Plateau, or Bluegrass Region. Some of Ohio's most interesting plant communities are found within this unglaciated limestone country. Six state nature preserves are located in or near the Bluegrass Region.

The three basic bedrock types exposed in this region are all sedimentary, having been formed from sediments deposited at the bottom of a sea which once existed here. The Silurian dolomites at the bottom of the gorge were deposited nearly 400 million years ago while the Mississippian sandstones which cap the highest ridges did not settle to the bottom of the sea until almost 100 million years later.

THE GORGE OF ROCKY FORK

Hiking the trails at Miller Nature Sanctuary not only provides the visitor with spectacular scenery, but often provokes the question, "How did this place come to be?" Many geologists have pondered this particular question and not all

Miller Nature Sanctuary

Highland County



agree completely. One of the most thorough reports on the area, *Glacial Geology Of Highland County*, was written by Theodore E. Rosengreen in 1974. Rosengreen credits meltwater coming from the retreating Illinoian glacier with forming the gorge of Rocky Fork around 200,000 years ago.

According to Rosengreen, as the glacier began to retreat or melt back along its southern edge, it halted briefly just north of present day Rocky Fork Lake. Here massive amounts of meltwater coming from the glacier formed a lake in the depression of the old preglacial valley of Rocky Fork. The natural outflow for this glacial lake would have been to the east but it was not to be that simple.

The eastern route for the meltwater was blocked by a large, dam-like ridge called an esker. The ridge had been formed when an earlier stand of the glacier had dropped a large amount of sand, gravel and other material across the old Rocky Fork valley. The esker can be traced today in a north-south direction just north of Carmel along the present course of S.R. 753. The water rose behind this natural dam and began to be diverted around it at present Beavers Mill. The diverted meltwater then began flowing over dolomite bedrock and in a veritable blink of geologic time carved its way down into the earth forming the tremendous gorge.

For the next 175,000 years or so, the Highland County area was free from glacial influence but about 25,000 years ago the ice returned again. This time, however, the ice did not move quite so far south, stopping just two and a half miles to the northwest of the preserve. Although the area of Miller Nature Sanctuary was not covered in glacial ice during this most recent glaciation, known as the Wisconsinan, the Rocky Fork Gorge did receive increased amounts of meltwater from this ice sheet.

This last great flood of waters no doubt helped place the final touches on the gorge we recognize today.

HIKING TRAILS

Visitors can hike three separate trails at Miller Nature Sanctuary. Each of these trails provides easy to moderate hiking over slightly hilly terrain. Wooden steps, staircases, bridges and boardwalks have been built for convenience and safety, but visitors should exercise caution as the surface of these structures can become slippery when wet or covered with fallen leaves. Please hike only on these designated trails. They have been designed to lead the visitor to the most scenic areas of the preserve. All trails begin and end near the parking area.

Arch Trail. This is the shortest and easiest of the Miller Nature Sanctuary trails. Only 1/3 of a mile in length, the Arch Trail passes directly below its namesake, which is more accurately a natural bridge than an arch. The bridge was formed as surface water running downslope and over the cliff, became captured by a vertical joint in the bedrock. This joint (or crack) was slowly enlarged by the dissolving action of the surface water until all the water running down this slope flowed through the joint and under the bridge as we see it today. The bridge stretches forty-six feet wide and three and a half feet high. The capture of surface water by vertical joints in the bedrock accounts for the formation of 75 percent of Ohio's natural bridges. In fact, the steep-sided nature of Rocky Fork's Gorge is largely the result of the control of such joints. The Arch Trail leads the visitor upstream along Rocky Fork past dolomite slump blocks draped in spring wildflowers which reach their peak bloom in late April.

Tuliptree Trail. This 3/4-mile trail leads visitors upstream along a small tributary of Rocky Fork. The stream bottom here is solid dolomite and forms a waterfall near the beginning of the trail. The Tuliptree Trail loops through a stand of tuliptree (*Liriodendron tulipifera*) so named because of the tulip-like flowers produced by the tree in late spring and early summer. The flowers usually are high in the tree tops and difficult to see, but the orange and green "petals" are often found on the ground beneath the trees. Timbermen often refer to this tree as "yellow poplar" and value it for its fast growth and straight grain. Tuliptrees do not reproduce well in heavy shade and are therefore considered a pioneer species, being one of the first tree species to invade forest openings. They are long-lived, however, and giants 6-9 feet in diameter and over 500 years old still can be found in some areas of the Smoky Mountains.

This area now supporting tuliptrees probably was cleared 60 or 70 years ago and has reverted to forest. Now other species of hardwoods, more tolerant of shade, are beginning to encroach on this stand of tuliptrees.

Falls Trail. At one mile in length, the Falls Trail is the longest hiking trail at Miller Nature Sanctuary. The Falls Trail follows Rocky Fork downstream to the extreme northeastern end of the preserve, passing its namesake near the half-way point. A small tributary enters from the north and tumbles over the gorge wall forming an impressive waterfall during wetter times of the year.

Colorful displays of wildflowers abound along the lower section of the Falls Trail in the spring. Here, as along the Arch Trail, slump blocks of various sizes can be seen resting at odd angles and covered with ferns, mosses, wildflowers and even trees. Observant visitors will notice that many of these slump blocks were calved from the cliff face along the same type of vertical joints responsible for the formation of the natural bridge along the Arch Trail. A few of these blocks have tumbled all the way into the stream where full sun and periodic flooding create the harsh conditions that favor a few unlikely species of prairie grasses. Big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*) and Indian grass (*Sorghastrum nutans*) are scattered on the tops of the most exposed slump blocks.

Along the banks of Rocky Fork proper, large patches of scouring rush (*Equisetum hyemale*) grow on the sandy banks. This plant gets its name from embedded bits of silica in the plant fibers which in the past were used like sandpaper. This use led to many common names for this plant, including "polishing rush" and "gun bright". In this area you also will find evidence of beaver activity, such as the cut stumps of small trees, trees that have been girdled and even larger, fallen trees with the bark stripped off. Completely trapped out of Ohio by about 1836, this large rodent has reestablished itself throughout most of Ohio. Herein the deep pools of Rocky Fork, beaver rarely build dams, except during times of low water in summer.

Scattered along the Falls Trail, and especially near the top of the large staircase, grows one of the most fascinating spring wildflowers to be found at Miller Nature Sanctuary. Snow trillium (*Trillium nivale*), a potentially threatened species in Ohio, blooms in early to mid-March. The smallest of Ohio's eight species of trillium, the tiny snow trillium does well on rocky, limestone slopes.

The higher section of the Falls Trail traverses a thin layer of weakly acidic bedrock known as the Hillsboro Sandstone. This portion of the Sanctuary is forested with a variety of oaks, while the number of spring wildflowers is rather few. Here and there the trail dips low enough to reach the dolomite as indicated by thriving patches of shootingstar (*Dodecatheon meadia*), wild columbine (*Aquilegia canadensis*), or an occasional red cedar (*Juniperus virginiana*). The drier portions of the trail are dotted with clumps of American columbo (*Swertia carolinensis*). This unusual plant grows as a large rosette of broad green leaves resembling a young cabbage head or tobacco set. After many years, perhaps 15 or more, the columbo shoots up a stalk 4 to 5 feet in height, sporting a large cluster of unusual greenish flowers. It then promptly dies, leaving behind a dried stalk that may persist for up to a year, perhaps as a monument to its struggle to bloom. In fact, some call it the "monument plant."

Reprinted from the Ohio Department of Natural Resources, Division of Natural Areas and Preserves publication, "Miller Nature Sanctuary", 8/99

Invasive plants of Ohio

Autumn-Olive and Russian-Olive*Elaeagnus umbellata*, *E. angustifolia*

DESCRIPTION:

Autumn-olive and Russian-olive are non-native, deciduous shrubs or small trees that grow to 20 feet tall. The leaves on autumn-olive are small, oval, untoothed and dark green. It has small, light-yellow fragrant flowers in May-June and small round juicy fruits that are reddish to pink in color and dotted with silver or brown scales. Russian-olive's leaves are narrower and longer, and dull green. It has yellow flowers and dry yellow mealy fruits. Silver scales occur on the underside of the leaves of both species. The twigs of Russian-olive are typically covered with thorns. These shrubs begin to flower and fruit annually after 3 years. An individual plant can produce 8 pounds of fruit each year.

HABITAT:

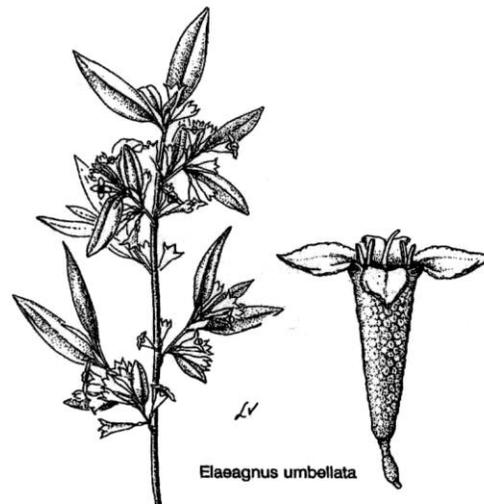
Autumn-olive and Russian-olive have nitrogen-fixing root nodules which allow them to adapt to many poor soil types. They are found in areas such as pastures and fields, grasslands and sparse woodlands.

DISTRIBUTION:

Autumn-olive is native to China and Japan. It was introduced to the United States in 1830 and is distributed throughout the state. Russian-olive is originally from Europe and Asia. It was introduced to North America in the early 1900s and is also found throughout Ohio. Historically these plants have been used for erosion control, strip mine reclamation, wildlife habitat, and in landscaping.

PROBLEM:

Autumn-olive and Russian-olive aggressively out-compete native plants and shrubs. They grow rapidly and re-sprout heavily after cutting or burning. Both species are prolific fruit producers, with seed dispersal mostly accomplished by birds.

*Elaeagnus angustifolia**Elaeagnus umbellata*

CONTROL:

Mechanical: Hand-pulling seedlings and sprouts is effective in the early spring when the ground is moist and the entire plant and root system can be removed. Other forms of control, such as mowing and burning, without the application of a herbicide usually contribute to a larger number of root sprouts.

Chemical: Systemic herbicides, such as Roundup®, Glypho® and Garlon®, can be used effectively when applied to cut stumps or when used as a foliar spray. Re-sprouts should be treated with a foliar application of herbicide. Basal bark application of Garlon® can also be an effective form of control.

Biological Currently there are no biological controls for Autumn-olive or Russian-olive.

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RATING NATURAL AREAS: THE FLORISTIC QUALITY ASSESSMENT INDEX

By Barbara Andreas, John Mack, and Jim McCormac

“The outstanding scientific discovery of the twentieth century is not television, or radio, but rather the complexity of the land organism. Only those who know the most about it can appreciate how little we know about it. The last word in ignorance is the man who says of an animal or plant: ‘What good is it?’” (Aldo Leopold, from Round River)

Many times, when someone asks what we think of a particular piece of land, we reply with subjective superlatives like “good”, “significant”, or “excellent”. These terms don’t necessarily tell the true story, as what’s “high quality” in your book may not be in mine, or vice-versa. Many factors go into forming the opinion a biologist – or anyone for that matter – will have regarding a property. Opinions are dictated by experience, and in our business of land preservation, the opinions are shaped by the degree of statewide familiarity with various habitats, the level of knowledge of botany and zoology, and firsthand comparative experience with the best and worst of ecosystems. Since everyone has varying degrees of experience with these factors, few opinions regarding a natural area will be equal. This subjectivity in describing the supposed significance of a site leads to rather arbitrary viewpoints, or at least ones that are sometimes difficult to defend.

What is a “Natural Area”, anyway? Generally, at least from the Division of Natural Areas and Preserves’ (DNAP) perspective, these are habitats that approximate the conditions found prior to European settlement. After this time, changes in the environment rapidly occurred as Ohio was settled. Very little in the way of undisturbed plant communities remain in the state, and some sobering statistics bear this out. Of our estimated 1,000+ square miles of original prairie, less than 1% is left. 98% of Ohio’s bogs and fens have been destroyed. And even though forest once blanketed 95% of Ohio, virtually all of it has been cut over at least once, resulting in fragmented and disturbed woodlands in most cases. So, DNAP tries to identify and protect the “best of the best” that remains.

With very limited fiscal resources at our disposal, it’s important for us to be able to justify and rationalize our acquisitions, and how we decide upon one area over another. And, there is a better way to scientifically assess the quality of a particular site, rather than rely exclusively on the old opinion method.

“Floristic Quality Assessment Index” was a term coined by Floyd Swink & Gerould Wilhelm in their 3rd Edition of the *Plants of the Chicago Region* (1979). Essentially, a

floristic quality assessment index (FQAI) is a method of assessing the “naturalness” or degree of ecological integrity of an area, and expressing its value numerically. This technique hinges on a basic ecological tenet, that a given plant species has a certain fidelity – or likelihood – of occurring in a particular habitat. Of course, some plants are more tolerant of a range of habitats (facultative), while others will only grow in a very narrow niche (obligate). So, the crux of an FQAI is dependent upon evaluating an association of plants from a defined area, and determining the percentages of obligates to facultatives, and everything in between.

In an FQAI, such as one currently under development for Ohio, all plant species are assigned a number known as a coefficient of conservatism (C of C). C of C’s range from 0 to 10, with zeros being non-natives or natives that are very generalistic in regards to habitat preference. As the scale slides upward, the plants become more habitat specific, culminating with the tens, which are extremely habitat specific. An example of a low C of C plant is the **Broad-leaved Cat-tail**, *Typha latifolia*, which is a 1, as it will grow in just about any sunny, moist site, and does not by itself reveal much about the habitat. At the other end of the spectrum is **Northern Monkshood**, *Aconitum noveboracensis*, a 10. This Federally Threatened species only grows in the shaded sandy soil of rock overhangs in cool sandstone gorges. Just because a plant is rare doesn’t guarantee that it will have a high C of C. **Running Buffalo Clover**, *Trifolium stoloniferum*, which is also Federally Threatened, has a C of C of only 5. Even though rare, it doesn’t occur in a well-defined niche in specific natural communities. As a rule of thumb, when assigning C of C values, we think of how exacting we could be in describing the habitat a plant came from, if someone brought it to us and asked where it was found. In Ohio, almost 3,000 species of vascular plants have been collected in the wild, and about 1,800 of these are native. C of C’s had to be assigned to all of these natives, and that by far is the most arduous task involved with the development of an FQAI.

There are several ways that the FQAI can be used. For the first, the only requirement is good botanical field skills. When assessing an area, the surveyor need only delineate the boundaries of the site, and collect as complete a list of vascular plant species as possible. It’s critical to note, though, that a comprehensive list of flora must be gathered; recognition of at least 80 - 90% of the species that are present at the time of the survey is necessary. Furthermore, it’s important to have the ability to recognize the more

obscure floristic elements, such as sedges, as they often have the greatest habitat fidelity and consequently the highest C of C's. Once the plant list is compiled, the surveyor adds the coefficients for all native species, and divides this figure by the square root of the total number of native species. This simple formula yields an FQAI score which is also known as the **Natural Area Index**.

Alternatively, the surveyor can standardize the level of sampling effort by using quantitative vegetation sampling techniques like relevés or transects and quadrats and only calculate the FQAI score from the plants that were present within the sample plots. This allows for relative comparisons to be made between sites where the same level of sampling effort was applied. Ohio EPA has successfully used this approach in its wetland bioassessment program. Again, good botanical field skills are essential.

Finally, the components of the FQAI can be linked to quantitative plant data like percent cover or stem density to yield measures of tolerance or intolerance to human disturbance. For example, plants with low C of C's (0, 1, or 2) can be considered "tolerant" of human disturbance. The % cover of plants with low C of C's can be summed to yield a measure of the amount of tolerant plants at a site. In areas where restoration management is taking place, the FQAI can be used to monitor the effectiveness of management techniques. As more non-native species are eliminated, the index value will increase.

An example of a very high scoring site would be Cedar Bog, the famous fen near Urbana. Sampling the prime fen meadows yields a natural area index of >73, which is the highest score we've recorded anywhere in Ohio. This is due to the large number of fen-obligate species that are present at Cedar Bog, plants with C of C's of 8, 9, or 10. Daughmer Savannah, a high quality relict savannah-prairie area, has a natural area index of 46. Contrarily, an old successional field dominated by Canada Goldenrod and New England Aster would score very low, probably having a natural area index of <5.

Oftentimes, the technical expertise of DNAP staff and others involved professionally in conservation is called upon to provide an opinion as to an area's "quality". Usually, opinions are sought in cases where the site is faced with development of some sort, and a decision must be made as to whether to proceed or not. Very often these situations get bogged down in emotion, which tends to cloud the true facts regarding the biology of the area. Appropriate utilization of the FQAI provides an unbiased approach to assessing the rarity – or natural value - of the land in question, in a very defensible way.

As the recognition of need for an unbiased, scientific approach to natural lands evaluation has grown, many states have begun to develop FQAI's. Currently, in addition to the landmark Chicago-area FQAI published by Swink & Wilhelm, several states have completed FQAI's, including Michigan and Missouri. In Ohio, Barbara Andreas published a floristic index for northern Ohio in 1995, in collaboration with Robert Lichvar of the U.S. Army Corps of Engineers. Building upon the usefulness of that project, Andreas joined forces with John Mack, a biologist with the Ohio Environmental Protection Agency and Jim McCormac, botanist with the Ohio Division of Natural Areas and Preserves. Barb's initial effort has been expanded to produce an FQAI that encompasses all of Ohio, and can be applied to any site in the state.

The authors have secured a Wetland Program Development Grant from Region 5 of U.S. EPA (CD975762-01) to pay for publishing costs, and the completed document should be available late in the fall of 2002. Over two years of regular meetings between the authors was necessary to complete the project, but when done, land managers and those involved in decision-making that impacts natural areas will have a powerful tool to help guide them.



Web Pages of Interest

www.bhwp.org

Bowman's Hill Wildflower Preserve is located in Bucks County in Southeastern Pennsylvania.

<http://tncweeds.ucdavis.edu>

Weed control methods handbook. Downloadable, 200 pages. Includes grazing, fire, biocontrol, and herbicides.

www.wildflower.org/npin/index.html

Native plant information network at Lady Bird Johnson's Wildflower Center in Texas. It includes a searchable database of native plant species seed suppliers, landscapers and native plant organizations, regional publications covering everything from native species to landscapers and

seed suppliers, and answers to the most Frequently Asked Questions.

http://wildflower.avatartech.com/Plants_Online/Success_Stories/success.html

Also from Lady Bird's Wildflower Center, 90 success stories from all over the US about people growing and promoting native plants.

www.inpaws.org

Web site of the Indiana Native Plant and Wildflower Society. Their current newsletter is posted here, as well as information about invasive plants, landscaping with native plants, and a list of Indiana native plant reference books.

Botany 101 – sixth in a series
Plant Reproduction

by Dr Rebecca Dolan

So far we have studied the details of flower structure and seed production from a morphological perspective. Seeds are generally products of sexual reproduction, the result of sperm, produced in pollen, fertilizing an egg.

Plants can reproduce via sexual reproduction in several ways. They can be **outcrossers**, plants that can only make seeds when the pollen is from a different individual of the same species, or **selfers**, plants that can fertilize themselves by having pollen from the same flower or another flower on the plant fertilize one of its flowers. Some plants are able to produce seeds via pollination by either source. They are referred to as having a **mixed mating** system. Selfing, outcrossing, and mixed mating systems require pollen to be deposited on the stigma.

Some plants, such as violets, produce above-ground flowers (the characteristic purple, white or yellow flowers of violets) that are primarily or entirely outcrossed. They are called **chasmogamous** flowers. The same plant will also bear underground flowers that do not open and therefore self-pollinate. These are **cleistogamous** flowers. Jewelweeds (*Impatiens capensis*) and (*I. pallida*) also produce both chasmogamous and cleistogamous flowers.

Plants have a number of ways to reproduce themselves without sex. Some methods result in seeds, but the "embryo" is a clone, genetically identical to the parent plant. It is not produced from the fusion of egg and sperm. Dandelion seeds contain

"embryos" split off from the wall of the receptacle, or base of each flower in the flowering head. This method must work very well for them!

More common means of asexual reproduction are more directly vegetative. Strawberries spread from runners, or stolons, along the soil surface. New roots are produced at the tips of the runners, followed by leaves and flowers. Grasses spread via underground stems or rhizomes. Apples and raspberries produce sprouts or suckers from their roots.

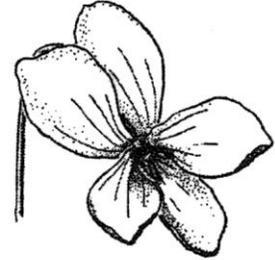
Biologists have long pondered why organisms reproduce sexually at all. If a plant or animal has grown to maturity successfully, why not just reproduce that same individual. It has already proven to be well matched to the environment. And sexual reproduction is risky, usually requiring meeting up with a mate. The shuffling of genes that occurs during sexual reproduction seems to have a much greater chance of producing less well matched offspring than it does of improving the chances of success.

Of course, environments change, in large and small ways. So it must be that the advantages of sexual reproduction outweigh the disadvantages.

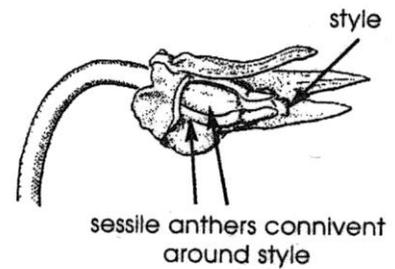
Reprinted from the Indiana Native Plant and Wildflower News, Autumn 2000

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

Primrose-Leaved Violet
(Viola primulifolia)



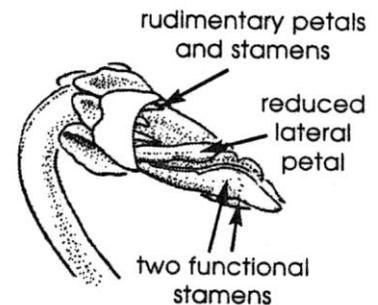
CHASMOGAMOUS FLOWER



CHASMOGAMOUS FLOWER
 PETALS AND TWO SEPALS REMOVED



CLEISTOGAMOUS FLOWER



CLEISTOGAMOUS FLOWER
 TWO SEPALS REMOVED

Sugar Maple: Most American of Northern Hardwoods

by Robert T. Leverett

SYMBOL OF NORTHEAST

What tree best symbolizes the Northeast? Those enamored of tall trees may choose the white pine, *Pinus strobus*, the great lumber tree of colonial America. Some are drawn to the paper birch with its white bark. *Betula papyrifera* has been poetically cast as the "candle of the forest." The venerable oak, symbol of strength and longevity, will garner its share of supporters. Others are irresistibly drawn to the beauty of the American beech. Odds are, though, that most American of hardwoods, the sugar maple, will nudge out the competition.

As evidence of its widespread popularity, the sugar maple, *Acer saccharum*, is the state tree of Vermont, New York, West Virginia, and Wisconsin. With its distinct reflectivity, sugar maple foliage adorns ridges, brightening the landscape in spring with a coating of light, almost iridescent green. Elsewhere, maples stand as staunch guardians of open fields, proudly presenting their gentle curving crowns as studies in symmetry and arboreal perfection.

The Northeast is world-famous for vibrant and colorful autumns, and the sugar maple is the chief contributor to that reputation. The maple is the very symbol of the New England fall. We are so accustomed to sugar maples lining stone walls, city streets, and rural roads that for most of the year we hardly notice them. Then as autumn arrives, greens turn to fiery yellows, oranges, and reds. Sugar maples color the countryside.

The sugar maple's dazzling autumnal beauty fills the coffers of many New England towns with tourist dollars. To me it almost seems taboo to overly scrutinize the subtle physical processes that annually produce one of nature's gala events. Less sentimental heads who have delved into the process tell us that when the production of chlorophyll shuts down within sugar maple leaves, a pigment called anthocyanin reveals its beautiful bright reds. Anthocyanin is produced in leaves with a high sugar content. But it is short-lived. It soon decomposes, allowing other pigments called carotenoids and xanthophylls to show their tawdry yellows. As these pigments break down the leaves turn brownish and the splendor of autumn diminishes. Once on the ground the relatively low carbon to nitrogen ratio of the leaves allows them to decay rapidly, returning nutrients to the soil.

Traditionally, the sugar maple has been a preferred tree to plant along city streets. Nowadays, however, in many New England towns, our cherished symbol is compromised with the flourishing, but brittle, less sweet, and decidedly less colorful Norway maple. The latter's prolific regeneration, fast growth, and greater tolerance for road salt pollution makes it an economic choice in the minds of many.

DISTRIBUTION AND CHARACTERISTICS

Acer saccharum has a wide distribution. It grows northeast to Nova Scotia, northwest to Manitoba, southeast to Georgia, and southwest to Texas. It prefers deep, rich, well drained soils, though it can tolerate a variety of soil types. Individual trees are bisexual. They flower in early spring. The maple's two winged fruits mature in late spring or early summer. Young sugar maples' foliage is remarkably symmetrical. Through loss of limbs and thinning, older trees lose much of their symmetry. Sugar maple bark is gray to grayish brown, thin on young trees and thick on old ones. The bark often develops long, narrow ridges.

Sugar maples commonly grow to ages of between 125 and 200 years. On favorable sites, *Acer saccharum* has no problem reaching 250 years and there are records of 400 year old specimens. I suspect that the right minerals and proper microbial action in the soils of undisturbed old-growth stands lead to the greatest longevity in the species.

The sugar maple is a fire-sensitive species. Once flames sweep through an area, sugar maples may not return for many years. Maples are highly shade tolerant. They can live 100 years or longer in a state of suppressed growth as a component of the understory.

Eventually a disturbance, such as a nearby tree fall, releases them and rapid growth permits them to assume their role in the canopy. In the Northeast, American beech and sugar maple have an interesting relationship in forests dominated by the two species. Studies show that sugar maple grows better under a canopy of beech and vice versa. Consequently, the abundance of each species tends to oscillate in these forests. In Minnesota and Wisconsin, sugar maple and basswood form an association comparable to maple and beech in the Northeast, though oscillation in abundances of the two species may not follow the beech-maple



pattern.

USES OF THE SUGAR MAPLE

Sugar maple sap was the only source of sugar during the early colonial period of America. One maple tree may produce 12 gallons of sap per year. It takes 35 to 40 gallons of sap to produce one gallon of pure maple syrup. Consequently, one tree can produce about a quart of maple syrup per year. Though descriptions are scarce, there is good reason to believe that aboriginal Americans processed maple sap to produce maple sugar.

Those familiar with lumber describe sugar maple wood as hard, durable, shock resistant, close-grained, and easy to work. Accordingly, it is valuable in veneer, cabinets, and flooring. In colonial times, sugar maple was used in malting potash. As a fuel it ranks high, though not so high as hickory.

DISEASE

Fortunately for all of us, the sugar maple is not in any imminent danger from major fungal blights or insect infestations. Nonetheless, it is attacked by tent caterpillars, gypsy moths, and pear thrips. Acid rain is suspected as an agent in the weakening of the tree's defenses, making it vulnerable to attacks from these sources. We are told that more study needs to be done before the full effects of acid rain can be known. Since this article is not about our nation's inadequate pollution control efforts, I will say no more about acid rain.

DIMENSIONS OF THE SUGAR MAPLE .

The sugar maple is a large hardwood. As with other species, books give widely varying descriptions of both average and maximum sizes for the species. *Acer saccharum* commonly exceeds 3 feet in diameter and approaches 100 feet in height, but it can grow significantly larger. Dimensions often reflect growing conditions. The largest diameter sugar maples grow in open conditions. The tallest grow inside the forest. Open grown trees, particularly those tapped for sugar, branch low and exhibit knots and bulbous growth around trimmed branches. They often appear deformed. These "spreaders" can easily exceed 10 feet in circumference, occasionally 20. They reach 80 to 90 feet in height. By contrast, their in-forest counterparts are amazingly straight-boled and often exceed the 100 foot mark, but their girths are usually in the 7 to 13 foot range. I have measured many old-growth maples in the 100 to 115 foot category that barely reached 7 feet in circumference. One soaring specimen along Cold River in the Massachusetts Berkshires tops 121 feet. The tallest of the Berkshire maples grows at the base of Todd Mountain in the Mohawk Trail State Forest; it reaches 134 feet.

Large sugar maples are not limited to the North. *Acer saccharum* can reach 11 feet in circumference in the Southern highlands, matching Northern specimens in size. The largest sugar maple recorded in the Smoky Mountains grows near Trillium Gap. It measures 15.25 feet in circumference.

WHERE TO SEE OLD-GROWTH SUGAR MAPLES

Few other trees exhibit such remarkably different profiles as does the *Acer saccharum* when open-grown versus grown in a closed canopy forest. Thanks to the sugar maple's sweet sap, the Northeast is blessed with an abundance of mature sugar maples grown under both conditions. However, with a few notable exceptions, true old-growth specimens are limited to small patches in remote locations.

Anyone yearning to see large stands of virgin sugar maples should visit New York's Adirondacks. They are a national treasure. The West Canada Lake Wilderness Area contains an extensive, highly accessible stand. Another sizable stand grows on the side of Ampersand Mountain west of Saranac Lake. The

Five Ponds Wilderness contains a large acreage of virgin sugar maples. Michigan may match or surpass New York for acreage of old-growth sugar maple. The Sylvania National Recreation Area in the Ottawa National Forest has extensive reserves of old-growth sugar maple. Farther west, Minnesota's Boundary Waters Canoe Area Wilderness contains large virgin tracts. Maple is listed as a component of nearly 60,000 acres of old-growth. However, it is not clear to me if the principal species in this large acreage is red maple, *Acer rubrum*. Though spread more thinly, the Southern Appalachians have their share of old-growth sugar maples, particularly in the Smoky Mountains of North Carolina and Tennessee. It has been estimated that in pre-park days 10 percent of the forest cover in the watershed of the Little River consisted of sugar maple.

Numerous small virgin or near-virgin patches exist throughout the range of the sugar maple where one can see original sugar maples. Gifford Woods State Park and Lord's Hill in Groton State Forest, both in Vermont, have small areas containing old-growth sugar maples. In Massachusetts, Fife Brook, Dunbar Brook, and Cold River have excellent old-growth sugar maples. Ohio's Dysart Woods Laboratory contains sugar maple. Farther south, the Great Smoky Mountains have northern hardwood zones with big sugar maples. In fact, the Sugarlands area of the Park was famous for maple syrup, though you will find few sugar maples in this area now, thanks to the lumber barons of the early part of this century.



WHAT'S IN A NAME

In these articles I use both common and scientific names for the trees. It may be useful to briefly consider the value of the scientific names. For the amateur first learning to identify plants and animals, it is usually enough to begin by learning the common names for the species. Taxonomy is complicated and initially most of us prefer to avoid the bottomless pit of scientific nomenclature. But as one becomes more proficient, the inadequacy of common names becomes increasingly apparent. Initially, sugar maple seems a sufficient handle for the species, so why burden the memory with scientific terminology'?

The sugar maple is also called hard maple and rock maple. Occasionally it is called white maple. Trees given the latter name are also called soft maples by some. Confusing! There is only one scientific name for the sugar maple, *Acer saccharum*. It may be harder to remember, but it uniquely identifies the species.

Acer saccharum is closely related to *acer nigrum*, the black maple. In the past some botanists considered the sugar and the black maple to be variants of the same species. However, today the two are considered to be separate species. The black maple has darker bark, slightly curled leaves, ranges farther west, and is adapted to somewhat drier conditions than the sugar maple. Nonetheless, *acer nigrum* possesses the same sweet sap as its close relative.

Reprinted from Wild Earth, Fall 1992

American Holly, George Washington, and 'Beautiful Ohio'

By Tom Cooperrider

It was the kind of tree you stand and admire, an American holly (*Ilex opaca*) described later in a book by Galle (1997) as having leaves of "dark olive green" and fruits of "deep reddish orange." The year was 1959 and the tree was in a front yard on Summit Street in Kent, about a block from McGilvrey Hall where Kent State's Biology Department was located. New to the University the previous year, I spent a lot of time surveying the plants in the area.

The owner said it was a cultivar named 'Beautiful Ohio'. Being a native Ohioan and knowing the song of the same name, I thought that was nice and after a brief conversation walked on, storing the name away for a few decades. Forty years later, I learned that the owner with whom I had spoken was Joseph G. K. Miller. Mr. Miller worked at the Davey Tree Expert Company in Kent for 46 years. He has now passed away, the house has changed hands a time or two, and the tree is gone.

The word *cultivar* was coined by combining the first part of two words: *cultivated* and *variety*. A cultivar, as one might therefore expect, is a horticultural variety of sufficient importance to be given a name. Familiar examples from other plant groups are 'Better Boy' tomato, 'New Dawn' rose, and 'Heavenly Blue' morning-glory. "Cultivar names are now formed from not more than three words in a modern language and are usually distinguished typographically by the use of single [rather than double] quotation marks" (Bailey Hortorium Staff, 1976). 'Beautiful Ohio' meets all the requirements.

When I prepared the section on the holly family for the Ohio Flora Project (Cooperrider, 1995), I recalled 'Beautiful Ohio' and mentioned it in the text. The story might have ended there, but a few years ago I learned that a Kent resident, Audrienne Galizio, whom I have known for many years, is Mr. Miller's daughter. She remembers the holly tree at her childhood home on Summit Street and how it came to be planted there.

As a part of his work for Davey Tree, her father was in charge of tree restoration at Wakefield, George Washington's birthplace and the Washington family estate near the Potomac River in Virginia. Wakefield is about 75 miles downstream from Washington's later home, Mount Vernon. In 1933, while working at Wakefield, Miller came across a good-looking seedling of American holly. He brought it to Kent and planted it in his front yard. As it grew and over the years became an attractive tree, he and his Davey co-worker M. W. "Biff" Staples decided to give it the cultivar name 'Beautiful Ohio'. Staples registered the name with the American Holly Society (Galle, 1997) and a supporting herbarium specimen taken from the tree was deposited at the U.S. National Arboretum.

Seedlings can frequently be found under American holly trees. But in order to propagate a holly cultivar it is necessary to use a cutting, i.e., a small branch that will become a clone of the parent tree. Seedlings, although similar to the parent tree, are not genetically identical to it. Had Mr. Miller, I wondered, given cloned specimens to any Ohio arboreta? After several inquiries, I learned that he had.

With the help of Ken Cochran of Secrest Arboretum in Wayne County, Ethan Johnson of Holden Arboretum in Lake County, and Bonnie Beeman and Greg Payton of Dawes Arboretum in Licking County, I was able to see recently two living 'Beautiful Ohio' holly trees. One is at Secrest, the other at Dawes. The Secrest tree, marked with a metal tag, is in a plantation of some 50 holly trees set out in rows. The Dawes tree, with a wooden marker, is part of a group of 100 or more specimen hollies widely scattered on "Holly Hill." Both trees were planted about 1970; the one at Dawes is the more vigorous of the two. There may also be living trees at other arboreta.

The waltz "Beautiful Ohio" lives on as Ohio's official State Song. If the holly tree of that name is to be perpetuated, it must be done by cuttings from these known trees. It would seem appropriate to have such a tree at each of Ohio's major arboreta.

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Tom Cooperrider is the author of the recent book *Seventh Catalog of the Vascular Plants of Ohio*.



Biocontrol for Purple Loosestrife

Michigan State University currently oversees 150 test sites where purple loosestrife is being challenged by introduced Galerucella beetles. The beetle was approved in 1992 by the Michigan Agriculture Department to control the spread and density of purple loosestrife stands. The beetle defoliates the plant which eventually dies. The beetles have been slow to establish themselves at the test sites, but some are beginning to over-winter, and the purple loosestrife stands are being reduced in density. For current information on this project, see www.msue.msu.edu/seagrant/pp/

Shawnee State Forest: Ohio's "Little Smokies"

Jim McCormac

There aren't too many places one can go in Ohio and truly get the sense of being in a wilderness area, but Shawnee State Forest is such a place. Located just north of the Ohio River near Portsmouth, Shawnee sprawls over much of western Scioto County, and part of eastern Adams County. Land acquisition began in 1922, with the inaugural purchase of 5,000 acres – land formerly inhabited by Shawnee Indians, hence the forest's name. Continual expansion since has made Shawnee the largest of the twenty state forests, at 63,000+ acres.

In 1922, Shawnee State Forest would have looked quite different than today. The area – like much of southern Ohio – had been subjected to large-scale land clearing and logging, leaving a mostly barren and denuded landscape. Grazing of animals greatly exacerbated erosion problems, and contributed to silting of creeks and streams, and caused numerous washes and gullies on the hillsides, creating the effect of a lunar landscape in many areas. Many of the forest-dwelling animals and plants were displaced, and some probably never did recover.

Today, thanks to the efforts of ODNR's Division of Forestry, Shawnee State Forest provides the opportunity of experiencing what the unglaciated hills of southern Ohio looked like when the Shawnees roamed the land. Dry razorback ridges covered with hickory and several oak species offer majestic overviews of vast forest, and glimpses of the distant Ohio River and neighboring Kentucky. Deep dark coves with intriguing names like Dead Man's Hollow are carpeted with trees requiring moister conditions, like Yellow Poplar, Beech, and Sugar Maple. Such is the wild aspect of this area, that Shawnee has been dubbed "Ohio's Little Smokies", due to its resemblance to the famed park of North Carolina and Tennessee, the Great Smoky Mountains National Park.

Shawnee State Forest is truly a botanical paradise – perhaps the most ecologically significant region in the state. The floristic diversity is almost overwhelming, and a flatlander accustomed to the glaciated north will find him or herself on a new and steep learning curve when first experiencing Shawnee botany. And if it's the rarities of the plant world that you seek, this is the spot. At last count, nine endangered, sixteen threatened, and nineteen potentially threatened species have been documented. Adding to the thrill of the hunt is the possibility of seeing a Timber Rattlesnake – Shawnee has the best remaining Ohio population. New discoveries are being made on a regular basis, too. Just a few weeks before this writing, the Creeping Aster (*Aster surculosus*) was rediscovered in the forest. This diminutive, blue-flowered species is southern in distribution, and had been collected but once before in Ohio, in 1954, also in Shawnee Forest.

Why is Shawnee such a treasure trove of rarities? The answers are probably fourfold. One, the sheer size and largely unfragmented nature of the forest is necessary for certain species to survive and flourish. Not just true for plants, the importance of large forest ecosystems might be best evidenced and most obvious by the presence of multitudes of interior forest birds. Not only is Shawnee a paradise for the botanically inclined, but also the diversity and numbers of noteworthy breeding avifauna will enchant birders. Species elusive in other areas occur here commonly, and dozens of territorial males can be heard singing in season. Significant species include: Wood Thrush; Yellow-throated, Pine, Cerulean, Black-and-white, Worm-eating, and Hooded Warblers; Louisiana Waterthrush; Ovenbird; and Scarlet and Summer Tanagers.

Secondly, the geographical location of Shawnee Forest is important in influencing the compliment of species that are present. Many southern plants reach the northern limits of their range in this part of Ohio, like the Creeping Aster. While the aster and a number of others are rare in Ohio and only found in this area, they become common in Kentucky, West Virginia, and points south.

The third factor affecting plant distribution is the presence of the Ohio and Scioto river systems. Over eons, rivers are vital conduits for plant migration, and these streams play a major role. Myriad plant species have moved northward from the Mississippi Valley up the Ohio River, reaching the northern and eastern limits of their ranges in southern Ohio. These rare southern specialties include Passion-flower (*Passiflora incarnata*), Mistletoe, (*Phoradendron serotinum*), and Cross-vine (*Bignonia capreolata*). Meteorologically, the Ohio River valley has a slight moderating effect on winter temperatures, remaining warm enough that half-hardy southern species can survive the winters.

Finally, perhaps the most significant factor dictating the presence of rare plants in Shawnee Forest is another river; however, this one can't be seen! The ancient Teays River originated in what's now North Carolina and flowed northwest, entering Ohio in Scioto County. It then extended northwest, exiting Ohio near Grand Lake St. Marys. Glaciers of the Pleistocene Ice Age obliterated the Teays about two million years ago. Many Appalachian plants may have migrated north along the Teays, and established populations well to the north of their current distributional centers, some of which persist today. Some of these Appalachian migrants are found in Shawnee, and often their populations are the only occurrences north of the Ohio River. These outlier populations are termed "disjunct", and Shawnee harbors many such disjuncts.

One distinctive Appalachian species in Shawnee is the Umbrella Magnolia (*Magnolia tripetala*), a small tree with enormous leaves. Magnolias grow along small creeks, and their jumbo foliage creates a jungle-like aura. Another woody Appalachian plant are wild azaleas of the genus *Rhododendron*. Shawnee harbors two varieties of the species *Rhododendron nudiflorum* – Northern Rose Azalea (*R. nudiflorum* var. *roseum*) and Pinxter-flower (*R. nudiflorum* var. *nudiflorum*). While not occurring in profusion as to the south, they can be frequent enough to add spectacular color to the late spring landscape.

Most exciting to the botanist, though, are the true disjuncts – species that are far removed from the closest populations - and Shawnee has amazing examples of these vegetative renegades. Perhaps showiest is the Early Stoneroot (*Collinsonia verticillata*). Sizeable populations of this May-blooming mint occur in the forest, which might remind one of it's common relative, the widespread Richweed (*Collinsonia canadensis*). The Shawnee Early Stoneroot sites are several hundred miles north of the nearest known populations.

A case of incidental preservation of a rare disjunct occurred adjacent to Shawnee State Forest, at Raven Rock State Nature Preserve. The Division of Natural Areas and Preserves (DNAP) acquired this site in 1995, due to it's significance as a geological feature. Raven Rock is a spectacular sandstone promontory overlooking the Ohio

River valley, and the the summit offers a commanding vista ranging over several miles. On May 5, 1998, a botanist making the arduous hike to the summit rediscovered Small-flowered Scorpion-weed (*Phacelia dubia*), a plant not found in Ohio since 1904. Small-flowered Scorpion-weed is a tiny annual with clusters of delicate, china-blue flowers, and attractive pinnately divided leaves. Growing colonially, it forms a carpet-like mist of pale azure when at peak bloom. A permit is required to visit this preserve; interested persons should contact DNAP.

Shawnee State Forest represents the best of Ohio's biodiversity. While fractional in comparison with Great Smoky Mountains National Park – 63,000 acres to 512,000 – the diversity of flora and fauna in Shawnee illustrates why Ohio has some of the richest forestland in the world. Over 950 species of native vascular plants have been found here, including over 70 types of trees. A remarkable 110+ species of breeding birds have been recorded. The Shawnee is large enough that the occasional Black Bear is seen, and it's possible that Bobcats still find refuge. So, for a taste of the Great Smoky Mountains without leaving Ohio, visit our "Little Smokies" – Shawnee State Forest. For maps and information, contact the Ohio Division of Forestry at 614-265-6694.

Jim McCormac is a botanist with the Ohio Division of Natural Areas and Preserves Reprinted by permission of the Ohio Division of Natural Areas and Preserves

Where can one buy native plants?

John Totten

This is a simple question that has many important implications for conservation-minded gardeners. I don't think many of us would consider it ethical to dig up plants from the wild for garden use, but many of us unwittingly buy such plants.

The majority of native plants sold today is "nursery propagated," i.e., grown from seed, cuttings or divisions of nursery stock. One reason why is economics. It is easier for a nurseryman to grow a beebalm plant or a columbine from seed or from a cutting than to collect it from the wild. Unfortunately, this is not true for slow-growing woodland species such as trilliums, orchids, bloodroots, and arbutus. Nurseries can now grow these plants, but they cost more.

A disturbing trend I've noticed lately: rather than being cheaper than nursery propagated plants, collected plants are priced at roughly the same level. They are put in pots (a practice euphemistically referred to as "nursery grown"), and the vendors—there can be many in the chain from gunnysack to shopping cart—pocket the difference.

What if the plants are legitimately rescued from land slated for development? I agree with the New England Wildflower Society: the term "rescued plants" is too open to interpretation and abuse to be anything more than a loophole for disreputable collectors.

The key for all of us interested in the ethical garden use of natives is to ask questions. Many nurserymen simply don't know the origin of their plants because of the middlemen involved. I suggest buying only from those who do and state (in writing) that they sell only "nursery propagated" plants. I have seen how native plants in the home landscape can inspire gardeners to care about the fate of these plants in the wild. We can all help make sure we are not sending a mixed message.

Note: Native plants are available from the Native Plant Center at the Audubon Society of Western Pennsylvania. The plants are grown from seeds taken from plants in the Allegheny Plateau and propagated at the Center at 614 Dorseyville Road, Pittsburgh, PA. John Totten was instrumental in developing the Center.

John Totten is the Estate Gardener for Elm Court. He has received several awards for his volunteer efforts in native plant conservation.

Reprinted from *Wildflowers*, the Bulletin of the Botanical Society of Western Pennsylvania, August 2001

Blue Trillium

Ernest Kerr

It started innocently enough!

As with most governments and industries, the Ontario Government practises discrimination on the basis of age: employees are retired at age 65 with thanks and reduced income.

In anticipation of this momentous time, I was looking for something to do besides watch the boob-tube. One spring weekend I was wandering through an unpastured woods and noticed a yellow trillium among hosts of white ones. The diamond shaped leaves, relatively small flower and red ovary identified it as a red trillium, *Trillium erectum*. I have learned since then that this form is fairly common. As I've been involved with plant breeding and genetics all my life, it seemed a good idea to cross the yellow with the common red form and determine its inheritance. If other mutants could be found they could also be crossed and linkage groups of the genes established. This shouldn't be very difficult because trilliums have only five pairs of chromosomes and therefore all the genes must be in five linkage groups.

At my retirement party I mentioned that, as a hobby, I was considering doing breeding with trilliums. There were a lot of government dignitaries around and one of them, suggested that a blue trillium would be a worthy objective. Civil servants are supposed to be politically impartial. There already were red and orangish types to represent our other two major political parties. Therefore, it seemed only fair that there should be a blue trillium. The press picked up the idea. I think they got as much footage out of it as they did when the Horticultural Experiment Station introduced "Veeopro" - the first commercial square tomato.

The trillium has been the floral emblem of Ontario since 1937 but the government had never supported any research on it. The Ontario Ministry of Agriculture and Food kindly provided a small grant from 1983 to 1985 to cover some of my out-of-pocket expenses in studying it.

Everyone recognizes trilliums: They are still quite common throughout southern Ontario in unpastured maple woodlots. They have about the largest chromosomes in the plant kingdom and have been intensively studied by cytologists. I thought there would be so much known about them that there would be very little to add to our scientific knowledge. However, I had never heard of a blue trillium and decided some minor contribution might be made through a genetic study.

After spending two days in the library at the Royal Botanical Gardens, Hamilton, I realized there had been practically no scientific studies in the area in which I was interested. There were lots of reports of variations in trillium species but at that time, I found no breeding studies. I did find out however that it takes two years to germinate the seed and another five or so years before they bloom. I have a lot of experiments under way to try to reduce this time and

know a lot of techniques that don't work. It's lucky I'm still young!

Another problem I've found in breeding red and white trilliums is that they are self incompatible and must be crossed with other clones for seed production.

There are four species of Trillium native to Ontario. Besides the white trillium, *T. grandiflorum* and the red trillium, *T. erectum*, there is the painted trillium, *T. undulatum*, which requires acid soil and the nodding trillium, *T. cernuum*. There are reports that types intermediate between the red and nodding trilliums have been found in the wild. I hope to get specimens of *T. cernuum* and confirm that they can be crossed.

Frequently white trilliums are found which have green stripes in the petals. Near them you may also find ones with short stems or with petioled, roundish leaves. Many of these are very beautiful but they are all diseased by an organism called a mycoplasma. This is a microscopic entity with characteristics of a virus, a fungus, and a bacterium. Many mycoplasmas are spread by leaf hoppers and other sucking insects. I don't collect trilliums with green stripes!

For the last two years my wife and I have traveled across Ontario from Owen Sound to Renfrew and south looking for variations of healthy trilliums. For the most part it has been hit-or-miss although friends have found some very distinctive mutations for us. Only rarely have we found more than one or two mutant plants at a location. This makes me suspect that most of the mutations are recessive.

The mutant plants have been transplanted to our garden where they are in shade most of the afternoon. We have had nearly 100% success by digging the plants with a five inch ball of soil and transporting them in a plastic bag. By having the variations growing in one location we can determine that they are genetic and not caused by environmental differences such as soil acidity, soil fertility, shade or temperature.

To date we have found about 35 variations that appear to be distinct in the white trillium and about the same number in the red trillium. Many of those in the white trillium may be attributable to environment but most in the red trillium appear genetic. A total of 24 specimens with pink petals have been obtained from 15 different locations. These have varied somewhat in amount of pink in the bud and in intensity but most of them still haven't been compared under similar conditions. Hopefully a red-white trillium can be obtained by crossing pink mutants. Other variations concern modifications of petals, sepals, peduncles and stems for shape, size and colour.

Most of the variations of the red trilliums are in petal colour. They range from exceptionally dark maroon-red to red, pink, several shades of yellow, and white. There are also bronze, pale purple, mauve, violet and orchid shades. Some

are bronze on the outside of the petal and a different colour inside. One of the most beautiful has a dark central eye.

With a bit of imagination, I've been saying that the, mauve, violet and orchid trilliums are blue. They were obtained from five widely separated locations ranging from Norfolk to Renfrew. They are not sky blue or Tory blue but even the skeptics admit there is some blue in them. I have crossed these "blues" with yellow and white *T. erectum*. Hopefully one of the crosses will produce a pure blue.

There are still a lot of healthy trillium mutants hiding across Ontario. By looking carefully at individual plants, we have found them in nearly every woods. Besides a pure blue, we are looking for miniature plants, ones with speckled or mottled leaves, ones with no purpling on the stem, ones that are genetically very early or very late, ones that have

exceptionally large or small blooms on a plant of average size, ones with different coloured anthers or berries, etc.

To date my work has been with the white and red trilliums. I hope to expand it to include our native painted and nodding types. Other hardy species such as the snow trillium, *T. nivale* would be a welcome addition to the research. Any help with these genetic studies or the search for the blue trillium would be appreciated.

Reprinted from Wildflower Magazine, 1985

Dr. Kerr was for many years a research scientist with the Ontario Ministry of Agriculture. He has a Ph.D. in genetics and plant pathology from the University of Wisconsin. Since 1982 he has conducted research in plant breeding with Stokes Seeds of St. Catharines, Ontario.

Finding Rare Seed

By Carol Deppe

Small seed companies that exclusively sell heirloom and open-pollinated seed play a unique role in plant breeding and preservation. They often rediscover and reintroduce varieties that are subsequently distributed by seed saving organizations and large seed companies. Most of them are run by single families that share a passion for farming and for the land.

Growing and selling open-pollinated seed is the least profitable part of the seed business. Those who do it are essentially operating a public service. Some have formally organized as foundations. Most have not, but still appreciate and, in some cases, survive only by virtue of the occasional unsolicited donation.

Beyond their basic similarities, these small seed companies are as individual as can be, with distinctive personalities, unique areas of specialization, and inventory lists ranging from a few loose pages to a good-

sized booklet. When dealing with them, don't expect slick catalogs, toll-free phone numbers, or instant service. If you ask for a catalog in late spring, summer, or fall, for example, you will most likely be put on a mailing list for the following year.

In addition, order fulfillment during the busy season can fall behind for weeks. This is not mega-corporate America – only individual families trying to promote and preserve values and varieties they believe in. They often have a limited amount of rare seed. So if you want something special, order early, and order well before the planting season.

Following is a selection of companies that I've ordered from. I personally recommend and commend them to you for your interest and support.

ABUNDANT LIFE SEED FOUNDATION
PO. Box 772
Port Townsend, WA 98368
Phone: (360) 385-5660

NATIVE SEEDS/ SEARCH
526 N. 4th Avenue
Tucson, AZ 85705
Phone: (520) 622-5561

PETERS SEED AND RESEARCH
407 Maranatha Lane
Myrtle Creek, OR 97457
Phone: (541) 874-26.15

BOUNTIFUL GARDENS
18001 Shafer Ranch Road
Willits, CA 95490
Phone: (707) 459-6410

OREGON EXOTICS NURSERY
1065 Messinger Road
Grants Pass, OR 97527
Phone: (541) 846-7578

SAND HILL PRESERVATION CENTER
1878 230th Street
Calamus, Iowa 52729
Phone: (319) 246-2299

J.L. HUDSON
Star Route 2, Box 337
LaHonda, CA 94020

PEACE SEEDS
2385 SE Thompson St.
Corvallis, OR 97333.

Reprinted from *Plants & Garden News*, the Brooklyn Botanic Garden, Summer 2001

Landscaping With Natives Ericaceous Hoosiers

By Barbara Wilde

Say what?! Well, it's shorter than "members of the Ericaceae native to Indiana." Ericaceous plants are members of the heath and heather family, perhaps best known by their member tribe of rhododendrons. But rhododendrons and azaleas aren't the only garden-worthy representatives of this noble family. In fact, if there is a homely member of the Ericaceae, I've never encountered one.

For years, I was under the impression that Indiana could claim the refined roseshell azalea (*Rhododendron prinophyllum*) as one of its own. Unfortunately, I searched the stern pages of Deam in vain for mention of this beauty. The closest we can come is pinxterbloom (*R. periclymenoides* syn. *R. nudiflorum*), which Deam banishes to the excluded--or mistakenly reported--species. Which of course is not to say that either of these lovely plants wouldn't make an excellent and hardy subject for an Indiana azalea dell.

Mountain laurel

The most flamboyant ericaceous shrub actually native here is mountain laurel (*Kalmia latifolia*), which has been reported from a handful of the extreme southern counties along the Ohio River. As a garden plant, mountain laurel is exceptionally beautiful when properly sited and grown. A bona fide broadleaf evergreen, its lustrous foliage appears almost whorled around the stems. A massing of mountain laurel is a superb addition to the landscape in winter, when the deep, rich green of its leaves is highlighted by a rime of frost or snow.

Unlike rhododendrons and azaleas, whose fat flower buds make it easy to imagine their spring blossoms, mountain laurel is more modest, hiding its buds somewhere. I have searched the botanical literature in vain in an attempt to accurately inform you of the winter whereabouts of mountain laurel's flower buds. They are definitely formed the previous year, in August and September, but they don't become visible until late spring in Indiana. Where and in what state they exist while invisible is a matter neatly skirted by all authors. Why am I making such a big to-do about this? Because I've always thought it a laudable trait of kalmia that it prudently hides its flowerbuds until danger of frost is past. So, unlike those of the foolhardy rhododendrons and azaleas, kalmia's flowers are never blasted by frost.

If you've never seen mountain laurel in bloom, you're in for a treat. The mysterious clusters of buds emerge first almost pinhead-sized, and expand as if they are being inflated. They resemble little accordion-pleated balloons, and are often an intense red or vibrant pink. Finally

they pop open into glorious starry flowers as large as an inch across. These may be white, pale to bright pink, many shades of red, or even banded red and white, giving them an appearance similar to that of bicolor sweet william blossoms. The flowers have no discernable fragrance.

Grow mountain laurel as you would an evergreen rhododendron. Give it protection from winter sun and wind, and a well-drained, humusy soil enriched with lots of leaf mold or compost and acidified with sulfur. Be aware that neutral or alkaline soils such as those prevailing in the central part of the state will need to be acidified on an ongoing basis. If you plant your mountain laurel close to a house foundation, be even more alert for signs of iron chlorosis, which appears as yellowing of the leaves between the veins, in this perpetually alkaline soil zone.

During the summer and fall, mountain laurel needs to be kept evenly moist. And make sure to water it thoroughly in early winter before the ground freezes. Broadleaf evergreens continue to transpire water through their foliage throughout winter, and cannot take up water through their roots when the ground is frozen. So good hydration going into the cold season is essential. Soggy, poorly drained soil, however, sounds the death knell for this plant. Under these conditions, if the roots don't rot first, the plant will surely succumb to phytophthora, a fungal disease which causes wilting and death.

Mountain laurel needs no pruning except for removal of deadwood. Pinching out the spent flower trusses after blooming encourages more vigorous blooming the following year. A slow-growing plant, it may reach five or six feet in height and width after many years in an Indiana garden.

Bearberry

The most versatile and useful of our native ericaceous plants is without a doubt bearberry or kinnickinnick (*Arctostaphylos uva-ursi*). Bearberry has become one of my favorite and most frequently used landscape plants. This diminutive shrublet is less than six inches tall, and its prostrate, creeping branches are densely cloaked with small, rounded, glossy evergreen leaves that are burnished to deep bronze and wine-red in winter. It blooms with diminutive pink to white, urn-shaped flowers in spring, followed by red berries in summer. A well situated bearberry will spread to a three-foot diameter in three to five years, making it an eminently refined and well-behaved groundcover.

Need a plant to cascade over a sunny retaining wall? Look no further. Nothing does this more gracefully than bearberry, and the drainage provided by this situation suits it

to a tee. And while there are some perennials that billow nicely over a wall, bearberry has the advantage of being evergreen, but without the ragged-curtain effect of the rug junipers commonly used in this situation.

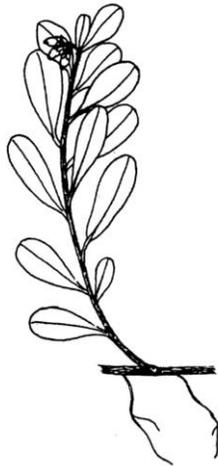
For some reason, bearberry has been much maligned around Indiana as requiring extremely acid soil and as not being hardy. In fact, it thrives in any sunny, dry spot if you incorporate plenty of organic matter deep into the soil. Of all the ericaceous plants, it is probably the least persnickety about pH. And it is completely cold hardy, withstanding even windswept sites in good form. Its downfall is poor drainage, and it is true that it will fail in a soggy spot. Since winter is often our soggiest season, this failure is usually misinterpreted as lack of hardiness, which it emphatically is not.

In an interesting aside, bearberry is a powerful medicinal herb for use in urinary tract infections. It contains compounds which are converted into hydroquinones in the presence of urine, effectively sterilizing the bladder. Because of its potency, it should only be administered under the guidance of a qualified health practitioner. Properly sited in a sunny spot with excellent drainage, bearberry is a totally maintenance-free plant, requiring no pruning and suffering no pests or diseases. It is equally at home as a spectacular evergreen underplanting to larger shrubs, or lending evergreen texture and substance to the front of a perennial garden. And of course, on a sunny, rocky slope, it is really in its element.

Highbush blueberry

Few of us think of blueberries as being ericaceous, but they are. Their urn-shaped-or urceolate-flowers are a dead give-away for members of this family. When it comes to edible landscaping, probably no other plant ranks as high in both the edibility and the landscape categories as blueberries. We all are familiar with the delicious fruit of highbush blueberry (*Vaccinium corymbosum*), which, according to Deam, used to cover hundreds of acres of swampland in northern Indiana. But if you've never had the pleasure of observing this plant throughout the year, you'd have no way of knowing that it is also a four-season landscape plant of rare beauty.

The show begins in spring when blueberries cover themselves with dainty bundles of delicate shell-pink flowers shaped like tiny Grecian urns. These are followed by clusters of fruits which begin green, slowly ripen through white, pink, and finally, a deep, inky, glaucous blue. At this stage, you'd best take measures to prevent the birds from gobbling the fruits if you intend to get any for yourself.



Bearberry

Once the fruits are gone, it won't be long until you get to enjoy the next glorious act in highbush blueberry's show: its incredible fall foliage. In late September to early October, its leaves turn a fiery fuschia as showy as that of any burning bush. Then, with the onset of winter's cold, even its bare twigs turn a brilliant scarlet, making a bright spectacle against the snow until the cycle begins anew in spring.

If you decide to include this wonderful shrub in your landscape, why not select several cultivars to ensure that you have fruits over a long season? And if landscape character is your main interest, try the cultivar "Ornablue," which has been especially selected for its attractive, compact, densely twiggy growth habit.

Pick a spot in full sun for your blueberries. Amend the soil with lots of peat moss or compost, and sulfur. Make sure there's a water source nearby, since fruit production is greatly amplified by lots of irrigation during dry spells. Highbush blueberry isn't the only *Vaccinium* species native to Indiana. According to Deam, there is a baker's dozen of others, including the lowbush blueberry (*Vaccinium angustifolium*) and even cranberry (*Vaccinium macrocarpon*). Lowbush blueberry is a very dwarf shrub growing only to 15 inches or so. Widespread in some Indiana woodlands, it makes a valuable underplanting or groundcover for deep shade if you can find a nursery source for it.

While the true heaths and heathers are best left to gardeners in areas with either milder or snowier winters than our own, our homegrown Hoosier representatives of this aristocratic plant family will flourish when properly sited. Mountain laurel, bearberry, and highbush blueberry are all garden-worthy plants in their own right. But they're also great conversation pieces, because when your fellow gardeners come to visit, they'll likely be amazed to learn that these plants are actually Indiana natives.

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Barbara Wilde is a landscape designer, horticulturist, educator, and writer in residence at Mark M. Holeman, Inc. She is the regular gardening columnist for Indianapolis Woman magazine, and has written for Horticulture and American Nurserymen magazines as well as Rodale Press.

Illustration of Bearberry by Jan Glimm Lacy, INPAWS charter member and professional botanical illustrator

Walking Gingerly Through The Woods

By Barry Glick

Its a blazing hot Summer afternoon and you've decided to go botanizing. Hiking up one of the steepest, rockiest slopes that you've ever ventured upon, your parched throat feeling like sandpaper, you reach for your canteen and...Oh no, its empty. Geez, you're two hours up the mountain, past the point of no return. Watcha gonna do, who ya gonna call. How bout Ginger???

No, I don't mean the Ginger that you buy at the supermarket, the one that they make ginger ale from or that you use in your stir-fry. I'm talking about *Asarum* or *Hexastylis*-our wild Ginger.

Long known and used by Native Americans for it's stimulant effect, members of these genera have a pungent aroma when you snap their firm roots that's reminiscent of the tropical Ginger. In fact you can easily substitute it for the culinary ginger in your favorite Thai or Chinese recipe.

I frequently chew a piece of the root of our most common Ginger, *Asarum canadense* whenever I stumble across a patch, which is almost every time I go hiking in the woods. Its very easy to identify as its foliage is among the largest of our native plants,

Wild Gingers are members of the Aristolochiaceae (Birthwort) family. This is a very small family of five genera, most of the species being of tropical origin. The common name of the family seems to be derived from two Greek words, *Aristos*, meaning best and *Lochia*, meaning delivery. This name pertains to the Genus *Aristolochia* which is supposed to be of value as a medicinal herb in childbirth.

In West Virginia, we have five species of Wild Gingers. According to C. Ritchie Bell, author of the Flora of the Carolinas, only the deciduous species are still in the genus *Asarum*, the evergreen types are now placed in the genus *Hexastylis*. *Asarum canadense* is most common in moist rich woods in light to dense shade. I have seen leaves as big as your head under favorable conditions. You have to get down on your hands and knees to see the curious, pendulous flowers which hang down under the foliage. The flowers are pollinated by ants and other small insects that crawl into the flowers and move the pollen from the open pollen sacs on the anthers to the sticky receptive stigmas.

Hexastylis virginica is the only evergreen type that I've found in West Virginia. It seems to favor the higher elevations of Greenbrier County on mainly Northern facing slopes. According to Flora of West Virginia, it occurs in 16

of our 55 counties. You can tell it by the glossy, round to cordate (heart shaped) leaves 4-6cm (1-1.5") wide. The plant is very prostrate reaching from 8-24cm (2-6") in height. The foliage is silvery mottled and like snowflakes, no two are alike.

Also noted are *H. memmingeri*, named for Edward Read Memminger, and supposedly similar to *H. virginica* but with a more rounded leaf and smaller calyx (the outer part of the floral structure), *H. heterophyllum* (*heterophyllum* means diverse leafed) which can be found in five Western counties and *H. shuttleworthii*, named for Robert James Shuttleworth 1810-1874, which is much larger than any of the others and has been seen at only four stations in West Virginia. It is more common in the mountains of the Carolinas and down through Georgia and Alabama.

Fred Galle of Callaway Gardens in Georgia discovered a particularly beautiful variegated plant and named it 'Callaway'. I have seen leaves of *H. shuttleworthii* approaching 6" long.

There are several other *Asarum* and *Hexastylis* species in the U.S., another more Southern species is *H. arifolium*, native from Southern Virginia down through Florida and West to Alabama, the specific epithet refers to the arrow shaped leaves which are evergreen and can be up to 20 cm (5") long. On the West Coast there are two species, both considered evergreen so that would put them into the genus *Hexastylis*, *H. caudatum* which grows from British Columbia to California and *H. Hartwegii* said to grow in Oregon and California.

I also grow some of the Asian species such as *H. splendens*, which has the most silvery markings of any plant that I have seen, on huge arrow shaped leaves. In Japan people fanatically collect these plants. There are several societies and many exhibitions. One of my Japanese trading partners recently sent me two books, each with over 400 color photos of cultivated *Asarums* and *Hexastylis*. One book focused on the various leaf types and the other on the bizarre flowers.

In the garden these plants, *Asarum canadense* in particular, make great ground covers for the shade. If conditions are favorable they spread quickly and vigorously. I use them under trees and in the front of taller plants. If they get too much sun they will burn a little, so the more shade, the better. In cultivation they usually get 8"-12" tall. Plants can be divided in the early Spring by slicing the thick rhizome which grows very close to the soil level, sometimes exposed. You can also collect the seeds which ripen in mid-late

Summer. Sow them on the surface of 4" pots and cover with a layer of granite grit. Place the pots outside for the winter and the seeds will germinate the following Spring.

As briefly mentioned earlier, another genus in the Aristolochiaceae family is *Aristolochia*. We have two species in these mountains, *A. macrophylla*, (named for its large leaves) formerly known as *A. durior* and *A. serpentaria* (named for its reputed value in curing snakebites).

A. macrophylla is common in rich moist woods throughout the state. The common name, Dutchmans Pipe Vine refers to the unusually shaped curved flowers that resemble a Dutch Pipe.

The leaves on this vining plant are very large, I've seen them approaching 20cm-25cm (up to 12"). The vine can climb

5m-10m (15'-30') up a tree. They make a great addition to the garden where you have a porch or trellis to cover. If you look in the woods, you can find old vines that are 3cm-6cm (1"-2") thick and perfectly coiled around tree branches.

The other species, *A. serpentaria*, which grows from 12 cm to 45 cm (4" to 18") tall has oblong leaves, cordate at the base that are 4 cm to 12 cm (1.5" to 5") long. It has a history of use as a bitter tonic since pioneer times.

The key to successful gardening with native plants is to replicate the growing conditions found in their natural habitat. I hope that everyone gets a chance to enjoy these plants both in the wild, and in their gardens.

Reprinted from www.sunfarm.com/plantlist/ginger.htm

Carex Plantaginea

By Barry Glick

Thanks to my friend Randy Baldwin at San Marcos Growers in Santa Barbara California, <http://www.smgrowers.com>, for the following brief description of the Genus *Carex* from his website:

"The true sedges are a major component of the family Cyperaceae with over a thousand species. Most are native to wet soil and are widely distributed throughout the world. The name *Carex* comes from the Greek *kerio* meaning to cut, referring to the minute saw-tooth edges on the leaves."

The phrase on Randy's web site, "Carex have edges" comes from the following botanical rhyme:

"Sedges have edges and rushes are round, grasses are hollow and rush all around." Author unknown.

There are 128 *Carex* species in West Virginia alone and thousands worldwide. Some species are so visually indistinct to others that you need a microscope to identify the minute differences between them. But some are very distinct in shape, form and growth habit and are very garden-worthy.

Carex plantaginea is one that fits into that category. While it won't set your world on fire like a double red Peony, the stippled, wide foliage of *Carex plantaginea* will add a bold statement of texture to your shade or woodland border.

The flowers are interesting, albeit not that showy. You can see a picture of the flowers and read about how the Menominee Indians used the plant medicinally at <http://www.herbvideos.com/sedgebrd.htm>

The best means of propagation is division, although I'm sure that the seed is easily collected and germinated. Division can be slow, and we wait a few years before redividing clumps.

Although they produce many new buds, the root structure is very slim.

If you'd like to see some identification keys of *Carex plantaginea*, go to:

<http://www.csd.tamu.edu/FLORA/carex/k2388900.htm> and a wonderful line drawing of *Carex plantaginea*, can be found at:

<http://www.csd.tamu.edu/FLORA/carex/carex284.htm>

These are full page scans from a set of very serious books by a fellow from the New York Botanic Garden in 1940. The name of the two volume set is North American Cariceae and the author is Kenneth Kent Mackenzie. The entire book is reproduced on the Texas A & M University web site and there is a list of links to hundreds of line drawings at: <http://www.csd.tamu.edu/FLORA/carex/carexout.htm>

I'm evaluating over 200 *Carex* species, so stay tuned. A few of my favorites so far are: *Carex sylvatica* - <http://www.csd.tamu.edu/FLORA/carex/carex345.htm>
Carex pseudocyperus - <http://www.csd.tamu.edu/FLORA/carex/k2391300.htm>
Carex grayi - <http://www.csd.tamu.edu/FLORA/carex/k2345600.htm>

Domatia: A Room of One's Own

Scott Zona, Fairchild Tropical Garden, Coral Gables, FL

First noticed by botanists over one hundred years ago, these homes are called domatia. They are found on the undersides of leaves, usually along the midvein of the leaf, especially where the primary veins branch from the midvein. Domatia may be small pits in the leaf, they may be tufts of hairs, or they may be pockets formed by overarching veins. They are found in unrelated families on woody perennial trees, shrubs, and vines. (I've never seen domatia on annuals.) Some families, such as the Rubiaceae and Combretaceae, very often possess leaf domatia, while others never do.

In study after study, biologists have found that domatia are almost always inhabited by mites. What kind of mites? Surprisingly, domatia-dwelling mites are not those that feed on plants. Instead, they are predatory mites that feed on other mites, fungi, or microbes. All these mites in all these domatia beg the question: what sort of relationship do mites and domatia-bearing plants have? Is it mere coincidence that mites are found in domatia? Is it a one-sided arrangement or a mutually beneficial symbiosis? Strangely enough, these questions have still not been answered to everyone's satisfaction, even after more than a hundred years of domatia-watching.

Here's what we know so far: First, domatia are not traps; the plants are not feeding on the mites. Second, domatia are not caused by the presence of mites; they are not galls. Moreover, domatia don't seem to be doing anything for the plant, as they typically don't contain glands for absorption or secretion, cells for gas exchange, or any other structural specialization.

So, is the association between mites and plants just by chance? Are the domatia there (for whatever reason) and the mites just happen to move in, like squatters?

Both mites and plants seem to benefit from domatia. Mites preferentially lay eggs in domatia, more so than on the leaf surface, so it seems that, from the mite's point of view, domatia are good places to raise families. Domatia dwelling mites benefit the plant by preying on plant-eating mites or disease causing fungi. In effect, the plants muster a standing militia to protect the front lines simply by providing barracks.

But proof is in the minutiae. Inquisitive biologists have conducted several experiments in which pit domatia were plugged with paint and tuft domatia were shaved off. The result was that fewer predacious mites hung around to defend the leaves from herbivorous mites, and the plants suffered. One biologist constructed artificial domatia out of polyester fibers and attached them to leaves of plants that normally lack domatia. He found that plants thus outfitted fared better and had more predacious mites. Another

biologist found the same results using tufts of cotton as artificial domatia, but no one bothered to notice if the mites preferred cotton over polyester!

These experiments suggest that mites and their landlords have a mutualistic relationship, a symbiosis in which both partners benefit. Mutualism would help explain why so many unrelated plants have domatia of similar sizes and shapes. These domatia are not coincidental; they function in a partnership that we are only beginning to appreciate.

How much further is a plant willing to go to accommodate tenants on its leaves? Some plants provide specialized homes for creatures even smaller than the individual cells that make up the leaf tissues. These creatures are bacteria, single-celled organisms that cannot be seen with the naked eye. They are tiny in the extreme...there is lebensraum aplenty on every leaf.--Scott Zona, Fairchild Tropical Garden, Coral Gables (Miami) FL

Ed. note: Is it understandable that some of us field ecologists sometimes overlook the smaller worlds "down under" as Jim Hardin so well researched? At any rate, somehow these little microscopic microhabitats that may be very important to the presence of some species in a given habitat have been overlooked by me (and I am near the end of my professional career!). I find this little essay to be not only informative but perhaps helpful in our understanding of how some species, such as *Vitis rotundifolia*, may be present in our flora because they evolved these little "houses" that provide for associated guardians resulting in healthy leaves in some species of our native flora.

Reprinted from *Chinquapin*, The Newsletter of the Southern Appalachian Botanical Society, Autumn 2000. (Excerpted from *Garden Views*, Fairchild Tropical Garden, September 2000)



The Pollution Prevention Video Series from Appalachia – Science in the public interest includes more than 40 videotapes, each 30 minutes long. Their production was made possible through a grant from the US Environmental Protection Agency. Titles include "Forest Preservation Techniques," "Artificial Wetlands," "Organic Fruit and Nut Growing," "Wildscape as a Replacement for Lawns," and "Alternative Pest Controls." For a price list, send a self-addressed, stamped business-size envelope to ASPI Publications, 50 Lair St., Mt. Vernon, KY 40456-9806, or see their web site at www.kih.net/aspi/EHE1.HTM

Reprinted from *Plants & Gardens News*, Brooklyn Botanic Garden, Spring 2001.



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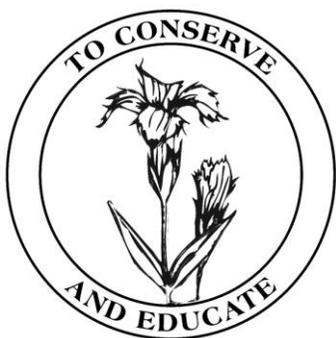
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