On The Fringe

Journal of the Native Plant Society of Northeastern Ohio

The Knotted Dodder and Other Curiosities

by Perry Peskin

Until the day I first encountered the knotted dodder, I had mainly good feelings about plants. After all, being at the bottom of the food chain, plants are responsible for making their own sugars and starches from water and carbon dioxide under the influence of sunlight and the green pigment *chlorophyll,* in a process called *photosynthesis.* And what's more, they feed the rest of the world as well in the form of grains, fruits, and vegetables. With all those green, chlorophyll-loaded leaves and stems working day after day to keep our refrigerators filled with groceries, who could criticize the quiet, efficient, unemotional behavior of the plant kingdom?

And yet when I saw the dodder choking the bejabbers out of an innocent sunflower – and in broad daylight, too! – I began to realize that even plants have their malcontents, have-nots, and criminal elements. They're as bad as we are!



Dodders (genus *Cuscuta)* belong to one of several families of plants with a long police record. These are the plants that have evolved, for obscure reasons, a different life style, one that doesn't require a dependence on chlorophyll. Without green leaves or stems, some of them (the *parasites,* including dodders) adopt the characteristics of the fungi and steal the food that law-abiding plants carefully manufacture – while others (the *saprophytes),* like grave robbers, go underground in search of dead plant material. Still others, like assassins, take on animal characteristics – jaws that snap shut; stomachs that digest – and are called *carnivores.* Most carnivorous plants feed almost entirely on insects, although in the South, pitcher plants have been known to catch tree frogs.

Dodders must have turned to a life of crime a long time ago because they are found on every continent and even on oceanic island groups, such as the Hawaiian and Galapagos chains. Generally thought to have evolved from morning-glories *(Ipomoea* of the bindweed family), dodders retain the creeping and climbing habit of their ancestors but have lost their leaves and roots. Their yellow-orange stems grow in great profusion, covering large areas with such a web-like tangle that farmers in medieval Europe, whose crops suffered greatly from dodder infestation, were reminded of strands of egg yolk on the ground. In fact, the word *dodder* comes from a Germanic root meaning *eggyolk,* which is also the ancestor of another modern word, *doddering,* meaning trembling, referring originally to the quivering motion of egg yolk just removed from the shell.

Most of the 12 species of dodder native to northeastern US and eastern Canada look superficially alike. They bear abundant clusters of tiny white flowers, scattered randomly on the stem or in loose panicles; these blossoms bear no outward resemblance to the big, colorful tube-shaped flowers of their morning-glory ancestors. A few species of dodders – the generalists, such as common dodder, *Cuscuta gronovii – prey* on a wide variety of *host plants* (euphemism for *victims),* largely in open areas, such as meadows, prairies, marshes, roadsides, and farm fields. Others are *host specific,* meaning they pick on certain plants and ignore the rest, and are seldom seen by amateur plant hunters, who after a while get into the habit of identifying every dodder as *C. gronovii.*

That's why I was so startled to see the knotted dodder for the first time; it actually had some individuality and was not part of the mob. For one thing, its tiny flowers were pale yellow, not the dead white that I would expect in *gronovii.* Secondly, its stems spiraled up particular host plants and were not cast over a wide area like a web. Oddest of all, the individual strands of the yellow stems were so closely parallel to each other as they climbed up the host and were so tightly packed with tiny flowers that no part of the parasite's stem was visible. The whole effect appeared as if someone had taken a thick yellow clothesline and tied it carefully around the stem of each host in the form of the knot commonly known as the hangman's noose. No wonder that I thought a crime was in progress!

All of this took place in a part of Ohio that I had never seen before, the prairie-fen country of west-central Ohio, roughly between Dayton and Columbus. The Ohio Department of Natural Resources (ODNR) had invited the public to its annual open-house tour of five prairie fens,

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Summer and Fall Programs

Jun. 8, Sat., 9:00 am: **Kelley's Island**. Joint trip with Northeast Ohio Naturalists (NEON) led by Jim Bissell, Curator of Botany, Cleveland Museum of Natural History. We will visit Museum property on the Island, home to many plants rare in Ohio. This unique island community of wet quarry flats, wave-splashed alvar limestone, and island forest features smooth rose: *Rosa alba, Carex garberi,* blue ash: *Fraxinus quadrangulata*, and rock elm: *Ulmus thomasii*, among others. Meet at Kelley's Island ferry dock in Marblehead. Directions to ferry: From the Marblehead sign on Rt. 163, the boat is on your left about ½ mile down the road. Go under the overhead trestle and turn left into the Kelley's Island Ferry Boat Line. Bring money for ferry and a sack lunch. Registration limited. Call 216-231-4600 ext 219 for reservations.

Jun. 15, Sat., 9:30 am: **Mayer Property**. Assist in a plant survey for a newly conserved property in Chesterland. Led by Bill Hudson of the Chagrin River Land Conservancy. Panoramic view, rolling hills, lush fern-covered ravines and a swamp forest along a tributary of the East Branch of the Chagrin River. Take St. Rt. 6 east of Rt. 306 approximately 2 miles to Sperry Road. Turn right (south) approx. ¾ mile to 11154 Sperry. Follow drive up hill to grassy parking area. Call Judy Barnhart to register: 440-286-9504(W) or 440-564-9151(H).

Jul. 28, Sun.: **Dry-Oak Forest at State Road Park,** Parma, a remnant of the original upland dry oak-hickory-beech forest. Led by George Wilder. Call George within 3 days of the trip if you wish to attend: 216-687-2395. 9am

Aug. 25, Sun.: **Bog plant community at Jackson Bog**. Led by Emliss Ricks. A boreal fen remnant with many rare plants. We plan to meet at the bog parking lot at 9:30 am. Directions: Take I-77 south through Akron and get off at the Arlington Road exit. Go south (right) on Arlington. Several miles south the road appears to veer to the left with one road going straight. Stay on the road to the right. This is sometimes called the Arlington Road extension. It will dead-end into Fulton Road. Take a left onto Fulton, then turn right into the drive where you see the Jackson Bog Sign (also a Jackson Park sign). Go to the stop sign and turn right into the large parking lot.

Sep. 28, Sat.: **Highland Heights Community Park**, a superb natural area in suburban Cleveland. On Wilson Mills between Lander and Bishop Roads. Led by Suneeti Jog, (W) 216-687-2316 or (H)440-460-2301. 9am

Oct. 12, Sat.: **Late Fall Orchids and Gentians. Cuyahoga Valley National Park**. Led by Tom Sampliner. Meet at Happy Days visitors' center on Rt. 303 east of Peninsula. 9am

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Wild Ones 2002 National Conference

Low Maintenance Landscaping With Native Plants. For home gardeners and landscapers of corporate and public places. Keynote address: Andy Wasowski, "The Landscaping Revolution."

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August 12, 1989, under the guidance of experts from its Division of Areas and Preserves. Alkaline wetlands formed after the glaciers receded 12,000 years ago, fens typically are found near limestone-gravel ridges and are watered by cold alkaline springs.

I had already seen Canadian-type fens in Portage, Geauga, and Summit counties in northeastern Ohio, the kind of wetland that is often near a large pond or lake, surrounded by tamaracks, and filled with unusual Northern sedges, orchids, willows, carnivorous plants, and heaths.

Now I was going to see a Midwestem-type fen, not near a large body of water; surrounded originally by grasslands and an occasional bur oak *(Quercus macrocarpa)* and now by acres of farm fields; and filled with a mix of Northern plants and prairie species from the Midwest and Great Plains.

After a 3½-hour drive from Cleveland, I met our guides at a designated state park in the Dayton-Springfield area, Ohio. We were given the itinerary – Buffenbarger, Urbana Fairgrounds, Liberty, Prairie Road, and Gallagher's Fens – and were asked to divide up into groups, each led by a knowledgeable guide. I chose the group led by Guy Denny, whom I had met several times before when he had lectured in northeast Ohio and who had written many informative articles on endangered plants in the ODNR *Newsletter.*

If anyone knew about rare species, it would be Guy, and I wasn't disappointed. At Buffenbarger Fen he pointed out queen-of-the-prairie *(Filipendula rubra),* a tall member of the rose family, sometimes over 7 feet, with globular panicles of small pink, fuzzy flowers resembling those of spiraea. It has a large range from Pennsylvania to Iowa south to Georgia and is apparently an invader from the tall-grass prairies of the Midwest, still working its way east to New England and the Maritimes.

Also at Buffenbarger the blue-leaf willow *(Salix glaucophylloides*, now *myricoides)* grew in short, dense clumps. Guy told us that this species was once considered extinct in Ohio but is now rated as potentially threatened. Its leaves, bluish-gray as if dipped in ashes, certainly lived up to its common name.

Around noon we came to Liberty Fen, located in such typical flat prairie country, now turned into farms, that one could see for miles in all directions. The buildings of the small community of West Liberty seemed close at hand although they must have been several miles away.

As we passed through a weedy low spot in the prairie between the road and the fen proper, we noticed a stand of about 10 goldenrods and sunflowers, not in bloom yet but infested with many pale-yellow, snakelike growths spiraling up the stalks. Someone wondered aloud if they were fungi because they did look fuzzy and unwholesome like certain mildews. I was sure they were dodders but of a kind I had never before seen in the wild. Somewhere, my memory screen informed me, in some wildflower book I had seen a picture of this one, but where?

"Say, Guy," I called out. "Is it all right with ODNR if I collect one of these?"

"Go ahead," he answered. "You can even eat it." This was said probably because we were scheduled to have lunch pretty soon, courtesy of the brown bags and thermos bottles in our backpacks. I stashed the specimen plus its sunflower host in a plastic bag, took several photos, and went on my way.

The rest of the afternoon went by quickly with many good sightings, and after thanking Guy for pointing out the highlights of a new and remarkable flora, we went back to our cars and drove home. I put the dodder specimen into a plant press and took it to the Cleveland Museum of Natural History herbarium, where I was a volunteer one day a week. A few days later I put it into the freeze-dry, to kill insect eggs, and later, on a shelf with the rest of my donated specimens.

Still later, while leafing through an out-of-print hardcover book that I had purchased from the Museum shop years before, entitled *Wild Flowers of Ohio and Adjacent States* by former Ohioan Isabelle H. Klein, I finally found my hangman's noose. Isabelle Klein called it knotted dodder *(Cuscuta glomerata),* meaning having clustered as opposed to scattered flowers, and one of its favorite hosts was the sunflower.

It took several more days before I thought of looking up its rarity status in Ohio. With the latest ODNR listing of "Rare Ohio Native Plants" in front of me, I turned casually to the Cuscutaceae, and, lo and behold, knotted dodder was X-rated – for extirpated, extinct. I had rediscovered a lost plant, not seen in Ohio since 1933, or 56 years before!

I lost no time in calling Guy in Columbus about my discovery, but he informed me that while I was lollygagging about, two of my botanist buddies from Cleveland, who had been at the same prairie-fen open-house but with a different group and leader, had reported the same discovery almost a week earlier.

"But you were the only one who collected a specimen," Guy went on. "If you want to, you can write it up and submit it to a botanical journal. Most of the botanical discoveries in Ohio, at least from this department, go into *The Michigan Botanist."* And thus my first and only scientific-journal article was born.

To write about a rare dodder with some understanding of the topic, I decided I had to learn about the life cycle of the whole dodder family as well as that of other non-green, leafless plants, which existed in Ohio and the Great Lakes region in more variety than I had imagined. For starters, as I quickly learned from my references, dodders have no roots. When their seeds germinate in the soil, they put down a structure that may have been a root in its past evolutionary history but now serves only as an anchor; it has no rootlets which can absorb water and minerals from the soil. At the same time, a non-green creeping stem develops that begins to search for a host plant to parasitize.

It lengthens to three inches at the most, moving imperceptibly in a circle, like the tentacle of a vegetable octopus, to find a green plant to attach itself to. Any plant not in the grass family will do. Once attached to a

temporary host, its "root" in the soil withers and dies, and the young dodder will send out a branch, or perhaps a whole network of branches, to find its preferred host.

How it does this without a sense of smell or taste is unknown, but some chemical reaction is probably involved. In Ohio hazel dodder *(Cuscuta coryli)* and buttonbush dodder (C. *cephalanthi)* seek shrubs and small trees. Smartweed dodder *(C. polygonorum)* seeks plants of swamps and wetlands, such as the water smartweeds *(Polygonum),* ditch stonecrop, and water horehound. Knotted dodder seeks large members of the composite, or daisy, family, especially sunflowers, goldenrods, asters, and blazing stars. Common dodder will make do with any sort of host, except grasses.

Why dodders would rather die than victimize grasses is another mystery, but it's one of the luckiest breaks in the history of agriculture, since so many of the world's farmers have depended on cereal grains (wheat, rye, and barley) as well as oats, rice, and corn for their livelihood and their very survival. How would the great civilizations of the past have fared if their agricultural base, already besieged by fungi, such as wheat rust, and predatory insects, such as plagues of grasshoppers, had to fight off dodders with their super-efficient absorption organs called *haustaria?*

The word *haustoria* comes from the Latin word *haustus,* meaning to drink, or draw in, water-or to drain or use up, as in our word *exhaust.* Only the first meaning applies to the dodder-since the parasitic process never results in the death or critical injury of the host. Despite the appearance of being strangled, the host of knotted dodder actually is healthy and well nourished. If it were to weaken and die, the dodder, lacking its own roots, would also succumb.

Haustoria are generally considered to be modified rootlets and are perhaps similar to structures already present on morning-glory vines. I remember one year I trained a morning-glory to grow up a trellis leaning against the side of the house. Once it got started, it quickly twined itself around the vertical supports until it reached the top, where it would normally stop. But not this morning-glory. Sending out little green structures like suction pads on the sides of its stems, it continued to climb the clapboard siding of the house for about 5 more feet before calling it quits.

It's not clear how haustoria can enter the hard epidermal tissues of plants, let alone penetrate the bark and dissolve the dense woody cells of shrubs and trees. When plant anatomists discovered tiny, hair-thin rows of cells sent out by the haustoria, they named them *hyphae,* a term also used in describing the growth tissues of fungi. And perhaps there is a similarity in structure and chemical makeup in the absorption tissues of two totally different organisms.

Once the dodder establishes itself on its host plant, it turns into a seed factory, sending out prodigious quantities of tiny flowers, quickly pollinated by bees and wasps and followed by fruits containing 4 seeds each, packed with nutriments for next year's stems.

Like many fast-spreading weeds, dodders are annuals with well-developed methods of seed dispersal. Although its seeds are too heavy to float on water or be blown about by the wind, a heavy rain can wash them away after they fall to the ground and bring them to new areas with the right sort of hosts. Since they are waterproof, they will not rot. Also, because of their rough seedcoats, they may cling to the feet and fur of large grazing animals, such as deer, and be transported long distances. Furthermore, dodders have learned to use people, by clinging to their shoes, clothing, vehicles, farm machinery, and domestic animals.

Guy Denny to the contrary, dodder seeds are not appetizing to mammals or birds, or even digestible, but they can be swallowed accidentally, when mixed with grain or fodder, and pass through the intestinal tract unharmed. In the process, the tough seedcoat of the dodder is weakened sufficiently to allow germination. This seems to be the usual method, as proved by lab experiments that imitate the digestive conditions in grazing animals: the dodder seeds are soaked in concentrated sulfuric acid, put in a blender filled with ground glass, and given the cold treatment (to duplicate overwintering) before they begin germination. Dodders have to be tough to survive these conditions.

One wonders how many other non-green parasites have a similar life style. In Ohio there is a whole family of plants, the broomrapes, whose irregular, two-lipped flowers show them to be closely related to the snapdragons and other *scrophs* (short for members of the Scrophulariaceae). The broomrapes, however, prefer to do their dirty work underground by parasitizing the roots of forest trees. Anyone exploring the mature forests of the Great Lakes region is sure to find beechdrops *(Epifagus virginiana)* growing beneath the canopy of the American beech *(Fagus grandifolia).* The erect, branching stems are brown with a few scales that probably once functioned as leaves for its non-parasitic ancestors. Its flowers, buffy brown with red-purple stripes, bloom and go to seed August to October, the same time as the beechnuts of its host. Perhaps its abundant seeds are dispersed by the beechnut-loving animals, such as squirrels and wild turkeys, in the fall.

An attractive pale-lavender wildflower with an ugly name, broomrape or cancer-root *(Orobanche uniflora)* has no true stems above ground, only 1 to 4 flower stalks with a few small scales, vestiges of leaves, at the base. Because it prefers shaded wet woods with usually a thick understory of shrubs, broomrape is not as conspicuous as its relatives. It has been known to parasitize trees, shrubs, and large composites, such as asters and goldenrods. Probably because its color is so subdued, it has evolved a delightful fragrance for attracting butterflies and other pollinators of its tube-shaped flowers.

Oak-hickory forests also have a member of this family: squaw-root *(Conopholis americana),* consisting of a spike of yellow-brown flowers alternating with scales of the same color (descendants of the original leaves), which harden as the fruit matures. The whole plant then resembles a pine cone stuck in the ground. One wonders if blue jays and

squirrels are taken in by this mimicry and disperse the seeds. Like the famous European parasite, mistletoe, squaw-root victimizes mainly oak trees. Large woody knobs on the roots of its hosts are evidence that this species has been at work.

Most of our American mistletoes (from the family *Loranthaceae)* are from a more primitive group than the broomrapes, but they retain their green leaves. They are widely distributed in tropical America and in the West; however, many parts of the Northeast and the Great Lakes drainage are subject to the infestations of the leafless, little-known dwarf mistletoe *(Arceuthobium pusillum),* which attacks spruce, tamarack, and white pine. To find a dwarf mistletoe is not easy, since the mature seed-bearing plant is no more than two inches high and usually sits in the middle of a growth deformity called *witches' broom,* a tangle of short, skinny branches that grow out in all directions as the conifer host responds to the infection site. (Witches' brooms are also caused by certain fungi.)

Like dodders, mistletoes lack true roots, but they never disperse their seeds on the ground. When a sticky mistletoe fruit or seed lands on the branches of its host tree (usually through the agency of a bird), it sends out haustoria, which tap into the water and nourishment systems of the host tree by means of hyphae, the same as for dodders and fungi. But unlike the dodders, the dwarf mistletoe sends up a tiny stem with scale-like deep-brown or purplish leaves that surprisingly resemble the scales of a northern white cedar, or arbor vitae. This is a case of plant mimicry that is more effective in the Old World, where the parasite actually attacks cedars and related scale-bearing conifers. *(Arceuthobium* in Greek means "living off cedars.")

Some of the most remarkable non-green plants not only feed on dead plant material as many of the fungi do, but their waxy, spongy appearance reminds the plant hunter of mushrooms. The pyrola family, close relatives of the heaths, produce many normal green-leaved plants, such as the shinleaves *(Pyrola)* and wintergreens *(Chimaphila),* small plants often found on the floor of rich, moist woods. But it also contains the strange ghost-white Indian pipe *(Monotropa uniflora)* and many of its weird-looking Western relatives like the famous blood-red snow plant of the Sierras *(Sarcodes sanguinea).* Indian pipe even turns black when its flowering cycle is over, just as mushrooms do, and mushroom field guides warn novices not to pick it as a specimen.

Depending on what sources one uses, Indian pipes and their relatives are described as either strict parasites or parasitic-saprophytic, feeding on living and dead tree roots, as do their look-alikes, the mushrooms. Recent research finds the truth much more complicated. In the extensive coniferous forests of the West, snow plant has been discovered to tap into the nutrients produced by the fungus associates *(mycorrhizae)* of tree roots, especially of pines. Mycorrhizae are feltlike masses of mushroom tissue that invade and cover the rootlets of pines and provide them with minerals, nutriments, antibiotics, and moisture, which the fungi have recycled from decayed organic material in the soil. In this arrangement, the fungi also benefit by obtaining carbohydrates from the rootlets of the pine. Apparently mycorrhizae also invade the roots of the snow plants growing under pines, and all three organisms benefit in a benign form of partnership called *symbiosis,* living together for mutual advantage.

Mycorrhizae also play an important role in the orchid family. Some of the well-known leafless orchids are saprophytes, such as the coral-roots and the strange, but beautiful, three-birds orchid. Like the knotted dodder, the coral-roots never develop true roots; instead, they send out odd-looking, many-branched underground stems called *rhizomes,* which become wrapped with mycorrhizal tissues. These supply the rhizomes with all the nutriments, minerals, and moisture that the coral-roots need for flowering and setting seed.

Since the spotted coral-root *(Corallorhiza maculata)* is the commonest of the group and most widely distributed in the East, it is the first that plant-hunters usually find. Blooming in the dense shade of mature forests in rich organic soil, the spotted coral-root with its light purple flowers and spotted lip (the lowest petal of an orchid) is very often the only plant seen on the forest floor during the hot, humid days of July and August.

Very different are the big stands of the crested coral-root *(Hexalectris spicata),* a southern species just reaching into Adams County in Ohio along the Ohio River. Tall for an orchid, the crested coral-root can grow over two feet tall and often in big, conspicuous clumps in light shade among oaks. With its elegant-looking flower, the buffy petals with conspicuous purple-red stripes being somewhat ribbon shaped, the orchid reminds the viewer of the kind of ornamental scrollwork found on awards certificates. Because its rhizomes store nutriments unevenly, it blooms very irregularly, a habit shared by all the saprophytic orchids, but carried to an extreme by the seldom-seen three-birds *(Triphora trianthophora).*

More often seen in wildflower manuals than in the wild itself, three-birds blooms in mature forests, such as beech-maple, on deep soil loaded with decayed material. Although a perennial, the plant puts no vegetative parts above ground until late July when the tuberous rhizomes trigger a growth hormone after certain conditions of soil moisture and air temperature have occurred. A stem arises, bearing the poorest excuses for leaves of any member of the orchid family: from 6 to 18 millimeters long (at most, equaling the width of a dime), the roundish, clasping leaves probably contribute little in the way of photosynthesis and are perhaps evolving their way out of existence. Two to three weeks later, three flowers appear in succession, each in a separate leaf axil. The flowers are white, as benefits a plant blooming in deep shade, and of such a beautiful shape—like miniature corsage orchids, frilled lip and all – that orchid photographers will take endless pains to locate a colony, as a friend of mine and I experienced on August 21, 1983.

Jack and I had been all morning at the famous Oak Openings Park near Toledo, Ohio, a prairie and sand-barrens area with one of the richest and most diverse floras in Ohio. We were having great luck. We had found our first Great Lakes goldenrod *(Solidago remota),* a native to only 4 states on the southern shores of Lake Erie and Lake Michigan. At a small prairie adjoining a railroad right-of-way, we found the tubercled orchid (*Platanthera flava* var. *herbiola*), just going out of flower.

Before noon we met a friend of Jack's, a park naturalist from a state-owned nature preserve in western Ohio, who gave us the great news that three-birds was in bloom at his park. He even gave us the name of the nature trail and the number of the station where it would be found. How could anyone miss this opportunity? And with all the location information, how could anyone fail to find the orchid?

Very easily. Although we got to the park in less than two hours, found the right nature trail, and found the small colony of three-birds, none of the plants was in bloom. Why? Three-birds blooms only in the morning! Naturally disappointed, we later found out that all bottom orchids in a single colony bloom at the same time; that is, the lowest orchid of every plant blooms on the same morning, then is pollinated, wilts, and begins to go to seed in the afternoon. Next day, the second orchid in each plant does the same, and on the following day, the third and last orchid repeats the procedure. Result: no more orchids until next year if conditions are right. And if not, try the year after that.

As it turned out, we didn't have the time to return that week, and we didn't hear there were any orchids in bloom in the park until August 15, 1985. This time we made sure to get there in the morning! We found at least 50 plants in bloom, scattered over a large area and, true to their saprophytic nature, most of them were growing by rotted stumps or dead tree trunks lying on the ground. In one group more than 10 plants were growing close together, and some of the flowers were pink as well as white. For me this was a high point in my orchid-hunting career, and I learned a lot about saprophytes at the same time.

As for carnivorous plants, in Ohio there is only one species that can do without green leaves. It is neither the sundew with its sticky leaves nor the pitcher plant with its big, vessel-shaped leaves. (These two plants often have red leaves, but in many species red masks the green of the chlorophyll.) Rather, it is the aquatic carnivorous group of the bladderworts *(Utricularia),* related to the scrophs, that seem to be moving toward a leafless condition.

Opinion is still divided on whether they have leaves to begin with. The famous bladders, which are traps to catch microscopic aquatic organisms, such as the well-known water flea *Daphnia,* seem to be part of a stem or root system, which may have been originally the veins of a set of large basal leaves. The bladders, which are unique in the plant kingdom, contain hairs that are a signaling device, acting somewhat as the sense of touch in animals. When *Daphnia* or a similar organism touches a hair, the bladder nearby suddenly opens, almost as if controlled by the equivalent of a jaw muscle, and the *Daphnia* is swept inside by the current. The bladder "door" closes behind it, and it is trapped. After a victim is digested by enzymes similar to those in an animal's stomach, the bladder door opens again, and the hair-trigger is reset.

In a species of bladderwort, the highly dissected basal leaves (or whatever they are) may still manufacture food for the plant, but there is no doubt that the aquatic animals caught in the traps provide most of the calories. Most plant physiologists believe that nutrients containing important nitrogen compounds are in short supply in the bog or swamp habitat where carnivorous plants live; therefore, the process of catching and digesting animals has evolved to supply the needed nitrogen.

Although most bladderworts are aquatic, a few, such as the horned bladderwort (*U. cornuta)* of the Great Lakes region and Atlantic coast, are terrestrial, growing in wet sand or mud. Here it is fairly clear that the dissected leaves have no food-making function since sunlight doesn't reach them.

After studying all the different types of non-green plants that seem to function and even thrive without the benefit of chlorophyll and photosynthesis, I was better equipped to understand the knotted dodder.

First, I could see why it was so rare in Ohio, not only at present but ever since plant records have been kept. Since it is more or less host-specific on large composites, such as sunflowers, its usual habitat was the tall-grass prairies extending from the Great Plains into the Midwest in a sort of funnel shape, called, in Ohio, the Prairie Peninsula. Here the small end of the funnel seemed to have centered around Columbus, nearly in the middle of the state. There has been only one record of *C. glomerata* east of Columbus, in Licking County; this represents the easternmost point of its range, not just in Ohio but also in North America.

However, in the Great Plains, knotted dodder is one of the commonest species of its genus because large, colorful composites dominate the *broad-leaf* prairie flora, meaning all the plants other than grasses. The center of its abundance is the eastern half of Kansas, where it is found in nearly every county, and in the early days of settlement it was found from southwest Michigan west to South Dakota and south to Mississippi and Texas, a truly enormous midcontinental range. Why did such a successful plant become so uncommon in the eastern part of its range?

Apparently agriculture did it in. In Ohio the natural prairie went down from 2,000 square miles to 2,000 acres. Corn and soybeans took the place of grasses and prairie composites, except in wetlands like prairie fens.

Another problem with knotted dodder is its distinctive appearance and color. Why is it the only dodder in the East to have yellowish flowers rather than white, and a ropelike inflorescence rather than a stringy or web-like appearance? From what I've seen of plant mimicry in the dwarf mistletoe, the squawroot, and the Indian pipe, my guess is that a furry, ropelike appearance is too reminiscent of mold or mildew to grazing animals, such as deer, and they will

avoid it. On the other hand, bees will be drawn to the yellow color of the tiny, crowded flowers because they look like the disk flowers of its composite hosts, and they will be pollinated, just as the host's own flowers would be.

This brings up another problem: where *were* the flowers of the host plant? Shouldn't at least a few of them have been in bloom by August 12, the day of the prairie-fen open house? Is it possible that the knotted dodder is not only a thief, stealing its host's nutriments, but also a kidnapper, stealing its host's young? Could it be that the host plants never bloom? Although knotted dodder has not been studied in depth, botanists in California and Arizona have studied the field dodder *(C. campestris),* which is an important pest on alfalfa grown for seed, and which in some areas can destroy nearly all the crop. Somehow it does this by causing most of the flowers of its alfalfa host to fall off before being fertilized and preventing the remainder from setting viable seed. Perhaps knotted dodder does this to its sunflower and goldenrod hosts. In the underworld of criminal plants, it's either "us or them."

Will knotted dodder ever become a farm pest? So far, it hasn't been documented as such, principally because its favorite targets – the composites – have seldom been grown as commercial crops. In recent years, however, sunflowers have become the staple of the birdseed and margarine industries. In Ohio one sees fields of huge-headed Kansas sunflowers grown for seed. Actually the biggest enemy of sunflowers right now is the rival rapeseed industry, mostly centered in Canada, where cultivation of an Old World mustard, called rape *(Brassica napus),* has for the moment captured the low-fat, low-cholesterol cooking-oil industry. But even if knotted dodder should invade commercial sunflower fields by being transported by farmers and their machinery, there are several ways to control this species.

One is to plow up the sunflower fields and plant grass for 2 or more years before replanting sunflowers. This gets rid of most of the dodder, if not all, because newly germinated dodders must avoid grass. Secondly, to remove all hosts, get rid of all broad-leaf plants between the nearest road and the former sunflower field. (In the case of Liberty Fen, the area of infestation was between the fen and the road.) Finally, if there is a chance that dodder seeds have gotten mixed with sunflower seeds after the harvest, one can use a gizmo called a "dodder mill," with moving, felt-covered rollers – something like a cotton gin, I imagine. The rough seed coats of dodder will stick to the felt, while the smooth sunflower seeds will go through.

Lastly, why did the knotted dodder return to Ohio after 56 years of absence? We may never know. The answer may have something to do with this era of fast, long-distance surface transportation. The tires of a truck, passing through Kansas, for instance, may pick up many dodder seeds; the next day, in Ohio, many of them may drop off. Or perhaps the viability of *C. glomerata* seeds in the ground is the answer, Researchers can state that field dodder definitely loses its viability in 5 years, but other species may still retain it after 10 to 20 years. It is entirely possible that knotted dodder seeds remained dormant in the ground for 56 years or longer, waiting for...we don't know what: an increase in the deer population to transport seeds, a change of farm crops from corn to broad-leaf plants? No one is sure.

Anything is possible when one is dealing with a slippery crook that works boldly in the open, a master of many disguises, a rootless despoiler of green-leaved plants, a brazen thief that would deserve the hangman's noose if it hadn't stolen it first, *Cuscula glomerata* – the mother of all dodders.

The author wants to acknowledge help from two sources in particular: Guy Denny's article on prairie fens in *Ohio's Natural Heritage* (1979, The Ohio Academy of Science, Columbus, Ohio) and Allison Cusick's articles on the coral-roots and the three-birds orchid in *Ohio Endangered and Threatened Vascular Plants* (1984, Division of Natural Areas and Preserves, Columbus, Ohio). For a general overview of non-green plants, Job Kuijt's *The Biology of Parasitic Flowering Plants,* 1969, is excellent.

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Old-growth Forests

MILFORD, Ohio (AP) -- Tree experts have confirmed a startling find of old-growth forest in southwest Ohio. For years, the staff of Cincinnati Nature Center's Rowe Woods and its 800 acres in Clermont County knew that portions of the forest were mature and relatively undisturbed. Now, they know they have one of the largest chunks of old-growth forest remaining in the state, including trees that sprouted before the Revolutionary War.

Confirmation of the forest's age and ecological significance came after a year of mapping and inventory revealed that Rowe Woods contains at least 5 percent of the old-growth forests remaining in Ohio.

"They all realized they had some mature forest, but I don't think they put it into total perspective until we mapped it and started looking at it," said Barry Dalton, a botanist and director of the Environmental Resource Management Center at Northern Kentucky University.

Keepers of the forest plan to use this newfound knowledge to boost educational programs at the nature center. "That's going to be kind of a calling card for them," said Chris Manning, a landscape architect with Human Nature Inc., a Cincinnati firm that participated in the inventory. "That was kind of a shocking find." The oldest trees in Rowe Woods -- beech, maple and oak -- cover about 66 acres and rise 100 to 130 feet. They are estimated to be at least 150 to 250 years old. "There are very few old-growth remnants left in this area," Dalton said. "Finding them is like finding little jewels of natural diversity." Old-growth forest offers "a snapshot of how this area might have looked before white settlers arrived," said David Whittaker, a landscape architect with Human Nature.

Reprinted from The Associated Press 4/9/02 2:03 AM

Book Review

Tinkering With Eden: A Natural History of Exotics in America by Kim Todd. Norton, Norton, $26.95

Review by Art Hopkins

The biota of modern America is very different from that found by the first European explorers. The plow, the dredge, firearms, fire, fire suppression, toxic waste, pavement all contributed to the redistribution, and in some cases, to the extinction of species. As significant as any of these factors has been the introduction of non-native species.

Tinkering With Eden recounts the introduction of many such species, some brought here purposely with the intent to "improve" conditions; others released accidentally. Honeybees, Asian mulberry trees, Queen Anne's Lace, and "Kentucky" bluegrass are introduced species with which we are familiar, and that seem to be benign additions to our landscape.

Other invaders give no pretense of benignity. Mosquitoes, for example, stowed away on whale ships and reached Hawaii for the first time in the 1820's. They spread various avian diseases that have devastated those islands' bird species. English starlings were purposely released in New York's Central Park by someone who wanted to hear Shakespeare's birds in the New World. Starlings are the birds whose huge, noisy flocks mob residential neighborhoods each spring. They out-compete many of our native songbirds, and prey upon the nests of some.

Garlic mustard, purple loosestrife, and other exotic plant species shade out or crowd out the native plant communities that they encounter, but the native plants, including many of our most beloved wildflowers, are not the only loss. Each plant co-evolved with insect pollinators and predators which depend upon it and which are, themselves, food for chains of higher species.

As Todd writes, "these tales of exotic species are steeped in sadness. While they appear tales of addition, subtraction is the underlying theme."

Reprinted from the Indiana Native Plant and Wildflower Society News, Summer 2001

Focus on Native Forages: **Cup Plant**

by Rebecca Zych, Anna Bennett, and Paul Hammond

Cup Plant (*Silphium perfoliatum*) ranges throughout the Midwestern tall-grass prairies. It becomes more rare, like most prairie species, as you proceed east. The species prefers sunny, moist areas along prairie streams, in floodplains, or along the edges of woodlands.

Cup Plant is a perennial that can reach heights of eight feet tall. It has yellow daisy-like flowers, but its more interesting feature is the leaves from which it gets its name. The large coarse leaves are borne opposite each other on the square stem and the leaves' bottoms fuse to form a cup, which holds rainwater. Cup Plant is not known to have many pest or disease problems. It is readily transplanted when young, but developed plants have an extensive root system that makes transplantation difficult if not impossible. Cup Plant has served many uses over time from chewing gum to alternate forage for livestock.

While Native Americans used the hardened sap from the plant for chewing gum to freshen their breath, it is cup plant's usage as an alternate forage that is gaining wide interest. Farmers have begun to appreciate cup plant's ability to grow in wet conditions and produce good yields with high nutritional quality when other forages would do poorly. Its thick stems prevent it from being useful as a hay, however, and proper, measured drying techniques must be practiced in order to ensile cup plant correctly. Cup Plant's digestibility overall has been found to be comparable to alfalfa. While the alfalfa might be digested faster than cup plant, cup plant maintains a higher amount of digestibility as it matures because of a slower increase in its indigestibility fraction.

Reprinted from the Indiana Native Plant and Wildflower Society News, Summer 2001



Cup Plant
(Silphium perfoliatum)

THE OAK OPENINGS OF NORTHWEST OHIO

Part 1 of 4: A Marvel of Botanical Diversity

By Robert Jacksy, Jr.

The ancient post-glacial beach ridge on which Ohio's epicenter for biodiversity sits is a plant lover's paradise. After the last glacier receded, a biological backfill occurred and the nutrient-poor sandy soils of The Oak Openings Region of Northwest Ohio became home to more rare plant species than anywhere else in the state. Almost 200 species of Ohio's endangered, threatened, or potentially threatened plants have been identified here. The Oak Openings Region comprises about 80,000 acres of mostly prairie and oak savanna habitats extending through Ohio's Lucas, Fulton and Henry Counties and into three counties in southeastern Michigan. While suburban sprawl and commercial development have consumed most of this land, a few far-sighted public agencies and conservation organizations have ownership of critical habitats.

Prairies are grass-dominated and the most botanically diverse of North American ecosystems. Oak savannas in Ohio historically had about 2 to 20 trees per acre. White oak (*Quercus alba*) and black oak (*Q. velutina*) were the most common trees, with understories dominated by grasses and sedges. The Metroparks of the Toledo Area are responsible for about 4,700 acres, the State of Ohio, Department of Natural Areas and Preserves holds 393 acres, the State of Ohio, Division of Forestry has 3,068 acres, and The Nature Conservancy owns 600 acres. Many private landowners have much smaller lots that they maintain as prairie and savanna.

Before Euro-American settlement, native peoples used fire as a land management tool. Fire would kill many thin-barked trees such as maples, black cherry, beech and small shrubs, and often spare mature oak trees, which produce acorns, and also encouraged the growth of prairie grasses that the Indians would harvest to eat. These acorns and grasses also fed the animals the Indians hunted: wild turkey, deer, elk, bison and other game. The cruel displacement of the native cultures in the 1600's through the 1800's spelled the end of the use of fire as a terrestrial medicine — until its recent repatriation with the land.

A reawakening of the benefits of using fire to restore and maintain prairies and savannas occurred in the latter part of the twentieth century. The four previously mentioned holders of prairie and savanna habitats have been using prescribed burns to reinvigorate their degraded landscapes. The results of these intentional, controlled fires have been nothing short of astounding. Plant species such as wild lupine (*Lupinus perennis*), fern-leaf false foxglove (*Aureolaria pedicularia* var. *ambigens*), Junegrass (*Koeleria macrantha*) and many, many others have made a comeback from a very marginal existence. A great deal of grassland plant species' seeds can persist for decades, even over a century in the soil. Ecologists call this a *seed bank*. These seeds can lie dormant if sunlight is absorbed by thick leaf litter or by an overly dense canopy. If a disturbance, such as fire, clears away these growth inhibitors the suppressed seeds can be liberated.

In Oak Openings Preserve Metropark there are plant species that have not been found naturally occurring anywhere else in Ohio. Gay-wings (*Polygala paucifolia*), an attractive member of the milkwort family is found at three closely clumped sites in the Preserve. Sand serviceberry (*Amelanchier sanguinea*) was recently discovered by the keen-eyed botanist Timothy Walters at a place where hundreds of learned naturalists have walked past it over the decades not noticing it as a special *Amelanchier*.

The other exciting plants that have been found at this preserve are too numerous to discuss in this article, but a couple of favorites are porcupine grass (*Stipa spartea*) and spatulate-leaved sundew (*Drosera intermedia*). Porcupine grass is kind of an oddball wild grass in that, like the previously mentioned Junegrass, it is a cool-season plant, meaning that it flowers before what are usually the hottest months of summer, the end of July, August and early September. Its leaves are very slender and the seeds are fascinating. The seed's tip is needle sharp and the long awn is twisted, like a corkscrew. When dry, the awn shortens, when moist, the awn elongates. This change of lengths screws the seed into the ground! Many fringe players, such as the spatulate-leaved sundew, find their niche here. This sundew, an annual that exists on a few wet sandy margins, augments its nutritional needs by luring unsuspecting insects to its nectar-droplet secreting leaflets. Hoping to procure an easy meal, the bug is captured by the adhesive in the sweet fluid and is externally digested by enzymes of this deadly cocktail.

The awareness of the unique natural history of The Oak Openings Region was catalyzed in the late 1920's when Professor Edwin L. Mosley's monograph, *Flora of The Oak Openings, West of Toledo* was published in the *Proceedings of The Ohio Academy Of Science*. Since Mosley's groundbreaking work, many other naturalists and scientists have added to the body of knowledge of this remarkable landscape. With this knowledge and awareness comes a great responsibility for current stewards of the remaining preserves. We now know that The Oak Openings Region depends on humans for maintaining the restorative fires that clear the understories of the savannas and weed the prairies of shrubs. A measure of our generation's concern for Northwest Ohio's natural history will be how well we have managed The Oak Openings Region for its unique native biodiversity. We have truly been given an opportunity to get it right.

Robert Jacksy, Jr. is a naturalist/historic interpreter for the Metroparks of the Toledo Area

Conservation Biology Studies of Royal Catchfly

Rebecca W. Dolan, Ph.D.

For more than 12 years, I have been studying Royal Catchfly (*Silene regia*) in prairies of the Midwest. Conservation biologists strive to understand why some species are rare and to determine which management practices will best insure survival of rare taxa. It is hoped that information gained through detailed studies of single species will apply to other species with similar attributes. This field of study has existed as a discrete scientific discipline for only about 20 years, although botanists have always been interested in rare plants.

With my colleague Eric Menges, currently at Archbold Biological Station in Florida but formerly with Holcomb Research Institute of Butler University, I have had funding from the National Science Foundation, the Indiana and Ohio Departments of Natural Resources, and the Indiana Academy of Science to study Royal Catchfly. This beautiful red-flowered member of the pink family has a global distribution restricted to the eastern United States. It is very common in southern Missouri, with scattered populations to the north and east. It is state-listed as rare or endangered in Illinois, Indiana, Ohio, and Kentucky. In the eastern part of its range, Royal Catchfly grows in prairies, grass-dominated plant communities that have almost all been converted to row-crop agriculture. Remnant populations remain where the farmers could not reach, in cemeteries, along fence rows, and roadside and railroad rights-of-way. Soils farther west were shallow and rocky and more historical prairie vegetation remains in fields used for pasture or hay production.



Royal Catchfly
Silene regia

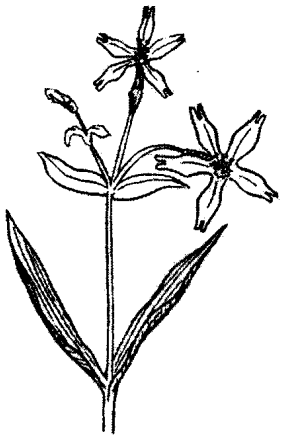
There are two other red-flowered Silenes east of the Mississippi. They are the woodland Fire Pink (*S. virginica*), a plant promoted by many as a good choice to replace the Chinese peony as the State Flower, and Round-leaved Catchfly (*S. rotundifolia*), a rare plant restricted to sandstone outcrops along the Ohio River in Ohio and West Virginia. Previous studies have shown that these three species are interfertile, but that the offspring are sterile. This sterility barrier, along with habitat specificity, keeps the species distinct and eliminates hybridization as one potential cause of rarity for *S. regia*

As part of our work in Indiana, my students revisited all recorded locations for Royal Catchfly in the state. Based on records in the DNR's Heritage database and herbarium records, the distribution of this showy plant has been pretty well documented. Of about 12 reported sites, Royal Catchfly still grows in half. The students had the fun of finding a new population of about 75 plants growing in a fencerow in Warren County, while scouting county roads near another extant site.

The noted early botanical explorer Thomas Nuttall first collected Royal Catchfly in the early 1800's from near St. Louis, MO. He called the plant "one of the most splendid species in existence." Plants are tap-rooted perennials, up to one meter tall, with striking red flowers with sepals and petals fused at the base. Anthers and stigmas are exerted out the end. "Royal" of the common name comes from red being the color of royalty, "Catchfly" from sticky mucilage that is present on the sepals. Red-flowered plants with fused parts are often pollinated by hummingbirds. We demonstrated, with a series of studies that excluded pollinators of different sizes using chicken-wire cages and mesh bags, that ruby-throated hummingbirds are the principal pollinators, although swallowtail butterflies also visit Royal Catchfly flowers. Flowers are readily pollinated and seed production is prolific, so lack of pollinator service is not currently a problem contributing to rarity.

So, lots of seeds are produced, but are they viable? After cold-treatment and scarification, Eric conducted germination experiments with seeds collected from a range of natural populations. He discovered that seeds from small populations had a lower germination

percentage than seeds from larger populations. Could it be that small populations were suffering negative effects of inbreeding?



Fire Pink
Silene virginica

In order to investigate this possibility, we selected a set of populations with a range of sizes, in terms of number of Royal Catchfly plants, and undertook a series of studies at each site. We permanently marked plants at each site with metal tags and mapped their locations so that plants could be relocated. For up to seven years we revisited study populations to see if individual plants had survived or died and to monitor new seedlings. We could determine if populations were stable, declining, or growing in number. We also could construct actuarial tables (like those for humans used by insurance companies). Based on the data from each site, we determined the likelihood of survival for a plant of a given life history stage (e.g., the likelihood of surviving from the seedling stage until juvenile, juvenile to reproductive etc.). At most sites, most plants were very long-lived, and over 90% of plants survived the entire period of the study. Recruitment of new seedlings was very low and mostly occurred on soil that had been disturbed, as by rodent digging.

To address the potential role of inbreeding and lack of genetic variation in contributing to rarity in Royal Catchfly, we used a laboratory technique to quantify genetic variation. My students and I looked at allelic variation in essential enzymes of metabolism (requiring only a single leaf from each study plant) using starch gel electrophoresis and staining to visual isozymes. Studies of rare plants often focus on the potential role of limited genetic variation. Genetic variation is viewed as a resource a species can draw on for short-term environmental adaptation (such as surviving this summer's [1999] unusual drought) and for long-term evolutionary change.

Interestingly, we found no relationship between population size and genetic variation. What we did find was evidence for the overwhelming importance of fire as a management tool to promote persistence of Royal Catchfly populations. Royal Catchfly colonies that received prescribed burning, regardless of population size, genetic variation, or degree of isolation of a site from other populations, were the most demographically healthy. That is, they showed stable or increasing numbers of Royal Catchfly plants. Prescribed burning to kill seedlings of woody trees and shrubs that overtop shade-intolerant prairie grasses and forbs.

We used computer simulations that projected our actual observed demographic fluctuations in field populations out over 100 and 1,000 years. Sites receiving burning were assured, based on our data, of surviving to the next millennium. Fire's beneficial effect on prairie vegetation has long been known. In the case of Royal Catchfly, I think that fire's benefit is to help existing plants hold on, rather than to affect seed germination. Although its mechanism calls for further study, we demonstrated that, for Royal Catchfly, it is the single most important of the factors we studied for promoting persistence of this "splendid species."

Reprinted from the Indiana Native Plant and Wildflower Society News.



Round-leaved Catchfly
Silene rotundifolia

Rebecca Dolan is Director of the Friesner Herbarium at Butler University. Illustration of Royal Catchfly by Jan Glimn Lacy, botanical illustrator. Illustration of Fire Pink by Jeanette Ming. She illustrated the line drawings for *Go Native! Gardening With Native Plants and Wildflowers in the Lower Midwest*, published by Indiana University Press, September 1999.

Conkles Hollow State Nature Preserve

Located in one of the most scenic regions of Ohio, Conkles Hollow is one of the most spectacular features within the Hocking Hills region. Here one can find the unequaled beauty of sheer cliffs of Blackhand sandstone rising nearly 200 feet above the valley floor. The deep, cool gorge, which is only 100 feet wide in places and is considered by some to be the deepest in Ohio, has numerous waterfalls cascading over its sandstone cliffs. The cliff tops with their magnificent overlooks and the quiet gorge beneath offer the visitor an opportunity to explore different habitats, each with its own unique plant and animal communities.

Conkles Hollow was purchased in 1925 by the state of Ohio in order to preserve its scenic beauty. On April 22, 1977, the hollow was dedicated as a state nature preserve by the Ohio Department of Natural Resources' Division of Parks & Recreation with responsibility for subsequent management and protection given to ODNR's Division of Natural Areas & Preserves. The Ohio Natural Areas Act of 1970 provides for the permanent protection and preservation of areas which contain scientifically and educationally valuable examples of Ohio's native plant and animal communities, geological features, or the habitats of rare or endangered species. These preserves are intended solely for research, nature study, hiking, art, photography and other non-consumptive uses.

GEOLOGIC HISTORY

About 350 million years ago, this portion of Ohio lay under the waters of a vast inland ocean. Rivers flowing into this ancient sea carried coarse and fine grained sands, depositing them in large wide deltas much like the present day delta at the mouth of the Mississippi River. Over millions of years, these sand deltas were buried by finer textured silt and clay sediments. Eventually these sedimentary deposits were compressed to form a thick hard layer of sandy textured rock which we now refer to as Blackhand sandstone. This thick sandstone layer which attains a depth of over 250 feet is the prominent bedrock throughout the entire Hocking Hills region.

Great forces of energy within the earth caused the land surface of eastern North America to gradually rise, eventually forming the present Appalachian Mountains. As the ocean waters drained away, the new land surface dried out and became subject to the erosional processes of surface water and climatic extremes. The newly exposed sediments were weathered away, layer by layer, and washed onto some distant river delta. Today the Blackhand sandstone layers are now the uppermost of these past sediments and they in turn are being acted upon by erosional forces. If we could only return, in say a million years or so, the beautiful highly sculptured bedrock so common to us now would be only a memory. Perhaps new gorges, rock shelters and dazzling waterfalls will be carved from the rock layers beneath you which have yet to be uncovered.

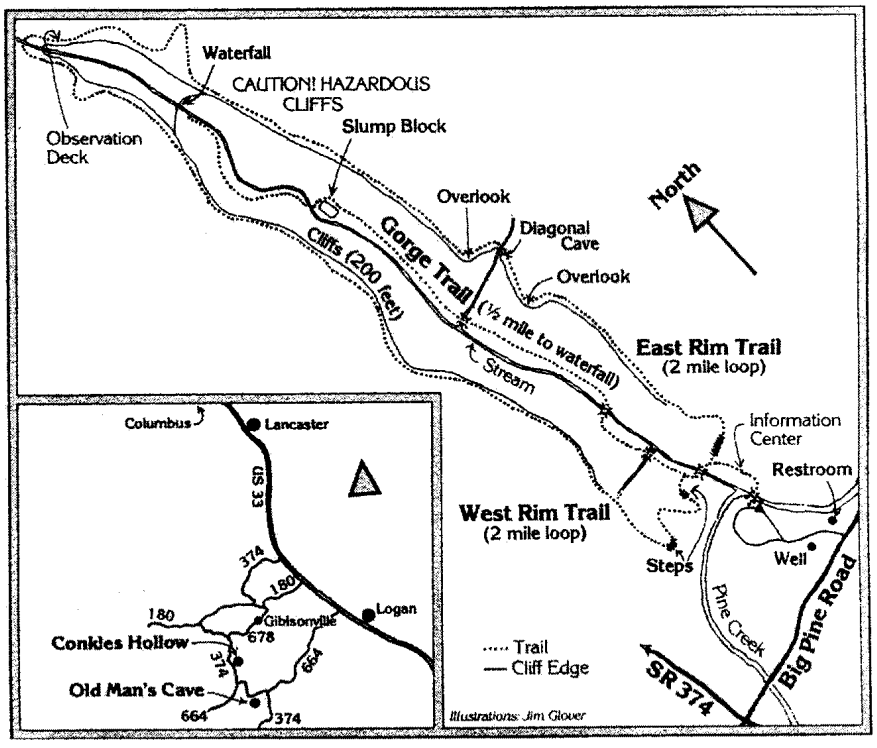
The encroachment of four great continental glaciers across most of Ohio starting about one million years ago, greatly changed the existing physical features of Ohio's landscape.

However, these glaciers did not scour out Conkles Hollow – the edge of the closest and most recent ice sheet stopped roughly six miles northwest of the preserve. Even though the glaciers may have created a temporarily wetter, cooler climate with greater surface runoff, it was thousands of years of slow steady erosion by water that formed the great gorge.

By human reckoning, the process of erosion is infinitely slow. It is hard to imagine that the gentle stream trickling through the narrow cool gorge created Conkles Hollow. But given a million years or so, even the action of a tiny stream can produce a magnificent gorge.

PLANT COMMUNITIES

The plant communities of Conkles Hollow were certainly at the mercy of the last continental glacier. Many species that flourished in cool climates preceding the advancing ice have maintained sizable populations in the cool, damp recesses of Conkles Hollow. Even today, after thousands of years, within the gorge itself one finds plants



such as Canada yew, teaberry, and partridgeberry, which are generally associated with more northern climates. The gorge also contains numerous species of ferns.

The dry, shallow soils of the ridges support sparse stands of oak and pine and contain several species of endangered native orchids. Here and on the exposed cliff faces wherever their roots can find a crack or crevice, blueberries, huckleberries, and mountain laurel thrive. The damp valley soils favor the growth of giant hemlock, tulip poplar, and other hardwoods.

ANIMAL POPULATIONS

Although the black bear, mountain lion, elk, fisher and marten disappeared from the Hocking region long ago, others like the beaver, white-tailed deer, grouse, turkey, and bobcat have made a sometimes dramatic recovery in numbers. Springtime offers an echo of diversity from bird and amphibian songs. Annual bird counts attest to the many warblers, vireos, flycatchers and thrushes that remain in and around Conkles Hollow to foster their offspring.

HISTORICALLY

Not much is known about the use of what is now called Conkles Hollow by prehistoric Ohio Indians, except that some Adena and Fort Ancient cultures apparently frequented the Hocking Hills region. There is little evidence that any permanent habitation was established, but one can speculate that hunting parties used the overhangs of the hollow for temporary shelter. In historic times, the Shawnee and Wyandots inhabited this area. Both groups used a nearby trail which linked West Virginia and Central Ohio. The Wyandots were said to believe that the deep ravines were mysterious and dreary, but the region was still one of their favorite hunting grounds.

Conkles Hollow takes its name from the inscription [WJ. Conkle 1797], once visible on the west wall of the gorge. However, there is no further evidence that other early settlers used this rugged ravine for anything more than hunting and occasional logging.

Reprinted from the Ohio Division of Natural Areas and Preserves Division of Natural Areas and Preserves.
Illustration and map by Jim Glover



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Innovative Erosion Control in Kalamazoo

2001 growing season is a success for the Graphic Packaging Corporation

A highly eroded portion of property along the Kalamazoo River owned by Graphic Packaging Corporation of Kalamazoo, Michigan, was planted in Fall 2000 with native prairie grasses and wildflowers, a unique method for soil stabilization at industrial properties. The experiment, funded by a grant through the Great Lakes Commission and carried out by Kieser & Associates of Kalamazoo, Michigan, aims to demonstrate the feasibility of using native grass and flower mixes at industrial sites. Additional benefits of the project include habitat creation for grassland insects, opportunities for prairie education, and a colorful attraction along the river corridor throughout the year.

The project site, measuring approximately 5 acres in size, was divided into three plots of approximately equal size. The southern plot was planted in the conventional fashion, adding topsoil and using turf grasses. The center plot was also spread with topsoil, but was planted in native prairie grasses and wildflowers. The northern plot received no topsoil and was planted with prairie plants.

The results of the 2001 growing season support the hypothesis that native grasses and flowers are appropriate forms of ground cover for industrial sites where soil quality is poor. The native plants occurring on the northern plot, without the aid of topsoil, outperformed the plants on the other two plots, remaining green and flowering throughout the growing season. Very few weeds were observed on this plot, demonstrating that such non-native plants cannot tolerate the harsh conditions of poor soil and lack of moisture existing at the site.

Alternatively, weeds flourished on the middle plot, where topsoil had been applied. A small number of native prairie seedlings were observed struggling against the weeds on this plot only after the thick tangle of weeds had been mowed in midsummer. Both the weeds of the middle plot and the turf grasses planted on the southern plot went dormant partway through the summer, unable to tolerate the hot, dry conditions. Photos and additional information are provided at the recently updated http://www.kieser-associates.com/prairie. The plots will be monitored for several years to determine the short- and long-term effects of such a planting.

Reprinted from the Indiana Native Plant and Wildflower Society News, Spring 2002

INVASIVE PLANTS OF OHIO

Multiflora Rose (*Rosa multiflora)*

DESCRIPTION

Multiflora rose is a thorny, non-native perennial shrub with arching branches that can form dense thickets. Its compound leaves grow alternately and consist of 5-11 sharply toothed, oval leaflets. The stipules at the base of the leaf are feathery and characteristic of this plant. Multiflora rose produces many clusters of 1-inch-wide, white flowers in the late spring. Small, bright red fruits (rose hips) develop during the summer and remain on the plant throughout the winter.

HABITAT

Multiflora rose prefers sunny areas and well-drained soils, but can tolerate a wide range of habitats. This plant readily invades open woodlands, forest edges, successional fields, savannas and prairies. Once established, multiflora rose grows rapidly, forming dense, impenetrable thickets

DISTRIBUTION

Multiflora rose was introduced from Japan, Korea and eastern China in the 1860s as rootstock for ornamental roses. In the 1930s, it was widely promoted as a "living fence" for soil conservation and in wildlife programs. It is found throughout the United States with the exception of the Rocky Mountains, southeastern coastal plains and western desert areas. In Ohio, multiflora rose has a widespread distribution in pastures, woodlots and non-crop lands.

PROBLEM

Thickets of multiflora rose can successfully displace native plant species. Multiflora rose reproduces from seed and by rooting from the arching stems. It has been estimated that an average plant produces a million seeds per year, which may remain viable in the soil for up to twenty years.

CONTROL

Mechanical: Light multiflora rose infestations can be eradicated using a shovel, provided the entire root system is removed. For control of more severe invasions, mowing or cutting several times per growing season for 2-4 years can be effective. In some situations, a prescribed burn during the early growing season may be an appropriate method for controlling severe infestations.



Chemical: Applying a systemic herbicide, such as Roundup®, Glypro®, or Garlon® directly to fresh cut stumps or as a basal bark application is the most effective control method.

Biological: Rose rosette disease, a natural pest on multiflora rose, was first found Ohio in 1987. Symptoms include red and purplish vein mosaics and dwarfed foliage. A virus is transmitted by a tiny mite and on average plants die within two years of infection. Efforts to introduce the disease into uninfected areas have proven difficult, but research in the area of additional biological control is ongoing and may provide a more promising control agent.

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Illustration Courtesy of Jessica Winzeler, Ohio Department of Natural Resources.

Botany 101 - seventh in a series

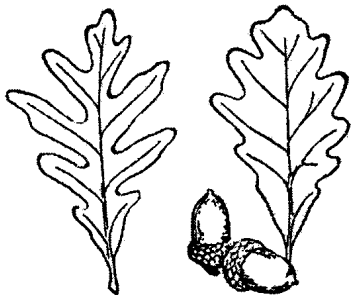
Leaf Characteristics

Dr. Rebecca Dolan

This time of year our attention is naturally drawn to leaves. Let's review the basic features of leaves, which are so often used to identify different species of trees. Leaves are attached to the twig at nodes. The space in between where leaves come out is referred to as the internode. If two leaves come out on opposite sides of a node, the leaves are referred to as opposite. If the leaf pattern alternates with single leaves coming out on every other side, the leaf arrangement is alternate.

The flat, photosynthetic surface of a leaf is the blade, while the little stem piece that attaches a leaf to its twig is technically the petiole. Leaves may be lobed or divided into parts. Margins may be entire, toothed, or even doubly toothed with saw-tooth edges.

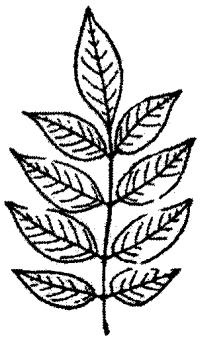
The most confusing trait for beginners is often distinguishing between simple and compound leaves. A simple leaf has a single blade with a bud present in the axil where the petiole attaches to the stem.



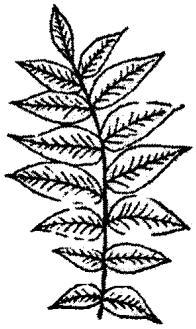
White Oak
(Quercus alba)

Sometimes these buds are obvious; sometimes they are small and/or buried. Compound leaves have the blade dissected into several leaflets attached to the same petiole. Once again, there is a bud present where the base of the petiole attaches to the twig.

Leaflets of compound leaves of some trees are easy to confuse with simple leaves. Location of buds is key, so it is sometimes difficult to tell a simple from a compound leaf once it has fallen from the tree. Maples, oaks and cherries have simple leaves. Ashes, walnuts and hickories have compound leaves.



White Ash
(Fraxinus americana)



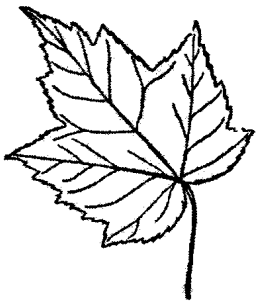
Black Walnut
(Juglans nigra)



Honey Locust
(Gleditsia triacanthos)

A few trees further complicate things by having doubly compound leaves in which the leaflets have leaflets. Honey locust and Kentucky coffee tree have doubly compound leaves. The arrangement of the leaflets in compound leaves can be palmate, in which the leaflets spread out from the petiole like fingers on a hand, as seen in Ohio buckeye; or pinnate, where the leaflets are arranged like pinnae on feathers, as in ash.

Shapes of crotches at the bases of lobes, presence of bristles on lobe tips, thorns on stems, and symmetry of the leaf base where it is attached to the petiole are also sometimes useful traits for tree identification.



Red Maple
(Acer rubrum)

More information on tree identification is available on the Butler University Friesner Herbarium website. Go to www.butler.edu, click on *The Campus,* then click on *Friesner Herbarium.* This material was developed as part of a grant for a tree identification workshop sponsored by Butler, the Indiana Department of Natural Resources Urban Forest Conservation Grant program, and the Marion County Soil and Water Conservation District. The best booklet on tree identification for Indiana is *Fifty Trees of Indiana,* available for $3.00 from the Agricultural Communication Media Distribution Center, 301 South 2nd Street, Lafayette, IN 47901-1232. It contains an easy to use one-page key and nice line drawings of most of our native trees.

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

Some Prairie Legumes

The vegetative community of a typical tallgrass prairie in Ohio may have up to 90% of its biomass and about 10% of the representative plant species in the Grass Family *(Graminae* or *Poaceaea).* The forb families (broad leaved flowering plants), on the other hand, have most of the remaining 10% of the biomass and almost 90% of the representative plant species in the prairie.

In many ways, forbs provide much diversity to the prairie's plant community. The vegetative parts provide food for some the prairie herbivores. Their colorful flowers attract numerous insect species. These insects also pollinate these flowers while they're seeking out the flower's nectar. The plant's seeds may provide food for some of the seed-eating bird species. The diversity of plant life with its different colors, forms, and shapes also attracts nature lovers who visit these prairies to observe their beauty.

There are many forb families that have representative species within the prairie community. However, some families have more prairie species than others. One plant family that has a lot of prairie species is the Legume Family *(Fabaceae, Leguminosae,* or *Papilionaceae),* also called the Bean or Pea Family. The Legume Family has a large diversity of species in North America, second only to the Composite Family *(Asteraceae* or *Compositae).*

The legumes are a highly beneficial plant family. Most legumes are hosts to nitrogen-fixing bacteria (Genus Rhizobium) that are attached to tumor-like growths, called nodules (Latin: knots), which are located upon the plant's root systems. These nodules are a result of the bacteria invading the roots through the roots' hairs and infecting the roots' subsurface. The nodules are formed where the bacteria has infected the root.

Because the Rhizobium bacterium requires an oxygen-free environment to function, red hemoglobins are manufactured to keep the oxygen away from the bacteria. This is why most of the nodules are pinkish in color.

The hemoglobin is composed of a protein, *globin,* which is manufactured by the legume's genes, and a non-protein and iron-rich pigment, *heme,* which is manufactured by the bacterium. Collectively, their biochemistries produce the hemoglobin.

The bacteria fix the inert atmospheric nitrogen and convert it into usable ammonia nitrogen for the plant's biological functions. The plant will subsequently convert the ammonia nitrogen into amino acids, nucleic acids, proteins, and other usable organic compounds. However, most of the nitrogen stays within the plant and won't be released into the soil until the plant dies and decomposes. The plant, in turn, provides the bacteria with sugars and other nutrients necessary for its biological functions. The root and the bacterium have a mutualistic or a symbiotic (Latin: life together) arrangement because both organisms benefit from each other.

All legumes have their seeds in pods that may hold one or several seeds per pod. These pods may dehisce (Latin: open) along their dorsal (Latin: back) and/or ventral (Latin: belly) seams.

Some of our more common foods, such as beans, lentils, licorice, peas, peanuts, and soybeans, are legumes. So are many food products that are derived from these plants.

Some legumes, such as Alfalfa or Lucerne *(Medicago sativa),* Birdsfoot Trefoil *(Lotus corniculatus),* Red Clover *(Trifolium pratense),* White Sweet Clover *(Melilotus alba),* and Yellow Sweet Clover *(Melilotus officinalis),* are used as forage and as hay for livestock. The latter two species are now listed as invasive plants.

Other legumes, such as Crown Vetch *(Coronilla varia)* and Kudzu *(Pueraria lobata),* are used for erosion control. Both of these are also listed as invasive plants.

Even four of Ohio's native tree species, Honey Locust *(Gleditsia triacanthos),* Black Locust *(Robinia pseudoacacia),* Eastern Redbud *(Cercis canadensis),* and Kentucky Coffeetree *(Gymnocladus dioicus),* are all members of the Legume Family.

The Legume Family is composed of three subfamilies. However, only two of them, the Senna Subfamily *(Caesalopinideae)* and the Pea Subfamily *(Papilionideae, Faboideae,* or *Lotoideae),* have prairie forb species.

SENNA SUBFAMILY
(Caesalopinideae)

The Senna Subfamily has bilaterally symmetrical flowers (also called zygomorphic (Greek: yoke-shaped)). The upper (or adaxial) petal (called the banner or the standard) is located inside the two lateral petals (called wings). The two lowest petals are called keels. Its calyx (Greek: cup) is composed of five fused or united sepals (Greek: covering) and its corolla (Latin: little crown) is

composed of five free petals (Greek: flower leaf). Its androecium (Greek: male house) consists of ten free stamens (Latin: filament), which produce simple pollen (Latin: fine flour). Its gynoecium (Greek: female house) consists of a superior and a unicarpeflate ovary (Latin: egg).

The leaves are alternately arranged upon the stem and are pinnately (Latin: feather) or bipinnately compound.

Of the three tribes in this subfamily, only the *Cassieae* Tribe has prairie forbs. Within the *Cassieae* Tribe lie the Genus Cassia and its two prairie species, Wild Senna *(Cassia marlandica)* and Partridge Pea *(Cassia chamaecristala).*

Cassieae Tribe
Genus Cassia

Wild Senna

Other Names: American Senna, Locust Plant, Maryland Senna, Senna, Wild Sensitive Plant.
Height: 3 to 6 feet.
Leaves: 6 to 8 inches long. Pinnately compound with 3-20 pairs of oval leaflets and with each leaflet up to 3 inches long and up to I inch wide, All leaflets have bristled tips. Base of the petiole has 1 club-shaped gland. Stipules are narrow and pointed.
Flowers: Yellow petals. About ¾ inches wide. Arranged in racemous clusters at the top of the stalks or in the leaf axils. Sepals are pale yellow. Has 10 stamens of unequal length. Has dark brown anthers that open by 2 pores. Blooms July to August.
Fruits: Has 4-inch-long and ½-inch-wide pods that are curved, dangly, flattened, hairy, and segmented. Pod segments are shorter than they are wide.

Partridge Pea

Other Names: Dwarf Cassia, Golden Cassia, Large-Flowered Sensitive Pea, Locust, Weed, Prairie Senna, Sleeping Plant.
Height: 1/3 to 4 feet.
Leaves: Finely-cut and pinnately compound with 6-20 pairs of oval leaflets, and one leaflet at the end of the rachis. Each leaflet is 1 inch long and has a thin bristle at its end. Below the lowest leaflet is a saucer-shaped gland. Leaves are sensitive to the touch.
Flowers: Yellow petals. About 1-1.5 inches wide. Arranged individually or in small groups and with long petioles in the axils of the leaves. Sepals are green. Has 10 stamens of nearly equal length. Has 6 drooping purple anthers and 4 drooping yellow anthers. Only 1 flower opens per day. Blooms July to September.
Fruits: Has flat pods that are nearly 2.5 inches long.

PEA SUBFAMILY

(Faboideaea, Latoideae, or *Papilionoideae)*

The Pea Subfamily also has bilaterally symmetrical (zygomorphic) flowers. Its calyx is composed of five united or fased sepals and its corolla is composed of five unequal petals. Its upper (adaxial) petal (banner or standard) is located outside the two lateral petals (wings) and, due to their lobing and to their color pigmentations, may actually resemble two petals. The wing petals are alike and are clawed. The two lowest petals (keels) are fused or united into a boat-shaped keel. Its androecium consists of nine stamens, which are fused at their filaments, and one free stamen, all producing simple pollen. Its gynoecium also consists of a superior and a unicarpellate ovary. Both male and female parts lie within the keel.

The leaves are alternately arranged upon the stem and are simple, palmately (Latin: hand palm), or pinnately compound.

Of the ten tribes in this subfamily, only three, the *Podalyrieae* Tribe, the *Hedysareae* Tribe, and the *Galegeae* Tribe, have prairie forbs. Within the *Podalyrieae* Tribe lie the Genus Baptisia and its species, White False Indigo *(Baptisia leucantha).* Within the *Hedysareae* Tribe fie the Genus Desmodium and its species Illinois Tick Trefoil *(Desmodium illinoense)* and Hoary Tick Trefoil *(Desmodium conescens),* and the Genus Lespedeza and its species, Round-Headed Bush Clover *(Lespedeza capitata).* Within the *Galegeae* Tribe lie the Genus Psorlea and its species, Sainfoin *(Psoralea onobrychis).*

Podalyrieae Tribe
Genus Baptisia
White False Indigo

Other Names: *Prairie False Indigo, White Wild Indigo.*
Height: 2-7 feet.
Leaves: Palmately compound with 3 oblong leaflets. Each leaflet is about 1 inch long and is broadest near the tip. Leaves turn black when dry.
Flowers: Petals are white or cream-colored and are about 1 inch long. Arranged in stiff 12-inch-long racemes. Has 10 separate stamens. Blooms May to August.
Fruits: 1-inch black papery oblong pod with a sharp point. Placed at end of ½-inch-long stalk.

Hedysareae Tribe
Genus Desmodium
Illinois Tick Trefoil

Height: 2-6 feet.
Leaves: Palmately compound with 3 leaflets. Terminal leaflet is 2-3.5 inches long and is atop a short stalk. All leaflets are strongly veined below. Has long ovate stipules.
Flowers: Petals are white, purple, or lavender pink. Up to ½-inch long, 1/3-inch wide, and are placed atop ¾ inch-long stalks. Located in branched racemes at top of plant. Blooms July to August.
Fruits: Flattened, hairy, sticky, and jointed pod with 3-7 segments that are each about ¼- inch long. Pods stick to clothing and fur.

Hoary Tick Trefoil

Other Names: Showy Tick Trefoil, Bush Tick Trefoil, Sticktight.

Height: 2-5 feet.
Leaves: Palmately compound with 3 leaflets. Terminal leaflet stalked. All leaflets 3 times longer than wide. Finely hairy and sticky petioles. Has ovate stipules.
Flowers: Petals are pink but later turn green. About ¼- to ½-inch long. Located in loose, much-branched racemes borne from axils of upper leaves. Blooms July to September.
Fruits: Flattened, hairy, sticky, and jointed pod. Joints wider than long.

Genus Lespedeza
Round-Headed Bush Clover

Other Names: Round-Headed Lespedeza, Roundhead Bush-Clover.
Height: 2-6 feet.
Leaves: Palmately compound with 3 narrow elliptical 1- to 1.5-inch-long leaflets that are about 3 times longer than wide. Bottom of leaflets have small silvery hairs.
Flowers: Petals are cream-colored with a pink or purple spot at its base and is less than ½ inch long. Arranged in dense, globose, hairy or bristly racemes that are located at the top of the stem or in the upper leaf axils. Has 9 fused or united stamens and 1 free stamen. Blooms August to September.
Fruits: Short pod with only seed per pod.

Galegeae Tribe
Genus Psoralea
Sainfoin

Height: 3-5 feet
Leaves: Palmately compound with 3 leaflets each being 2-3 inches long. Has leafy stipules. No tendrils at end of rachis.
Flowers: Petals are blue. Arranged in a spiked raceme that may not rise above the upper leaves. Upper petal (banner or standard) is tapered into a short claw. Lower lobe of the calyx is broader and longer than the upper 4 lobes. Calyx also has gland dots that emit a heavy or tar-like odor. Has 9 fused or united stamens and 1 free stamen. Blooms June to July.
Fruits: Pod with single seed.

When visiting a tallgrass prairie during its peak blooming season, which is usually during the latter half of the summer, look and see how many of these prairie legumes you can find and identify. Also look for any insects that may visit these flowers.

After you have seen these plants in their full bloom come back in the fall to observe and identify their seedpods.

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Reprinted from *The Catchfly*, newsletter of the Central Ohio Chapter of the Ohio Native Plant Society

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Stolen From the Wild

For the second year in a row, Home Depot is selling *Trillium grandiflorum*, 6 rhizomes for $7.96, under the Growing Colors line. WalMart is selling *Trillium grandiflorum* and two other species, 6 rhizomes/rootstocks for $6.47, under the Better Homes & Gardens label. Both have the misleading statement: "Grown in the USA from cultivated stock. Inspected by the US Department of Agriculture." According to the Investigative Division of the USDA (APHIS), the USDA does not inspect any plant material. Not only is the label false, but the price of these plants is so low that the plants are surely wild-collected. No nursery could afford to sell appropriately propagated plants at this price. These plants will be in retail stores, and the shelf life of the plants is probably less than a month. We need to protest the sale of unethically, and often illegally, collected plants. Inform your friends, family, and co-workers who may not know about this problem and threat to our native plants, that they should not purchase these plants for the same reasons that they should not be sold.

Contact APHIS to show your concern. Write to Larry Fowler: Larry.Fowler@aphis.usda.gov

Write to the plant companies to protest the misleading labels and disreputable method of wild-collecting plants:
Gardens Lines, Growing Colors, P.O.Box 6339, Freehold, NJ 07728-6339
Better Homes & Gardens, P.O. Box 37428, Boone, IA 50037-2428

Reprinted from *Native News*, Newsletter of the Maryland Native Plant Society, May/June 2002 Vol. 2, Number 2.

Goldthread

Coptis trifolia ssp. *groenlandica*

Family: *Ranunculaceae* (Crowfoot or Buttercup)

by Janice Stiefel

OTHER NAMES: Yellowroot, Canker-Root, Vegetable Gold, Coptis, Mouth-Root, Dye Root, Yaller Root, Golden-Seal
RANGE: Circumboreal; Alaska south to British Columbia, Iowa and New Jersey to North Carolina
HABITAT: Damp, mossy woods and bogs.

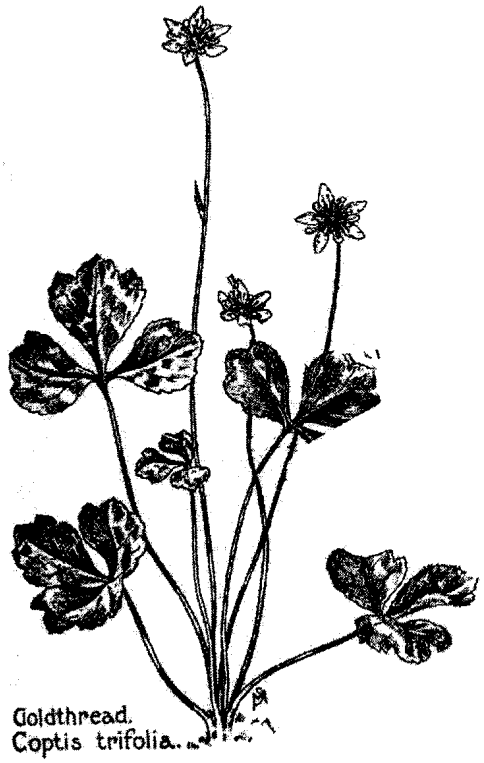
DESCRIPTION: Solitary white flowers and lustrous, evergreen basal leaves rise from a thread-like, yellow underground stem. The flowers are ½ inch (1 cm) wide with 5 to 7 white, petal-like sepals and very small club-like petals. There are numerous stamens and several pistils. The leaves are 1 to 2 inches (2.5 to 5 cm) wide, all basal, palmately divided into 3 leaflets with scalloped, toothed margins. The fruit is a dry pod, splitting open along one side. Height: 3 to 6 inches (7 to 15 cm) - Flowering: May to July.

COMMENTS: Although its flowers are small, patches of glistening, evergreen leaves catch your eyes. In 1807, it is recorded that American Indians stained their porcupine quills and feathers with a yellow dye made from the roots. Canadian Indians used the roots and leaves to dye skins, wool and flax yellow. As late as 1908, the roots brought a relatively high price.

MEDICINAL USE: Indians and colonists chewed the underground stem to treat canker sores and mouths irritated by smoking too much tobacco. It was made into a tea for use as an eyewash. A decoction made in conjunction with Goldenseal *(Hydrastis canadensis)* has been found to destroy the appetite for intoxicating liquors. In New England, it was valued as a local application for thrush in children. Recordings from 1785 report that the roots were frequently used as ingredients in gargles for sore throats. A 1945 French Canadian source says, "The boiled roots are, used for serious colds and respiratory troubles. A linen is soaked in a tea of the plant and applied to the eyes. The Canadians, without doubt, borrowed the knowledge, of this plant from the Indians."

NAME ORIGIN: The genus name, Coptis, is from the Greek word, *coptein*, meaning "to cut," alluding to the divided leaves. The species name, *trifolia*, means "three-leaved or three leaflets." The second species name, *groenlandica,* means "of Greenland."

The common name refers to the bright yellow, thread-like rhizomes (underground stems). Many tribes of Indians used the root as a remedy for sore or ulcerated mouths, hence one of the plant's other names - Canker-Root.



CULTIVATION INFORMATION

According to William Cullina's *Growing and Propagating Wildflowers of the United States and Canada,* "goldthreads are relatively easy to establish in cool climates and damp, acid soils under deciduous or evergreen trees. They put up only one flush of leaves in the spring, so do not worry if your transplants just sit there the first year – underground they are sending out new rhizomes and roots and should triple in size the following year." Cullina recommends sowing fresh seed outdoors as soon as the seed is ripe (mid- to late summer). He also says that it is easy to divide Coptis by lifting individual rosettes along with an inch or two of rhizome in spring, or in summer after it has hardened.

Janice Stiefel is a naturalist, writer and photographer who lives in Door County, Wisconsin. She is the editor of Wisconsin Flora, *published by the Botanical Club of Wisconsin, and The Wisconsin Entomological Society* Newsletter.

Reprinted from *The Blazing Star*, the newsletter of the North American Native Plant Society, Winter 2002
Illustration from Schuyler Mathews *Field Book of American Wild Flowers*.

Invasive Natives

Charles Smith

We have all heard admonitions against using invasive alien plants in our gardens. But at the December VNPS Board meeting a discussion ensued about emphasizing again the fact that the use of all invasive plants, whether alien or native should be discouraged in our gardens or landscape projects.

Have you ever walked in an old cornfield in a river floodplain and fought your way through wingstem *(Verbesina alternifolia)* eight feet tall? Most of us have been discouraged by the onslaught of poison ivy *(Toxicondendron radicans)* on the edge of a wooded area. These plants are examples of native invasive plants.

Essentially, invasive plants are highly competitive and very successful. They out-compete other plants for access to limited nutrients, and they often thrive in poor soil. Highly invasive alien plants such as Japanese honeysuckle *(Lonicera japonica)* and purple loosestrife *(Lythrum salicaria)* can establish themselves in healthy plant communities. However, most invasive plants, whether alien or native, are not that successful. Instead, they thrive on disturbance.

Disturbance, then, is the key: wherever there are humans, there is disturbance. We are always tinkering with the landscape. Every time we clear land or turn a bed we are creating opportunity for invasive plants. Indian strawberry *(Fragaria virginiana),* common violet *(Viola sororia),* trumpet creeper vine *(Campsis radicans)* and blackberries (*Rubus* sp.) are all native plants that benefit from constant disturbance in our yards.The main issue is whether we can control the plants that we introduce. In most cases we can. However, we have a responsibility to prevent the spread of aggressive plants whether native or alien.

Such plants simplify the ecosystem by out-competing other plants and prevent establishment of stable, diverse plant communities.

Aggressive plants readily jump the fence into a neighbor's land or a natural area. Their seeds may be spread by birds or wash downstream to establish themselves in a suitable disturbed habitat. The effect of dispersal could be the endangerment of a local plant or animal species. These unintended introductions of invasive plants progressively degrade our ecosystems. The presence of invasive plants is usually an indication of disturbance. Limiting disturbance should be the highest priority. The second best thing conservationists can do is to try not to introduce more native or alien invasive plants into local ecosystems. One useful resource, which to my knowledge doesn't exist yet, would be a list of invasive native plants to be avoided in gardening and landscaping. In the meantime, use your observations of plants both in yards and "wild" landscapes to guide you. Ask other gardeners about plants that have entered or left their yards without invitation. You might also seek out your chapter horticulture chair and consult books for tips on plants to avoid.

In my own yard, I need to think hard about my trumpet creeper vine (an invasive native). It doesn't want to stay put where I've established it on an old tree stump. How can I keep it contained and prevent it from becoming my neighbor's headache? I am trying to be very careful about what I plant and where, and I have to remind myself that just because a plant is native doesn't mean it can't be harmful.

Reprinted with permission from the Bulletin of the Virginia Native Plant Society, *May 2000*



Gardeners' Introduction To Native Grasses Of Eastern North America

By the Education Committee of the North American Native Plant Society

The grass family, Gramineae, is one of the largest and most widespread families of flowering plants – yes, flowering plants – in the world. The grass family has the third largest number of species globally, after the Orchid and Daisy families (Orchidaceae and Compositae respectively).

Grass flowers are so tiny you may never have noticed them. In fact, grasses have evolved without colorful or scented sepals and petals to attract pollinators. They rely on wind pollination. Each tiny flower is enclosed in a bract, which looks like a scale, and clustered together in a spike.

Along with one-quarter of all flowering plants, grasses are monocotelydons. This means they sprout with one seed leaf or cotyledon and the leaves have parallel veins.

Grasses are distinctive because they continue to grow after being cut. Growth arises from the base up, like a fingernail, rather than unfolding from the bud. This is an adaptation to grazing. They have jointed stems and a complex but subtle flower structure. The stems are hollow except at the point where the leaf is attached. Look closely at the stem and you will notice that most are round.

Grasses evolved during the Cenozoic era, 65 million years ago, and today can be found worldwide in all types of ecosystems. In fact, they are the most numerous plant type found in Arctic regions.

Far from boring, grasses offer color, texture, form and winter interest to a garden. In the fall, some grasses turn colors such as bronze and burgundy, and they make a terrific contrast to other flowering plants.

After planting grasses in your garden and seeing them dance in the wind, you'll wonder why you waited so long to add them to your little bit of nature. All this in addition to (most) requiring very little water and maintenance.

EASY TO GROW GRASSES FOR EASTERN NORTH AMERICA

Small to Medium-Sized Grasses

Canada Wild Rye – *Elymus canadensis*
Native habitat: Moist to dry fields and meadows, dunes, bluffs and stream banks.
Garden Conditions: Wide range of conditions in full to partial sun, moist to dry soil, clay, loam or sand. Drought tolerant. Good for covering a bare area while other prairie species establish.
Form and Flower: It blooms in late summer. The graceful arching seed heads turn sandy as they ripen and are very distinctive and decorative.
Range: New Brunswick to Alaska, south to North Carolina, Texas and California.

Bottlebrush Grass – *Elymus hystrix* (syn. *Hystrix patula*)
Native Habitat: Found in woods and open clearings.
Garden Conditions: Dappled light, moderate to full shade. Grows in dry to moist sandy loam soils with good drainage.
Form and Flower: Flower clusters are arranged perpendicular to the stem and resemble an actual bottlebrush. It grows naturally interspersed among other woodland plants. Flowers June to August. Grows 60-120 cm.
Range: Nova Scotia and Quebec to North Dakota, south to Virginia and Oklahoma.

Sweetgrass – *Hierochloe odorata*
Native Habitat: Moist meadows, shores and bog margins.
Garden Conditions: Grows in partial to full sun in wet to moist soil, sand or loam.
Form and Flower: Flowers appear in the spring and are bell shaped and arch upwards and/or downwards. The attractive clusters are shiny, tan, bronze or purple. The leaves become very fragrant when dried and are used by North American First Nations in religious ceremonies. Sweetgrass grows up to 60 cm in height and can spread vigorously by rhizomes.
Range: Circumboreal, south to New Jersey, west to Arizona.

Little Bluestem – *Schizachyrium scoparium*
Native Habitat: Fields, prairies and open woods.
Garden Conditions: Full sun and dry soil. Will not tolerate competition. An important species of tall grass and mixed grass prairies. It is the larval host plant for several species of Skipper butterfly.
Form and Flower: The flowers line the branches and appear in late summer. Grows 20-80 cm in height. In the fall the leaves turn red at the tips. A beautiful plant.
Range: New Brunswick to Alberta, south to Florida and Mexico

Medium to Large-Sized Grasses

Big Bluestem – *Andropogon gerardii*
Native Habitat: Prairies, savannah and meadows.
Garden Conditions: Full sun to light shade. Dry to mesic soil (sand, loam or clay). Drought tolerant. Attracts birds and butterflies. A major component of tall grass prairies
Form and Flower: Flowers are reddish-blue short spikes that resemble a turkey's foot, August to October. The seed heads ripen to a golden brown. Attractive bronze foliage in the fall. It grows in clumps to 75-150 cm in height.
Range: Quebec to Saskatchewan, south to Florida and Arizona.

Switchgrass – *Panicum virgatum*
Native Habitat: Prairies, open woods, marsh edge, coastal dunes, shores and brackish marshes.
Garden Conditions: Full sun. Dry to moist soils, sand and loam.
Form and Flower: Flowers are borne singly at the ends of branches in a very open form. Delicate looking. Flowers are purple from August to October and the seed heads are tan to brown in color. Grows in a clump 40 cm-200 cm in height.
Range: Nova Scotia to Manitoba and Montana, south to Arizona and Mexico.

Indian Grass – *Sorghastrum nutans*
Native Habitat: Tall grass prairie (moist or dry) and open woods.
Garden Conditions: Full sun to partial shade. Dry to mesic soil (sand, loam or clay), well drained. A signature plant of tall grass prairie ecosystems. Larval host plant for the Great Spangled Fritillary, Little Wood Satyr and the Pepper and Salt Skipper. Birds feed on the seeds.
Form and Flower: Flowers are small and bright yellow and appear in the late summer. The seed heads are golden brown, forming upright plumes in the fall. Grows 60-270 cm
Range: Throughout North America

Other Good Grasses

Canada Bluejoint, *Calamagrostis canadensis,* is a rapidly spreading, sod-forming grass that is useful for erosion control on wet sites. Grows 50-150 cm in height.
Range: Greenland to Alaska, south to North Carolina, Missouri and Arizona.

Poverty Oat Grass, *Danthonia spicata,* is the host plant for Indian Skipper Butterflies. Grows 10-60 cm in infertile soils.
Range: Newfoundland to Florida, west to BC and Mexico

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North American Native Plant Society, Box 84, Station D, Etobicoke, Canada M9A 4Xl nanps@nanps.org, www.nanps.org, 416-680-6260. Current membership for 2002 season = $10.00

WILD BERGAMOT
2001 Wildflower of the Year

by Mary Carol Cooper, Native Plant Program Coordinator, Salato Wildlife Education Center



Wild Bergamot *(Monarda fistuloso)* has been selected as the Salato Wildlife Education Center's Wildflower of the year 2001 by wildflower enthusiasts from all across the state. The Wildflower of the Year is chosen based on the number of nominations it receives and how well it fits the established criteria (must be native, common and widespread across the state, seeds must be readily available, must be easy to grow, and must have wildlife value).

Wild Bergamot is common in old fields, thickets, prairies, and borders throughout the state. It is a member of the mint family and has spicy-aromatic leaves that are opposite and ovate-lanceolate on a square stem. It has slender two-lipped corollas about one inch long densely aggregated in terminal clusters subtended by conspicuous bracts. The corolla is a pale lavender. Wild Bergamot ranges in height from three to five feet tall, depending on the habitat. It is a short-lived perennial that rapidly forms colonies in both moist and dry soil. It is very versatile, as it will tolerate clay soils and drought and will grow in full or partial sun.

Wild Bergamot is a premiere nectar source for butterflies, moths, and hummingbirds. Indigo buntings are known to build their nests in the stems of this plant. It blooms from June through August, providing food and shelter all summer long.

Historically, physicians used leaf tea to expel worms and gas. The Native Americans used the leaf tea for colic, flatulence, colds, fevers, stomachaches, nosebleeds, insomnia, heart trouble; in measles to induce sweating, and poulticed leaves were used for headaches. The pioneers made a lotion of boiled leaves for treating pimples and skin eruptions. Today, Wild Bergamot is still used for headaches and fever, and it makes a great tea. Its flavor is similar to true bergamot, the oil of a Mediterranean citrus fruit that flavors Earl Gray Tea. It is also excellent cut for fresh bouquets.

Wild Bergamot seeds and plants are available from many native plant nurseries and are fairly inexpensive. It is also very easy to propagate either by seeds, cuttings, or division. Seeds sown in January should be kept moist and cold (40° F) for 90 days to cause germination. Since the seedlings are tiny and slow-growing, they should remain in the flat for 6-7 weeks after germination before being transplanted. To propagate by cutting, take stem tip cuttings, 3-4 inches long, any time from May to August. Remove the lower leaves and all flower or seed heads, dip cutting in rooting powder and insert at least one node into a sand and perlite rooting medium. Place cuttings in an enclosed chamber and mist them several times a day. In 4-5 weeks, cuttings are well-rooted and can be transferred to the garden in the early fall. To propagate by division, divide mature clumps in March before they send up stems. Dig up the plant and using a pair of pruning shears or a sharp shovel, cut the clump into sections. Replant and water the division immediately

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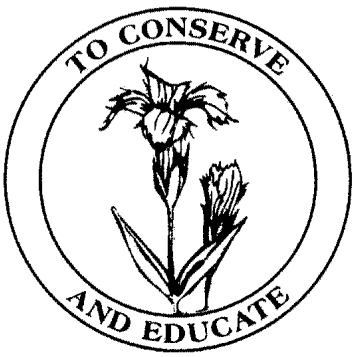
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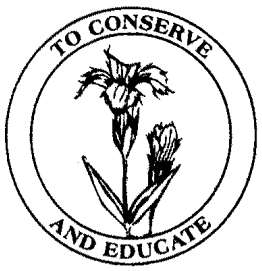
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