Sempervirens

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Corallorhiza in Virginia

Bizarre ambassadors of the plant world

Article and photographs by Zachary Bradford

Virginia's native orchids are unparalleled emissaries of our flora, with beautiful and structurally intriguing species like Pink Lady's-slipper (*Cypripedium acaule*) being among the most recognizable plants in the state. In addition to those well-known, showy species, Virginia is home to numerous small and inconspicuous orchids that few people notice or are even aware of—the coralroots, of genus *Corallorhiza*. Though drab in color and less than a foot tall, the coralroots are among the most alluring members of Virginia's diverse guild of native orchids. What they lack in showiness they make up for with their elusiveness, fragility, and truly bizarre way of life. Instead of photosynthesizing to generate carbon compounds, coralroots hijack the mutualistic relationship between ectomycorrhizal fungi and nearby photosynthetic plants, essentially stealing carbon compounds from fungi that were originally generated by their fully photosynthetic symbiotic partners.

Because they no longer need to compete for light, parasitic plants, including the mycoheterotrophic coralroots, tend to be small in stature, drab, and have highly reduced leaves. As such, coralroots are all quite similar in appearance, with various aspects of flower structure, along with habitat and bloom time, being the best diagnostic characteristics. *Corallorhiza* is a primarily New World genus, with all 11 to 15 species found in North and Central America. A single species, Early Coralroot (*Corallorhiza trifida*), the most widespread species in the genus, is found across the entire northern hemisphere. Of the seven species found in North America north of Mexico, five are found in Virginia and West Virginia, making those states the coralroot diversity hot spot of eastern North America, with species to be found blooming from April through October. What follows is a brief introduction to the five species (one of them with two varieties) found in Virginia, presented by flowering time.

CORALLORHIZA WISTERIANA SPRING CORALROOT

For those in the western half of the state, Spring Coralroot is the first orchid of the year, often starting to bloom in early April. Due to its reddish-brown coloration, Spring Coralroot is easily overlooked among fallen leaves. Close inspection of a single flower reveals a white lip speckled with vivid purple, extending downward from the rest of the loosely

Spring Coralroot

Early Coralroot

2017 Wildflower of the Year brochure inside!

Actaea racemosa
Common
Black Cohosh

clasped petals and sepals. This species prefers rich woods over limestone or dolomite in the western Piedmont but can also be found in similar sites in the mountains. Curiously, a disjunct population grows in a calcareous ravine in Surry County, an indication that this diminutive species should be hunted in similar ravines that intersect the Yorktown Formation shell marl in and around Williamsburg.

CORALLORHIZA TRIFIDA EARLY CORALROOT

Unlike the rest of our coralroots, plants of Early Coralroot are a vivid yellow-green. The slightly three-lobed lip is spotless white, while the rest of the petals and sepals are the same yellow-green as the stem. Despite the presence of chlorophyll, recent experiments indicate that it does little, if any, photosynthesizing. Early Coralroot is a circumboreal species, found in the northern hemisphere around the globe. In the eastern United States, Early Coralroot is a primarily northern species that ventures farther south along the Appalachians and has long been known from the Allegheny Highlands of West Virginia. It is the newest addition to Virginia's orchid flora, first documented in 2015 when an astute landowner in the central Blue Ridge Mountains realized she had something interesting on her property and brought it to the attention of her botanically inclined friends. True to its common name, Early Coralroot blooms at around the same time as Spring Coralroot, in early to mid-April. The lone Virginia population occupies slightly raised microsites, like hummocks and rotting deadfall, within a forested seepage area along a stream at around 2,700 feet in elevation, considerably lower than the nearest populations in West Virginia. What is most fascinating and promising about this site is that the seep is decidedly ordinary; there are many more in the area that might support this species.

CORALLORHIZA MACULATA VAR. *OCCIDENTALIS* WESTERN SPOTTED CORALROOT

In the late 1960s, renowned avocational botanist Charles "Mo" Stevens found Virginia's only population of Western Spotted Coralroot growing beside Eastern Hemlocks (*Tsuga canadensis*) near braided stream headwaters in the southern district of Shenandoah National Park. Plants in this population were yellow, as opposed to the normal reddish brown, and so were incorrectly treated as Early Coralroot for many years until critical examination by *Corallorhiza* expert John Freudenstein of Ohio State University. Western Spotted Coralroot appears to be closely affiliated with hemlocks here in the eastern portion of its range, and all evidence suggests that Virginia's only known population has been lost as the hemlock woolly adelgid has ravaged the hemlocks in Shenandoah National Park. I resurveyed the area in 2016 and found a botanical war zone: dense tangles of fallen hemlocks nearly enveloped by huge wood nettle (*Laportea canadensis*) taking advantage of the increased light. Those dead hemlocks still standing had sloughed off their bark into huge piles around their bases, the very places that Western Spotted Coralroot favored before the hemlock woolly adelgid arrived. This taxon should be sought in areas where our native hemlocks persist, and it can be distinguished from the nominate variety by its late May to early June flowering and by the rounded margin of the central lobe of the lip. Rumor has it that Western Spotted Coralroot may persist in the Cranberry Glades area of West Virginia.

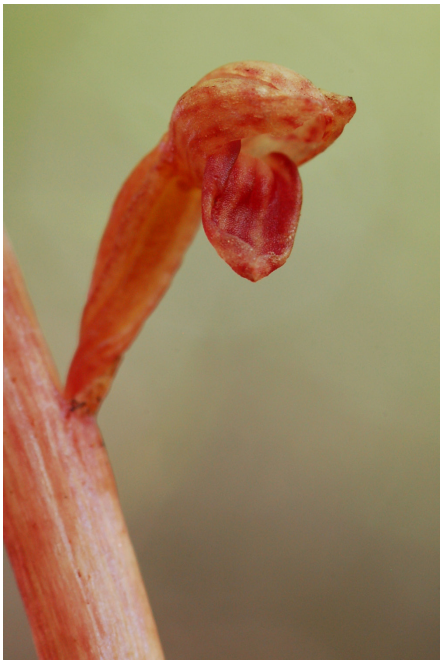
Spotted Coralroot

CORALLORHIZA MACULATA VAR. *MACULATA* SPOTTED CORALROOT

Spotted Coralroot is a widespread but infrequently encountered resident of Virginia's mountains. Compared with other *Corallorhiza* species, Spotted Coralroot can show considerable variation in stem and flower color, from brick red to butterscotch yellow. Each white lip is three-lobed and spotted with purple, and the large central lobe has straight sides. It prefers mature, somewhat acidic woods, usually with a strong hemlock or oak component. Unlike Western Spotted Coralroot, it seems able to persist in areas impacted by the hemlock woolly adelgid. Despite the loss of the mature hemlocks two decades ago, keen eyes can still find Spotted Coralroot growing along the Limberlost Trail in Shenandoah National Park. Spotted Coralroot blooms toward the end of July, almost two months later than Western Spotted Coralroot.

CORALLORHIZA BENTLEYI BENTLEY'S CORALROOT

Eastern North America has been botanized extensively, and the Orchi-



Bentley's Coralroot

Autumn Coralroot

daceae is a highly studied family, making the recent discovery of Bentley's Coralroot all the more astonishing.

Bentley's Coralroot was first discovered by naturalist and Pulaski County resident Stanley Bentley in 1996 as he walked an abandoned railroad grade in Monroe County, West Virginia. Since then, several more small populations have been found in Virginia and West Virginia along the border between the two states, but it remains one of the rarest orchids in the United States. Bentley's Coralroot is autogamous; the pollinia germinate in place, and the pollen tubes grow down to the stigmatic surface, so it always self-pollinates. Many plants bear cleistogamous flowers, while others present only the lower lip. Curiously, the flowers of Bentley's Coralroot can be tan with red or yellow lips, or entirely yellow. All color forms can be found in a single population, but the red form appears to dominate. Compared with our other native coralroots, Bentley's Coralroot is more robust, with stouter stems and thicker flower parts. Adding to the list of phytogeographic mysteries, Bentley's Coralroot is a sister species to the southern Mexico endemic *Corallorhiza involuta*, to which it is extremely similar in both appearance and genetics. Bentley's Coralroot seems to favor sites close to disturbance; nearly all documented populations are known from old railroad beds or directly adjacent to road cuts. Such proximity to roadways makes this already rare species susceptible to the vagaries of road maintenance activities like herbicide spraying and vegetation clearing.

CORALLORHIZA ODONTORHIZA VAR. *ODONTORHIZA* AUTUMN CORALROOT

Serving as a temporal bookend to its sister species, Spring Coralroot, Autumn Coralroot is one of Virginia's last native orchids to bloom in the fall, often flowering through October. Autumn Coralroot is one of our most widespread orchid species, documented for nearly every county in Virginia, but in my experience it is almost always an orchid that finds you, not the other way around. Its drab green-and-brown coloration hides it well, and most Virginia specimens are cleistogamous, offering just a hint of the underside of the purple-spotted white lip. Unlike our other cleistogamous coralroot, Bentley's Coralroot, Autumn Coralroot lacks the thin bit of tissue that separates the pollinia from the stigmatic surface, so 100-percent fruit set is frequent even in plants with fully closed flowers. Lucky orchid hunters occasionally come across open-flowered plants that nicely illustrate the close evolutionary relationship between Autumn Coralroot and the April-blooming Spring Coralroot; the two are nearly identical save the five-month difference in bloom time! Given the widespread nature of Autumn Coralroot, the habitat description must be necessarily vague: mesic to dry woods with a strong oak component. The first place I saw Autumn Coralroot is still my favorite place to observe it: the margins of Multi-Use Trail 3 at James City County's Freedom Park.

BENTLEY'S BOOK

Those interested in pursuing our native coralroots should buy a copy of Stanley Bentley's *Native Orchids of the Southern Appalachian Mountains*, which offers an unparalleled and much more detailed assessment of all of the coralroots mentioned here, along with other Appalachian orchids, and includes a detailed account of his discovery of Bentley's Coralroot.

Zach Bradford is the Chesapeake Bay Region Steward for the Virginia Natural Heritage Program, a division of the Virginia Department of Conservation and Recreation. A native-plant enthusiast since the third grade, he spends most of his free time during the warm months searching for and photographing Virginia's orchids with his wife, Jean.

From the President

Winter Travels: Opening Cuban Doors

As we tend to hibernate within the comfort of our warm homes in winter, some may dream about visiting tropical climates. In November Harry and I had the opportunity to travel to the almost mystical land of Cuba on a two-week birding trip. From our 4:30 a.m. rendezvous with our small group at Miami International Airport, we knew that this would be no ordinary vacation. We flew on a charter that included many Cuban-Americans visiting Cuban relatives they had left behind during the revolution in 1959. And they took gifts to them! The airport has a bustling shrink-wrap business for that excess baggage—little things like a set of four automobile tires, televisions, and other appliances! Needless to say, we were grateful that weight limits are enforced on such flights.

Cuban Firebush (Rubiaceae: *Hamelia patens, by* Nancy Vehrs) and Bee Hummingbird (Rick Flaherty)

Once in Havana, after customs and money exchanges to convertible pesos (called cucs, short for Cuban convertibles), we went into the parking lot to meet our bus. There we caught our first views of the vintage cars of Havana and our bus, a modern, Chinese-made, 24-passenger model used just for tourists. Our group of 17 included 14 U.S. birders of varied skills, a cultural guide from the Cuban tourist bureau, a Cuban birding expert, and our bus driver. The back of the bus was filled with large water bottles for our use during the entirety of the trip.

Our first stop was the Havana home of renowned Cuban ornithologist Orlando H. Garrido, author of *Birds of Cuba*, who displayed mounted specimens of most of the 27 endemic species of birds of Cuba, including the colorful Cuban Trogon, the national bird. It was hard to imagine that we would see most of these exotic birds in the field during our trip.

We stayed in government-owned hotels and in *casas particulares*, bed-and-breakfasts run by entrepreneurial Cubans and sanctioned by the Cuban government. We ate our best meals at private restaurants, another avenue for Cuban entrepreneurship. We received heaping servings that belied the food shortages of the ordinary citizens. Unfortunately, tourists receive the best-quality foods and are driving up prices. We saw few grocery stores on our route, and some towns had no stores at all.

Cuba is a very poor country with innovative and resourceful people. Besides the vintage American cars in Havana that serve as taxis, few citizens own cars. Hitchhiking, walking, biking, or riding in crowded buses or horse-drawn carts are the normal modes of transportation. Stray animals—dogs, cats, chickens, and livestock—appear everywhere. Our group discovered that Turkey Vultures, Cattle Egrets, and Palm Warblers were the most common birds.

National parks are a treasure in Cuba, and they are vast and unspoiled. But not all endemic species are found in pristine parks; we observed the endemic and uncommon Fernandino's Flicker in the trees surrounding a small, dilapidated family farm. A Cuban Pygmy Owl spent the night in a tree near the office of our resort hotel at María la Gorda, at the far southwestern edge of the island. While our first glimpse of the endemic Bee Hummingbird, the world's smallest bird, was in a natural area, we had close encounters with it in the small backyard of a family with a large Firebush (*Hamelia patens*). This treelike shrub has continuous blooms of red tubular flowers, and its berries are popular with the hummingbird and a number of other bird species. The residents also had put up hummingbird feeders, but these were all but ignored by the birds. We must strive to teach people the desirability of native plants over artificial food sources.

Habitat was key to finding many of the endemic birds. Our local bird guides understood that, but they were not plant experts. I had to settle for

CUBA OUTDOORS: Traveling by horse-drawn vehicle (above). Clockwise from below: a Caribbean Passionflower (*Passiflora cuprea*) and nonnative Giant Milkweed (*Calotropis procera*) and Fringed Rosemallow (*Hibiscus schizopetalus*). (Photographs by Nancy Vehrs)

seeking out and photographing flowers without identifying them. While not as floriferous as Costa Rica, in my opinion, Cuba did have some lovely blooms and some spectacular trees. This island country, with a length comparable to the distance from D.C. to Chicago, is caught in a time warp. We can only hope that its leaders continue to value and preserve its natural areas as economic prospects change.

Though it is not particularly botanical, we found the Cuban urban areas we visited interesting, colorful, and hopeful. We were fortunate to spend the equivalent of a day and a half in Havana. There we explored the 10 to 20 blocks of Old Havana (*La Habana Vieja*) with its graceful pastel but crumbling buildings. Much of this section dates to the 17th and 18th centuries. Everywhere we walked, we were confronted with magnificent façades, balconies, and doorways. And everywhere, there was music! Street musicians, radios, and ensembles in open bars and restaurants playing Afro-Cuban jazz, salsa, rumba, flamenco, and many other styles. The contrast between the music and the bright, happy people, and the obvious poverty was striking.

We explored the famous Hotel Nacional de Cuba on the city's waterfront boulevard called the Malecón. The Nacional is famous as the gathering spot for American Mafia figures in the 1940s and '50s when the mobsters operated in Cuba with impunity. The second *Godfather* movie featured that history. The hotel is open and operating as vigorously as it did 70 years ago and remains an elegant vestige of Havana's storied past.

We were particularly taken with the Cuban people. We learned that the Cuban life expectancy is the same as that of the United States. Health care is free and is considered very good. There appeared to be little obesity, tobacco use, or alcohol consumption. Perhaps this is because there is a shortage of food and no money to spend on the vices of a society. But it seemed that everywhere we went there were laughter, happy children, and beautiful and vast national parklands. ***—Nancy Vehrs***

This Spring, Explore the Botanical Delights of Southwest Virginia

Russell Fork Gorge at Breaks Interstate Park, on the Kentucky line. (Photograph by Gary P. Fleming)

This year on the Virginia Native Plant Society's spring trip we will visit special botanical and ecological areas in far Southwest Virginia, where the Cumberland Mountains and southern Ridge and Valley provinces intersect the state. The trip will take place the week of April 23–30, and our field leader will be Gary Fleming, vegetation ecologist with the Virginia Natural Heritage Program. Many of you know Gary and the expertise he will bring to the sites we visit.

The six days of tours will encompass Breaks Interstate Park on the north and Cumberland Gap National Historical Park on the south, both on the Kentucky line. In between, sites will include The Cedars and several important areas of the Jefferson National Forest in the Cumberlands. Although the hikes will be slow-paced, participants should be able to navigate short stretches of steep and rocky trails and hike up to four miles a day.

VNPS members might remember that an addition to The Cedars Natural Area Preserve was the focus of our 2015 state fundraising campaign.

Gary has conducted field studies of the natural communities and flora of Virginia for more than 35 years. He wrote two introductory chapters of the *Flora of Virginia*, "The Nature of the Virginia Flora" and "Learning the Virginia Flora: 50 Sites for Productive Field Botany," as well as all the habitat and distribution information used in taxon descriptions. Fleming is a long-time member and a past president of the Virginia Botanical Associates, the nonprofit organization that has been devoted to mapping the distribution of vascular plants in Virginia for more than 35 years and administers the Digital Atlas of the Virginia Flora (http://www.vaplantatlas.org/).

The price of the trip will be $850 for double occupancy (Call the VNPS office for single occupancy cost.) Included will be seven nights' accommodations, six lunches, and a $300 donation shared between VNPS and the Virginia Botanical Associates. Sign up now! A $200 deposit will reserve a space for you on this trip. More details will be available soon.

Make your check payable to VNPS and send it to 400 Blandy Farm Lane #2, Boyce, VA 22620, or call 540-837-1600 (mornings) to sign up using a credit card. ***—Sally Anderson***

Dwarf Larkspur (*Delphinium tricorne*), above, and rare Glade Spurge (*Euphorbia purpurea*) were seen by Southwest Virginia explorers last year. (Photographs by Nancy Vehrs)

Zoologists find 6 newbees for Virginia

Heritage Program Abuzz with Discovery

From Your Natural Heritage Program
By Jason Bulluck

One of the most exciting endeavors here at the Virginia Natural Heritage Program is expanding our comprehension of Virginia's biodiversity. There is so much that we still don't know. As a result, with modest effort, Natural Heritage biologists have frequently uncovered a species new to science or one that has never been seen in Virginia.

Many of you are familiar with some of our plant discoveries, for example the new-to-science Piedmont Fameflower, *Phemeranthus piedmontanus*, discovered by Chris Ludwig and Alan Weakley, named by Stewart Ware, and now protected at the Bald Knob and Grassy Hill natural area preserves. As you might guess, we have discovered more new animals than new plants. These come from a wide range of groups including amphipods, ant lions, bats, bees, beetles, butterflies, caddis flies, centipedes, clam shrimps, damselflies, dragonflies, fish flies, frogs, froghoppers, isopods, millipedes, moths, mussels, robber flies, scorpion flies, snakes, spiders, sponge flies, stone flies, and true bugs.

Over our 30 years of existence we have tried to be strategic in picking groups of organisms for which to survey. And over the past few years, we realized that there was so little known about pollinators (a group in serious decline) that we needed to devote some of our time to learning about them, particularly our bee fauna. Our field zoologist, Ellison Orcutt, is our budding expert, and we have found funding for him to put in considerable time on this group.

During the 2016 field season, our bee-sampling effort was scattered across the state and produced more than 2,500 specimens. With the help of Sam Droege, a bee expert with the U.S. Geological Survey's Bee Inventory and Monitoring Lab in Beltsville, Md., it was determined that six bee species that we had collected had never been encountered in Virginia.

Sampling in western Virginia produced a state record from Augusta County (*Pseudopanurgus solidaginus*), another from Grayson County (*Lasioglossum perpunctatum*), and two from Pulaski County (*Melissodes tepaneca*, pictured at left, and *Pseudopanurgus labrosiformis*).

Melissodes tepaneca, a new bee to the Virginia fauna, collected last year in Pulaski County. (Photograph © Sam Droege, USGS)

Heavy emphasis was placed on collecting bees from the sandhills of the southeastern Coastal Plain, which have good bee diversity but have been poorly sampled. This region has benefited from strategic land conservation and stewardship by the Natural Heritage Program and its partners. Our 1,066-acre Chub Sandhill Natural Area Preserve in Sussex County yielded many interesting bees including several rarely captured species and two new state records, *Lasioglossum floridanum* and *L. raleighensis*.

The future of our native plants is inextricably tied to the conservation of our native pollinators, and there is so much to learn. We are working to secure funds to further understand our bees and other pollinators in 2017 and beyond. We would love for our future days to be filled with more new species finds as we slowly gather a robust database about Virginia's amazing plants and animals.

Jason Bulluck is director of the Virginia Natural Heritage Program, a division of the Department of Conservation and Recreation. Learn more about Virginia's Natural Area Preserves at www.dcr.virginia.gov/natural-heritage

VIRGINIA NATIVE PLANT SOCIETY

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Next submission deadline: March 15, 2017

Sepals and Petals and Stamens—*Oh, My!*

Or, a brief discourse on putative homologies of perianth elements of Common Black Cohosh

By W. John Hayden, Botany Chair

I encountered some contradictory information while preparing to write the 2017 Wildflower of the Year brochure: some sources describe flowers of *Actaea racemosa*, Common Black Cohosh, as having petals, while others say petals are absent. How can that be? How could there be such uncertainty about this common plant, one known to science since before the time of Linnaeus? After a little research, I decided to describe Black Cohosh flowers as having a series of organs interpretable either as staminodes (nonfunctional stamens) or as petals located between its sepals and stamens (Figure 1). Frankly, I waffled on the petal issue, and this article explores why.

Petals are the floral organs situated between sepals and stamens, usually distinctively pigmented, and functioning to attract potential pollinators. At some fundamental level, all floral organs are interpreted to be modified leaves attached to the end (receptacle) of the flower-bearing stem (pedicel)—an idea first articulated by the German poet Goethe (1790). But the diversity of flowering plants is profound, and there are lots of variations in floral organography. Certain flowers challenge simplistic interpretation, and the structural details of petals and petallike organs have led botanists to ponder whether the petals of all flowers are fundamentally the same.

Comparative morphologists have developed two models for the origin of petals. One model posits that petals represent stamens that lost the capacity to form anthers and pollen as they became larger and pigmented; these modifications mark a shift away from a direct role in reproduction to the equally important supporting role of enhancing pollinator attraction. Flowers believed to have produced petals via sterilization of stamens are said to possess *andropetals*. This model involves a somewhat round-about path: leaflike organs bearing anthers and pollen first became stamens, and then some stamens became petals of this sort. An alternative model suggests that petals originated more directly from a leaflike ancestral condition simply by loss of chlorophyll and enhancement of other pigments; such petals are termed *bracteopetals*. For any species, either the andropetal or the bracteopetal model could be correct, but not both. For flowering plants as a whole, however, both models could be valid; some plants may have andropetals while others may have bracteopetals.

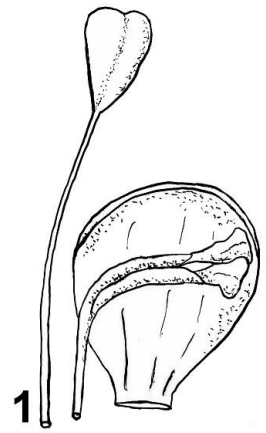

Figure 1 Stamen (left), petal/staminode (right front), and sepal of *Actaea racemosa*. Illustration by Sheila Hayden.

Multiple tools are available for addressing which model of petal origin applies for a given species. From the realm of morphology, an andropetal originates as a slender bump (resembling the first visible stages of a stamen primordium), and at maturity it has a narrow base and a single vascular trace, just like a stamen. In contrast, a bracteopetal originates on the floral meristem as an arclike bulge, retains a relatively wide base at maturity, and

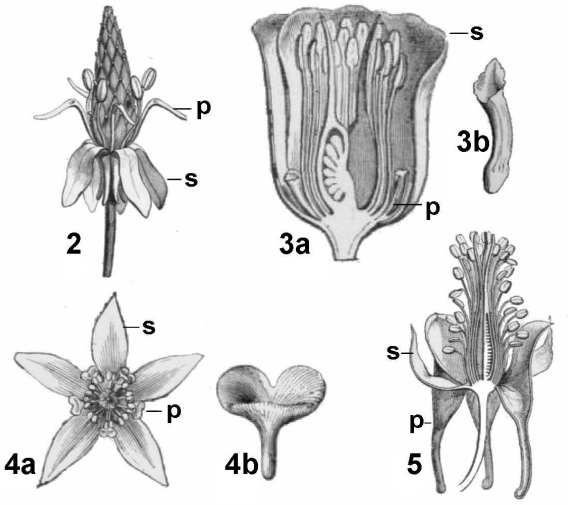

Figure 2 *Myosurus minimus*; **3a**. *Helleborus foetidus*, flower, longitudinal section; **3b.** *Helleborus foetidus*, petal; **4a**. *Xanthorhiza simplicissima* flower, top view; **4b.** *Xanthorhiza simplicissima*, petal; **5.** *Aquilegia vulgaris,* flower, longitudinal section. Images from H. Baillon. 1867–1869. *Histoire des plantes,* vol. 1. Hachette, Paris.

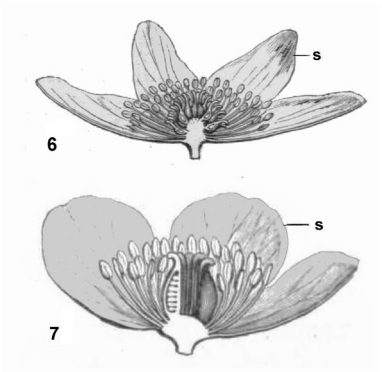

Figure 6 *Anemone nemorosa*, flower longitudinal section. **7.** *Caltha palustris*, flower, longitudinal section. Images from H. Baillon. 1867–1869. *Histoire des plantes*, vol. 1. Hachette, Paris.

has three (or more) vascular traces. In these features, bracteopetals are essentially like differently pigmented versions of sepals. Further, determination of which genes are active during initiation and early development of floral organ primordia can help resolve the question. Finally, phylogenetic perspective provides insight to petal organ identity by mapping morphological characteristics on well-resolved evolutionary trees. For a long time, based only on morphological evidence, many botanists subscribed to the andropetal model for all eudicots (traditional dicots minus basal angiosperms). But this paradigm of petal origin has been overturned by de Craene (2007, 2008), whose analyses support the bracteopetal model for core (i.e., most) eudicots.

And this is where the story returns to *Actaea*. Black Cohosh is classified in Ranunculaceae, the Buttercup Family, which, along with Poppies, Barberries, and several other families, constitutes the basal eudicots, distinct from most (or core) eudicots now modeled to possess bracteopetals. So what's the story with petals in Ranunculaceae—and in *Actaea*? Morphology, development, developmental genetics, and phylogenetic perspective support the idea that petals, when present in Ranunculaceae, were derived from stamens. That is, petals in Ranunculaceae are andropetals and thus fundamentally different from bracteopetals of core (i.e., most) eudicots. Further, when present, petals in the Buttercup Family often bear nectar-secreting glands; classical-era German morphologists called these unusual nectar-bearing petals *Hönigblatter* (honey-leaves) (Figures 2-5). These nectary-bearing petals can be downright odd: in Mousetail (*Myosurus*, Figure 2), they are extremely narrow, flexed structures with a nectary located at the point of flexure; in Hellebores (*Helleborus*, Figures 3a, 3b), they are tubular; in Yellowroot (*Xanthorhiza*, Figure 4), they are stubby and bilobed; and in Columbine (*Aquilegia*, Figure 5), nectary-bearing petals form distinctive elongate spurs. In Buttercups (*Ranunculus*), nectary-bearing petals look like ordinary petals that just happen to have a glandular region toward their base.

Other familiar plants in the Buttercup Family possess just a single perianth whorl that is brightly pigmented; further, these floral organs have relatively wide bases and three vascular traces, but not the vestige of a nectary. If we apply the criteria articulated above, these members of the Buttercup Family have sepals that have taken on the pollinator-attraction function of petals. Examples include Anemone (*Anemone*, Figure 6), Marsh Marigold (*Caltha palustris*, Figure 7), and Clematis (*Clematis*). The showy sepals in flowers of these members of Ranunculaceae are commonly referred to as petaloid sepals, but they also fit well the distinguishing features of bracteopetals. The point is that, regardless of what morphological terms we choose to apply, the things that look like petals in flowers of Anemone, Marsh Marigold, and Clematis are not the same as the things that look like petals in Buttercups—and the things that look like petals in Buttercups are fundamentally similar to the oddly shaped organs illustrated in Figures 2–5 and to the odd organs located between sepals and stamens in flowers of *Actaea* (Figure 1).

My decision to waffle about the petal/staminode organ of *Actaea racemosa* emerged from within the framework of issues outlined above. Including both interpretations for this organ in the Wildflower of the Year brochure provided an opening for this article and the opportunity to interpret floral morphology of *Actaea* in the context of Ranunculaceae in particular and eudicots at large. There is not much that is petallike about the petal/staminodes of *Actaea racemosa* (Figure 1). To interpret these organs as staminodes emphasizes their similarities with stamens: small size, narrow filamentlike base, and a bilobed apex that suggests a pair of anther sacs. On the other hand, though they would be decidedly odd in any plant family other than Ranunculaceae, these organs are not particularly unusual for the nectary-bearing andropetals of the Buttercup Family. So, good reader, take your pick, call them petals, andropetals, *Hönigblatteren*, or staminodes, but whatever you call them, know that the choice is a complicated one. Who would have imagined that these graceful forest herbs stood at the crux of such basic, yet complicated, issues of plant morphology? All petals are not the same! ❖

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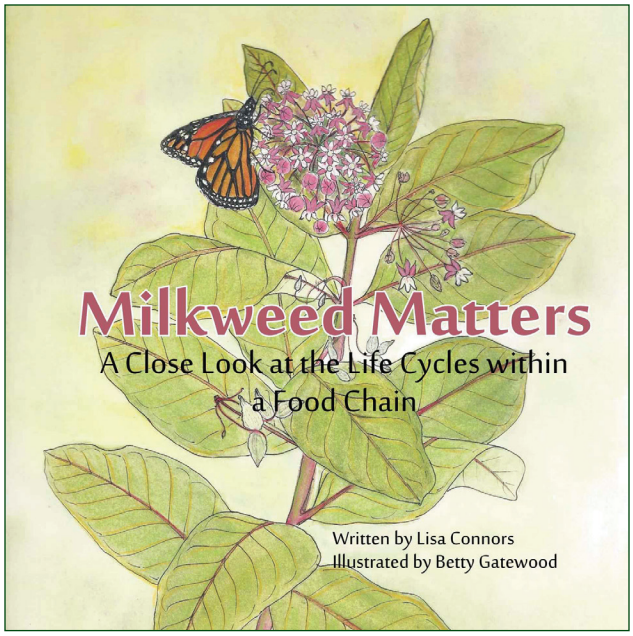
Goethe, J.W. 1790. Versuch die Metamorphose der Pflanzen zu erklären. Ettinger, Gotha.

A New Children's Book Points Up the Link Between Milkweeds and Monarchs

When two teachers team up, well, you had better watch out! Former elementary school teacher Lisa Connors has taken her first step into the publishing world with an illustrated children's book, *Milkweed Matters: A Close Look at the Life Cycles Within a Food Chain*. A number of the illustrations, including the stunning cover image, are the creations of award-winning botanical artist and former middle school teacher Betty Gatewood.



The oversize color paperback takes children through life cycles in a fashion not unlike that in the kid's song about the "old lady who swallowed a fly." Some will remember the poor lady who swallowed the fly and then had to swallow a spider to eat the fly and then had to swallow a bird to eat the spider and onward. In this case, Lisa chooses to make the milkweed–Monarch connection the centerpiece of the food-chain circle, rather than a fly. The food chain also includes the sun, a mouse, an owl, and a beetle.

"I got the idea because when I taught fourth grade, students learned life cycles and food chains, but not necessarily together, and I don't think they readily grasped how the two are connected and how each species is potentially connected to another," Lisa explained. "I wanted to find a way to show that, and that is how this book idea came about. I could have chosen any food chain and portrayed the life cycles involved, but I wanted to use a species familiar to children so that there was less new material to grasp. So I chose the milkweed–Monarch connection."

From writing to self-publishing took Lisa about three years, off and on. The milkweed idea was one of several stories Lisa had written. When she decided to move forward with producing a book, she presented the stories to Betty and asked her which one she would like to illustrate. Betty chose the milkweed and Monarch project because of her botanical illustration expertise and her love of Monarchs and milkweeds. In addition to Betty's illustrations, the book includes several of Lisa's own illustrations and photographs. The book also includes a glossary, with words like *chrysalis, metamorphose,* and *migrate* to help students understand the scientific language to which they are being introduced.

Lisa admits that her first foray into the publishing world was successful because of help from several others including a brother-in-law, who is a graphic designer, and her husband, who helped with the layout software.

"I know very little about design," she said, "so I based a lot of my layout ideas on what I liked in other picture books."

With *Milkweed Matters* behind them, Betty and Lisa are off on other projects. Look for Lisa's first traditionally published book, *Oliver's Otter Phase,* coming soon from Arbordale Publishing. Betty is constantly producing illustrations for note cards, calendars, and other publications, even occasionally for *Sempervirens.* Thirty-four of her watercolors just went on display at the Art Box in Crozet.

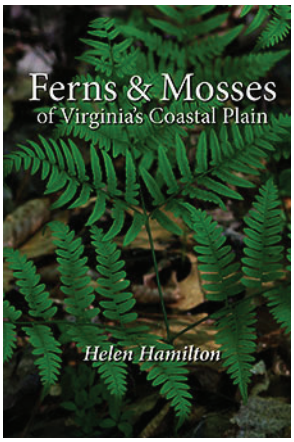
In addition to paperback, *Milkweed Matters* is available on Amazon for the Kindle or Kindle app. ***—Nancy Sorrells***

A Monarch caterpillar feeds on a milkweed leaf.

Primitive Va. Plants Take the Stage in Hamilton's Latest Field Guide

Mosses and ferns are some of the first plants that really intrigue us. There's something special, different about them. Something secluded, secret, odd and old. And Helen Hamilton's new field guide, *Ferns & Mosses of Virginia's Coastal Plain*, is a welcome door onto that world.

On the heels of the well-received *Wildflowers & Grasses of Virginia's Coastal Plain*, by Hamilton and Gus Hall, the new book coincides with growing interest in "primitive" plants among professional and avocational botanists alike.



"Although without showy flowers and pollinating bees and butterflies, ferns and mosses have important roles in the ecosystem," she writes in the introduction. "With the descriptions and habitat information provided here, amateur naturalists as well as families out for a walk should be able to identify what they see along woodland paths."

These species are "not usually included in field guides for the interested gardener and nature enthusiast," Hamilton writes about these plants that are considered ancestral to "familiar land plants, those that enclose their seeds in fruits," which renders them capable of reproducing in drier habitats. The earlier forms, like those covered in this book, have a clear link to moist environments.

"These are plants of swamps, wet forests, rocky outcrops, along streams, and woodland edges," reads the back cover. The guide covers most of the ferns of Virginia's Coastal Plain. The mosses and liverworts treated are those species that are "relatively easy to identify." The book also covers Running-cedar and Tree-clubmoss, "relatives of extinct giant trees," as well as spikemosses and quillworts.

Each species description begins with a color photograph, usually by Hamilton or another member of the John Clayton Chapter of the Virginia Native Plant Society. The plants are ordered by family and labeled with scientific and common names. Each is described, as is its habitat, with an eye to the plant's use in a garden or landscape. A comments section places the species in a broader milieu, the number of species in the genus, the etymology of the scientific name, interesting background on common names. Especially valuable are the field ID notes.

Ferns & Mosses is spiral bound, measures 7 × 9 inches, and is 78 pages long. The cost is $15 plus $4 for tax, shipping, and handling. Please send your orders to Helen Hamilton, P.O. Box 314, Lightfoot, Va. 23090-9998. And please take note: the book was sponsored by the John Clayton and the Northern Neck chapters of the VNPS.

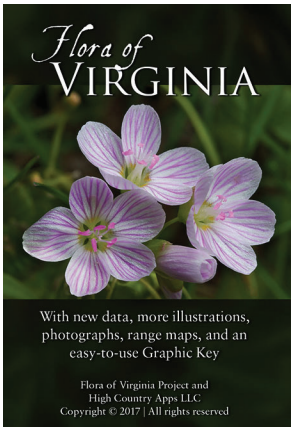
—Bland Crowder

Prototype of Flora Mobile App Will Soon Be Ready for Testing

The *Flora of Virginia* Mobile App was expected out this spring, but there will be a delay because of the volume of work that it has entailed. But what will come about this spring is the testing of prototypes, first an Android version, then an iOS version.

The Mobile App will run on smart phones and tablets and will include all the 3,164 species covered in the *Flora*. The prototype, though, will include fewer than 200 plants. Testing will seek to find flaws in the programming and to get testers' commentary, what they like, what they don't.

Essentially, the Mobile App allows you to browse a list of plants or to identify a plant you have found. Because we have so many plants in Virginia, you may wind up with a short list of possibilities, which you will then browse to close in on your ID. Tapping on a species name takes you to a species screen, which presents, say, a flower image, a habitat image, and a botanical illustration (including all 1,400 from the print *Flora*). A tab takes you to the description directly out of the *Flora*, as well as new information—on rareness, invasiveness, whether the plant is deemed native, or its value in wetlands.



We will also create an "office" version, which will bring in even more data and allow connectivity with your spreadsheet and word-processing programs, especially valuable to consultants and evaluators of ecological value of lands. This Office App is also our present fund-raising focus, and we have had an underwhelming response to our winter appeal. So please do give to support our App work. See our site, floraofvirginia.org, for more information.

If you would like to test-drive the Mobile App prototype, write me at flora@floraofvirginia.org, and I will get in touch with details.

—Bland Crowder

ARMAND THIEBLOT

On the Trail of the Native Plant Quarry

Even if your April calendar is filling up fast, you'll want to keep your ear to the rail about the opening of the Quarry Gardens at Schuyler—and do what it takes to fit a visit in.

The gardens are a 40-acre natural area featuring two miles of trails around the water-filled, abandoned soapstone quarries in Nelson County. The quarries, active from the '50s into the '70s, have been owned by Jefferson Chapter members Armand and Bernice Thieblot since 1991. Planning for the gardens began in 2014, with a focus on native plants and communities, as well as the soapstone industry. The trails and a classroom will be joined by areas dedicated to plant research and propagation.

The gardens were designed on ecosystem-modeling principles, taking advantage of the unique characteristics of 14 ecozones and 7 conservation areas. A demonstration garden illustrates how native plant communities can fit into more formal settings, a concern with many gardeners.

Reservations for free guided tours for individuals and families, as well as for events for organizations, may be made online at QuarryGardensa@Schuyler.org. From early April through November "we'll be offering free guided tours to small groups on Fridays through Sundays," Bernice Thieblot said. Other days they will make available for organizations like VNPS chapters.

Check online around March 1 for a revamped website, with details on the opening and a reservation calendar. ***—Bland Crowder***

Virginia Native Plant Society
Bland Experimental Farm
400 Bland Farm Lane, Unit 2
Boyce, VA 22620
www.vnps.org

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