The Blazing Star

Summer 2020, Volume 21, Issue 3

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Native Plant to Know

Woodland Pinkroot

Spigelia marilandica

by Stephen Johnson and Mary Stark

The glorious woodland pinkroot (*Spigelia marilandica*) couldn't help but attract the attention of early botanical explorers. Itinerant botanist John Bartram writes of his observation of Spigelia marilandica near Augusta, Florida, in 1765 and describes its use as a vermifuge. Intrepid botanist Andrée Michaux sent the plant's seeds to King Louis XVI's gardener, Monsieur le Comte D'Angiviller, for the Jardin du Roi (the king's garden) in January, 1789. One wonders if the king and his family had a chance to see the stunning Spigelia before the storming of the Bastille and the subsequent upheaval in that same year.

Variously called woodland pinkroot, wormroot or Indian pink, *Spigelia marilandica* is a uniquely northern member of the primarily tropical family Strychnaceae. Of the other species of *Spigelia* native to contiguous North America, only *S. marilandica* ranges north into the cold temperate zone. Two other species, for instance, are endemic and rare in Florida: Levy pink-root (*Spigelia loganioides*) and purple flower pink-root (*Spigelia gentianoides*). Though commonly available in nurseries, *S. marilandica* has threatened status in Indiana and is endangered in North Carolina. It occurs naturally from the southeastern coastal states north and west to Missouri at its western limit. And, though it is not native to Iowa, we have successfully grown it here for nearly 20 years.

The plant is structurally intriguing, especially as it begins to flower. The single-sided spike, or scorpioid cyme, extends outward revealing a succession of ever smaller flower buds, the largest being closest to the stem. The flower tops are all at the same height so that the cyme appears to be an elaborate candelabrum. The vibrant red of each tube contrasts with the striking yellow inner surface of each petal arrangement; together they look like glowing flames on scarlet candles.

The bluish-green to grass-green leaves showcase the flower clumps, which can be two feet (two-thirds of a metre) tall. Such a spectacular, tropical-looking display in late spring appeals to us winter-weary Iowans.

The tubular floral candles are adapted for hummingbird pollination. In our garden, we have witnessed only one prolonged visit to *Spigelia*, even

Continued on page 15

ILLUSTRATION BY STEPHEN JOHNSON

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***The Blazing Star* is . . .**

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FOREST CONSERVATION IN ONTARIO GETS A TWO-WHEELED BOOST FROM NANPS!

Since 1994, the Forest Gene Conservation Association (FGCA) has been a not-for-profit forest genetic resource management corporation with a geographic focus in southern Ontario. We strive to educate and support a variety of land managers to ensure native, natural forests stay healthy and resilient, whether under active restoration, conservation or sustainable harvest programs. For those who plant native trees, we assist or undertake training for active seed collection programs, seed orchard design and management, and strategic deployment tools considering

PHOTOGRAPH BY HAROLD SMITH

The NANPS trailer enabled FGCA to deliver several thousand white pine seedlings for a new seed production area they planted in May 2020 near Almonte. The stock, selected in the late 1970s and early 1980s, originated from their best mother trees in EcoRegion 7E in Ontario's Carolinian Forest Region.

PHOTOGRAPH BY BRIANA NEUVING (FGCA)

FGCA staffperson Becky McLaurin in a brief snow flurry on May 13, 2020 at the Taylor Lake White Pine Assisted Migration Seed Orchard Planting. At the time, Ontario deemed forestry genetic trial establishment an essential service. Plugs were delivered to the site in the NANPS trailer. This photo represents strategic population movement and a predicted climate change adaptation species "winner" for the future!

climate change. We help manage seed long-term for common industrial species like white pine (*Pinus strobus*) and alternative options for species at risk like butternut (*Juglans cinerea*). It's a lot of work by a few specialized people and every bit helps!

FGCA would like to formally thank the North American Native Plant Society

Photograph by Barb Boysen

Butternuts in their specialized nursery pots are loaded onto NANPS trailer.

Board of Directors for their donation last fall of the NANPS trailer to boost our seed collection and deployment capacity in 2020.

The NANPS trailer came in handy when we needed to transport two-year-old, putatively tolerant butternut clonal grafts to their forever homes in our Central and Southern Butternut Seed Orchards, near Glencairn and Ingersoll, Ontario in May 2020.

While we are not hosting in-person seed collection workshops in 2020, we hope to work with NANPS on seed training efforts in the future (**https://fgca.net/what-you-can-do/seed-collection/**).

We encourage you to read more about our programs. Please get in touch with us if you are interested in a particular project (**https://fgca.net/about/annual-reports/**).

To become a member at $20CDN/year, please contact us: Seed Program Coordinator Melissa Spearing, **melissa@fgca.net** or Chief Executive Officer Kerry McLaven, **kmclaven@fgca.net**.

Melissa Spearing

NANPS AGM

The 2020 Annual General Meeting of the North American Native Plant Society will be held online on Saturday, October 24. Details will be available at **nanps.org** in early September. We hope you can join us!

Photograph by Peter Fuller

Corydalis aurea *(golden corydalis) blooming in spring on a Lake Ontario pebble beach just above the high water mark.*

We still need your help in conserving North America's native flora

Like many non-profit organizations, we at NANPS are struggling to fulfill our mission due to the COVID-19 pandemic. All our events (including our major fundraisers, the spring plant sales) were cancelled for the season to ensure the health and safety of our community.

We still need money to operate though and we're asking for your help. You can support us through Canada Helps on our website donation page (**nanps.org/donate**) or fill out the back page of this newsletter and mail in your contribution. Your donation, large or small, will help us fulfill our mandate to study, conserve, cultivate and restore North America's native flora.

Photograph by Cornelius Sommer

Unusual pale version of Trillium erectum *(wake robin or red trillium) found in a regional forest in Whitchurch-Stouffville, Ontario.*

Be assured that your donation is much appreciated! We hope to see you again at NANPS events when it is safe to congregate in large numbers. Until then, please keep yourself, your family and your community healthy and safe.

Lessons from Nature

by Sean James

Non-native honeysuckle (*Lonicera* spp.) dotted the Neustadt, Ontario farm known as River Croft, where I was leading a walk focused on how pervasive and damaging alien plants can be to our native ecosystems. I urged the removal of these pernicious vines. The property owner and our host, Gary Kenny, pretended to be quite taken with the honeysuckle. I was selling the idea that invasives were bad and everyone was buying…except Gary. "It's good for the bees! The birds like it!" he joked. As we walked deeper into the property, we found a small stand of bladdernut (*Staphylea trifolia*). This super-cool and just plain lovely plant was overshadowed by several large honeysuckle vines. At this point, right on cue to deliver the message that would stick with everyone, Gary swung his opinion around, vowing to remove all the honeysuckle. In my experience, that's all it takes. People don't see what the big deal is with non-native invasives until they grasp how fast they spread and how they threaten what we love.

As a teacher, public speaker and eco-landscape designer and consultant, I like to think I know what I'm doing, but this trip to River Croft reminded me how much more there will always be to learn. The walkabout was intended to show participants how ubiquitous damaging plants such as buckthorn (*Rhamnus cathartica* and *R. frangula*) can be, but for me it was a magical trip.

We encountered a wide variety of native plants that I consider to be special. Michigan lily (*Lilium michiganense*) surprised me with its shade tolerance. Moonseed vine (*Menispermum canadense*) delighted me with its bold texture. From a designer's standpoint, bold texture in the local native plant palette is rare and valuable!

It may seem obvious to some, but it bears repeating: knowledge of the cultural requirements of native plants is important for gardeners. Understanding which plants will thrive in dry sun or shade, tolerate salt or make good candidates for rain gardens, can improve garden design and success. Keep your eyes peeled while walking in the wild. Roadsides reveal that Carolina rose (*Rosa carolina*), milkweeds (*Asclepias* spp.), goldenrods (*Solidago* spp. and friends), sumacs (*Rhus* spp.) and pearly everlasting (*Anaphalis margaritacea*) all tolerate salt. Which plants do well in sandy soil? High Park in Toronto is home to black oak (*Quercus velutina*) and the fun-to-say sassafras (*Sassafras albidum*). I often work with rain gardens; seeing Michigan lily thrive in moist shade at River Croft was an eye opener! I can add it to my palette of rain garden plants for shade.

Photograph by Sean James

*Bladdernut (*Staphylea trifolia*)*

At River Croft Farm, a diverse property with many ecosystems, there were lessons aplenty about the usefulness of native plants. Dogwoods (*Cornus* spp.) and willows (*Salix* spp.) stabilize streambanks while creating habitat for birds. They also provide food for the birds and their nestlings in the form of the caterpillars that feed on these lovely native shrubs. White waterlily (*Nymphaea odorata*) grows well in stagnant water as does the butterfly magnet, pickerelweed (*Pontederia cordata*). I don't recall if I saw it there or not, but woolgrass (*Scirpus cyperinus*) is also a great riverbank stabilizer and one of my favourite grass-like plants. I've had a chance to walk Gary's property only a couple of times, but I think that any trip during any week of the year, would yield new observations about the ecosystems that plants inhabit and the interrelationships that support

PHOTOGRAPH BY SEAN JAMES

Not all invasives are plants. A red lily beetle is doing a job on the Lilium michiganense *at River Croft Farm. Sean James is hopeful that some native predator will develop a taste for these alien beetles!*

PHOTOGRAPH BY SEAN JAMES

*Ramps, aka wild leeks, (*Allium tricoccum*) are becoming less common with overharvesting. Farms can be refuges for special species when forests are protected.*

biodiversity.

What grows well where? Look at how some plants that suffer in the urban landscape perform much better in the wild. Plants under stress such as ash (*Fraxinus* spp.) are often healthy in vernal (spring) wetlands in my hometown of Milton; huge specimens show no signs of emerald ash borer infestation. Perhaps that offers us a lesson on where to plant certain species so that they will be able to fight infestations and infections. Do you have a challenging area in your yard? Are there special plants you want to grow that you fear won't succeed? Look to nature for guidance.

Are there more positives that we, "the choir", can teach folks about the plants growing wild in our back 40? I was one of those slightly creepy kids who collected insects. Now I just photograph them. I have become especially interested in obligate feeders, insects that can only feed on one family, genus or species of plant. The list is long and fascinating. As a professional landscape designer, I love watching my customers' faces light up when I tell them that the violets (*Viola* spp.) I plan to use as a groundcover are not weeds but food for fritillary butterflies. New Jersey tea (*Ceanothus americanus*), a lovely, white-flowered shrub is the host plant for caterpillars of mottled duskywing butterflies. Most of us know about the special relationship between monarchs and milkweeds, but did you know that the amazing giant swallowtails rely on prickly ash (*Zanthoxylum americanum*)? Golden Alexanders (*Zizia aurea*) are essential for black swallowtails, as are turtleheads (*Chelone glabra*) for Baltimore checkerspots. That's a trimmed-down list of great landscape plants that feed pollinators. Teaching my clients about the added bonus of helping butterflies and moths is a great sales tool.

Many of today's gardens rely on a few species of plants. I try to bring a new plant to every design I create, just

Continued on page 6

Continued from page 5

Photograph by Sean James

*Woolgrass (*Scirpus cyperinus*) offers great winter interest and structure. It stabilizes riverbanks and makes a great pondside plant.*

to keep myself fresh. Visiting new places surprises me with beautiful native plants where I might not expect them. For example, I found hoary vervain (*Verbena stricta*), a purple-flowered, perennial, midsummer bloomer that deserves a place in our gardens. Chinquapin oak (*Quercus muehlenbergii*), shadbush (*Amelanchier arborea* – an *Amelanchier* in tree form!), maple-leaf viburnum (*Viburnum acerifolium*), zigzag goldenrod (*Solidago flexicaulis*) and its cousin bluestem goldenrod (*Solidago caesia*) all grow on a very thin layer of soil at the edge of the Niagara Escarpment in Dundas, Ontario. Inspiration from my visit there allowed me to design a garden over a parking garage that had only 25 centimetres (10 inches) of soil.

There's always more. I thought I had my head wrapped around the sedges (*Carex* spp.) in my area until I found out that there are 96 species of sedge in my home county of Halton alone! Okay, so I'll most likely never know all my sedges. I can satisfy myself learning the most useful ones.

Folks don't realize how insidious alien invasives can be, pushing out native plants that provide food for native species of insects and birds, and changing everything from soil ecology to erosion patterns. But, with luck, the educational session that Gary organized on his farm helped to change a few minds. I was inspired by the many open and inquisitive faces that greeted me from the local farming

Photograph by Sean James

River Croft Farm is a soothingly pastoral example of how farmers can work with nature.

community and beyond (including Master Gardeners!), belonging to people who came to learn about invasive plants, and the native plants that should be in their place.

***Sean James** is a graduate of the Niagara Parks School of Horticulture and owner of Sean James Consulting & Design (**seanjames-consulting.ca**).*

River Croft Farm

by Gary Kenny

The weather was typical for a November day – cold, damp and grey – when my wife, Deborah, and I first set eyes on what would become our rural paradise. I saw in that forlorn landscape something of the garden the farm could become. My spouse saw only dreariness and gloom. That incongruity – and my having lost an argument – explains why we did not pursue the farm at first sight.

We had decided to sell our house in Toronto, our children having left the cradle of home, and move to southern Ontario's Bruce-Grey County region. We both have roots and family there. An old farm would make an ideal new home. But not just any farm. It had to include forest, fields that could be cropped organically, a natural water feature, a diversity of tree, shrub and wildflower species, a livable farm house, a bank barn and some outbuildings.

It took eight months, but we found that property. And surprise! It was the same 39 hectares (96 acres) we had surveyed the previous November. Except that now, in late May, it "showed" differently. The assorted deciduous and coniferous forests, fields, meadowlands, riverine areas and wetlands were alive and humming with a rich diversity of insects, birds and other fauna and flora.

When we walked the farm the second time, on that warm, sunny spring day, my wife's eyes lit up. The gloom of the previous November had yielded to May's fresh, vibrant hues and the sweet sounds of songbirds crooning from the treetops. "Splendour" was her defining word for the property during that hour-long walkabout.

Carpets of white trillium (*Trillium grandiflorum*) and trout lily (*Erythronium americanum*) danced in the forest's stippled sunlight. Tall, delicate fronds of ostrich fern (*Matteuccia struthiopteris*) intermingled in heavily shaded glades.

Photograph by Gary Kenny

*Moonseed vine (*Menispermum canadense*)*

Wild leek (*Allium tricoccum*) huddled in clumps at the base of stout sugar maple trees (*Acer saccharum*). At the forest edges, moonseed vine (*Menispermum canadense*) and virgin's bower (*Clematis virginiana*) resolutely wound their way up the trunks and branches of white ash (*Fraxinus americana*), basswood (*Tilia americana*) and other young trees.

Sunny marsh marigolds (*Caltha palustris*) blanketed a meadow adjacent to a lowland coniferous swamp. Along the banks of the South Saugeen River, which delineates the western boundary of the farm, sedges (*Carex* spp.) grew in spiky tufts. They

Continued on page 8

Continued from page 7

would be joined later in the spring by broadleaf arrowhead (*Sagittaria latifolia*) and American water lily (*Nymphaea odorata*).

The farm sang in so many ways that first spring day – and we sang with it.

But like many old farms, ours bore the scars of decades of disruptive human activity, most of it agricultural. In the late 1800s, when Grey-Bruce was being homesteaded by people of European origin, the term "ecosystem" hadn't been coined. Homesteaders tended to think of nature as something that had to be tamed for their survival. Today, an increasing number of farmers are realizing the value – economic and ecological – of natural ecosystems to their farming operations, and they are working to conserve them. Organizations like Alternative Land Use Services (ALUS) provide farmers with eco-service funding to protect, rehabilitate and establish forests, fence lines, buffer strips, wetlands, bird habitat and more.

At River Croft Farm most old-growth trees, such as maples (*Acer* spp.), oaks (*Quercus* spp.), pines (*Pinus* spp.), hemlocks (*Tsuga canadensis*) and American beeches (*Fagus grandiflora*), were cut down for timber and firewood by the settlers. The relatively young forest we find today grew up in their place. Only a few ancient "mother" trees survive. The original bush was felled to the very edge of the river to maximize cropland area. The clear-cutting left the banks vulnerable to erosion and the fields susceptible to soil loss during heavy rainfalls.

Human traffic and timber harvesting in the forest, grazing of marginal areas (including some wetlands) and other agricultural practices took a toll on the farm's native flora. We found the aforementioned trilliums, trout lilies, marsh marigolds and other species of native wildflowers still growing in abundance, but other species one would expect to find in this natural environment were absent, such as the brilliantly hued cardinal flower (*Lobelia cardinalis*), yellow lady's slipper (*Cypripedium calceolus*) and blue flag iris (*Iris versicolor*).

To conserve and enhance the farm's remaining biodiversity, we drew up a simple bio-plan. It addressed the need for buffer strips along the exposed riverbanks; the planting of more native trees and shrubs along fence lines; the reintroduction of native wildflowers to attract pollinators; the planting of native berry-bearing shrubs to attract birds; the building of nesting habitat for resident snapping and painted turtles; and the construction of a hibernaculum as snake habitat. We are always adding new ideas to the bio-plan.

PHOTOGRAPH BY SEAN JAMES

Riverbank erosion is exacerbated when land is cleared right to the edges.

PHOTOGRAPH BY SEAN JAMES

Rivers are much healthier with their banks vegetated.

Buffer strips are an important part of the farm's bio-plan. They can

perform many ecosystem protection and enhancement functions, including stabilizing river and stream channels, filtering out sediments and unwanted nutrients (especially from agricultural fertilizers), purifying water (especially of bacteria and pathogens) and preventing erosion. They provide terrestrial and stream habitat for myriad species of animals and insects.

We decided to maintain the croplands. This meant that our bio-plan had to protect the property's natural biodiversity and ensure that the croplands produced high-quality crops. Ongoing scientific research confirms that environments of high biodiversity and agriculture can be mutually supportive and beneficial. Measures we've taken include rotation of crops to improve soil organic matter and soil regeneration strategies, including planting cover crops to restore and maintain a healthy soil food web.

Management of invasive plant species has also become a priority in our bio-plan. Over past decades many exotic species of trees, shrubs, grasses and wildflowers were introduced to the region for practical or ornamental purposes. Since the biological controls found naturally in their places of origin are lacking here, the plants spread, sometimes aggressively, threatening native ecosystems.

Among the worst Eurasian imports at River Croft Farm are common buckthorn, Japanese barberry and garlic mustard. It is very hard to eliminate well-established colonies by hand. In some cases only a herbicide will do the trick. Even then, total elimination is unlikely, especially if one's neighbours are less inclined to tackle these invaders on their own properties.

Common buckthorn (*Rhamnus cathartica*) is a shrub or small tree native to Eurasia, apparently introduced to North America in the 1880s and valued as an ornamental. (Note that there are species of buckthorn native to North America, such as alder-leaf buckthorn [*Rhamnus alnifolia*] which is distributed across the continent.) Farmers planted *Rhamnus cathartica* to form fencerows and windbreaks. Birds, its principal vectors for distribution, eat the purple berries and deposit the seeds in their droppings. Buckthorn can dominate roadsides, riverbanks, mature forests, farm fields and hydro corridors, where it shades and crowds out native plants.

Japanese barberry (*Berberis thunbergii*) is a shrub that can grow

Continued on page 10

PHOTOGRAPH BY GARY KENNY

*A riverbank behind the bank barn which eroded and pancaked downward during an extreme weather event two years ago. While they are not visible in the photo, the bank was planted this past spring with native shrubs and trees with bank stabilization attributes. They include buttonbush (*Cephalanthus occidentalis*), pussy willow (*Salix *spp.), red osier dogwood (*Cornus sericea*), grey dogwood (*Cornus racemosa*) and arrowwood (*Viburnum dentatum*).*

Continued from page 9

two metres (six feet) in height. Its vividly red berries are also spread by birds; branch fragments can readily root to form new plants. In partial sunlight or deep shade it forms dense thickets that push out native plants, reduce wildlife habitat and restrict recreational activities along trails.

Garlic mustard (*Alliaria petiolata*) is the invasive plant species we are most challenged by. Native to Eurasia, it was brought to North America in the early 1800s as an edible herb. An early spring plant, it has a distinctive garlicky smell similar to garlic. It has become one of Ontario's most aggressive forest invaders; dense stands can produce over 60,000 seeds per square metre and double in size every four years. Seeds, which are easily spread by animals, can remain in the soil for up to 30 years and still be viable. The plant grows in a wide range of sunny and fully shaded habitats – in other words, almost anywhere! – and displaces native wildflowers that carpet forest floors. It interferes with the growth of fungi that transfer nutrients to the roots of other plants.

The greater diversity of native trees, shrubs and wildflowers (some of which we re-introduced) results in a high diversity of fauna. Resident ducks and a great blue heron forage in an oxbow pond. The river, streams and ponds are home to bass, pike, steelhead trout, catfish and other fish species, as well as frogs, salamanders and turtles. Prey and predatory mammals include white-tailed deer, coyotes, beavers, muskrats, minks, martens, bobcats, skunks, porcupines and rabbits.

Snapping turtles represent what really makes this place magical to us – the cojoining and partial integration of wetlands, forests and croplands into the context of the farm's operations.

Every May and June sexually mature females emerge from the southwest-corner oxbow pond to lay their eggs in an adjacent field. These dinosaur-like, apex predators vary in size. The largest we've seen measured 40 centimetres (16 inches) along the length of its carapace. Given their combative disposition, powerful beak-like jaws and highly mobile head and neck, we give snapping turtles a wide berth. Their ability to dig out nests with their sturdy hind legs in a densely rooted hay field never ceases to amaze us.

Our efforts have rewarded us with many delights. Three new bird species that readily come to mind are indigo bunting, grey catbird and eastern bluebird. The buntings may have been attracted by the thickets of native black raspberries (*Rubus occidentalis*) we planted. The catbirds "meow" from the hedgerows, which provide great foraging and nesting habitats for both species of birds. We lured the cavity-dwelling bluebirds to our property simply by installing cavity boxes on fence posts.

Here at River Croft Farm, we count our blessings. Each day, regardless of the season, brings a reward. We don't take this land and what it provides for granted. As its stewards, we work to preserve its integrity as a place of natural bounty and beauty.

PHOTOGRAPH BY GARY KENNY

*A buffer strip in progress. Coniferous trees such as white cedar (*Thuja occidentalis*), white pine (*Pinus strobus*) and white spruce (*Picea glauca*) were planted on the east bank of river; deciduous trees and shrubs are to be added this fall. A buffer strip exists on the opposite bank of the river, but is not visible in the photo because of its high banks.*

***Gary Kenny** recently retired from a career in international human rights and development. In retirement, he often writes freelance about nature, biodiversity and agriculture. River Croft Farm is situated on the traditional land of the Three Fires Confederacy of the Ojibway, Potawatomi and Odawa peoples, subject to Saugeen Treaty No. 45 1/2 (1836).*

Beaver Made: The Botany of a Keystone Species

by Rob Rich

If we are indeed what we eat, the North American beaver (*Castor canadensis*) is one of the most miraculous plants around. Contrary to what Mr. and Mrs. Beaver in the *Chronicles of Narnia* have led readers to believe, beavers do not eat fish or anything else with animal flesh. As unwavering herbivores, beavers have marched an evolutionary path with plants that has become increasingly specialized. A whopping 33 genera of prehistoric beavers roamed the Earth in previous millennia, exhibiting different lifestyles than we see today. There was the prehistoric beaver genus, *Paleocastor*, whose squirrel-sized members burrowed corkscrewed tunnels in the earth – with their teeth! There was the bear-sized beaver genus, *Castoroides*, which lurked in wetlands without cutting any wood at all. But 5.7 million years ago, with the rise of the genus *Castor*, the semi-aquatic, wood-cutting niche came into being. Only *Castor* survives today, having found just the right combination of traits to shape the texture and function of the earth.

Photograph by Jen VanderHoof

*Beavers don't only eat wood. They'll readily incorporate leaves and grasses into their diet, especially in the warmer months when greens are plentiful. They will also add them to the bedding of their lodges. Some aquatic plants produce starchy rhizomes that beavers find delectable such as the fragrant water lily (*Nymphaea odorata*), a taste which has earned the plant the nickname beaver root.*

It may not be possible to answer why modern beavers co-evolved so closely with plants, but the beaver's tools for herbivory help us appreciate how they persist with such impact. Robust incisors are a hallmark of every rodent; since rodents must gnaw to keep these constantly growing teeth short and sharp, most have evolved horticultural habits. But only the beaver, North America's largest rodent, is so completely built for forestry. Iron minerals in wood harden the enamel on the outside of a beaver's incisors to a deep red-orange; these teeth are honed into chisels as they wear against the soft white dentine on the inner sides of lower teeth. Thick zygomatic arches (cheekbones) support large masseter muscles that, when coupled with stout molars, aid the beaver in grinding wood to pulp. Dexterous front paws allow versatility in digging, hauling and nimble weaving, while flippered hind feet with thick-boned hind legs offer aquatic propulsion and heavy-duty support. The beaver is masticator, feller-buncher, skidder and forwarder all in one – and a whole lot lighter on the land than most forestry equipment.

Other than the porcupine, the beaver is the only mammal that is truly xylophagous (wood-eating), a term typically reserved for insects like termites or bark beetles. Stretched out, a human's intestine will be about four times as long as his or her body, but a beaver's intestine spans six times its body length, given its role in digesting complex plant compounds with elaborate molecular chemistry. From phenols like 4-ethyphenol to ketones like 3-hydroxyacetophenone, beavers concentrate at least 24 aromatic compounds into castoreum, a unique secretion that is useful in olfactory communication among fellow beavers.

Continued on page 12

Continued from page 11

And its pleasing notes of vanilla have not been lost on humans: beyond the appalling commodification of beaver fur, some people have sought castoreum for use as a medicine, perfume ingredient, trapping lure and a "natural flavour" for food. What the beavers' internal alchemy cannot synthesize into castoreum gets excreted as dark, orange-red urine (whose tannic tints suggest more plant concentrates) and scat, which beavers actually consume for a second round of nutrients. This habit, called coprophagy, may seem peculiar, but to a beaver it's just another way to economize digestion, extracting every last mote of nourishment that can be drawn from a coarse diet. And beavers seem proud of their metabolic miracles too: along with herbaceous vegetation, leaf litter and mud, they'll heap castoreum on "scent mounds" made to mark their territories in spring.

Woody plants also provide shelter and safety for beavers. Their peculiar physical and physiological adaptations make beavers appear awkward and odorous to humans, and an important prey species for wolves, bears, cougars and coyotes. But in water they are often able to elude their predators and their deft manipulation of wood into dams allows them to expand their aquatic havens. The number and size of dams varies according to local topography, water velocity and proximity to food or building materials, but they almost always aim to maximize water storage. The impoundments help beavers to keep chutes into their lodges or bank burrows safely submerged and to cache the wood underwater that will keep them fed through winter in places where their habitat will freeze.

It is crucial to note that the dam is not merely a product, but a work-in-progress that catalyzes plant succession. In the right place and time, felling trees for dams floods more trees; these efforts open access to more trees for more dams and more flooding. All this work affirms the tight social units of beaver families and provides a model that two-year-old beavers take with them when they disperse. But, of course, this process is not as linear as it sounds. Inevitably, dams will need patching when topographical constraints intervene or streams in spring runoff change course. Partly by choice and partly by chance, these imperfections mean that beavers make and remake a complex mosaic of microhabitats, supporting life that would not otherwise exist. Research has found that beavers are keystone species in part because they create and engineer wetlands, and wetlands are hotspots of biodiversity. In upstate New York, beaver-shaped wetlands contribute as much as 25% of the total herbaceous plant species richness in the riparian zone.

These conspicuous impacts on plant life make delightful puzzles for naturalists who seek to comprehend the intricate social and individual lives of beavers, creatures that are mostly cryptic, quiet and active at night. Beavers are often described as "choosy generalists" in their plant selection, but the riparian hardwood species they chiefly depend on, such as willows (*Salix* spp.), aspens and cottonwoods (*Populus* spp.), evolved to thrive in spite of or because of beavers. The astounding potential of these favoured foods to re-sprout from cuttings or coppiced limbs are cause to consider: are beavers cultivators? When beavers are present, these plants may exist in a continued state of young, vigorous, tender growth, with more reliance on vegetative propagation than reproduction by seed. Unfortunately, there's no way to intuit a beaver's decision-making process, but even when they do not seem to be directly manipulating re-sprouters, they've been known to fell or girdle conifers and less-favoured

PHOTOGRAPH BY ROB RICH

When a beaver snips a willow and eats the cambium layer of living cells below the bark, the ingested result will, eventually, look something like a flake of soggy shredded wheat. Holding such a lump of lignin and cellulose may seem mundane, but it's also precarious, for the mushy, twice-digested, loosely connected strands are prone to disintegrate at the slightest touch. As it's so delicate, it's a rare treat to find beaver scat at all.

species, potentially to create the conditions for their choice foods to grow.

Coho salmon, wood ducks, moose… the list of charismatic creatures who benefit from the beaver's woodwork is long, but insects are among the most colourful and captivating examples. Consider the butterflies, that group of insects renowned for their intricate, particular dependencies on the host plants that provide shelter and sustenance at key moments in their metamorphosis. Though it is not exactly the same as monarch larvae relying on milkweed (*Asclepias* spp.), beaver activity indirectly hosts plants that make life hospitable for adult butterflies. The mourning cloak, which overwinters as an adult, offers an example: emerging in early spring, these dark beauties have been known to flock to sap flowing from cottonwoods and willows that beavers have cut. A rarer example is the Saint Francis' satyr, an endangered butterfly whose range is restricted to two counties in North Carolina. There, the sedges (*Carex* spp.) that serve as larval host plants and the sap that provides adult food exist in disturbed wetlands, a habitat the beaver makes best.

Beavers will vacate landscapes if food availability or water storage capacity declines, but gnawed branches, old waterlines, soil profiles or other signs of herbivory may prevail for decades, even centuries. In the beaver's native range, plant succession continues at abandoned sites, with a more complex assortment of species than if they had never been touched by teeth. The same cannot be said in the Tierra del Fuego, at the southernmost tip of South America, where beavers are not native. Ever since the Argentinian government released North American beavers there in 1946 – with the ludicrous plan of creating a fur industry – the native plants have suffered immensely. Without the ability to vigorously re-sprout like willows, aspens or cottonwoods, stunted beeches (*Fagus* spp.) and other natives of these austral climes have confirmed the powerful co-evolution of beavers and their native plants across North America and Eurasia.

Photograph by Rob Rich

"Death by a thousand cuts" doesn't make sense for willows, which can thrive with beaver herbivory. In beaver habitats, this adage might be more true: "Where there's a willow, there's a way!"

But here in North America, where beavers are a native, necessary force of nature, we should be thankful for all the ways they have conditioned the hydrated lands we call livable, arable, diverse and beautiful. The fur trade collapsed in roughly three centuries North America's historical beaver populations from a high of up to 400 million to a mere 100,000 animals, but their populations are rebounding. A prime beaver pelt is worth less than $10 today. People increasingly accept

Continued on page 14

Continued from page 13

that live beavers are worth far more in the ecosystem services they provide. In various collaborative efforts across the continent, restoration is underway. Some people are reintroducing beavers to old haunts. Others are planting native shrubs and trees or building "beaver dam analogues" to restore degraded habitat and induce beavers to return. Still others are improving tools for non-lethal conflict prevention to increase landowner tolerance. And the growing movement couldn't have come sooner because, now more than ever, we need the beavers' water-storing, fire-buffering, habitat-diversifying feats to reverse species loss and adapt to a rapidly changing climate. No other animal can so masterfully make use of plants to inspire hope for our planet. If you're lucky enough to find a scat or see this live rodent in action, you might just become a Beaver Believer.

***Rob Rich** is a naturalist based in northwest Montana. His writing has appeared in* Earth Island Journal, Camas, High Country News *and elsewhere. If you want to learn more about the recovery of beavers and their habitats, check out Rob's 2017 article "Better with Beavers: How Partnerships with a Rodent Are Helping Restore Watersheds in the Pacific Northwest" in* Earth Island Journal *or Ben Goldfarb's 2018 book* Eager: The Surprising, Secret Life of Beavers and Why They Matter.

PHOTOGRAPH BY ROB RICH

The cottonwood leaf beetle is another insect that benefits from beaver herbivory. While the adults and larvae feed on the leaves of cottonwoods, they are drawn to the sap of the plants for defence. Sap in the resprouted growth that beaver cuttings promote contains twice as many of the salicylic and phenolic glycosides as older trees; beetles that seize the benefits of this changed chemistry are safer from their predators.

SEND US YOUR SEEDS

Could this be the year that you participate in the NANPS Seed Exchange by collecting native plant seeds from your garden or wild places? Send the seeds separated by species and identified with the source/parentage to NANPS Seed Exchange, Box 69070, St. Clair P.O., Toronto, Ontario, M4T 3A1. For help on how to collect seeds and do it ethically, visit nanps.org/seed-collecting. Thank you very much for your valuable contribution to native plant restoration!

PHOTOGRAPH BY DEBORAH CHUTE

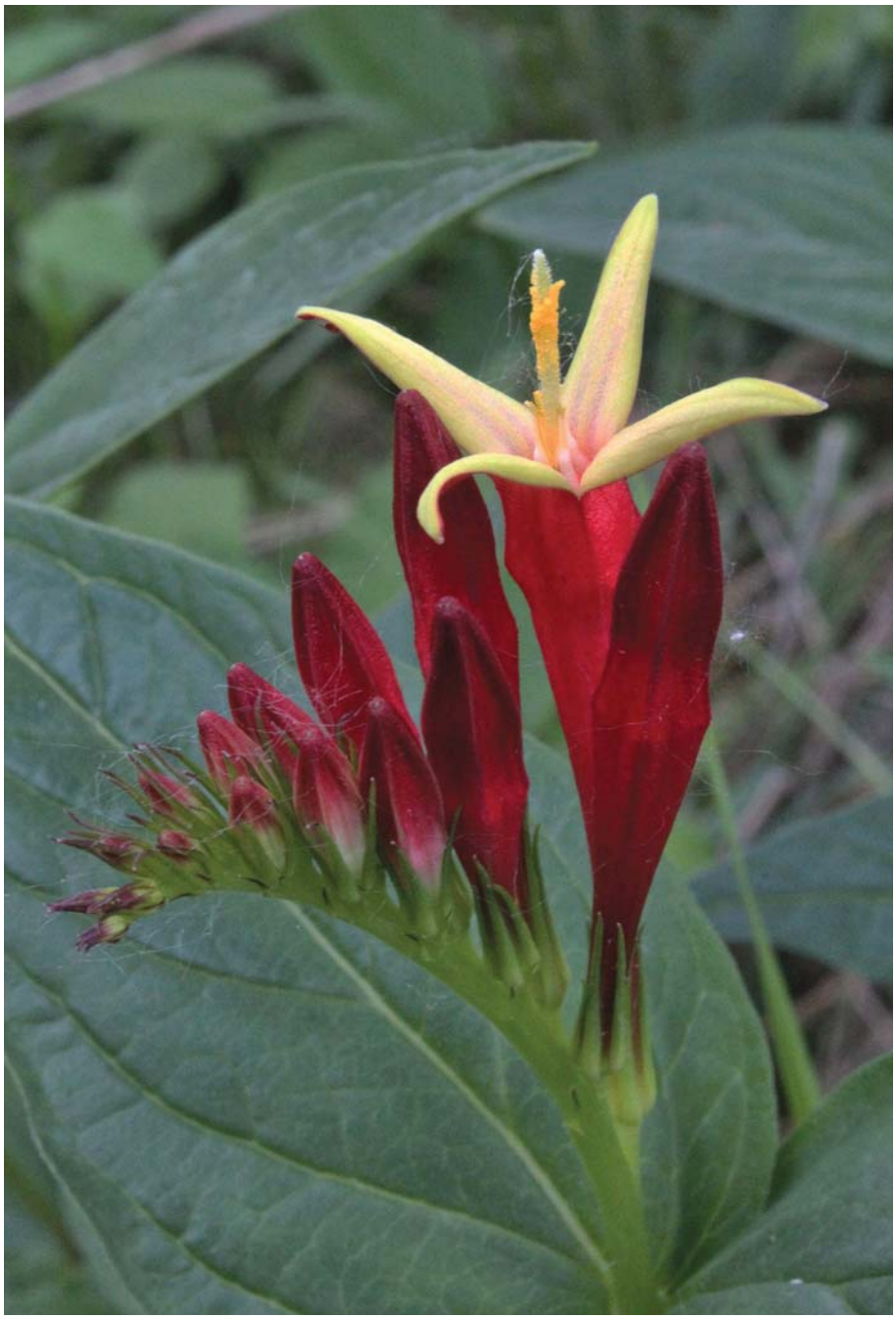
Continued from page 1 – **Woodland Pinkroot**

though we frequently see the birds visit other plants in the yard, including wild columbine (*Aquilegia canadensis*), and the brilliant reds of royal catchfly (*Silene regia*), beebalm (*Monarda didyma*) and cardinal flower (*Lobelia cardinalis*). We find this puzzling as we thought pollinators would swarm *Spigelia*. Is it because of the vertical nature of the flower? Do hummingbirds prefer flowers with a horizontal entry or entry from below? They certainly love Abbeville red iris (*Iris nelsonii*), which has a horizontal floral presentation. Of course, it could just be that we are not seeing the hummers in action at the pinkroot.

The scientific name of woodland pinkroot is derived from the name of the fifteenth-century polymath Adriaan van den Spiegel, who may have been the first to instruct the public on how to create a herbarium, wrote Merritt Lyndon Fernald, the last author of *Gray's Manual of Botany*. It was common practice for people of science to Latinize their names; Carol von Linne became Carolus Linnaeus, Charles de l'Ecluse changed to Clusius and Spiegel became Spigelius.

One of the common names of *S. marilandica*, wormroot, refers to Cherokee and other Native American uses of the roots as a treatment for internal worms. Other members of the genus such as the tropical species wormgrass (*Spigelia anthelmia*) also reflect this usage. Indian pink is resistant to most herbivory, except for occasional snacking on the foliage by deer, as it contains toxins such as alkaloids and calcium oxalate crystals. The chemical constituents of the plant, if taken in large doses, can cause nausea and subsequent strychnine-like convulsions in humans. Even so, Stephen Elliot in *A Sketch of the Botany of South Carolina and Georgia* (1831) writes that the taste of the root is sweetish or insipid. He noted that a typical dose given to a seven-year-old child was 20 grains of powdered root, but mentioned that a purgative might be necessary. The effect is narcotic or sedative, but is seldom attended with danger. *Spigelia marilandica* was a commonly prescribed medication for elimination of endoparasites such as worms. This practice no doubt arose from the Native American use of a vermifuge tea made from the roots. This striking plant has a rich history but is questionable as a therapeutic.

Spigelia marilandica is a welcome tropical addition to a temperate garden.



PHOTOGRAPH BY STEPHEN JOHNSON

One of four Spigelia marilandica *plants in Stephen and Mary's yard and the only one they've seen being visited by a ruby-throated hummingbird.*

***Stephen Johnson** enjoys the relaxation that a diverse greenscape can bring. **Mary Stark** continues to learn about plants and ecological contexts from Stephen and shares the knowledge with students in nature writing and environmental literature.*

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