The Blazing Star

Spring 2025, Volume 26, Issue 2

A Publication of the North American Native Plant Society

Native Plant to Know

Sassafras

Sassafras albidum

by Catherine Goddard

Sassafras was perhaps most famous – or infamous – as a flavouring for root beer until researchers discovered that safrole, the oil extracted from its roots, was carcinogenic. Its addition to root beer was banned in the 1960s.

Sassafras albidum was valued by Indigenous peoples for thousands of years for its many medicinal properties, spicy flavour and wood that resists decay. The pungent roots were steeped into infusions to treat fevers, heart troubles, rheumatism, measles, diarrhea and any number of ailments. Sassafras leaves were pulverized to thicken and add flavour to soups and other foods. Fresh leaves spiced up meat soups.

Soon after European explorers arrived in eastern North America, sassafras was exported back to the Old World in amounts second only to tobacco. It gained a reputation as a cure-all. At one time in the 1900s it was pressed into service to treat syphilis and other sexually transmitted diseases. Many medicinal uses remain to this day. Among colonialists, the ground, dried leaves of sassafras are still occasionally used as a thickening agent in Creole gumbo.

The sassafras tree boasts a graceful structure of arching, upright, alternate branches. The young bark is green and smooth, turning grey-brown with deep, corky ridges in older age. It forms colonies by suckering, often in response to browsing by wild animals such as deer, rabbits and beavers. Sassafras is dioecious, with tiny yellow flowers on both male and female trees. The female tree develops blue drupes, which ripen in September on striking scarlet pedicles. A distinctive and charming feature of this tree is its three leaf shapes. One is a simple, smooth oval, another is mitten-shaped (occurring with left- and right-hand "thumbs") and the third is three-lobed. All are bright green, glaucous beneath.

While sassafras can develop into a large tree, up to 15 metres (50 feet) high throughout its southern range, in

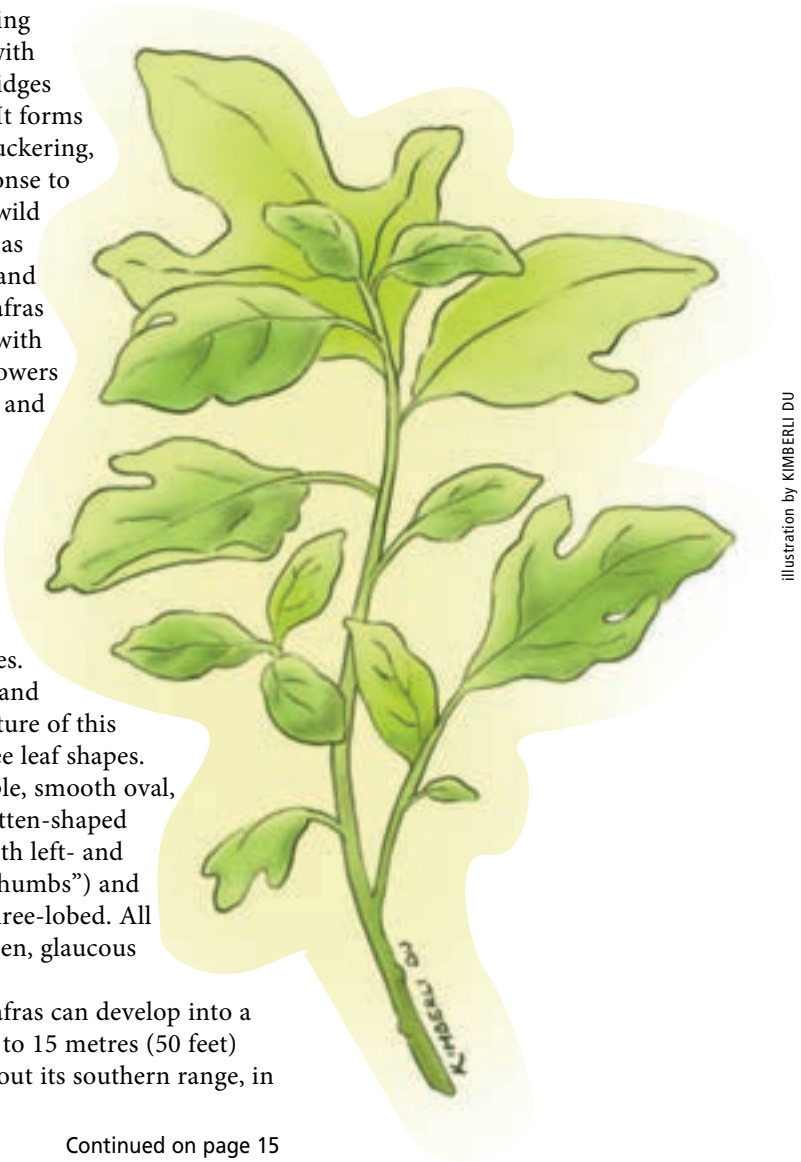

illustration by KIMBERLI DU

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

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NANPS NEWS

North American Native Plant Society's Annual Plant Sale

Saturday, May 17, 2025
Toronto Botanical Garden
777 Lawrence Avenue East at Leslie, Toronto

Native wildflowers, trees, shrubs, vines, ferns, grasses and sedges will be available for purchase with knowledgeable volunteers on hand to help you choose the plants just right for your conditions.

Floor sales are from 9:30 a.m. to 2:30 p.m.

Advance ordering is a benefit of membership. You can join or renew your membership when you place your advance order before April 27 (or as long as quantities last). Pick up advance orders starting at 10:30 a.m. on May 17.

Restorations Committee

The Restorations Committee focuses on creating and contributing to projects that promote native plants and the stewardship of their habitats. The committee is currently in transition. We are looking for a new leader. The ideal candidate will generate innovative ideas to further our mandate and create connections with like-minded organizations. Among other successes, the Restorations Committee contributed to the David Suzuki Foundation's Butterfly Way project and participated in stewardship of the Rail Path Gardens. The committee has also organized rescues of native plants from development projects. The new leader will collaborate with other NANPS volunteers passionate about native plants and ecosystems. On this committee, we all get our hands dirty, planting, weeding, watering and maintaining our installations. If you are interested in taking on the leadership role or simply joining the committee, please contact Adam at **amohamed@nanps.org**.

Photograph by CATHERINE GODDARD

On a drive in the Niagara area, Catherine Goddard spotted a very tall, old sassafras that must pre-date the nearby houses and development. It measures nearly 100 centimetres (40 inches) DBH (diameter at breast height). Catherine remarked, "What majesty and beauty on a nondescript corner of a road built over ancient Indigenous trails!"

Adam Mohamed

Liverworts: Greening the Earth's Land Surface

by Andy Fyon

When I look out over a summer forest, I am struck by the range of lush green vegetation. The Earth's land surface was not always green. For more than 88% of Earth's history, terrestrial Earth – the part of the Earth's surface that rose above the oceans – existed as a stark, rocky landscape devoid of vegetation. In fact, for the first 4,000 million years of Earth's history, life evolved under the protective cover of the oceans and, perhaps, large freshwater lakes that filtered out life-killing ultraviolet radiation from our sun. There were no land plants and no land animals. Life did not exist on terrestrial Earth until quite recently in geological time – the most recent 500 million years.

How was the terrestrial Earth transformed from a barren rocky surface to the verdant one we see today? That transformation began, in part, through the colonization of the land by a small, inconspicuous plant: the liverwort.

In this article, I share a simplified geological perspective of the factors that led to the colonization of terrestrial Earth by liverworts.

Idle Thoughts

It was early July. I stood at the end of a long gravel road, in front of a rock cliff in northeastern Ontario, Canada. I was about 180 kilometres (110 miles) southwest of James Bay and a few hundred metres south of the boundary between the Ontario Shield Ecozone, where I was, and the Hudson Bay Lowlands Ecozone to the north. The cliff was about 10 metres (32 feet) tall. When not frozen, the cliff remained wet from water that dripped down from moisture-saturated mosses growing on the cliff top. It faced north and was constantly in the shade. It was a cool, moist habitat.

My botany hobby brought me to this location to see if I recognized changes in the types and distributions of vascular flora that could be attributed to changes in the local climate and geology. What I saw surprised me: a small, nonvascular plant that took my imagination back to the time when terrestrial Earth was a plantless surface. It was a thallose liverwort (*Marchantia* sp.), growing right where you would expect it – on the shady, moist, cool rock cliff.

What Is a Liverwort?

Liverworts, hornworts and mosses are three lineages that botanists classify as bryophytes. The common name liverwort owes its origin to the resemblance between the shape of the thalloid liverwort and the human

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Photograph by ANDY FYON

This road-cut cliff along the Mattagami River in northern Ontario supports liverwort plants. It is ideal liverwort habitat because it faces north, is constantly shaded and remains moist.

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liver. This caused those who followed the doctrine of signatures to assume liverwort could be used to treat human liver disorders.

Liverworts are small, nonvascular, rootless plants, seldom exceeding 20 millimetres (0.8 inches) in width and 10 centimetres (four inches) in length. Often they are much smaller than that. They are attached to the ground by rhizoids. Unlike vascular plants, liverworts do not have stomata that close during hot, dry weather. Under those conditions, liverwort plants shrivel and dry out. Liverworts do not produce fruits, seeds or flowers. They reproduce both vegetatively and by spore dispersal.

Their small size and the absence of a flashy flower mean that liverworts are often missed by nature lovers. Yet, there are an estimated 9,000 liverwort species. Liverworts found in northern temperate areas occur in two common forms: as a flat, ribbon-like thallus or as a flattened or three-sided axis, with scaly leaf-like structures. To non-experts like myself, thallose liverworts are easy to recognize. However, up to 90 percent of all liverwort species are leafy liverworts. We often mistake them for mosses.

Photograph by ANDY FYON

*Thallose liverworts are relatively easy for non-experts to identify because of their distinctive rubbery, leaf-like structure called a thallus. This liverwort, tentatively identified as narrow mushroom-headed liverwort (*Marchantia quadrata*), was found growing on the moist, north-facing cliff referenced in this article.*

A Brief History of Plant Life on Earth

Scientists use three sources of information to date primordial Earth events: the absolute ages of rocks, fossil records and phylogenetic plant relationships.

The absolute age of a rock containing a fossil is measured using the decay of naturally occurring radioactive elements and elements produced by radioactive decay.

Ancient plant and animal remains – the impressions and traces of organisms preserved in rocks – constitute the fossil record. Fossils are a snapshot of ancient life. They provide empirical insight into the timing of evolutionary events on Earth over millions of years.

Phylogenetic relationships are the evolutionary connections among organisms based on their shared ancestry. These relationships come from two lines of evidence: morphological – similarities or differences in physical traits – and molecular – DNA, RNA or protein comparisons. Phylogenetic relationships are commonly depicted in the form of a cladogram to illustrate how species, populations or other taxonomic groups relate to one

another over evolutionary time. Phylogenetic relationships help scientists understand how life is interconnected, how species evolved and how traits are passed down or adapted over time.

Thus, the phylogenetic patterns seen in plant fossils, taken together with the absolute age of the rock containing the fossil, tell us when a plant species lived on Earth and allow us to make inferences and predictions about the nature of ancient life.

Early Life on Earth

Combining biological and geological data, like the absolute age of rocks, helps define the history of key events on Earth, including the evolution of life on Earth (see timeline on page 6). Early Earth history – from 4,500 million years ago, when the Earth formed, to 4,000 million years ago – was pre-life. Earliest life appeared 4,000 million years ago as single-celled, prokaryotic cells that lacked a nucleus. These organisms were like bacteria. They were not animals, land plants or fungi. They were the dominant form of life until 2,500 million years ago, when multicellular organisms joined them in the oceans. But when did terrestrial plants, specifically liverworts, appear?

Liverwort and Plant History

Liverworts likely evolved from aquatic green algal ancestors that resemble Chara, an extant green alga commonly known as stonewort. The following evidence indicates that liverworts are the oldest lineage of terrestrial plants:

- Fossilized spores and spore-like structures contained in terrestrial rock from Argentina date to 475 million years ago, a period known as the Ordovician. Researchers have not discovered fossils of the actual primitive land plants that made these spores, but the ancient fossilized spores and spore-like structures resemble those of extant, modern-day liverworts.
- DNA molecular clock estimates indicate the first land plants colonized terrestrial Earth between 500 and 400 million years ago.
- Thalloid fossil plant remains of *Metzgeriothallus* ssp., considered to be of liverwort lineage, occur in New York, dating to between 393 and 382 million years ago, a time scientists call the Middle Devonian.
- Thalloid plant fossils of liverwort lineage predate fossils of other bryophytes such as mosses, which date to 359 - 299 million years ago

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Photograph by BERND HAYNOLD, CC BY-SA 3.0,WIKIMEDIA CREATIVE COMMONS

Bazzania trilobata*, also known as greater whipwort or three-lobed bazzania, is an example of a leafy liverwort. It grows in the temperate northern hemisphere.*

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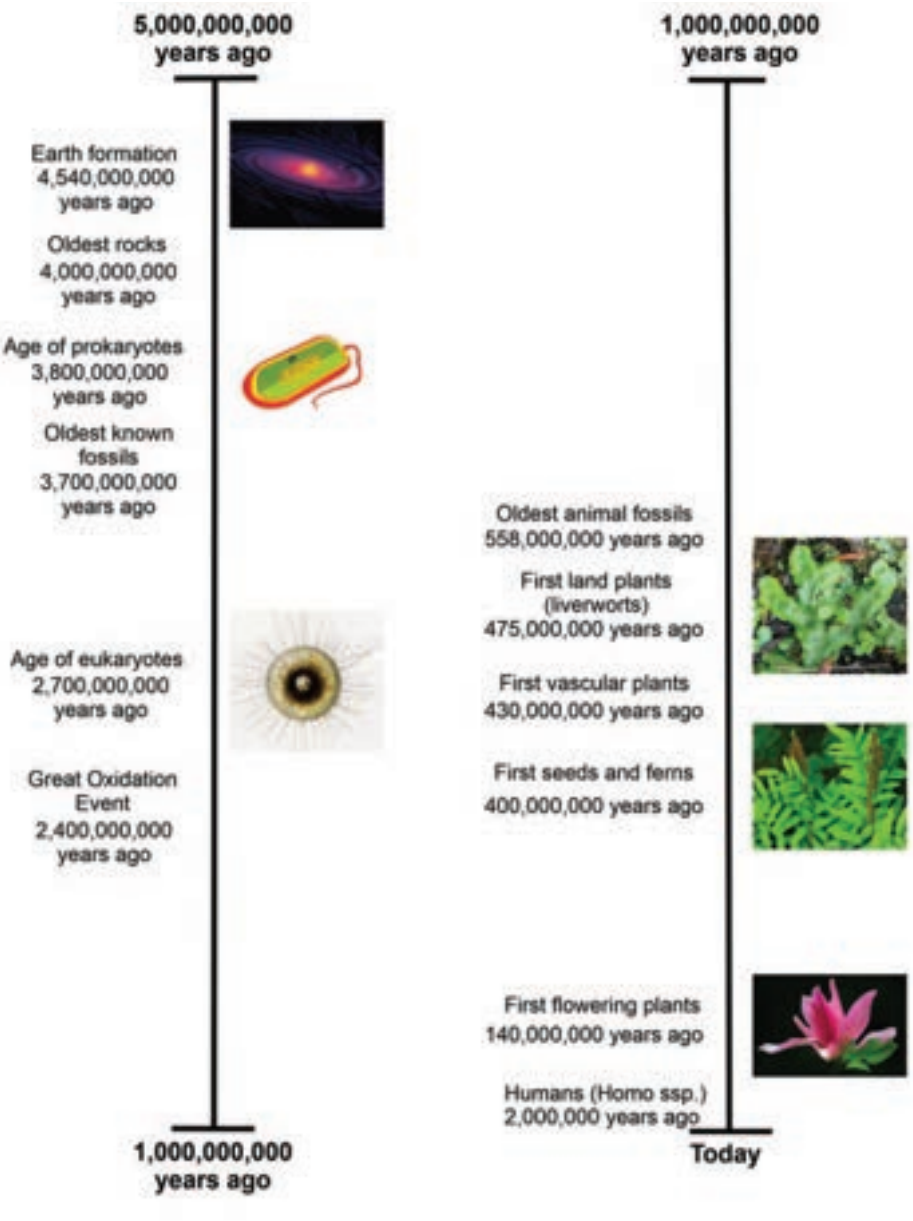
(Carboniferous age), and hornworts, which date to 145 - 66 million years ago (Cretaceous age).

- Comparative DNA studies of liverwort, hornwort and mosses indicate that liverworts are the oldest genetic lineage.

The convergence of the fossilized remains of primitive, nonvascular, liverwort-like structures and spores, phylogenetic analysis and comparative DNA studies give scientists the confidence to state that not only were liverworts the original land plants, but they colonized Earth's land at least 475 million years ago.

An Abbreviated History of Plant Life on Earth



This timeline shows some key events in Earth's history, beginning with the formation of the Earth. There are two striking facts about terrestrial plants: about 4,000 million years, or 90% of Earth's history, passed before terrestrial plants colonized the rocky surface of the Earth; and during the subsequent 500 million years, or 10% of Earth's history, terrestrial plants rapidly evolved from being entirely nonvascular to including vascular, seed-bearing and flowering plants.

Why Did It Take So Long for Life to Colonize the Land Surface?

Given that the Earth is 4,540 million years old and terrestrial life appeared only 475 million years ago, you might ask why it took so long for life to move from the oceans onto terrestrial land. Part of the answer lies with changes to the Earth's atmosphere – specifically, the increased concentration of oxygen and ozone in the atmosphere, due to photosynthesis by eukaryotes. This is called the Great Oxidation Event, which culminated between 2,400 and 2,100 million years ago. By 500 million years ago, there was enough ozone in the atmosphere to absorb the sun's life-killing ultraviolet radiation. At that point, organisms, such as ancestral liverworts, could leave the protection of the oceans to colonize the barren land surface of the Earth.

In summary, the history of life on terrestrial Earth involved a complex interplay of geological, chemical and biological processes, culminating with oxygenation of the atmosphere and absorption of the sun's deadly ultraviolet radiation. The Earth's surface was transformed from a deadly environment to one capable of supporting life. Once on land, liverworts and other land plants changed the Earth's climate, altered soils and allowed all other multicellular life to evolve and occupy almost all of Earth's continental land masses.

Andy Fyon is a retired geologist with a keen interest in the relationship between geology and plant life. His recent book, Walking Together: Engagement Lessons from My First Nations Learning Journey, *is available from Indigo, Amazon and Barnes and Noble.*

Andy thanks Wasyl Bakowsky, Community Ecologist, Natural Heritage Information Centre, Ontario Ministry of Natural Resources, for reviewing an early draft of this article.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Courtesy of the ARTIST AND HOSFELT GALLERY

"This image of a meadow, north of New York City, across the Hudson River from the Palisades, shows what may once have lived there along with plants and animals that still do. We forget, when we look at a plot of land, how it once appeared: a place like this one probably had 10? 15? 20? times the species richness we now see. This concept, that it is hard to register loss over time, is known as shifting baselines. We must become better stewards of our own future and incorporate, even incentivize, a longer view of appropriate land use." Isabella Kirkland

To see more of the artist's extraordinary work, please visit ***isabellakirkland.com****.*

Reblooming Native Perennials

by Clement Kent

Cultivated perennials are great, but they often bloom brightly for just a week or two. That's one reason highly inbred "everblooming" annuals are so popular. But there are many natives that can be coaxed to bloom again, flower more abundantly or change their flowering form with a few interventions from us.

For example, *Coreopsis verticillata* (threadleaf coreopsis) has excellent, low-growing masses of golden blooms in July and early August but then leaves us with its attractive foliage – unless we take out scissors or shears and cut it back to remove the old flowering stalks. That's what I did with the plant in my kitchen window-box.

"Deadheading" used to refer to long-haired people in tie-dyed clothing travelling long distances to get stoned at Grateful Dead concerts. However, both before and after the summers of love, the summers of gardening have been brightened by removing old flowers, as they go to seed, to encourage new buds to grow. I do this every spring with some *Viola* spp. (violets) in my garden, but I don't usually have time to do it with the masses of April-May bloom from *Viola sororia*, *V. labradorica* and *V. canadensis*. Have you deadheaded your violets? If so, were you able to prolong the blooming season?

The "Chelsea Chop" (**https://www.rhs.org.uk/pruning/chelsea-chop**) is usually done in late May or early June, around the time of the Royal Horticultural Society's (RHS) Chelsea Flower Show. As the RHS tells us, cutting back otherwise leggy perennials at that time causes them to branch out with more flower stalks and to stay a bit shorter. It recommends "the chop" for *Echinacea purpurea* (purple coneflower), *Helenium* spp. (sneezeweeds), *Phlox paniculata* (fall phlox) and *Solidago* spp. (goldenrods). In my street-side garden, I have goldenrods that would love to grow to two metres (six feet) and flop onto passersby. With two chops (May and June), I get compact bundles of bloom instead.

Photographs by CLEMENT KENT, CC-by-SA 4.0

Coreopsis verticillata

The purple panicles of ironweed (*Vernonia novoboracensis*) want to grow to 2½ metres (eight feet). Two chops can produce nice branching, with as many as six flower stems per original stalk and a blooming period that will start a bit later than usual but last until early September.

Why does the Chelsea Chop work? The story goes back, as so many do, to Charles Darwin. In 1880, he and his son Francis published *The Power of Movement in Plants*. They had carefully experimented with many kinds of vines, seedlings and plants such as sensitive plant (*Mimosa pudica*) and Venus flytrap (*Dionaea muscipula*). They showed that the youngest shoots from grass seeds would bend toward the light only if sunbeams fell on the very tips of the shoots; the bending occurred in the part of the stem below the tip. They advanced the theory that a message was sent from the shoot tip downwards. After looking at hundreds of mobile plants, Darwin said, "I think that I have succeeded in showing that all the more important great classes of movements are due to the modification of a kind of movement common to all parts of all plants from their earliest youth." [Darwin to DeCandolle, 28 May 1880, in Life and Letters of Charles Darwin, Vol II., edited by Francis Darwin, p. 506.]

Photographs by CLEMENT KENT, CC-by-SA 4.0

Goldenrod blooms with ironweed in the background

Inspired by Darwin's ideas, 20th century scientists looked for the

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Beck, Lewis C., James E. De Kay, Ebenezer Emmon, Ebenezer Emmons, James Hall, J. W. Hill, W. W. Mather, et al. 1842. Natural History of New York. Albany: D. Appleton & co. and Wiley & Putnam. https://www.biodiversitylibrary.org/page/28734546. Public Domain

*Darwin grew wild cucumber (*Echinocystis lobata*) from seeds sent to him by the famous American botanist Asa Gray. He studied the movement of its tendrils intensely.*

"message." Danish botanist Peter Boysen Jensen showed in 1910-1912 that the message came from the shaded part of the tip and was transmitted by some kind of dissolved substance. In 1928 Dutch botanist Frits Marmolt Went captured the substance in tiny blocks of gelatin. The substance was named auxin, from the Greek αὔξειν or auxein, meaning "to grow or increase." Went and others isolated an auxin compound, indole-3-acetic acid (IAA), which is now routinely used in horticulture. Later, powerful chemical mimics of auxin like 2,4-D and 2,5-T were created and used as herbicides.

Auxin was the first plant hormone discovered. In addition to its role in helping stems turn toward the light, it does many other jobs. One of them is to help stems, leaves and buds know where they are in the aboveground architecture. Just as the very tip of the grass shoot makes auxin to signal to the stem below, so each growing tip on a plant sends auxin signals to parts below. The large terminal bud sends the most IAA down; buds lower on the stem sense it and are "told" not to grow so much.

This is why the Chelsea Chop works. Normally, the tip of the stem of *Coreopsis* or *Solidago* tells buds further down to stay dormant. But, if a wandering deer or bison nibbles off

Photograph by CLEMENT KENT, CC-by-SA 4.0

A ruby-throated hummingbird visits a beebalm.

Photograph by CLEMENT KENT, CC-by-SA 4.0

"The Spigelia marilandica *flower stalk above bloomed on September 4, 2024. I had left it alone previous summers, gathering seeds, but this summer I plan to cut the June stalk in the half-day sun location to see if I get better rebloom," says Clement Kent.*

the tip, the lower buds are released from auxin inhibition and begin to grow. If it's not too late in the spring or summer, they will form flower buds and bloom. If you're looking for a truly North American phrase, rather than "Chelsea Chop" try "Bison Breakfast" or "Deer Delicacy" on your gardening friends.

The RHS mentions purple coneflower as a good candidate for chopping. I'll add beebalm (*Monarda* spp.), a much-loved hummingbird magnet that gets leggy and flops in my garden. Deadheading keeps it going much longer.

Another hummingbird flower I'm intensely fond of, for its beauty and shade tolerance, is *Spigelia marilandica* (Indian pink), called *ala imokhinsh* by the Choctaw peoples, *unsteetla* by the Cherokee and *mi-ka-k'e* by the Osage. These names translate into tonic or medicine (the noxious roots were used as a vermifuge), or starflower. Formerly found only as far north as New York State, starflower is now hardy in southern Ontario. In my Toronto garden, *Spigelia marilandica* has been growing in half-day, one-third-day or tree-filtered light for three years.

Photograph by CLEMENT KENT, CC-by-SA 4.0

White phlox

I leave you with two other native perennials I chopped last year, which I will chop harder this year: obedient plant (*Physostegia virginiana*) and garden phlox (*Phlox maculata*).

Happy chopping!

Clement Kent *is an adjunct professor of biology at York University, co-founder of the Parkdale Horticultural Society and Project Swallowtail, a NANPS director and author of* How to Make a Pollinator Garden.

Photograph by CLEMENT KENT, CC-by-SA 4.0

This obedient plant disobediently flopped sideways and grew new shoots.

Photograph by CLEMENT KENT, CC-by-SA 4.0

A second stem stayed upright and responded well to a chop.

New & Noted

A Trillion Trees: Restoring Our Forests by Trusting in Nature
by Fred Pearce
North American edition:
Greystone Books, 2022

Fred Pearce's *A Trillion Trees* offers an alternative perspective on how best to reforest the earth. He eschews simple narratives, and there's nothing simpler than "plant a tree, save the planet." Instead, tree planting, as Pearce knows, is imbued with complexity. He courageously strides into the tangled thickets of this complexity in his book.

An interview with the celebrated Canadian anthropologist, Wade Davis, aired on CBC radio in Canada on January 6, 2025. Davis spoke as he walked Bowen Island in British Columbia, where he now lives. He observed that the entirety of the island was clearcut in the 20th century and yet, it is now, once more, covered with large trees. He sees this as evidence of how robust nature is. Davis also reflected on the resurgence of nature during the Covid epidemic, commenting "just how capable the earth is [able] to regenerate."

Pearce aligns with Davis's perspective, also touting the resilience of trees: "Trees are not passive victims of our assaults. Everywhere they fight back to restore their domain." He wants more trees, but he sees intensive planting as the wrong way to achieve that goal. "A planet with a trillion more trees would be a much better place," he writes. "My problem is not with the ambition of a trillion more trees; it is with the word 'planting'." Pearce chafes at the expense of growing nursery trees and then putting them in the ground. He sees a grand global effort to plant trees as entirely unnecessary: "We don't have to do the planting. We shouldn't do the planting. Nature will mostly do it for us. And she will do it better. If we stand back and give them room, forests will regrow."

Nature, in large parts of the world, including most of eastern North America, returns inevitably to trees without our help. I've lived long enough to witness this return over the decades in my corner of the continent north of Lake Ontario where diverse mixes of trees appear – unbidden, unplanned, unplanted – along roadside verges and on abandoned farmland. I agree with Pearce that nature, left to its own devices, can do much of the tree planting for us. However, I diverge somewhat from this model when considering how best to manage trees in towns and cities. In urban centres we need to be involved. Tree planting along roads, boulevards and on commercial and residential properties needs to be planned carefully, informed by considerations that include the ultimate size of the trees and the species mix. Perhaps in some of our larger urban parks we can let nature take the lead, but generally people need to continue to exercise control over which trees go where.

Pearce's criticism of tree planting is sure to antagonize lots of people. Tree planting has achieved almost unassailable status in our societies as a major pillar in the fight against climate change and in nature restoration. To question tree planting, or question how it is done, is to invite rebuke.

In parts of the world – Pearce mentions Israel and sub-Saharan Africa – we sometimes plant in landscapes that don't ask for trees and don't want trees. Deserts and savannahs sometimes want to remain deserts and savannahs, and they support biodiversity that forests deny. But perhaps most cogently, we exercise hubris in believing that we can do better than nature – that we are better arbiters of what trees to grow than nature is.

I think that prominent among the welter of good intentions surrounding tree planting is a basic ignorance of ecological succession: meadows to shrublands, shrublands to first-growth forests, first- growth forests to second-growth forests and, if we allow it, the achievement of old-growth forests. This is nature's plan in eastern North America and much of the world. Like the maturing forests of Davis's Bowen Island, many of the forests we hike today – the forests that calm us, beautify our landscape, modify our climate and serve as homes for wildlife – are growing naturally on land that was historically clearcut.

Pearce also serves up the heretical possibility that planting large numbers of trees may not reduce climate warming. He doesn't quibble with the ability of trees in urban heat-islands to cool their surroundings. But he cites research suggesting that, globally, trees may actually warm the climate.

He notes that dark boreal zones cloaked in trees absorb heat while adjacent snowy barrens reflect it. He delves into the complex science of tree chemistry and finds, among other things, that trees release lots of methane, the second most important greenhouse gas. "Trees, it turns out, make methane in their foliage, in their trunks and by feeding raw materials for methane generation to the microorganisms living among their roots," he writes.

He also explores the importance of

VOCs (volatile organic compounds) that trees release through their stomata. These VOCs are thought to help create the clouds that cool the climate and recycle moisture that trees give off. Pearce wonders about the synergy between VOCs and methane. Does the cooling produced by VOC-seeded clouds balance the warming caused by that methane? He advocates more research to answer these questions about tree transpiration or, as he calls it, "the forests' breath." He calls for "more consensus-busting scientists who are just amazed at the versatility and sheer cleverness of trees."

Regardless of whether trees have a net warming or cooling effect on the environment, Pearce sees an essential need for a trillion more trees because of their role in moisture recycling. He cites mounting evidence that major droughts occur because of deforestation upwind from the affected areas. Forests transpire enormous quantities of moisture into the atmosphere and that moisture eventually returns to earth as precipitation. In short, forests bring rain. Pearce sees the loss of moisture recycling in much of the world as a more imminent threat than global warming. Groundwater is depleted, crops fail and civil unrest often follows.

Millions of people depend on distant forest transpiration. Cut the forests and vital water supplies wane. In South America a massive conduit of moisture above the Amazon, called the "flying river," is sustained by water released by trees. Like the loss of glaciers that feed mountain streams, the loss of trees upwind diminishes the moisture-delivering capacity of this aerial river, with potentially dire consequences downwind.

A trillion more trees would increase the amount of moisture that quenches the thirst of our crops and our cities. Pearce advises that this would largely be accomplished by allowing more room for trees to re-establish naturally. Again, "Nature will do much of the work," he says.

Pearce visits disparate parts of the world to critique the state of reforestation in various countries. As I read his findings, I was struck repeatedly by how complex the issues surrounding trees are. In Canada, for example, he finds simultaneous claims that deforestation is dire and, conversely, that tree cover continues to blanket much of the country. He seems to come down somewhere in the middle, finding that 90% of the Canadian landscape that was forested at the end of the Ice Age remains forested today.

Photograph by DON SCALLEN

*American elm (*Ulmus americana*)*

The Canadian government contends that widespread deforestation is not happening because forests lost to cutting, insect outbreaks and fires regrow. This is essentially correct, but Pearce notes the fundamental differences in recovery between logged forests and forests lost to fire. Much of the biomass is removed from the system during logging, for example, and regrowth after logging may be inhibited by the disruption of sub-surface fungal networks. Moreover, fire resets the system by opening pinecones and creating conditions necessary for herbaceous plants to grow. Blueberries and huckleberries that feed birds and mammals are an example.

Pearce also addresses the issue of power stations fueled by biomass from trees. Unsurprisingly, such power generation is touted as renewable, because trees grow back. One power station in Britain "sends into the air each year, more carbon dioxide than the entire emissions of 124 nations," according to Pearce. The trees come largely from the southern United States. And this is where the logic of "renewable" gets murky: there are no guarantees that the cut forests will be replaced and, of course, it will take decades for any newly planted forests to sequester the carbon released from mature forests. Beyond this, there is the fact that replanted forests are usually species-depauperate plantations and far less biodiverse than natural forests.

In the latter chapters of his book Pearce extolls the knowledge of

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Indigenous custodians of forested landscapes around the world. He looks at aerial photos of the Amazon and concludes that the greenest areas are those managed by "assertive Indigenous communities."

Pearce decries the penchant of some conservation groups to celebrate "nature without people," suggesting that the presence of Indigenous people is somehow anathema to tracts of real "wilderness." He quotes from a 2018 book by M. Peters of the New York Botanical Garden called *Managing the Wild*: "Local people know a lot more about how to manage tropical forests than we do."

An activist named Guy Reiter of the Menominee nation in Wisconsin puts this sentiment succinctly, "If you live in a forest, you pay attention to things." The Menominee are not averse to managing their forests. Some trees are cut, leaving others to continue to grow and to reseed the harvested areas.

Indigenous forest management has merit in many parts of the world. Alongside these examples from the Amazon and North America, Pearce describes local people living in sustainable relationship with forests in Nepal, Guatemala and Congo. I suggest though, that these successful forest management models depend, at least in part, on low population densities. Most of the largest, healthiest forested tracts on the planet are thinly populated. I wonder if their sustainability might be threatened if the number of inhabitants increased significantly.

Fred Pearce gives us a lot to think about in *A Trillion Trees*. Some of his ideas will raise the ire of conservationists who have invested in the standard view of tree-planting as one of the finest things we can do to mitigate climate change. Others, I hope, will step back and consider the value of letting nature take the lead in reforestation.

Mitigating climate change, enhancing biodiversity and working towards a planet with a trillion more trees are goals most of us can agree on. The ways to accomplish these goals are unavoidably complex, however. Pearce challenges our preconceptions and invites us to consider new ways of thinking about trees and the salvation they offer us.

Review by Don Scallen, a regular contributor to The Blazing Star.

Photograph by DON SCALLEN

*White oak (*Quercus alba*)*

Continued from page 1 – **Sassafras**

the north it is often much smaller. It can form pure stands but also grows happily with American sweetgums (*Liquidambar styraciflua*), fleshy-fruited American persimmons (*Diospyros virginiana*), flowering dogwoods (*Cornus florida*), towering American elms (*Ulmus americana*), oaks (*Quercus* spp.) and hickories (*Carya* spp.).

Sassafras albidum is alone in its genus. It's one of the few plants in the Laurel family in North America. Sassafras hesperia is extinct, known only from fossils in the west.

The native range of *S. albidum* is eastern North America from southern Ontario to Florida and eastern Texas. Sassafras grows in 34 states, where it goes by many colourful names, including mitten tree, cinnamon wood and smelling stick. On the streets of London, England, where sassafras tea was sold as a morning beverage, it was called saloop. The name ague tree harkens back to its old usage as a cure for ague (malaria).

One of my earliest encounters with sassafras was during a visit to Backus Heritage Conservation Area, a historic, well-preserved forest on the north side of Lake Erie. Some of the oldest living trees in Ontario are found here, including Carolinian species that are rare in the province. In the shade of the forest, I identified a slender tree by its mitten leaves as sassafras. I picked a tiny branch and inhaled its delightful, spicy scent. It was love at first sniff! The scent is pervasive in all parts of the tree.

Another great place to experience sassafras is High Park, a 161-hectare (400-acre) park in the heart of Toronto, Ontario. There it forms a small colony on a bank leading down to Grenadier Pond.

This fascinating Carolinian tree has a storied past that I soon began to explore, often with a small twig in my pocket for inspiration. I found older sassafras trees along the busy Niagara Parkway while on an autumn drive. Their red leaves were show-stopping, even among the many colourful old trees along this scenic route on the Canadian side of the Niagara River.

Sassafras albidum is best planted as a young sapling because of its tap root structure. Here in Ontario, I've had a hard time finding it in native plant nurseries, perhaps for this reason. The ones I saw listed last season were snapped up quickly, but I managed to get one from a nursery's reserves. Sassafras works well in larger native plant projects and large cultivated gardens. It grows in full sun or part shade, often in woodland settings where the soil is slightly acidic, although the tree is, reportedly, tolerant of dry and sandy soils. Very few serious diseases or voracious insects plague this native species.

Photograph by MARY ELLEN IRVING

Catherine Goddard: "This is a prized possession of mine. This contact cyanotype photograph of a sassafras leaf was made decades ago by my artistic gardening friend Mary Ellen Irving. Cyanotype, which creates Prussian blue prints, is one of the earliest photographic techniques. This unique piece of artwork was taken with a long exposure. Note the clear alternate venation in the leaf."

Over 20 species of birds, including wild turkeys, enthusiastically feed on sassafras fruits. It is a larval host plant for the spicebush butterfly and the tiger, Palamedes and pale swallowtails.

Given how widely this plant has been utilized over the centuries both in North America and Europe, it's a wonder we don't appreciate it in the wild or see it in planted landscapes more often. When planning your next tree planting venture, consider the adaptability, usefulness and sheer beauty of Sassafras albidum. It may be difficult finding it for sale, but it will be well worth the search.

Catherine Goddard *engages in ecological, environmental and gardening activism through volunteer work in her hometown of Guelph, Ontario. She helped establish the Guelph Tree Trust, working with other tree lovers to save legacy trees. Catherine highly recommends the reference book entitled* Native Trees, Shrubs and Vines for Urban and Rural America: A Planting Design Manual for Environmental Designers*, by Gary L. Hightshoe.*

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