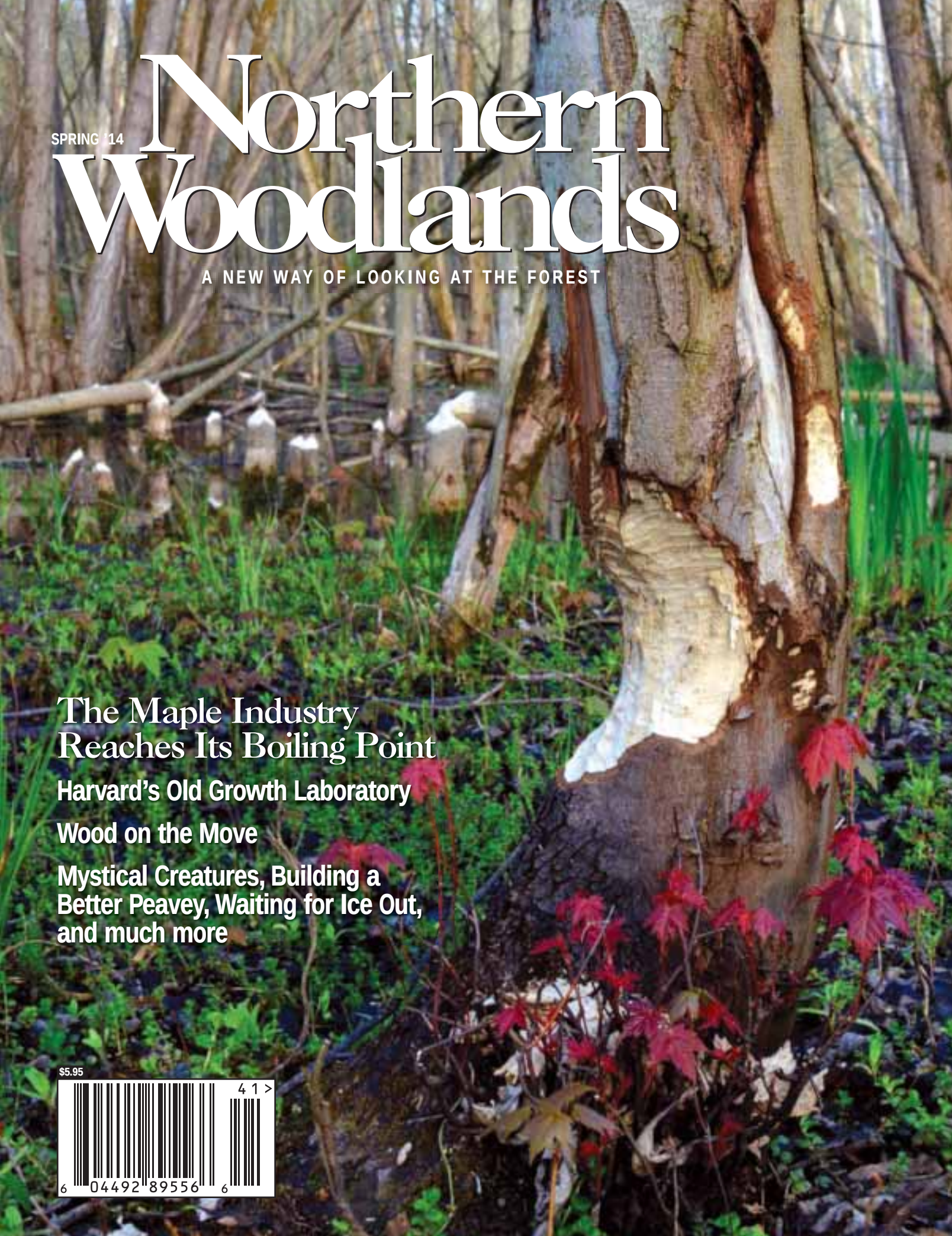

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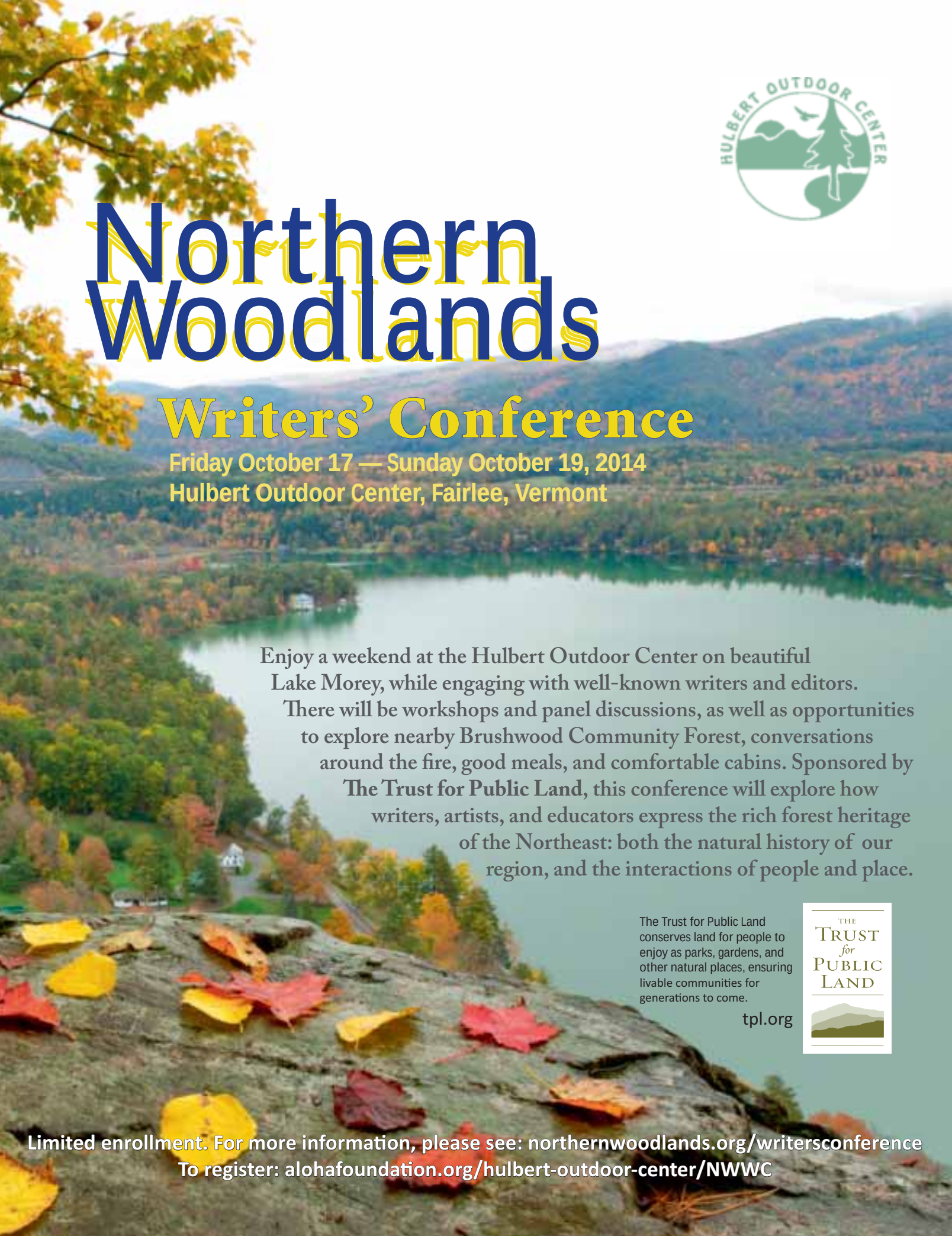

Northern Woodlands

Writers' Conference

Friday October 17 — Sunday October 19, 2014
Hulbert Outdoor Center, Fairlee, Vermont

Enjoy a weekend at the Hulbert Outdoor Center on beautiful Lake Morey, while engaging with well-known writers and editors. There will be workshops and panel discussions, as well as opportunities to explore nearby Brushwood Community Forest, conversations around the fire, good meals, and comfortable cabins. Sponsored by **The Trust for Public Land**, this conference will explore how writers, artists, and educators express the rich forest heritage of the Northeast: both the natural history of our region, and the interactions of people and place.

The Trust for Public Land conserves land for people to enjoy as parks, gardens, and other natural places, ensuring livable communities for generations to come.

tpl.org

Limited enrollment. For more information, please see: northernwoodlands.org/writersconference
To register: alohafoundation.org/hulbert-outdoor-center/NWWC

on the web WWW.NORTHERNWOODLANDS.ORG

THE OUTSIDE STORY

Each week we publish a new nature story on topics ranging from meat-eating trees to porcupine mating rituals.

EDITOR'S BLOG

… Rather than providing clarity, "scientizing" an issue often leads to greater intellectual uncertainty. More research reveals previously unknown complexity and more questions. (From "Should I Burn Wood?")

WHAT IN THE WOODS IS THAT?

We show you a photo; if you guess what it is, you'll be eligible to win a prize. This recent photo showed a chaga mushroom.

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Cover Photo by Mandy Applin

Photographer Mandy Applin took this photo on a warm mid-April day near Bushnell's Basin, New York. "I was in the woods looking for trillium flowers to photograph and was drawn to this wetlands by the sound of spring peepers," said Applin. "I decided to walk the perimeter of the pond and came upon this interesting and picturesque harvest site."

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from the center

In Fairlee, Vermont, there's a 540-acre stretch of former glacier called Lake Morey. If a loon on that lake pointed his bill northwest, flew straight as the idiomatic crow, and kept flapping for about 12 miles, he'd end up at Northern Woodlands' office.

That has, as far as I'm aware, never happened. However, this coming October, our office will be going to the loons. On the weekend of October 17-19, on the shore of Lake Morey, Northern Woodlands will hold our first annual writers' conference. The purpose of the event is to celebrate the rich heritage of nature writing in the Northeast.

There will be workshops, panel discussions, and conversations with writers and editors. Author John Elder will be the keynote speaker, and *Northern Woodlands* editor Dave Mance will also be participating. There will be workshops for educators interested in place-based education, which will help link engaging lessons to Common Core and Next Generation science standards. And we'll have some fun extras, as well – join me for a woods walk, anyone?

The Hulbert Outdoor Center is serving as our host, which means that, for at least one weekend, no writers will suffer for their craft – participants will enjoy snug cabins, good food, and warm fires.

The exclusive sponsor of the conference is The Trust for Public Land. This is the same group, appropriately enough, that has taken a leadership role in conserving nearby Brushwood Community Forest, the diverse woods and wetlands that lies just to the west of the lake. The Trust for Public Land's mission is to conserve land for people to enjoy as parks, gardens, and other natural places, ensuring livable communities for generations to come. (Learn more at tpl.org.)

I'm excited to attend this event, and I hope that a number of you will be, as well. Visit our website (www.northernwoodlands.org) to register and to learn the final details.

So mark your calendars. And, in the meantime, happy spring.

Elise Tillinghast, *Executive Director, Publisher*

The mission of the Center for Northern Woodlands Education is to advance a culture of forest stewardship in the Northeast and to increase understanding of and appreciation for the natural wonders, economic productivity, and ecological integrity of the region's forests.

features

departments

A Look at the Season's Main Events

By Virginia Barlow

	March	April	May
FIRST WEEK	Winter stoneflies are very cold tolerant. Adults of several species emerge from streams now and are often seen wandering around on top of the snow. Even the larvae are more active when the water is cold / Cedar waxwings may come to town to feast on crabapples / Ravens are rehabilitating their old nests. The female will soon be incubating four or five speckled blue-green eggs while the male perches nearby and feeds her. Both adults will feed the chicks	At 12 a.m. on the first day of the month, the fur of both short- and long-tailed weasels changes from its winter white to spring brown / Wild leeks are ready to eat / The earliest mosquitoes have overwintered as adults and they usually are not much of a problem – yet / Killdeer return. It's not easy to tell male and female killdeer apart, plus both will soon incubate the eggs and care for the chicks / Common loons will arrive very soon after ice disappears	Deer are shedding their dense winter fur and replacing it with a sleek reddish coat that has no undercoat / Cabbage white butterflies can be seen flying from now through September. They sometimes produce three broods / Bears are seeking out the opening buds of beech, poplar, and red oak. They don't seem to like sugar maple buds / Deer mice populations are on the rise as the first of several litters is born, each consisting of three to seven babies
SECOND WEEK	Bluebirds will soon be looking for a nice, dry, clean place to raise a family. They prefer a neighborhood that features a fair amount of open land / Like all fish-eating ducks, the hooded mergansers now moving north have serrated bills for holding their slippery prey / Many sodium-deficient mammals seek out antlers and the bones of freshly killed deer and other mammals / Heavy snow will send robins and red winged blackbirds to sumac berries and birdfeeders	The baby opossums being born now are ridiculously small: 20 of them could fit into a teaspoon. They have to crawl about 3 inches to the pouch, and will be on the nipple for two months / This year's litter of woodchucks is being born. The parents may already have been out nibbling grass / Mink are giving birth to their three to six young, not far from water / Winter wren nests are usually hidden among the roots of overturned trees and are very hard to find	May 10: Saturn at opposition. The ringed planet will be at its closest approach to Earth and its face will be fully illuminated by the Sun. Its rings and brightest moons can be seen with a medium-sized telescope / New leaves of ox-eye daisy are good in salad, though they do have a strong flavor / Scarlet tanagers capture insects by gleaning and grabbing them while hovering or they may hawk flying insects. They beat their prey against a branch to kill it
THIRD WEEK	Male striped skunks are on the prowl and can cover a lot of territory – unless they get hit by cars. Females will give birth to six to eight skunklets in about two months / Moose are shedding their long winter coats. The new fur will continue to grow over the summer and be ready for next winter / The courtship displays of the woodcock can now be heard. You can watch them at dusk, if you slowly move toward the strange "peenting" sound made by the male	April 15: A total lunar eclipse as the Earth's shadow passes in front of the moon. The maximum eclipse is at 3:46 a.m., when, if it's clear, the moon will appear to be rusty red / Marsh marigolds are blooming in wet pastures and road ditches / The first hot day may inspire tree swallows to check out birdhouses. They'll be cheerfully circling and chipping and circling and chipping and… / Also, on a hot day, you'll see that suddenly the hills look green	Despite its name, a bright yellow head is the most conspicuous feature of the blue-winged warbler. Listen now for its song, a buzzy "bees buzz," the second note lower than the first / Red-tailed hawks are feeding young. Generally they eat rodents, but will eat almost all forms of animal life, ranging from insects to baby woodchucks / Ovenbird nests, with their sideways "oven door" entrances, are on open ground, tucked into a cover of fallen leaves
FOURTH WEEK	Great blue herons usually nest in colonies, unlike most other birds. Also, unlike most other birds, these herons reuse nests, year after year / Like its relative, the mourning cloak, the Compton tortoiseshell butterfly overwinters as an adult. They don't need flowers because they feed instead on rotting fruit and tree sap / One female spotted salamander lays two or three egg masses, about 2-1/2 inches across. These swell to 4 inches and may be clear or milky	April 22, 23: The Lyrids meteor shower peaks / The chipmunks now being born each weigh about 3.4 grams. They'll be weaned at roughly 50 grams, in about five weeks / The weird, unmistakable sound of the American bittern may now emanate from marshes. It's a pounding sound, a bit like someone driving in a fence post / Red fox kits spend their days playing and play-fighting with each other at the entrance to their den	Little star-nosed moles are ready to leave their mothers and fend for themselves / If picked when very young, wild grape leaves are as edible as the ones in jars at the supermarket. Use them to wrap rice or meat / Most newborn fawns are walking and nursing when less than one hour old / A male leopard frog's call sounds like a long snore, lasting up to three seconds, but these frogs make several other sounds, as well / Bluebirds are leaving the nest

These listings are from observations and reports in our home territory at about 1,000 feet in elevation in central Vermont and are approximate. Events may occur earlier or later, depending on your latitude, elevation – and the weather.

By Dave Mance III

Some of the timberland my family owns abuts state forest. On our side of the property line is a thoroughly ordinary mix of beech, red maple, and white pine. Mixed age, but pretty young; the whole thing was probably pastureland 100 years ago. We've been harvesting firewood there to try to release some of the stems with sawlog potential, but there's just not a lot to work with.

On the state's side of the line is a mature stand of white pine and hemlock, and by mature I mean ancient and archetypal. A storybook forest where trees tower so mightily that you can't see the tops, trees fat enough that it would take three people linking hands to hug them. The forest floor is pitched and wavy like an ocean, littered with mossy limbs. It feels different. Special. When I'm in the area for no particular reason, I always gravitate here.

The only thing separating the two forest stands is a line of red boundary paint, so it seems likely that it was all once big and old – what ecologists call a climax forest. When our side was cleared, the clock was reset: pasture became weeds and berry canes, which became fire cherry and white pine and popple, which, in turn, became the mix we have today. Now we're playing God – encouraging the tree species we want, discouraging those we don't – while right across the line the vicissitudes of time have produced and maintain a remarkably different forest.

I was thinking of this place after reading David Foster's piece on the old growth Pisgah Forest in southwestern New Hampshire (page 40). In his story, Foster tells of Richard Fisher, a man who, nearly 100 years ago, spear-headed an effort to preserve that forest so it could be used as a research laboratory. This whole idea of doing nothing and simply observing how nature changes itself is such a quiet, graceful idea – especially considering the historical context. It made me admire Fisher and the people who carry on his vision.

We probably don't celebrate big, old, unmanaged forests enough in these pages. Part of this is because there just aren't a lot of old growth stands left out there, and thus relatively few stories to tell. But part is because we get so focused on promoting the working landscape that we forget to pan out and see the whole picture. It's a hazard that any activist promoting any cause faces, and when it happens the message gets parochial and a touch rote.

I watched an example of this a few years back at a teacher's conference, where a forester was using a stump cookie to explain to a teacher why we had to harvest trees. See how the growth rings are fat in the middle? The tree had a lot of light and was healthy then. See how the growth rings are small near the edge? The tree was overcrowded and in decline, and by cutting this one we made the forest healthy; we had to weed the garden. This is a fine point to make, of course, if you're talking to a landowner about crop trees in their working forest, or a 10-year-old watching their first tree fall, but the teacher's skeptical look hinted at time spent amidst giant storybook hemlocks. "However did the forest survive before humans?" she asked, then moved on to the next booth.

I once heard someone say that the key to improvisational comedy is that there's no such thing as "no" – you just take the word out of your vocabulary and the concept out of your head. When someone posits an idea you say "yes, and." It just keeps going around and around like this as the narrative builds. One idea doesn't have to be opposed to the other; they can build on each other to help the whole story grow.

We want the Northeast to be a place where people build a complex narrative about the land – where kids don't grow up thinking that heat comes from an oil truck and food comes from a grocery store and boards come from Home Depot. Yes, and we want there to still be places where the trees are huge – where we can walk to get a sense of bigness beyond ourselves, where researchers can study how nature works outside of human interference. Yes, and . . .

Correction:

The photograph of people skiing and the photograph of the man pointing to a track with his ski pole on page 59 of the winter issue should have been credited to Jo Anne Wazny.

Personal Points

To the Editors:

Thanks in particular for the Winter 2013 issue of *Northern Woodlands*. I always enjoy reading the magazine cover to cover, but it's mostly a cerebral enjoyment. This time it touched many points of personal interest.

For instance, I've always wondered about those stone chambers and wanted to learn more about them. Never got to it, so I appreciate Benjamin Lord's informative article and photos. Then, as a member of a family of birdwatchers, I understood and identified with Howard Norman's "Theology of Birds." Mike Freeman's feature about clear cutting put a rational perspective on something I've long been concerned (and ignorant) about. Anne Schwartz's report, "Linking a Landscape," discussed a subject I have personal concern for, as well as frustration with: we live in a wildlife corridor that's too small for any support organization to care about. So it's good to know that someone is paying attention to another one and working to keep it open. The editorial about hunting also struck a chord. As a non-hunter, it's worth knowing that hunters can be empathetic and respectful toward the animals they kill. I long ago learned to understand and accept hunting intellectually but have yet to emotionally embrace it. This article helped.

Other bits of the magazine were as interesting and informative as usual. Looking forward to next year's offerings!

Carolyn Haley, East Wallingford, Vermont

To the Editors:

My husband and I enjoy and learn a lot from all the great articles and stories in your magazine. We have woods to manage, so we especially enjoy articles about trees and logging. We are both avid hunters, and especially like the fact that your magazine has treated this subject with the respect we feel it deserves.

Dottie Matusewicz, Chesterfield, Massachusetts

Overstory Accession

To the Editors:

I enjoyed Virginia Barlow's "The Overstory" essay [Autumn 2013] on northern red oak. I'd like to add something to her list of its many uses that may interest readers of *Northern Woodlands*: growing edible and medicinal mushrooms, including oyster mushrooms, and especially shiitake. This latter mushroom is particularly adapted to grow well on all species of oak, with the upper limbs of trees being especially suited to this high-value forest crop. Logs of four to ten inches in diameter must come from a recently alive, disease-free tree, and have fully intact bark. After felling, logs must be allowed to rest for two weeks so that natural fungicides in the sap can break down. If inoculated within weeks to a maximum of two months thereafter, they will provide years of mushroom crops, if cared for. An internet search will turn up many tutorials on how to do this and sources for mushroom supplies.

Erik Hoffner, Ashfield, Massachusetts

To the Editors:

Some five years ago, one of my field naturalist students at the University of Vermont brought a seven-inch-diameter sumac log to our writing class – large for a sumac – and asked if I could make something from it. It made a lovely small bowl, and since then I've been on the lookout for large sumacs. At craft fairs, people are always surprised when they find out the name of the colorful yellow-green wood since so many people view sumac as roadside junk wood. I've also turned nice, and even larger, bowls from buckthorn, another wood with a bad reputation.

Toby Fulwiler, Fairfield, Vermont

Sumac bowls made by woodturner Toby Fulwiler.

Squirrels are Nuts

To the Editors:

Those interested in the recent article in *Northern Woodlands* by Susan Morse [Winter 2013] on squirrels, as I was, may be interested in the following additional information.

Oak trees, as well as many other trees, bloom and fruit intermittently: the white oaks every two years, and the reds every three years, give or take. This is believed to prevent seed predators from becoming too numerous and eating up those which may grow new plants. Oak nuts have tannins, which also retard predation.

Squirrels have learned to partially defeat this strategy by storing nuts and recovering them in off years. White oak nuts may be eaten immediately, as mentioned in the article, while red oak nuts are typically stored for later recovery to allow the heavier amount of tannins to leach out.

Ron Hummel, Cornwall Bridge, Connecticut

To the Editors:

Immediately upon seeing the cover of the Winter 2013 issue of *Northern Woodlands*, I thought of Vermont's greatest nineteenth century writer, Rowland E. Robinson, who described the red squirrel as flinging, "a shower of derisive jeers and snickers from the trunk of a great hemlock where he clung with spasmodic jerks of feet and tail." Anyone who knows the red squirrel, knows

that's perfect. And you can bet that snow in the air all around the squirrel is from his "spasmodic jerks of feet and tail."

David Budbill, Wolcott, Vermont

The Carbon Dioxide Debate

To the Editors:

Your article, "Carbon Dioxide Fertilization Effect," in the Winter 2013 issue, is so important and informative that it deserves to be reprinted in every magazine and newspaper in the country. In it, a highly accredited scientific study suggests that as the level of carbon dioxide increases, trees are storing more carbon and becoming more efficient in how they use water. This suggests that the planet is not in a "death-spiral" of out-of-control carbon dioxide growth. It may control itself.

Nicholas Ratti, Jr., Bristol, Rhode Island

Great Unknowns

To the Editors:

Your magazine gives me much pleasure and food for thought. The "Lost Histories" article by Benjamin Lord [Winter 2013] reminded me of a story concerning some blind men and an elephant.

We will see what we desire to see, even when the "data" show us otherwise. We should not assume that the "progress" of man has been a straight ascending curve. It is possible that an earlier people had higher developed capacities in certain areas than present man. An example might be the ability to observe the natural world.

Life can be enriched by the presence of some unknowns. Do we need to reduce everything to its smallest part to be explained and defined?

Howard Parks, Hughesville, Pennsylvania

Many Reasons Not to Post

To the Editors:

A sign at the entrance to my woodlot reads, "WELCOME, although motor vehicles are not allowed, feel free to walk."

I was brought up in New England in the 1960s and taught to hunt at an early age. I roamed the woods with or without a gun, exploring, hunting, and learning to appreciate the land. Growing up, I rarely saw "Posted" signs and was able to walk on most land. So when I bought my first piece of land, a woodlot, I vowed it would never be posted. Now, over 30 years later, my woodlot is still not posted and it has been one of the best things I could have done.

I've always believed that if you post your land, the honest people, who you would like to have on your land, will respect the signs and stay off your land; but if you don't post your land, they will be there to help you monitor the activity on your land.

I've had a hunter climb down out of his bow stand to apprehend someone breaking into my camp. If I had posted my land, the offender would have broken into my camp and there would have been no one there to stop him.

Last year, I hired a fellow to come up and dig a well for me. At the end of the day, when I asked him how much I owed him, he said, "Nothing!" I said, "What do you mean nothing?" He said, "I've hunted up here for years and I appreciate that you've never posted your land; you don't owe me a thing."

Whenever I run into someone enjoying the woods and they find out I'm the landowner, they thank me and mention how appreciative they are of the "Welcome" sign. I've met and made many friends on my land and now they are bringing their kids to hike, hunt, and camp (they always ask permission to camp). One fellow I met in the woods logs for me now; and now he is bringing his son up in the woods and teaching him how to run the skidder. His son shot his first deer on my land and I'm happy to know another generation is being taught how to recreate and respect the land.

I sure am glad I never posted my land. It's given me much joy to meet the people who also enjoy my land and who have helped me to maintain it.

Stephen Titcomb, Blue Hill, Maine

Pods and Thorns

To the Editors:

On a recent sojourn to New York's Fort Ticonderoga (which is quite vacant and quiet this time of year), I came across a stand of trees on the southern end of the peninsula that were quite unusual. The ground beneath them was littered with long (12-16 inches), dark brown bean-like pods, which seemed to be a source of food to animals, as some of them were torn apart. The trees themselves were quite large and covered with clusters of large, nasty-looking thorns. Even the twigs at the ends of the branches were thorny.

I was later told that these trees were a type of locust. We have many groves of black locust in this area, especially around old foundations and house sites. Apparently, they were cultivated in the past, although I'm not sure why. The trees at Ticonderoga must be a completely different species if they are locusts, as the locusts that I know have no thorns at all. Could you elaborate?

George Reynolds, Addison, Vermont

Editor Virginia Barlow responds:

I think the trees you found must be honey locusts (Gleditsia triacanthos). I had one in my yard a long time ago and the leaves are exceptionally nice – doubly compound, with many, many tiny leaflets. Apparently, people don't like the thorns and the messy fruits and nowadays there are several thornless and (mostly) non-fruiting varieties that are planted as yard and street trees.

Despite the name, honeybees don't visit honey locusts. They do make honey from black locust flowers.

We love to hear from our readers. Letters intended for publication in the Summer 2014 issue should be sent in by April 1. Please limit letters to 400 words. Letters may be edited for length and clarity.

CHRIS EVANS, BUGWOOD.ORG

Honey locust fruit. They turn dark brown as they age.


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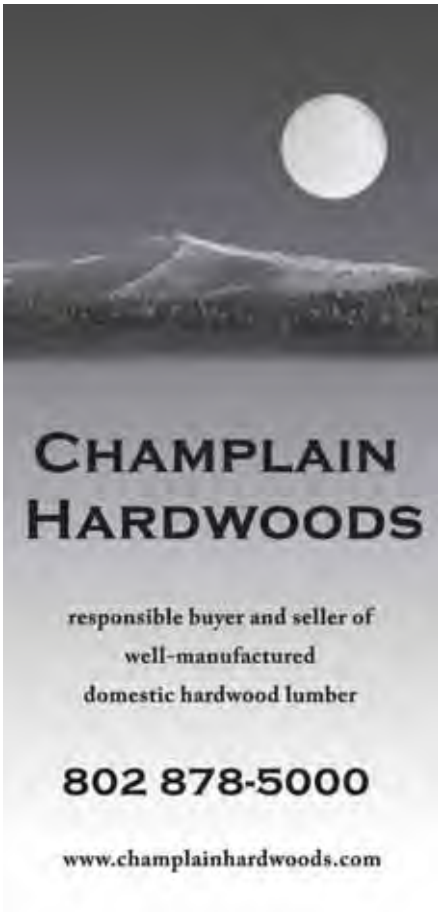
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FOREST PRODUCTS EQUIPMENT

Story by Bryan Pfeiffer

Repro-duck-tion

CHARLES GANGAS

For all the time we spend watching birds during the breeding season, rarely do we get to see birds actually breeding. That's because avian copulation usually lasts only seconds. Birds mate by joining at the cloaca – an opening beneath the base of the tail. We call this union – the male perched and wobbly on the female's back – the "cloacal kiss."

Among ducks, however, there is no kiss. Not even dinner and a movie. (Speaking of which, this column is about to become rated PG – politely graphic.) Male ducks seize upon females in what biologists euphemistically call forced copulation.

As it turns out, male ducks are among the few birds with a penis. But this is no ordinary organ. It's shaped like a corkscrew and resides most of the time inside his cloaca. As a male overtakes a female, he extends his penis into her reproductive tract. This extension happens quickly, in less than a half second in some ducks, a move biologists call explosive eversion. (I warned you.)

Having a corkscrewed penis would seem to be a favorable trait in an aggressive mating system. Favorable to him, at least. Forced copulation presents risks to females, including injury, death, vulnerability to predators, and lost opportunities to mate with more suitable males. It's an example of how males and females rarely share equally the burdens of reproduction.

But in their evolution, female ducks have developed a cunning defense.

BRYAN PFEIFFER

It turns out that the female's reproductive tract spirals in the opposite direction of the male's penis and is outfitted with various cul-de-sacs along its route. Her countervailing tract and its detours present a literal and genetic dead end for an undesirable male. When the female is receptive to a particular male, however, and her body lies prone and relaxed, her tail high and her cloaca exposed, the contours of her tract present no such barrier to fertilization.

Courtship and breeding among wildlife most often feature males competing with other males, employing ornate displays (peacocks) or aggressive rivalry (rams) to attract the attention of a female. That's classic Darwinian sexual selection. But among ducks (and some other animals) males and females also engage in a kind of sexual competition – an evolutionary arms race over who controls *fertilization*.

The shape of her reproductive tract doesn't protect the female from forced copulation and its risks. But it does allow her to control which male helps produce her young. At least that's the working hypothesis of researchers at Yale University. I won't go too explicitly into the details of their experiment, which involves birds at a commercial duck farm and custom-made glass tubes of various shapes mimicking a female's reproductive tract. Maybe you get the idea.

Suffice to say that some of this research is, well, twisted.

Bryan Pfeiffer is an author, wildlife photographer, guide, and consulting naturalist who specializes in birds and insects. He lives in Montpelier, Vermont.

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By Michael Snyder

Why Is It So Hard To Grow Street and Yard Trees?

Let's face it: trees are better off in the woods. Although forest trees – like their more urban counterparts – face many threats to growth and survival, at least in the woods they have the benefit of native soil and face almost no human-built infrastructure. Indeed, while healthy, intact forests contain some struggling and unhealthy trees, many forest-grown trees live and grow quite well for hundreds of years. Most urban trees are lucky to see 20.

But as much as trees are better off growing in forests, urban areas are undoubtedly better off with trees growing in them. Trees are proven, positive difference makers, providing everything from cool shade, clean air, and stormwater attenuation to bird habitat and increased real estate values. As the saying goes, life is a shade better in a treed city. Plus, urban trees function as gateways, connecting people and trees along the forest continuum, from town green to mountaintop. Many benefits come, to both downtowns and more distant woods, when people find something in a street tree that takes them to the back 40 and beyond. It is all good.

Alas, the valuable benefits package that accrues with community trees does not come easily. It turns out humans are very hard on trees: as we develop roads, utilities, and buildings, we make it ever harder for trees to succeed. Proof abounds. Street and yard trees everywhere exhibit ghastly evidence, ranging from wilted leaves and stunted growth to rot.

While the symptoms are readily observable above-ground, about four-fifths of all urban tree health problems stem from less obvious, *below-ground* conditions.

Soil compaction is by far the biggest problem for trees in the built environment. Though not often measured – or even much noticed – it is a pervasive and chronic stressor of trees. Compaction destroys a soil's natural structure by compressing the pore spaces needed for air, water, and roots. Remember the roots? Any limitation on the roots will result, directly or indirectly, in degraded tree health above ground. Even if the soil under a tree is watered and fertilized, the tree won't benefit one bit if soil compaction is limiting growth of its roots and the infiltration and uptake of water.

No tree is immune to the negative consequences of the compacted soil conditions typical of most non-forest planting sites. But tree species do vary in their tolerance to compaction. Accordingly, much emphasis should be placed on picking the right tree for the site. Examples of urban or "street" trees that exhibit some tolerance of compacted soils include red maple, hackberry, hawthorns, red oak, and red cedar. Sugar maple, on the other hand, is particularly intolerant of compacted soils.

Unfortunately, while the causes of compaction may be many, solutions are few. The best chance for success comes when tree plantings – or construction projects around existing trees – are planned to minimize damage to the native soil in advance of site work.

WILLIAM FOUNTAIN

Compacted soil and other root restrictions challenge urban trees.

If you did not plan ahead, hope remains. Homeowners, planners, foresters, and arborists have some tools for soil renovation to improve tree health and longevity in yards, parks, and downtowns.

Most renovation strategies begin by limiting vehicle access with strategic placement of fences and benches, for example. This is to minimize pressure and prevent additional compaction to a tree's rooting area. In some cases, piercing the soil with hydraulic core aerators throughout the rooting volume can significantly enhance aeration and water infiltration. Special tools using high-pressure air can also be used to break up compaction. In cases of extreme compaction in highly space-restricted conditions, breaking, aerating, and mixing of soil with added organic matter may be necessary. And, in instances where foot or vehicle traffic is present, specially constructed soils can be used to combat compaction. Cornell University's patented CU-Structural Soil, for example, uses a mix of gravel and soil (about 80 percent stone to 20 percent soil) to support heavy loads above while allowing tree roots to grow below.

Urban tree planting conditions and contexts vary, so – just as in the woods – good guidance from a qualified local professional is recommended. You might also check out the Vermont Department of Forests, Parks and Recreation's online "tree selector" tool (www.vtfpr.org/urban/treeselectiontool.cfm) that helps users find a tree species that will be a good match for their urban site.

Michael Snyder, a forester, is Commissioner of the Vermont Department of Forests, Parks and Recreation.

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Story and photos by Susan C. Morse

Bear Families in Spring

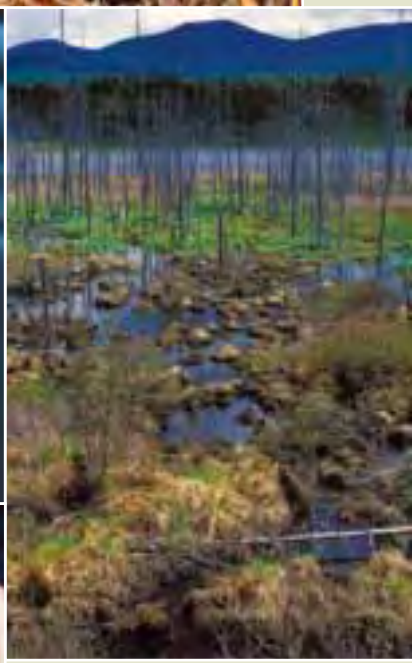
When snow drifts linger into late April and freezing rain challenges new blossoms, mother bears and their infant cubs seek out wetland edge habitats. Seepage areas and vernal pools, as well as bogs, marshes, and beaver flowages offer concentrated foods, which are largely unavailable within the cold woods. In our region, lactating sows eagerly consume the new stems, roots, swelling buds, catkins, and new leaves of a variety of tree species, including aspen, willow, American beech, and eastern hophornbeam. They'll eat the roots, stems, and new leaves and flowers of water parsnip, cattails, swamp thistle, water plantain, pickerelweed, sweet cicely, and water arum, and various spring flowers, as well, including wild sarsaparilla, yellow dandelions, hawkweed, blue violets, golden saxifrage, clovers, lilies, jack-in-the-pulpit, and skunk cabbage.

Aside from tracks in the mud, how can we determine if a sow with cubs has used a given wetland? I look for babysitter trees, usually large hemlocks or white pines. It's long been known that bears cubs will climb large trees to escape predators, but I discovered nearly 40 years ago that certain trees in wetland habitats are used every year by a female with her new cubs. Mother hides her cubs high in the concealing foliage of these large conifers while she forages throughout the wetland nearby. When she returns to retrieve and nurse her young, she keeps them warm in a "daybed" – a goose-nest-shaped depression that is often lined with grasses, pine needles, and other soft materials. Beside a daybed, look for greenish-black scat, which appears different from the fruit and nut-filled feces that we find later in summer and fall. Some scat may be filled with the remains of ants and other invertebrates. Protein-rich insects, including ants, woodborers, beetles, caterpillars, and even snow fleas contribute to a bear's diet as summer nears. Search for rotten logs and stumps that have been torn apart by a bear seeking these valuable foods.

Scent marking leaves the most enduring sign. See if you can find broken, bent over, bitten saplings with black bear hairs stuck within the splintered wood or sap. Such trees may have been straddle-marked and rubbed by the sow seeking to communicate her occupancy of the habitat. Other saplings, especially willow, aspen, beech, and eastern hophornbeam, may appear marked as well, but claw marks and broken tops on these species are evidence of a bear's feeding.

What about the hazards of searching for bear sign in wetlands during spring? Frankly, we are the dangerous ones out there! Our visitations, however well intentioned, frighten anxious mothers and disrupt their delicate energy budgets at a time when the bears can least afford it. Wait to look until July, when bear families don't need the concentrated spring foods of wetlands anymore. By then their foraging takes them throughout forest and glade, wherever summer's cornucopia of fruit, flowers, and nuts may be enjoyed.

Susan C. Morse is founder and program director of Keeping Track in Huntington, Vermont.



Clockwise from top: cub by a babysitter tree, greenup in a wetland, vegetation-filled scat of adult female, hornbeam sapling with bear sign.

[FORAGING]

Spring Nectar: Black Locust Blossoms

The black locust (*Robinia pseudoacacia*) is a woody member of the pea family (*Fabaceae* or *Leguminosae*), and a close examination of its winged flowers, bean-like pods, and pinnately compound leaves will make the relation obvious to any gardener. Native to the forests of the southern Appalachians, it is now naturalized in our region due to extensive cultivation. People often react with surprise when I suggest this plant as a good one for foragers; many have heard that locusts are poisonous, and indeed they are. The leaves, twigs, bark, and roots contain toxalbumins, which can shut down basic cell functions. These parts should never be eaten. There is some debate about the toxicity of black locust seeds. But if you can catch the blossoms during their short season, there is no denying their edibility and unique flavor.

If you plan on harvesting locust blossoms this spring, be ready. Often, the season is well under way by the time the blossoms become obvious, and the blossoms last only a matter of days. Here at the northern edge of the black locust's range, a good crop is anything but guaranteed. The flowers are very sensitive to frosts, and in years when a late frost occurs, there may not be a single blossom in an entire county. One year, I had to travel over an hour south to find a tree in bloom.

But the trees that do bloom are fecund; blossoms spill from every branch. They can be spotted at great distances, their snowy white flowers glowing against the light green backdrop of a spring hillside. And if you can't find them by sight, you may be able to find them by their thick, rich perfume, which can sweeten a whole valley. Unfortunately, most of this bounty lies well overhead and out of reach of the enterprising forager. Only the lowest branches can be harvested, and the thorns on the locust's branches discourage climbing. Still, it usually only takes one or two branches and less than 15 minutes to fill a shopping bag to the brim. The best way to harvest the blossoms is to pull off a whole cluster at its base.

The subtle sweetness of the raw blossoms is almost universally appreciated by those who try them. Just pluck individual blossoms from their stalks. You may be surprised at how addictive the tender texture and sweet nectar can be. In our house, we often plan to pick two bags – one for cooking and one for snacking.

There is not much occasion to use edible flowers in contemporary cuisine. Flowers are most often seen as a garnish rather than a vegetable. But we've found several ways to enjoy them, including this recipe, which captures the richness of this wonderful spring food. Eating the flowers this way feels like eating spring itself.

Benjamin Lord

Baked Salmon in a Locust Blossom Cream Sauce

- 3 cuts salmon, 6 ozs. each
- 2 tbsp. butter
- 1 small shallot, minced
- 1 ½ tbsp. flour
- 1 cup milk
- ¼ tsp salt
- 1 cup locust blossoms (removed from stem)

Preheat oven to 350°. Bake salmon on lightly greased cookie sheet for 15 minutes. While salmon bakes, melt butter in sauce pan. Sauté shallot in butter for five minutes – careful not to burn. Add flour. Stir constantly for two minutes. Add milk and salt. Heat until thick, stirring often. Add locust blossoms. Stir and cook one minute. Serve sauce over salmon with a few fresh blossoms as garnish.

Live Weird, Die Young: The Virginia Opossum

On our back porch, in a pocket of light from the window, was what looked to be an oversized rat wearing white face powder. As it gobbled down cat food, it flashed a demented crocodile grin. My mother shrieked.

This was my first encounter with a Virginia opossum.

This species, still described as "neotropical" by some sources, has been moving north since at least the 1950s. In many parts of the Northeast, opossums (frequently shortened to "possums") are as familiar as squirrels. Yet this is no mere rodent.

Possums are the only marsupials native to North America. Despite appearances, they are closer kin to wombats and kangaroos than rats or Kiss bassist Gene Simmons. Marsupials branched off of the main mammalian family tree long ago, and many of the traits they exhibit offer a window into what ancient mammals were like. Many of these differences relate to reproduction. All marsupials have pouches. They need these because they are not, like most mammals, placental. Their young spend barely any time developing in the mother's body. They're born in a near-fetal state, and the tiny, naked and blind young must make a scramble to the pouch where they can complete their development in relative safety.

Newborn possums are the size of honeybees, and many don't survive the trip to their mother's pouch. Those that do must locate one of 13 nipples, arrayed in a circle with one in the middle. As soon as a baby possum starts to suckle, the nipple swells in its mouth, effectively trapping it in place until it has grown big enough to free itself. Once out of the pouch, the baby possum, along with its littermates, will hitch a ride by clinging to its mother's back.

Females can have as few as four or as many as 25 offspring at a time, of which about eight make it to the pouch. It only takes the young 10 months to reach sexual maturity, and in warmer climates, possums can have up to three litters per year.

Easily the possum's most significant contribution to popular culture is the phrase "playing possum" – but when it comes to feigning death, the possum is anything but playing. Under most circumstances, a threatened possum will bear its (surprisingly numerous) teeth with a hiss or screech. However, faced with a dire enough threat, it up and "dies."

It drops into a near-coma. Its tongue lolls, eyes open but vacant, and a foul green liquid leaks from its anus. It may take a possum upwards of four hours to come out of this apparently involuntary biochemical state.

It's perhaps little wonder that the possum should be so good at imitating death, because death lurks around every corner for this species. Due to heavy predation, and a predilection for becoming road kill, possums typically live only a measly two years in the wild, and even those living in captivity succumb to old age quickly.

And this death rate is despite a few startling immunities. Possums are highly resistant to pit viper (e.g., copperhead, water moccasin) venoms. Research suggests that possums – which will eat snakes, among many other things – are locked in an evolutionary arms race where they are constantly developing new ways to combat snake venom. They're highly resistant to rabies, likely as a result of a slightly lower body temperature that makes it difficult for the virus to thrive.

They also function as tick vacuums. A possum trundling through the undergrowth accumulates a large collection of ticks, but possums are such fastidious groomers that ticks that latch onto them are as good as dead. A dense possum population may even help reduce the prevalence of Lyme disease.

The possum is a consummate opportunist, exactly the sort of middleweight scavenger that thrives in the margins of human society. By all accounts, it is doing well: despite a near-total lack of real winter survival skills, it can be found as far north as southern Ontario. Global warming and the ceaseless march of human development only serve to prime the possum for further range expansion in the near future.

All things considered, the possum may not be the worst hanger-on for humanity to have. It provides a lesson in the extraordinary-as-ordinary. It's easy to disregard the sheer, magnificent oddity of this omnivore, but truth is stranger than fiction, and few truths are stranger than the Virginia opossum.

Kenrick Vezina

[APRIL FOOLS]

Fantastic Animals of the Northeast

Many places have fantastical creatures: the Loch Ness monster in Scotland, Sweden's skvader (half hare, half wood grouse), and, of course, the Pacific Northwest's tree octopus. The state of Wyoming has even gone so far as to declare a hunting season for its mythical jackalope. (It's held on June 31st from midnight to 2 a.m. and prospective hunters may not have an IQ higher than 72.)

Here in the Northeast we have our own incredible beasts, perhaps less universally known, but just as colorful. In older, simpler times, they were front page news.

In August of 1817, a large sea serpent was sighted repeatedly in the harbor of Gloucester, Massachusetts. Dozens of reports were made, although accounts varied radically: the monster was 45 feet long or 100; it had shark's teeth or a horse's head. Sightings as far north as Nova Scotia and Maine fueled belief in sea serpents across the Northeast for the next 30 years. Professor Benjamin Silliman of Yale University, initially a sea serpent skeptic, eventually admitted they could exist. But if they existed, where was the physical evidence?

Enter Albert C. Koch, a paleontologist of dubious credibility. In 1845, Koch arrived in New York City with a 114-foot-long fossil sea serpent he called *Hydrargos sillimani*, in honor of the Yale professor. He exhibited *Hydrargos* to enthusiastic crowds, earning both a lot of publicity and a lot of money.

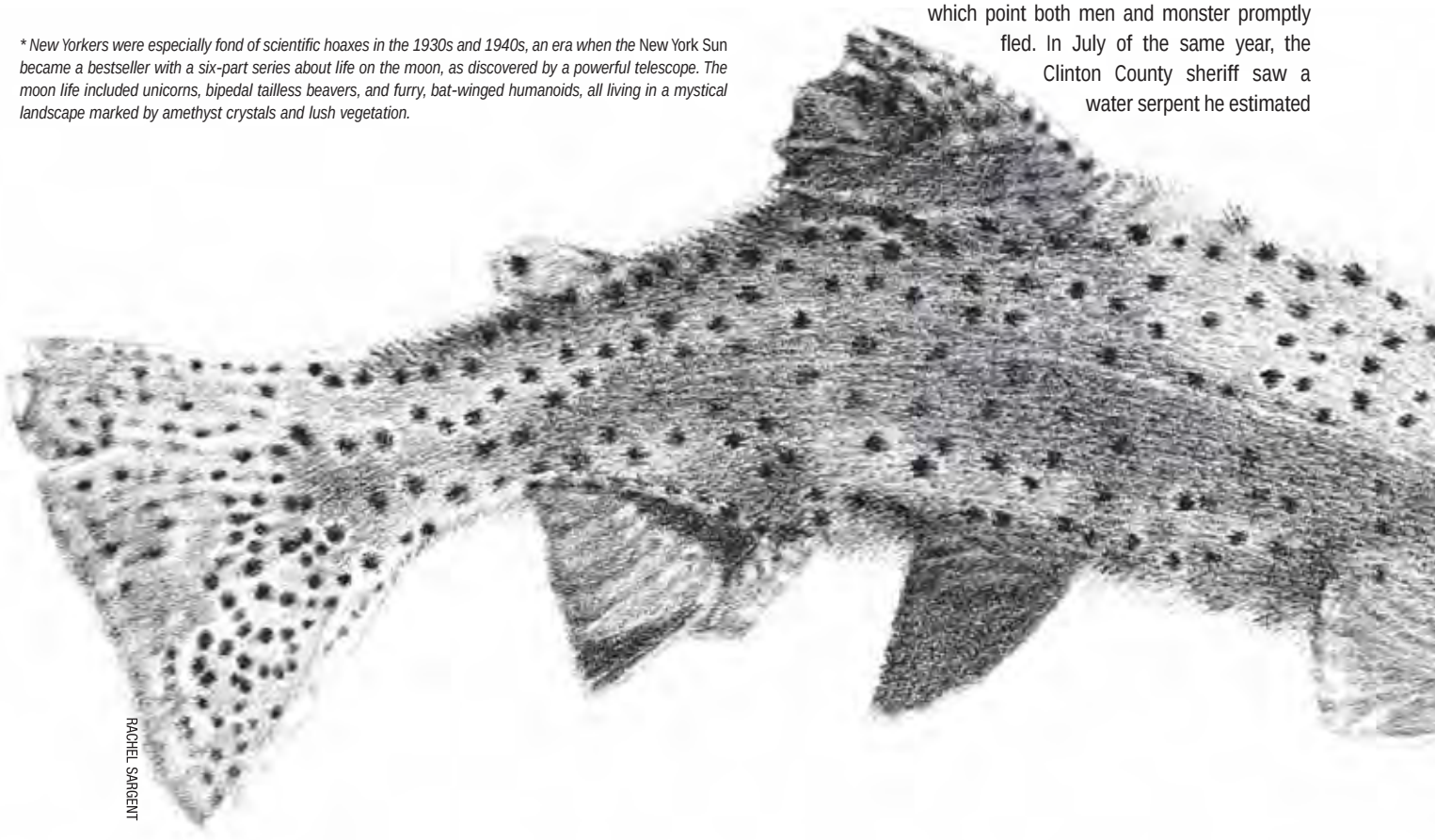
Scientists, however, were less impressed. Paleontologists who visited the New York exhibit declared that Hydrargos was made from at least five individuals and was a mammal, not a serpent. Undaunted, Koch took his sea serpent to Europe, where it was ultimately purchased by the King of Prussia and disassembled by scientists at the Royal Anatomical Museum into its components: five or six fossil whales. Some of these extinct whale species were new to science and, one can argue, would have been a more remarkable find than Koch's sea serpent, even if the latter had been real.

Around the same time, New York City* was host to a mermaid from the Fiji islands. The specimen became a city-wide sensation, helped in no small part by P.T. Barnum's pamphlets showing voluptuously bare-breasted mermaids. Unfortunately for museum goers, the mermaid was neither voluptuous nor beautiful, but a hideously wizened thing – an example of an East Indies traditional craft where fishermen made faux mermaids by stitching monkey bodies to fish tails. Barnum's mermaid perished in a Boston museum fire in the early 1880s.

Further inland, Lake Champlain's Champ has been making news since at least 1819, when the *Plattsburgh Republican* related the account of a Captain Crum, who saw a black monster, 187 feet long, with a head like a seahorse, rearing 15 feet out of the water. It had 3 teeth, eyes "the color of a pealed [sic] onion," a white star on its forehead, and a red band around its neck. Perhaps most remarkably, Crum saw all these details although the monster was 200 yards away.

1873 would prove a busy year for Champ, who had many dramatic encounters with people. A railroad crew working near the lake spotted the head of a gigantic serpent with silvery scales, at which point both men and monster promptly fled. In July of the same year, the Clinton County sheriff saw a water serpent he estimated

** New Yorkers were especially fond of scientific hoaxes in the 1930s and 1940s, an era when the* New York Sun *became a bestseller with a six-part series about life on the moon, as discovered by a powerful telescope. The moon life included unicorns, bipedal tailless beavers, and furry, bat-winged humanoids, all living in a mystical landscape marked by amethyst crystals and lush vegetation.*



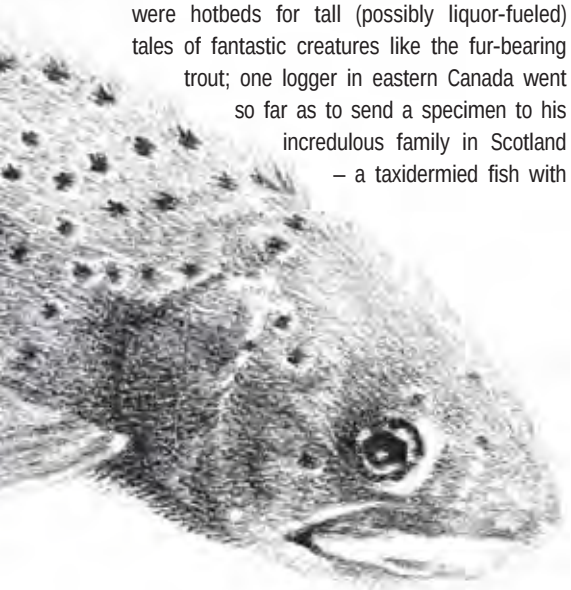
RACHEL SARGENT

RACHEL SARGENT

at 25 to 35 feet. In August, the steamship W.B. Eddy collided with Champ (or a sandbar), nearly turning over.

While Champ may be the most famous lake monster in the Northeast, New Hampshire has a few tales of its own. According to Rob Morphy, who collects stories of unknown animals on his American Monsters website, a skin diver went missing at Dublin Lake in the early 1980s. He was found days later, naked and babbling about monsters in caverns at the bottom of the lake. A decade earlier, twenty-two miles down the road, a scuba diver in Spofford Lake claimed that a large underwater log came to life and swam away like an eel.

While fantastic monsters seem especially fond of water, some seem to prefer our region's trackless forests. A hundred years ago, logging camps were hotbeds for tall (possibly liquor-fueled) tales of fantastic creatures like the fur-bearing trout; one logger in eastern Canada went so far as to send a specimen to his incredulous family in Scotland – a taxidermied fish with fur stitched on Frankenstein-style. The shagamaw in the Adirondacks paced the tote roads, counting its yard-long strides and switching between its moose hind feet and its bear front feet to avoid losing count. The billdad – known only in Boundary Pond, Maine – was said to use its kangaroo-like hind legs to jump into the water after fish, then smack them with its beaver-like tail to stun them before snatching them up in its hawk bill. William Cox's book *Fearsome Creatures of the Lumberwoods, With a Few Desert and Mountain Beasts*, published in 1910, profiles these and many similarly amazing creatures.



Not to be outdone, hikers in the Green Mountains have their own animal legends. On the slopes of Mount Mansfield, Vermont, is a trail with the strange name Wampahoofus, after a bizarre local animal. Described as looking something like a moose-gnu hybrid, the wampahoofus is reported to have lived only on this one mountain, at between 2,600 and 3,200 feet in elevation. It walked in perpetual circles around the peak, but only in one direction: males walked clockwise and females counterclockwise, boosting the likelihood that they'd meet to mate. One leg was said to be shorter than the other, an adaptation for a life spent walking in circles on a steep slope. According to sources at the Green Mountain Club, the short-leg adaptation was too dominant, and over time the animal's legs became shorter and shorter, until males and females could no longer mate with each other and the animal went extinct.

Some mystical creatures have a supernatural component. The Dover Demon is one such creature that haunts Dover, Massachusetts. Witnesses – usually teenagers – describe it as having the overall shape of a baby, but with spindly limbs, orange-tan skin, and a melon-shaped head with no facial features except glowing orange (or green) eyes. Some fantastic creatures are misidentifications of perfectly normal animals. Most park rangers are familiar with reports of coonigators – plump, gray-furred animals with the body of a raccoon and the face of an alligator. Skeptics claim they're just opossums.

The logical (and cynical) among us may dismiss these tales as child's play, or evidence that people used to be more gullible in the old days. A monkey mermaid? Seriously? But nature has conjured up some pretty bizarre animals. Consider the platypus, which scientists initially suspected of being a hoax. Is a fur-bearing trout any more improbable?

Rachel Sargent

[STEWARDSHIP STORY]

Managing for a Mix

Everett Towle is retired, but plenty active. As a sixth generation resident of Buxton, Maine, Towle inherited several parcels of forestland. He added more over the years, and now owns eight different properties totaling about 225 acres. "I think I've got all I can handle right now," he says with a laugh.

Managing forestland is nothing new to Towle, who earned a degree in forestry from the University of Maine in 1956. A long career with the U.S. Forest Service took him to Virginia, Kentucky, Florida, California, and several states in the Northwest, before landing him in Washington D.C. in the role of senior forester for comprehensive planning. After retiring in 1990, Towle returned home to Maine, where he still loves to craft forest management plans for his own land, as well as those of other local landowners, municipalities, and conservation groups.

"One thing I try to do that most foresters don't is to have at least two canopies, and sometimes even three canopies, in any area. That way, when I take off the top canopy, the second one will take over. I've found that this approach, you might call it shelterwood, works great for me," said Towle. He first experimented with this method about 20 years ago.

Towle said there is no one right formula for how to achieve this mix of different canopies; it all depends on the individual site. Nor is it always feasible. "It might not be possible to make that happen in one generation, but that's what I like, so if I get a chance, I try to do that," he said. "I go look at the trees and see what they need. I don't pre-judge."

EVERETT TOWLE

Achieving a mix of species is also important to Towle. "I'm in the white pine belt, so that's the major species. There's a lot of hemlock – and hemlock and pine like each other, which is good. The ideal is to have a third species, and, for me, I like oak. When you can grow those three together, that's a lot of fun," he said. Towle explains that he manages his woodlots to try to achieve that mix where he can, but doesn't force the issue. "I don't try to do the impossible. If the potential is there, then that's what I try to do."

The quality of the soil often determines the best way to manage a woodlot, Towle explains. "If I have clay soils – and you usually have some of that in any woodlot – I give those areas low priority. I pretty much write those areas off for wildlife. If there's some activity in there that needs to be done for wildlife, I would do that. But otherwise I focus on other areas."

Recently, Towle thinned an 18-acre plantation in a tract of about 100 acres that he purchased just a year ago. The result is impressive, he said, in large part due to the logger on the job. "A good logger is probably the most important thing there is in forest management," said Towle, adding that Bob Carr, based in Limington, Maine, is among the best he's ever worked with. "I had a client who went to look at the work I had done. He said, 'I want my land to look just like that.' I love to hear that."

Over the decades, Towle says he's seen a change in how landowners manage their woodlots. There was a time when many were content to let the land sit, rather than proactively working to manage their forests. "That's still sometimes a problem, but not like it used to be," he said. He points to the dramatic growth of the Small Woodlot Owners Association of Maine as evidence that more forest owners are now interested in – and educating themselves about – forest management. "And more women are involved now. And more families are involved. They're all proud of their land."

Patrick White

This series is underwritten by the Plum Creek Foundation, in keeping with the foundation's focus on promoting environmental stewardship and place-based education in the communities it serves.

Maple Minus Forest

Until the 1940s, most Christmas trees were cut from forests. Now they're harvested from tree plantations. The maple sugarbush may soon be making a similar move from forest to field.

In 2009, Tim Perkins and Abby van den Berg cut the top off a maple tree. As researchers at the University of Vermont's Proctor Maple Research Center, they simply wanted to learn more about sap flow. Instead, they discovered an entirely new way to make maple syrup.

Imagine a tightly-spaced plantation of two-inch-diameter sugar maple saplings. The stems are each cut chest high, and then covered with a sealed plastic bag. Inside the bag, the sap flows out of the stump under vacuum pressure and into a tube. The result: huge quantities of sap.

Typically, a sugarbush produces about 40 gallons of maple syrup per acre of forest by tapping, perhaps, 80 mature trees. With this new method, the researchers estimate that producers could get more than 400 gallons of syrup per acre, drawing from about 6,000 orderly saplings. In other words, these plantations would allow maple syrup to be produced like a traditional agricultural row crop.

"We didn't set out to develop this system," said van den Berg. "We were looking at ways to improve vacuum systems." But, during a spring thaw, the crown-less sapling they were experimenting on just kept yielding sap under vacuum pressure. And more sap and more sap.

"We got to the point where we should have exhausted any water that was in the tree, but the moisture didn't drop," said Perkins. "The only explanation was that we were pulling water out of the ground, right up through and out the stem." In other words, the cut tree worked like a sugar-filled straw stuck in the ground.

Theoretically, a plantation-style sugarmaker could cut and recut a single-stemmed maple sapling for around five years before they'd have to give it four to seven years off to regrow. (Juvenile trees are physiologically different than mature trees, so they have a higher tolerance for pruning .) "The better approach," said Perkins, "would be to coppice the tree early to form multiple stems. Then you would cut and harvest from only one stem per individual [tree] each year, which would give adequate time for the stem to recover and the process could continue almost indefinitely."

The researchers estimate that the cost of production would be roughly the same as with current methods. "I think you're going to find sugarmakers who are doing both," said Perkins, "standard sugarbush and plantation."

With climate change, this dual approach may offer improved chances for success in the face of warmer temperatures. "If this region is going to warm more, then with a plantation we don't have to rely as much on strong freeze/thaw cycles" to get sap flowing," Perkins said, "because these smaller trees freeze faster and thaw faster."

Sap flows into a sealed bag under vacuum pressure. UVM

Abby Van den Berg and Tim Perkins with a topless maple. UVM

Any form of maple syrup production relies on freezing temperatures to transform starch in the wood into sugar. But in larger trees, it's much more important to generate sap pressure from a freeze/thaw cycle, van den Berg explains. In a plantation system, small trees can rely predominately on vacuum-assisted flow.

Jacques Couture, a maple syrup producer in Vermont's Northeast Kingdom, and chair of the Vermont Maple Sugarmakers Association, sees how this new technique might help producers be more nimble. "One of the really interesting aspects [of the plantation approach] is the possibility to establish some maple syrup production in a much shorter time span than is the current norm," he notes.

"If we had a natural disaster, such as a widespread hurricane or some insect pest that would wipe out a large percentage of the maple stands," he said, "this might appeal to some who were affected as an alternative way of getting back into production sooner than the normal 40-plus years for trees to grow to tappable size, as we know it today." Plantation saplings could be ready in seven years – and not just maple: birch, walnut, and other syrup-producing trees work with this technique too.

Much remains unknown about the implications of this research. "It's too early to make any predictions," said Eric Sorkin, a producer of organic maple syrup from Cambridge, Vermont, who was briefed on the new research. But he believes it could lead to a fundamental shift in the way we make maple syrup. "If this leads maple syrup from a semi-wild crop to something farmed, plantation-style, I think that would be tremendously sad," he said.

Van den Berg foresees how this new technique could have positive implications for long-time maple producers and landowners. "If you are using ten acres of abandoned farmland that you already own, this technique makes a lot of sense," she said. With lower start-up costs, and quicker expansion (or contraction) of one's business, "it's another way to help us maintain the traditional working landscape."

The new equipment needed to produce syrup this way is not yet on the market. "We are just beginning discussions with some maple equipment manufacturers," Perkins said, "so it is possible we'll have prototypes to test for 2015."

Joshua Brown

[MANUFACTURING]

Bookcase Manufacturer Writes a New Chapter

HALE MANUFACTURING

The barrister bookcase was Hale's first foray into the home furnishings market.

Teddy Roosevelt was president when F.E. Hale purchased a factory in Herkimer, New York, and started making wooden bookcases. Hale retired in 1918, but the company that bears his name continues today. And while Hale Manufacturing Co. still makes bookcases, the company has evolved in ways that its founder could never have imagined.

The business is currently run by brothers Jim and Jon Benson, whose father and grandfather purchased Hale Manufacturing back in the early 1950s. While the brothers are proud that their kids are in the business – the fourth generation – they keep it all in perspective, according to Jim Benson, company president: "Certainly, with a family business you can get dragged down in nostalgia. But to be viable you have to keep an open mind and understand that things change, and you have to move fast."

That's exactly what the folks at Hale Manufacturing have done over the past 10-15 years. They built a new facility, added new items to their line, expanded their target market, and completely changed the way they sell wood products.

"Traditionally, we were a small niche manufacturer. We had bookcases that we offered out of a catalog – it was pretty standard stuff, maybe with some different finishes," said Benson. "Then people would call and ask for a bookcase that was, say, 29.5 inches wide. So we would say, 'Sure, we'll make that for you.'" Little by little, Hale developed a niche market in custom pieces. "Today, we'll work off a blueprint to exactly match an architect's design," Benson said, adding that the company has even started working with some new materials, including solid surface and marble tops. "We've sort of learned, 'You know, this stuff isn't so scary. We can do this.'" And with the traditional catalog market waning, it was clear that experimenting with new approaches was necessary.

HALE MANUFACTURING

In 2003, Hale was operating out of three different buildings, spread across about a 10-mile radius. "My brother and I decided that if we were going to take a run at this, we needed to consolidate into a modern building," said Benson. The result was a new 80,000-square-foot facility in Frankfort, New York, that moved all aspects of the business under one roof.

The decision to construct a new building shaped Hale in ways that extended far beyond giving it a new mailing address. "We determined we would need a 10 percent increase in sales in order to live comfortably in our new building," said Benson. To accomplish this, the company started offering a full-blown wooden library products line.

The process of diversifying wasn't easy, he notes. Moving beyond bookcases required designing and building tables, desks, shelving, circulation desks, and just about everything else needed to furnish a library. "We did it one chunk at a time," said Benson. "We started by adding different kinds of shelving and then reading tables, and we started selling chairs [which Hale does not manufacture]. We can do soup to nuts today."

To give it the ability to complete custom pieces, Hale had to invest in new equipment. Some was high-tech – the CNC machine, for instance – but some was more familiar. For example, a modern rough mill was purchased to increase productivity while maintaining the company's woodworking traditions. "A lot of big manufacturers got away from rough mill work. They buy dimension stock and just buzz up plywood panels. We never gave up on our mill," said Benson. Being able to offer solid wood products sets Hale apart from many of its competitors, he adds, because it provides the freedom to build just about anything a library buyer might want: "Being around solids, and working with solids, you find yourself capable of doing some different things." The rough mill also allows Hale to easily work with different hardwood species as the market demands change.

It wasn't only the production end of the company that had to learn new tricks. "There was a

tremendous learning curve for everybody, from the top down," said Benson. "The marketing effort had to be different; all new sales tools had to be created."

More recently, Hale has taken another big step by branching into residential furniture. "The library market is very cyclical. In the spring and summer months, we go like crazy because most of the installations take place in the summer and into the early fall. Then in the wintertime, the office is busy doing quotes but it's difficult to keep the production floor busy," said Benson. With guidance from Collin Miller, director of wood products initiatives for the Northern Forest Center, Hale has ventured into the home goods market as a means of boosting sales and balancing work flow throughout the year.

Somewhat ironically, it was one of the company's oldest product offerings – one that has been in Hale's library catalog since the very beginning – that seemed the best fit for this new venture. Barrister bookcases, what Hale calls "sectionals," are solid wood, stackable units with receding doors. Traditionally used for book storage, the company envisioned expanded uses for this product – storing files, say, or DVDs – in the home. Hale had experienced some past success selling these products through online retailers, but this time the company decided to cut out the middle-man and sell directly to customers over its own website – which also provides more flexibility in offering customized options. "The dotcom sellers are a little bit afraid of that," said Benson.

This control means the residential line will soon move beyond bookshelves, too. "Our hope is that next year customers will be able to go online and use a configurator tool to design their own wall system," said Benson. "We're going to add a wine rack, maybe offer custom tops to hold flat screen TVs. We'll even incorporate an ipad charging station." The customized units will be designed to be shipped via UPS.

These features could never have been envisioned when Hale started 107 years ago, but they are a part of modern life today. "The new generation, that's how they shop. They want products the way they want them, so you have to have a lot of options available for them," said Benson. "The buzzword today is 'mass customization,' and that's the component we're starting to get underway." The company has hired a specialist to help it market these products online. And the production department has had to rethink the way it manages its inventory – stocking more ready-made but unfinished parts, for example, that can quickly be assembled, sent through the finishing room, and shipped out the door.

Both the library market and individual consumers tend to place importance on the sustainability of products, said Benson. To this end, Hale Manufacturing, which is FSC-certified, touts the fact that it uses local woods, sourced from within 75 miles of the company's plant. "We generally buy trailer loads of dried, rough-cut lumber," said Benson, noting that the mills and brokers know as they're cutting what Hale needs.

Any waste generated – in block form or sawdust – is sent to a pellet manufacturing plant in town or used to heat Hale's own building via its Chiptec gasifier, which includes a hog to chip up the blocks. "It's all automatic; it's very neat," said Benson, recalling that, at one time, Hale employed a night watchman to feed the boiler.

Some ties to the past do remain. "We take pride in the fact that we build our products using real wood joinery," said Benson. "We want to make furniture that's going to last; furniture that you can pick up and move if you need to." He said Hale tries to position itself in the middle of the market, offering well-made furniture at reasonable prices. While the company has taken on some very high-end projects when they come along, it has shied away from budget jobs that would require lower-grade materials in order to match competing bids. "You can't be all things to all people," said Benson. "Some jobs we have to walk away from, and others are right in our wheelhouse."

With all the change that's taken place at Hale Manufacturing, Benson is confident that even more change is coming in future years. There's just no way of knowing yet what that might be. "The next generation is young, and they have elastic minds," he said. "They're very open to change, and I see nothing but better things coming."

Patrick White

This article series is underwritten by the Northern Forest Center, a non-profit organization. The Northern Forest Center creates economic opportunity and community vitality from healthy working forests in Maine, New Hampshire, Vermont, and New York. www.northernforest.org

HALE MANUFACTURING

Hale Manufacturing now produces custom wood tables, shelves, circulation desks, libraries and more.

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Photo by Mary Holland

Three tom turkeys vie for the attention of one hen. If puffed out feathers, red wattles, fanned tails and lowered wings don't win her over, a repertoire of nonvocal "hums" and "chump" sounds are used to woo her. Toms breed with multiple mates, so whether or not one, two, or all three toms are rejected by this hen, they will all move on to try to impress another female.

DAVE SHERWOOD

A Maple Bubble?

How the Syrup Market Works, and What It All Might Mean.

By Dave Sherwood

After the leaves fall in October, the mountains that rise toward the Canadian border north of Jackman, Maine, begin to wear their maple like a fuzzy, gray wool blanket.

Sugar and red maple are abundant here, but the trees grow mostly on high and inaccessible ridges. They're often scraggly and malformed, with roots like bony fingers clinging to steep slopes and thin, rocky soil – a low-rent district compared to the deep, rich tills of the postcard-perfect Vermont countryside that's more commonly associated with maple sugaring.

So it might have seemed odd when, in 1999, a successful Quebecois electrical engineer named Claude Rodrigue left his home country and abandoned an otherwise lucrative career with energy giant Hydro-Quebec in order to start a sugar farm in Maine – from scratch.

At the time, syrup markets were poor, prices depressed. So remote was the acreage he chose to lease from a local timberland owner – still off the grid at the dawn of the 21st century – that Rodrigue was forced to invest in 168 electric poles (and seven miles of powerline) to bring electricity across the border from Canada.

"When I came here 15 years ago, there was nobody," admits Rodrigue, who has the big, weather-worn hands, easy smile, and can-do attitude of the French-Canadian lumbermen from whom he descends. "People said I was crazy."

Today, Rodrigue's gamble seems more prophetic than crazy. He and his son, Francoise, now run a 50,000-tap operation that is among the largest in Maine. His cavernous, tin-roofed sugar shack houses a new reverse-osmosis machine for separating the "sweet stuff" from water; a hulking, stainless steel evaporator that glistens like the flank of a shiny new Harley; and three 8,000-gallon storage tanks, each large enough to house a pick-up truck.

Inset: Claude Rodrigue with barrels of syrup in his sugarhouse in Jackman, Maine.


1

DAVE SHERWOOD

Sap lines seem to tie the trees together in Claude Rodrigue's sugarbush.

And he is no longer alone in the valley. Some 150,000 taps now adorn even the steepest ridges, where a decade ago there were none. Local sugarmakers are collectively planning to add as many as 400,000 taps in the next five years. It's the same story all across the northeastern United States: the maple syrup industry is booming. Production has doubled in the U.S. in the last five years, and prices are high and stable. Last year wholesale buyers were paying nearly $3 per pound (about $33 per gallon), and there was more syrup produced – nearly 3.25 million gallons – than in any year since 1945.

Optimists see the maple syrup boom as the linchpin in a rural New England revival that includes expanding demand for locally sourced food, timber, forest products like wild mushrooms and fiddleheads, and eco-tourism.

But skeptics – and even a few of the optimists – can't help but wonder: Will the good times last?

Not always so sweet

In the early spring of 2000, when the sap first began to flow at Rodrigue's farm in Maine, quintessential New England weather brought warm, sunny days and bone-chilling nights, perfect conditions for sugarmaking. Sap flowed freely and markets were flooded with cheap syrup. "I think [wholesale buyers] paid $1.35 per pound that year," recalls Rodrigue. "It cost us more than that just to make it."

The next two years followed suit: big flows, low prices. Rodrigue stuck with it, but things didn't look good. "We worked hard those years and still didn't make money."

In truth, these were familiar problems. Maple syrup production was near the bottom of a wrenching, 150-year slide that had begun shortly before the Civil War. Shrewd American capitalists recognized that it was cheaper and more efficient to source sweeteners for tea and baked goods from neat rows of planted sugarbeets in the American South, or sugarcane in the tropics, than it was to try to tame unruly maple trees in the fickle weather of a New England spring.

Maple sugaring held on, of course, as a quaint, low-tech, rural pastime in places like Vermont and Maine, but for most, a serious business it was not. In the middle of the twentieth century, many operations still looked as they had 100 years before, with tin buckets fed by metal taps, wood-fired boilers, and sometimes even horse-drawn sleighs. Production was labor intensive, and demand small. By 1987, production had bottomed out at a paltry 757,000 gallons, a mere one-tenth of the astonishing 6.6 million gallons produced in 1860.

The development of chemically processed sweeteners was the last straw, and pure maple began to be phased out for these cheaper, easier-to-source alternatives. Most mass-market pancake dressings, including the kind labeled with pretty drawings of snowy mountain scenes and log cabins, came to be made almost entirely of corn syrup.

Committed sugarmakers, meanwhile, were forever caught between two opposing forces: Mother Nature and the marketplace. In a year of abundant sap flow, markets saturated and prices dropped. In a bad year, prices were higher but syrup quantities too low to turn much of a profit. Since maple was not subsidized like corn and most other agricultural commodities, in a bad year, things could get really bad.

"Supply and demand was not working too good," recalls Rodrigue, who had bought his first farm in Quebec when he was 26 years old. "We couldn't invest because we never knew when the price might collapse."

Despite the hardships, Rodrigue forged on. He was learning lessons, tweaking his system, investing in new technology and adding taps. Given the sluggish markets and poor prospects, such devotion didn't seem to make much business sense. Rodrigue blames his seemingly misguided persistence on an ailment he calls the "fever," an almost infectious urge to make maple syrup that he believes is inherited.

"In Quebec, we just like to make syrup," he says simply.

French Canada vs. the free market

The secret to understanding the revival in the maple syrup industry in the United States – and to predicting its future – lies with a once-obscure group of sugarmakers across the border.

In the late 1990s, the Federation of Quebec Maple Syrup Producers, which collectively represents 7,400 syrup producers in the province, had finally had enough of the whiplash dealt by free markets, unscrupulous buyers, and the vagaries of Mother Nature.

With the goal of giving poor rural areas a boost, its members agreed, by majority vote, to begin fixing syrup prices ahead of the season – high enough to ensure producers could keep their heads above water even in a bad year. With so much syrup under its control –upwards of 80 percent of the global supply – the Federation had the power to trump market forces, adjusting the amount of syrup available to buyers and controlling the price. If an American or European supermarket chain wanted to buy syrup, it would have to pay the Federation price, whatever that might be. Almost overnight, the Federation became, in the words of its director and general manager Simon Trépanier, the "OPEC of maple syrup" – a cartel capable of setting global prices. "It

helped to stabilize everything," he says.

It was the type of government meddling that made card-carrying capitalists in the United States cringe and cry, "Socialism!" – and in fact, such collusion would have been illegal south of the border – but the majority of Quebec's sugarmakers, mostly small, humble farmers in remote, rural areas, were more concerned with their livelihoods than ideology. And besides, the plan worked.

"Right away, producers began to install more and more taps, because they could be sure they would be paid a fair price for what they produced," explains Trépanier. Quebec's poultry and dairy markets had long benefited from such protectionist measures, he says, so the transition was easy.

But tinkering with the free market had consequences. After three good years of production in the early 2000s, Quebec sugarmakers, confident in the gift of stable prices, began to invest freely in new technology, more taps, and new farms. Supply leapt so far ahead of demand that syrup began to pile up in sugarshacks across the vast forests of southeastern Quebec. There simply weren't enough pancakes to absorb it all, and prices were fixed too high to attract new customers.

"That's when we decided we needed to do something," says Trépanier.

Rather than lower prices to move the syrup, the Federation dusted off another power granted to it by a 50-year-old Quebec law. It began assigning quotas to existing producers, based on the demand it anticipated the following spring. The system was designed to control the number of taps, rather than the total amount of sap or syrup produced. On a good year, a hard-working sugarmaker was welcome to produce more syrup, but anything above his or her tap quota, would be sent to warehouses for temporary storage – a sort of rainy day fund that the Federation anointed the "global strategic maple syrup reserve."

Cheats were prosecuted as criminals, and new producers were temporarily shut out of the market – with new quotas rationed by bureaucrats. As part of the deal, sugarmakers with quota were required to pitch in for storage costs – between 20 and 25 cents per pound, which included the warehouse, food-grade barrels, inspection, and pasteurization. Additional fees were levied for marketing and administration. And no sugarmaker would be paid for over-production until the syrup sold. For some producers, that over-production represented their only profit, and now they were being told millions of dollars worth of product would languish in a warehouse indefinitely.

Before the ramifications of this arrangement had time to sink in, Mother Nature struck again, this time with a series of too-warm or too-cold springs that sent production plummeting – a situation that might once have bankrupted the industry. But this time, the federation had options: over the course of the next three years, Quebec sugarmakers elected to sell all of their stockpiled 60 million pounds of syrup, successfully weathering the storm and buffering the province's producers against economic disaster.

The system, which remains in place today, had successfully passed its first real test.

An international impact

No one was happier with Quebec's new policies than sugarmakers across the border in the United States.

With prices high and stable – and guaranteed – American producers reaped all the benefits of so-called Canadian socialism but suffered none of the pesky consequences: heavy-handed quotas, tap limits, and draconian enforcement. Syrup began to flow like liquid gold.

"The Federation's policies have subsidized a major expansion nearly everywhere but Quebec," explains Mike Farrell, a maple syrup researcher and economist with Cornell University in New York and author of The Sugarmaker's Companion. "Sure, they've done a lot to support their sugarmakers, and there's no doubt they've done great things for the industry, but if I was a sugarmaker in Quebec right now, I might not be so happy."

Claude Rodrigue, sitting pretty just seven miles south of the Quebec border, is one of the many domestic sugarmakers who have benefited. "It's a good situation," says Rodrigue, with characteristic understatement. "If the price hadn't picked up, I wouldn't have been able to keep investing and expanding."

Steep hillsides far up above Rodrigue's farm, once deemed untappable, suddenly seemed within reach. By this time, Rodrigue's system was a model of sugarmaking excellence: he'd upgraded to state-of-the-art taps and tubing, electrified his entire operation, and built five pumphouses to serve groves of 10,000 maple trees apiece.

By 2013, he'd expanded to nearly 50,000 taps – far more than he would likely have been allowed in Quebec – yielding upwards of 20,000 gallons of syrup annually, a bounty for which he was well paid at nearly $3 a pound wholesale. "That's five tractor trailer loads," he says. "You don't sell that on a street corner."

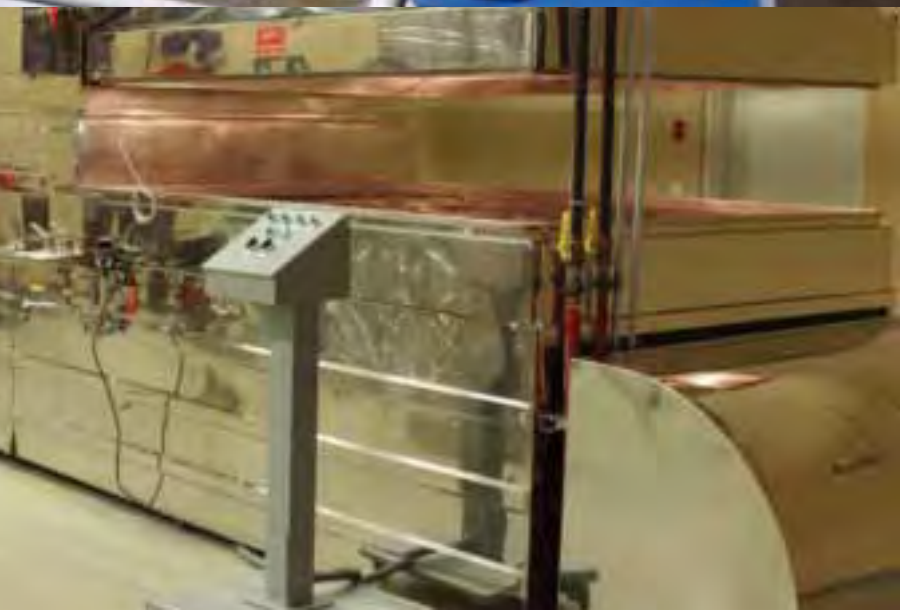
And the stable prices have had another, equally predictable, effect: They've attracted a new breed of tech-savvy entrepreneurs who, almost overnight, ushered the industry into the twenty-first century.

New efficiencies now permeate every facet of the process. Vacuum pumps suck sap through high-tech plastic taps and tubing, improving on Mother Nature and doubling or tripling yields. Reverse osmosis machines and industrial strength boilers have replaced

Top: Sap lines strung from telephone poles empty into a mobile collection tank at Limlaw Family Maple in West Topsham, Vermont. Middle: A large reverse osmosis machine that removes water from the sap prior to boiling. Bottom: Crown Maple's 24,000-square-foot sugarhouse in Dutchess County, New York, houses a massive three-stage evaporator rated to boil up to 100,000 taps

MICHAEL FARRELL

CROWN MAPLE



good old-fashioned patience and gravity, making it faster than ever to convert sap to syrup. Sugarmakers once happy with a quart per tap now typically produce half-a-gallon. Scale has grown right along with efficiency. Taps counts have increased by five to ten percent per year, and total syrup production has doubled in less than a decade.

Big buyers like Bascom Maple Farms of New Hampshire, one of the three largest in the United States, are awash in syrup – and profit. "Business has never been better," declares company owner Bruce Bascom. Bascom buys syrup, runs 76,000 taps of his own, and sells syrup-making equipment, sometimes on credit, to be paid in full (often with sap or syrup) when spring arrives. "The industry is expanding this year at about the fastest rate ever. Costs per tap are going down, but with prices so high, almost everyone is profitable," says Bascom. "The money is percolating down to everyone."

In rural New England, sugarmakers flush with syrup money have more to spend in local communities. Gas stations, hardware stores, equipment makers, local bars and restaurants, grocery stores, ATV and snowmobile dealers, and dairy farms have all benefited.

Forecasting the future

Farrell's recent work at Cornell shows there's plenty more room for expansion. Only 2.5 percent of the tappable sugar and red maples growing in accessible sugarbushes in the United States are actually tapped. Though the figure is higher in some parts of northern New England and New York, it still pales in comparison to the 35 percent utilization rate achieved just across the border in Quebec. In 2013, the U.S. had just 10 million taps, compared to nearly 40 million in Quebec, with American syrup representing a meager 20 percent of world production. "Right now, we're price-takers, not price makers," says Farrell. "What we do in the U.S. has very little impact on bulk syrup prices. We're just too small a part of the industry at the moment."

But, if recent trends continue, with more trees being tapped, and more sap flowing from each taphole, the United States might someday be able to exert more control over prices – a situation which could turn the market on its head. "Even though Quebec has traditionally produced 80 percent of the syrup, it may not always be that way if trends continue. And if they don't produce 80 percent of the syrup, then they can't control prices and supply. The whole situation could unravel," says Farrell. Will it happen? Farrell says his crystal ball is too foggy to tell. "How will public policy in Quebec affect prices?" he asks. "That's the elephant in the room."

Simon Trépanier, the Quebec Federation's director and spokesperson, is well aware of the weight his words

FEDERATION OF QUEBEC MAPLE SYRUP PRODUCERS

carry. When he speaks, syrup-makers on both sides of the border listen.

"For sure, we are helping others to develop," says Trépanier, pausing, before carrying on in precise, but accented English. "But the point is, it's a very fragile situation for producers in the States. We have two times the U.S. production in reserve right now. So if we have another big year and decide to sell that syrup, or part of it, at a much lower price, what will these people in the U.S. do? They won't be able to sell their syrup. They don't have anything to protect them from collapsing like we do here."

But Trépanier concedes the Federation is facing new pressure – from inside and out. A recent, well publicized theft of millions of dollars of syrup from the Federation's warehouses unleashed a public debate over quotas, warehousing requirements, and fees that brought to light simmering discontent with the Federation's policies in these areas. And another big production year like 2013 could overwhelm syrup reserves, forcing the Federation's hand.

"A few years ago, we asked a specialist to calculate how much syrup we needed to have in reserve to ensure there was no market shortage. He told us 40 million pounds. We are now at 60-65, so we are well above the average," explained Trépanier. "Whenever we are over 40 million pounds, in our meetings, producers say, 'OK, now we need to start selling. We need the money to produce more syrup.'"

It's a possibility that makes producers elsewhere antsy. Yankee Farm Credit, the largest agricultural lender in New England, maintains a branch in St. Albans, Vermont, a regional nerve center for maple syrup production. Branch manager Mike Farmer reports that maple syrup now accounts for as much as a quarter of loan volume there. "It's a statistic that didn't even used to show up," he says.

Is he worried that the bubble could eventually burst? "Sure. We're bankers, so we're always looking for the bottom to fall out of something," he says. The potential for disease, like the one currently affecting hemlocks in New England, or even another damaging ice-storm, are at least as worrisome as Quebec's price-fixing. But he sees plenty of signs of stability, too.

"The ability to make sap consistently and to compensate for what Mother Nature can't always provide has made a huge difference," says Farmer. If the price drops sharply, he says the producers that survive will be those – big or small – who built (or inherited) competitive advantages when times were good: state-of-the-art equipment, a cheap grove of abundant, healthy maple, a hard-working staff, or smarter business models.

"It's the guys who spend all night in the woods making sap that are repaying loans," says Farmer.

And everyone – Bascom in New Hampshire, Farmer in Vermont, Trépanier in Quebec, Rodrigue in Maine and Farrell in New York – agrees the market is ripe for expansion, with plenty of demand for the coming onslaught of syrup. The meshing of the organic, health and local foods movements – all of which have embraced maple syrup – already is boosting the country's syrup consumption per capita. Even so, syrup consumption averages a paltry three to four ounces per person each year – little more than a few flapjacks worth, and just one-tenth of historic highs in the 1800s.

"Not only are we seeing this incredible potential for expanding production, but we have just as great a potential to expand consumption," says Farrell, who studies the economics of syrup production. But he emphasized that producers and buyers both must actively seek out new markets if the industry is to continue to thrive.

"If, as an industry, we did a better job of putting our limited resources towards overall market expansion and promotion, pure maple could take a bigger piece of the sweetener pie, rather than competing over the limited slice we currently have," he says. "We'd all be better off."

Bascom, the syrup distributor in New Hampshire, says high prices have made it easy to overlook the importance of investing in new markets. He reports receiving some unusual requests recently from "some of the largest soda companies in the world" – without naming names – interested in perhaps adding maple sap or syrup to the ingredient lists of trendy new health drinks and soft drinks. "If you had normal supply and demand with a free market, the price of a drum of syrup would fall on a big production year and it would sell better at stores. People would be looking for new markets again. But with prices this high, most producers are happy to just sell bulk," says Bascom.

Back in Maine, Claude Rodrigue agrees. After 14 years spent developing a world-class syrup operation high in the mountains above Jackman, he has learned enough about making syrup so that he's not panicking about price fluctuations. He admits to a good bit of luck and a boost from his Canadian brethren these past few years – but there's more to it than that, he says.

"The Federation is important. But to make money, you still have to work hard and make a good crop."

Dave Sherwood reports for Reuters in Maine.

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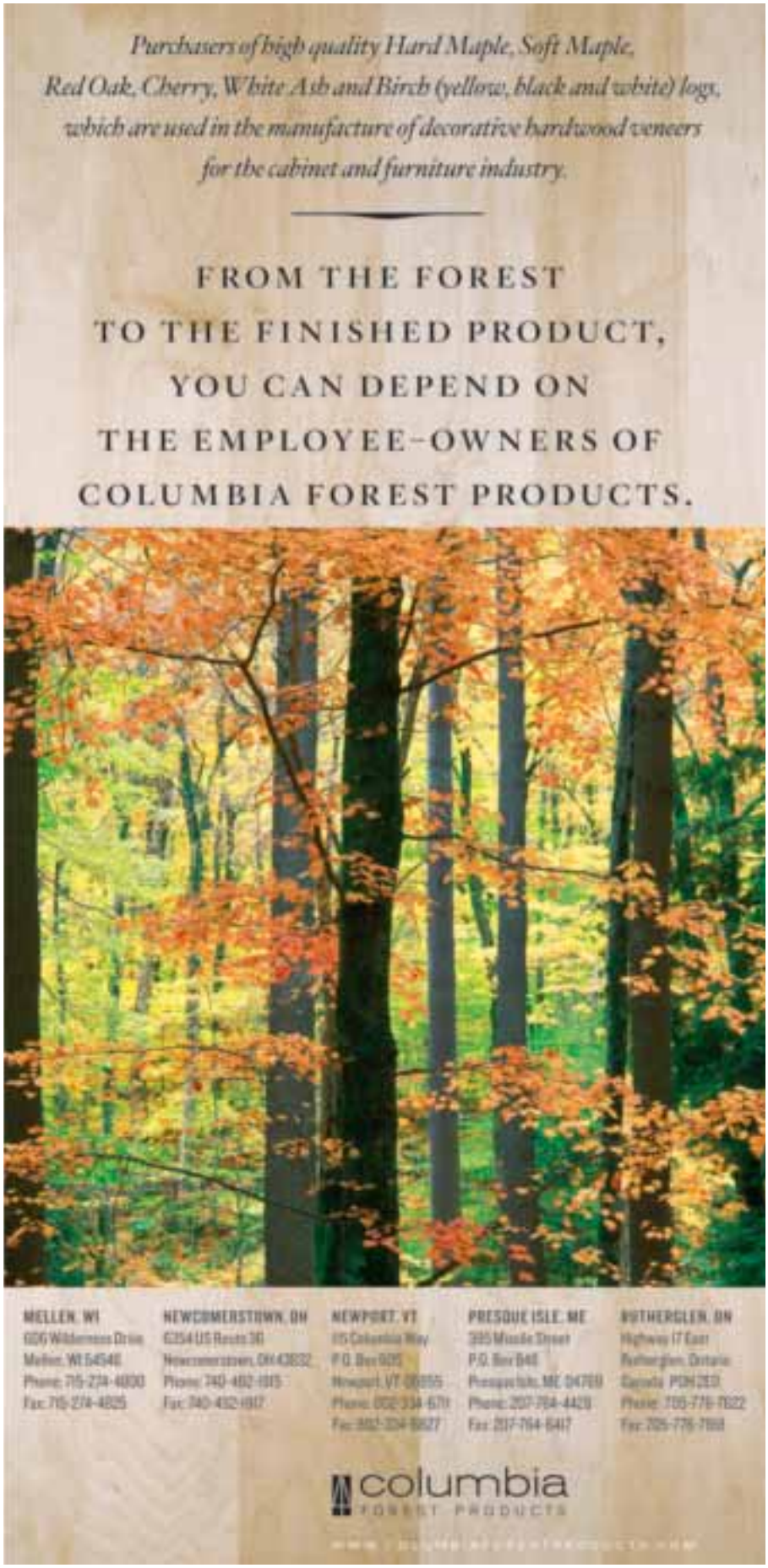

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Night Flyers: North American silk moths face invasive challenge

Story and photographs by Meghan McCarthy McPhaul

Days, sometimes weeks, before a luna moth hatches from its cocoon, it starts to move within its winter shell. Quiet bursts of rustling accompany the cocoon's sporadic movements. Eventually, the cocoon begins to shimmy and roll and the sounds escalate toward agitated scratching as the moth works to cut its way out. Then, suddenly, there it is – all white, fuzzy abdomen and sprawling, fern-like antennae. On stilted brown legs it climbs to reach an adequate height, then slowly unfurls its pale green wings and floats into the night sky.

Lucy Golden has seen luna moths enter the world hundreds of times, along with their giant silk moth cousins: polyphemus, promethea, and cecropia. Golden has been raising silk moths for six years from her small house on a 350-acre farm in Franconia, New Hampshire. A keen observer of the world around her, Golden never outgrew her childhood wonder of the natural world. The dust etched into the lines of her hands hints at much time spent outdoors.

Each May, Golden reaches into her project 'fridge, past the year's stores of foraged mushrooms and soon-to-be-planted gladiola bulbs, and pulls out four small plastic boxes. Each holds about 50 leaf-wrapped cocoons – one box for each species of giant silk moth native to the northern New Hampshire forest.

Golden started raising the large, showy moths after noticing an alarming drop in the number of cocoons in her backyard. "We used to find the tree-borne cocoons of the cecropia and the promethea in the winter when we were cross-country skiing," she said. "We'd bring them home and tie them in the appropriate [food source] trees around the yard. We would find easily over 100 cocoons, usually closer to 150 or more. Then, about six years ago, there were noticeably fewer cocoons, and the ones we did find had a very low hatch rate. When I opened the unhatched cocoons, they had clearly been parasitized."

Parasites aren't unusual for eastern silk moths – there are nearly 100 natural parasites that affect the 24 species of silk moths this side of the Mississippi River – but the sudden decline in cocoons close to her home made Golden wonder what could be causing such a seemingly abrupt change.

Turning to books and Internet searches, she learned that silk moths, like honeybees, like moose, are declining throughout the region based on a host of factors. The most troubling threat may be a non-native parasitic tachinid fly – *Compsilura concinnata*.

Golden sought a way to help the moths; thus, a new hobby was born.

Left: Cecropia, around third instar. Right: Lucy Golden is on a quest to protect silk moths.



Biological control gone wrong

The process of manufacturing silk was developed thousands of years ago in Asia, using silkworms (*Bombyx mori*) native to that region. In the late 1860s, non-native gypsy moths were brought to Medford, Massachussetts, in an attempt to cross-breed them with *Bombyx mori* and produce silk. The attempt failed, as have others to develop a commercial silk industry using other species, including Saturniid moths.

The gypsy moths in Medford escaped and were soon devouring forest canopies throughout the Northeast. In an attempt to fight fire with fire, or more accurately plague with plague, the U.S. Department of Agriculture introduced *C. concinnata* to the region in 1906 in hopes that it would stop the spread of gypsy moth and a handful of other introduced species. It didn't work. The gypsy moth continued to spread, and *C. concinnata* began wreaking its own brand of havoc on unintended targets, hitting some 200 species of moths and butterflies, including the giant silk moths native to the Northeast.

More than a century later, gypsy moths are largely under control, thanks in large part to an introduced fungus that kills gypsy moth caterpillars. And *C. concinnata* has had some success controlling non-desirable moth species, like browntail moth. It remains a threat, however, to dozens of native species, including giant silk moths.

Silk moth caterpillars evolved alongside native parasites, and have natural defenses to combat home-grown parasitic attacks. The caterpillars shed their skin five times as they progress toward adulthood. Because native parasites lay their eggs on a caterpillar's surface, this molting allows caterpillars to slough off the eggs. Native parasite and host can co-exist – the predation allows the parasite to survive and keeps the host's population in check. If the parasite is too successful, it wipes out its host and will subsequently also perish.

C. concinnata doesn't play by the same rules. It does not specialize on one species; rather, it attacks whatever is convenient. And its method of parasitism is considerably more destructive. "The female [*C. concinnata*] pre-hatches an egg in her oviduct and stabs the caterpillar to insert a maggot," said George Boettner, a wildlife biologist with the Department of Ecological Conservation at UMass-Amherst. "This maggot basically eats the host alive, saving the vital organs for last. Our native silk moths have no defense against this behavior."

C. concinnata can produce four generations in one year, and its life cycle is not synchronous with any one moth. That means the fly can build up its population on gypsy moth caterpillars in early summer, and then transition to silk moth caterpillars later, after the gypsy moths have pupated. This makes silk moth caterpillars easy targets at a time when the fly's populations are peaking.

Boettner has studied the effects of *C. concinnata* on native silk moths in Massachusetts, coastal Maine, and southern New Hampshire, and found that the introduced fly is devastating the moths in each area. Other biologists have conducted similar studies, with similar results, as far south as Virginia.

Like any species, silk moths experience population fluctuations from predators, diseases, and weather, as well as parasites. "It's really hard to sort out the most important agents with so much going on," said Boettner. "But the [decline] I saw in silk moths is from a new introduced species that adds a major agent to an already busy system. The numbers I saw could cause a collapse of this system."

A winged hobby: making small differences

When Lucy Golden stopped finding cocoons hanging in the trees around her home, she started buying them online from Bill Oehkle. A retired teacher, Oehkle raises a variety of native silk moths and sells them from his home in Prince Edward Island, Canada. He sells upwards of 3,000 cocoons and caterpillars each year to customers throughout North America and abroad. In addition to hobby moth raisers, he supplies science museums and researchers, including Boettner.

"When we first ordered cocoons from Bill Oelhke, it was simply to perpetuate what had become our tradition – the thrill of seeing newly hatched moths and keeping track of them," said Golden. The hobby grew, as hobbies are wont to do.

By the summer solstice, Golden's crop of silk moths will be in various stages of development. There may be a female promethea or two in the mating cage hung by the back door,

From left: A hatched polyphemus cocoon; remay protects Lucy Golden's caterpillars from parasites and predators; cecropia larva; a luna moth ready to fly; kindergarteners marvel at a cecropia moth; parasitic tachinid fly.

waiting for nightfall and the hopeful arrival of a male suitor. A recently mated polyphemus may be laying eggs in another container. A box of luna caterpillars in the first instar may be noshing birch leaves. Larger caterpillars, two or three weeks old, may have already been placed on their host trees – usually black birch or scrub cherry – with large branches wrapped in remay to keep the caterpillars safe from parasites and predators.

The caterpillars change drastically through their five instars. Each species is different, but all sport spiky protrusions as smaller caterpillars, along with a variety of spots and stripes. These become more colorful as the caterpillars progress, and by the third instar, cecropia larvae are particularly vibrant, dotted with bright red, sky blue, and yellow protrusions topped with black points. By the fifth and final instar, the caterpillars have grown into their spikes and look, in Golden's words, "like space alien cucumbers."

Just raising so many Saturniids – from newly hatched moths, to eggs, to tiny caterpillars that will eventually grow as long and thick as a large man's index finger, to cocoons that are collected in late summer and stored through the winter to start the cycle again – could be a full time job. For Lucy Golden it is simply part of an annual routine. But it's a routine that has taken some adjustment, both emotionally and logistically.

"I had a difficult time with this when we first started," she said. "I felt that containing these glorious moths was the antithesis of what they represented. Somehow I got over it, perhaps because I would like to believe that it is ultimately in the best interest of these moths to have a little hand up here and there."

Each season brings its own challenges, which Golden tackles as they arise. The first year, a bear ripped through the remay bags, and Golden discovered eggs, likely from a native parasite, on the caterpillars. These she painstakingly picked off, one by one, with tweezers. Another year, blue jays devoured her newly hatched luna moths. When Hurricane Irene raged through the region in 2011, Golden worried the winds would blow the remay bags off the trees. She collected the caterpillars – all 150 of them – along with their feeding branches and brought them inside until the weather cleared.

Raising the giant silk moths, which by their sheer beauty inspire wonder in anyone who glimpses one clinging to a tree at dusk, or hanging near the glow of a porch light, is a marvel Golden now shares with others. Of the 150-200 cocoons she saves each fall, Golden keeps about half. The rest she distributes to friends, families with children, and schools, where students love to watch the giant moths emerge from their winter confinement.

"I believe deeply that having an appreciation of nature is one of its best defenses, and thus one of ours, too," said Golden. "To provide opportunities for children, or anyone, to witness the magic and glory of the natural world at its best is a small act that may be carried down the road. If it instills a desire to save a caterpillar or a snake or a turtle, or to take steps to care for our environment, then it has made a difference."

It's not a matter of what is killing the caterpillars, but a desire to help them, that has inspired Golden to the considerable effort she makes each year. Since she embarked on the annual moth project, Golden has discovered others who are also raising silk moths, releasing them to the wild, hoping to give them a leg, or a wing, up.

Boettner said there are dozens of people in the Northeast raising moths as a hobby, some of them rearing giant silk moths in large numbers. Last year, he heard from moth watchers that it was a good season for silk moths. But there's no one officially tracking silk moth populations. Nor is there any monitoring of *C. concinnata* outside of controlled studies.

For Golden, the anecdotal evidence is enough. "I have found more wild cocoons in the past couple of years, but can't – and don't even want to – claim that it has anything to do with this project. If these moths are making a comeback, I don't care why so much, only that they are," Golden said. "The efforts that people make – they may not make a big difference, but they make a little difference. And those little differences add up."

Meghan McCarthy McPhaul lives in Franconia, New Hampshire, where she writes on a variety of subjects and maintains a blog: WritingsFromAFullLife.blogspot.com.

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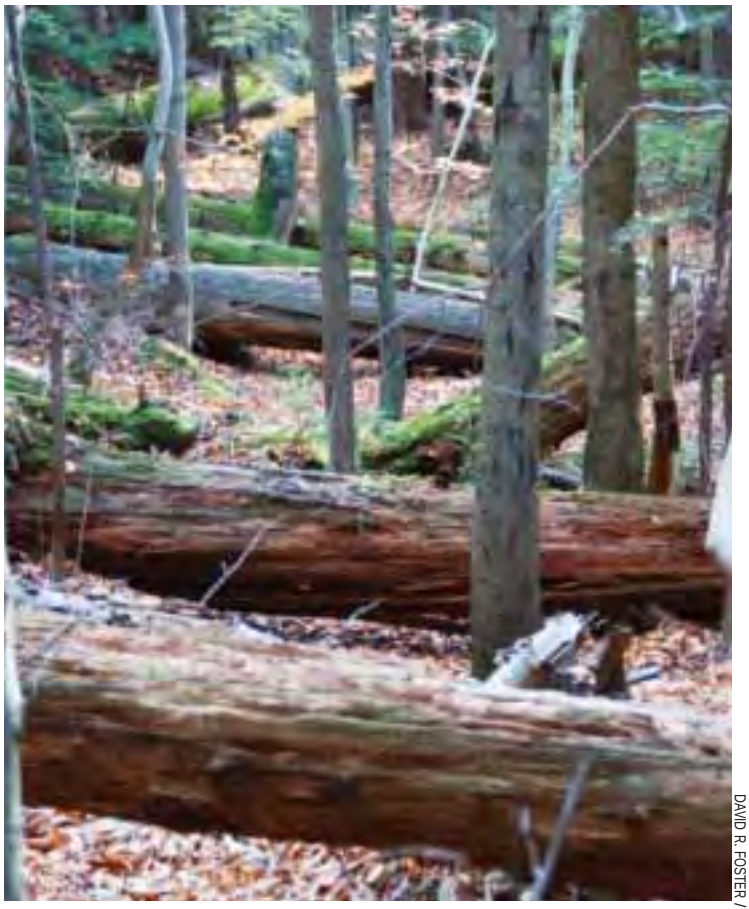

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The Pisgah Forest

Harvard's Living Laboratory

By David Foster

One irony of ancient forests and wilderness areas – known for their absence of human imprint – is that their names conjure up associations with people. In the Sierras, the Mariposa Grove of giant redwoods will be forever associated with John Muir. Gates of the Arctic, one of America's largest wilderness areas, is inextricably linked to Bob Marshall, the wildlands advocate who mapped this spectacular section of the Alaskan Brooks Range before he founded The Wilderness Society. Closer to home, Walden Pond and the Maine Woods are tightly associated with Henry Thoreau, Acadia with the Rockefeller family.

And then there's Pisgah, a magnificent forest in southwestern New Hampshire with a social history as tumultuous as its natural one, which is saying quite a lot given that the forest was saved from the logger's axe twice, flattened by the 1938 hurricane, and examined in minute detail by three different graduate students.

To those who know this forest intimately, Pisgah will always be associated with Richard Fisher, the founding director of Harvard Forest. Fisher grew up in the small town of Berkshire, Massachusetts, in the late 1800s, shortly after the relentless press of deforestation had crescendoed and the New England landscape was in the early throes of what Henry Thoreau termed "succession." A few artists, romantics, naturalists, and scientists began searching the region for nature untouched by human hands – drawn to the deep woods of northern Maine, the White and Green Mountains, the Catskills, or Adirondacks, where they could take in scenes of raw nature before the waves of logging and fire swept through. But wilderness zealots also spread out through already settled lands, searching for pockets of ancient woods in less inhabited corners, where they expected that rough terrain and thin soils may have left a few stands untouched.

One such forest lies along the Massachusetts and New Hampshire border. Here, rugged hills rise above Brattleboro, Vermont and stretch beyond the Connecticut River toward Mount Monadnock, through the border towns Hinsdale, Winchester, New Hampshire, and Winchendon, Massachusetts. In his never-ending search for local wildness, Henry Thoreau pursued rumors of big trees and ancient groves in this region.

The forest as it was around 1915 and now (inset).

Twice he climbed Monadnock for its rugged splendor, and on at least one occasion, he diverted his return to Concord through the well-rivered borderlands to gaze toward ancient forests and beyond the mill towns that were expanding to destroy them.

Growing up in this area, Fisher would have been familiar with these tales of immense trees. An English major at Harvard College in the late 1890s and a passionate consumer of Thoreau's writing, he spent summers on his uncle Abbott Thayer's small hill farm in the town of Dublin, New Hampshire. It was from his uncle that Fisher first heard of Pisgah Mountain and the ancient groves of pine and hemlock in the Ashuelot region, west and south of Keene.

Fisher graduated from Harvard in 1898 and went to work for Hart Merriam in the Division of Economic Ornithology and Mammalogy, predecessor to the U.S. Fish and Wildlife Service. Through his travels and work – from the redwood country of northern California throughout New England – he became convinced that forest management must be guided by a deep understanding of nature and the cultural processes that shape it through time. When he returned to Harvard to lead the new forestry school in 1903, Fisher increasingly focused his attention, and that of his students, on Pisgah Mountain. In that rough massif lay dozens of untouched and unnamed old-growth groves. The stands were diverse, ranging from immense beech, oak, maple, and birch on the slopes above North Round Pond to isolated patches of pitch pine on the most extreme rock ridges and outcrops.

He described Pisgah this way in a letter to friend Harry James:

"The stand in question is perhaps the best sample remaining of absolutely primeval forest such as once covered the whole tract and still covers various areas aggregating perhaps 600 or 700 acres. Personally, I do not know of any other absolutely authentic original forest, except for small areas, left in central New England. Furthermore, the remoteness and wildness of the region makes this particular example uncommonly valuable and interesting, not to say secure. The trees are for the most part white pine and hemlock, the largest of which range from 200 to 300 years old. Some of them are approximately 140 feet tall and three feet in diameter at breast height. If there is to be

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any surviving specimen of the original forest preserved for the enjoyment and study of the present and future generations, I do not know where it could be secured except here."

Living laboratory

Pisgah furnished Fisher with a grand laboratory for the investigation of nature in the raw. Fisher and his students commenced their studies in the old-growth areas, and were soon tallying its assets. They were struck by many features: the immense height, mass, and age of the trees; the variation in tree size and species, both in individual stands and across the landscape; and the abundant evidence of natural disturbance – wind, ice, insects, pathogens, and even small fires. Most striking were the features not found in typical New England forests: There were windthrow mounds ten feet high, immense dead snags that reached up so far they were lost in the canopy, and the fallen carcasses of trees up to four feet in girth that seemed to molder on the ground for decades.

Fisher's reconnaissance trips fostered an understanding of the New England landscape that stood in sharp contrast to the simple, deterministic view of nature that would dominate ecology for much of the twentieth century. Pisgah helped shed light on the tension that naturally exists in the forests of central New England, where the conifers of the far north meet the hardwoods of New England and are regularly buffeted by natural disturbances and climatic extremes. In his paper, "Evolution of Soils," Fisher, drawing on lessons from Pisgah, wrote:

"The original upland forest ... contained many species of hardwood together with hemlock and white pine, the hemlock a more or less constant element and the pine variable in numbers and distribution. Although this forest over huge areas was apparently stable in percentage composition of species, there is evidence for believing that on smaller areas, and over periods of several centuries, there was a tendency

A great hurricane in 1938 devastated the Northeast. The impact was particularly evident in the old growth forest at Pisgah.

HARVARD FOREST ARCHIVES / DAVID R. FOSTER

to fluctuation in dominance between softwoods and hardwoods. The natural adaptabilities of species to site were intermittently upset by lightning, fire, windthrow, ice storms, and sometimes insects or disease. Thus a declining group of pine and hemlock would be replaced by one of hardwoods, and vice versa. This tendency is indicated both by the frequent groupwise distribution of the softwood and hardwood elements in the stand and by the relative management of the size or age classes."

With a solid grasp on the structural patterns in this natural landscape, the Harvard group sought a temporal framework for interpreting the relationships among all of these features. Exactly how ancient were these trees, and what initiated their establishment? How frequently did these different disturbances occur, and what was their role in determining the age, type, and placement of individual trees? How much did the various disturbances vary across the landscape? And do forests develop slowly and progressively, or episodically and in fits and spurts? Though the academics could hazard guesses based on information like the sizes of trees or their degree of decay when fallen, they were rightfully insecure about these speculations. What they needed was to really dive into and disassemble the forest.

Saving — and studying — a stand

The opportunity for just such a breakthrough came with some calamitous news. In 1919, the sons of Ansel Dickinson, long-time principal of the New England Box Company, announced plans to log the old pine and hemlock on their 5,000-acre holding on Pisgah Mountain. New England Box held tracts across the region that it logged heavily, but the family had mined small pockets of old growth judiciously. Fisher had worked closely with the company on occasion, and there is no evidence that he attempted to reverse their thinking about Pisgah. But the Dickinsons' decision did motivate him to launch a comprehensive study of all the old stands and to count and measure the tree rings on every stump produced by their initial harvests in order to reconstruct the history and dynamics of the old-growth forests. Their decision to log also prompted him to raise funds to purchase and protect the most magnificent of the old stands.

Fisher's focus lay on a 50-acre tract that wrapped over one of the higher ridges in the region and across a narrow valley. Here stood the forest he described in the letter to his old chum Harry James with pines and hemlock three or four feet in diameter and more than 140 feet tall. To save this stand he sought funds from Harvard alums, like James, and forged a campaign with Philip Ayres, president of the Society for the Protection of the New Hampshire Forests. The effort ultimately led to Harvard University's peculiar ownership of a small parcel in the midst of what later became the largest state-owned property in New Hampshire – the 13,000-acre Pisgah State Park.

Richard Fisher, the founding director of Harvard Forest. Inset: Huge uproot mounds remain as a testament to the power of the hurricane.

Left: Pisgah, just a few years before the hurricane abruptly changed its appearance. Center: Hemlock saplings take root on a downed log – the next generation of trees growing off the last. Right: The 1938 hurricane didn't change Albert Cline's position that Pisgah was worth protecting. "It remains a place where one may study nature undisturbed by man," he stated in firm opposition to those who wanted to salvage the timber.

By the time Richard Fisher died of a heart attack in 1932, at the age of 54, his interpretation of the Pisgah landscape had been reinforced with solid data. Three of his students – W.C. Branch, Robert Daley, and Thomas Lotti – spent two years ferreting out and studying all of the ancient stands and following the loggers' fresh trail through the areas that had been cut. They studied 68 old-growth patches that either escaped logging or were located and sampled just before the axes and saws arrived. In 28 harvested stands, the ages and growth histories of the immense trees were recorded by laying a strip of paper across each fresh stump and then marking the tree pith and every 10 years of growth out to the bark and outermost ring. The students examined each site for evidence of past disturbance by laying out a few transects across the entire landscape and sampling at points along them to evaluate the variation in sites, forests, and history. Though their story would not become widely known until Al Cline and Steve Spurr mined it for their classic paper "The Virgin Upland Forest of Central New England" in the early 1940s, the students' joint thesis became a treasure in the Harvard Forest Archives and lore to all who worked and studied there. Cline and Spurr captured the major message from their work:

"The primeval forests, then, did not consist of stagnant stands of immense trees stretching with little change in composition over vast areas. Large trees were common, it is true, and limited areas did support climax stands, but the majority of stands undoubtedly were in a state of flux resulting from the dynamic action of wind, fire, and other forces of nature. The various successional stages thus brought about, coupled with the effects of elevation, aspect and other factors of site, made the virgin forest highly variable in composition, density, and form."

Letting nature take its course

As they studied the growth rings of the massive trees, researchers learned that part of the forest on Pisgah had gotten its start in the wake of a catastrophic disturbance in the 1600s. In 1938, history came full circle when a great hurricane swept the region, uprooting nearly three billion feet of timber from Long Island Sound to northern Vermont. On the Harvard tract in the Pisgah Mountains nearly every large pine and hemlock was laid flat.

In the storm's aftermath, Ward Shepard, Fisher's successor at Harvard Forest, declared the event a regional disaster and helped promote a massive, federally orchestrated timber harvest and clean-up. The New England Timber Salvage Administration

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was formed, which organized the single largest forest salvage operation in United States history. Fortunately, it also drew Shepard to Washington, D.C. to help administer the program and the ensuing timber effort in World War II. Shepard's departure left the Harvard Forest in the decidedly more capable hands of Fisher's old student and acolyte, Al Cline.

In his desire to focus federal resources on New England forestry, Shepard had advanced the argument for the region-wide timber harvest by appealing to concerns over human safety. His most strident appeal painted a fear-mongering vision of firestorms sweeping the damaged land and roasting villages, homes, and citizens. Rather than reflecting on the insights from Pisgah and Fisher, namely that hurricanes had shaped New England for millennia and that the forests would regrow rapidly, Shepard cast the 1938 storm as a national forest calamity and emergency. As a consequence, the salvage operation garnered support from federal, state, and local sources and crews began arriving from across the country and Canada. Ultimately, a remarkable 50 percent of the downed timber was harvested. But the environmental consequences of the post-hurricane logging frenzy were severe. The New England landscape was left cut over, scraped over, and smoldering from slash fires, which occasionally escaped into intact forests. The zeal to sanitize the land and thwart the flame even threatened the virgin forest that Fisher had fought so hard to save.

The most critical challenge arrived as pressure mounted to liquidate the voluminous material lying on the ground at Pisgah. Fortunately, with Shepard diverted, Fisher's insights were heeded at this critical moment. Acting director Al Cline was no visionary leader, but he revered Fisher, grasped the broad implications of his research, and subscribed to his philosophy of management. Cline faced intense pressure from federal, state, and local authorities, who argued that Harvard had a civic duty to protect the region from devastating fires, a moral duty to demonstrate appropriate management, and an economic responsibility to contribute its valuable old-growth timber to local mills and markets. Despite his well-known role in overseeing salvage operations on the three Harvard tracts in Petersham, and as a member of the town and state timber salvage commissions, Cline stood resolute behind the writings of Fisher and his students when it came to Pisgah. In the face of intense political and social pressure, he refused to allow any cutting on Harvard's small virgin tract.

"Even in their prostrate position, these veteran trees are an impressive sight," Cline wrote. "In the small openings among the fallen trunks and branches, the new generation is already becoming established. In accordance with the purpose of acquisition of the Harvard tract, no salvage of the down timber was permitted. It remains a place where one may study nature undisturbed by man."

Cline reasoned that the forest, in its uprooted condition, provided an invaluable natural laboratory in which recovery

and the slow development of the next old-growth forest could be studied in great detail. His bold decision proved prescient. Though no longer filled with immense trees, this virgin forest came to attract even more research following the hurricane than it had received in the three decades under Fisher.

By the late 1940s, Steve Spurr was a Yale graduate student and returned to Pisgah to evaluate the forest's recovery. His observations complement the photographs of the place and underscore its unique qualities relative to the rest of the New England landscape.

"Conditions following blowdown on this virgin timber tract differed very greatly from those on second-growth areas. The tangled blowdown of heavy timber (largely hemlock and white pine) was four to ten feet thick over most of the area. Under this criss-cross of logs, the soil was moist and relatively undisturbed except around the uprooted stumps. The boles of the fallen trees covered over 30 per cent of the area, and inasmuch as most of these were suspended several feet from the ground, they affected practically all of the surface."

Spurr also drew a major conclusion that has since been verified many times over the decades: he correctly recognized that natural disturbances often advance the development of mature forests, rather than generating the scarred and rather weedy early successional conditions produced by salvage harvesting.

"In this case where no logging followed the blowdown of old growth pine and hemlock, the following stand represents essentially a later successional stage than the preceding one, being characterized by hemlock and beech," Spurr wrote. "In other words, the blowdown accelerated rather than set back successional development by felling the overstory and releasing the tolerant understory."

Spurr's work was built on in the early 1960s by David Henry, a young master's student, and his advisor at the Harvard Forest, Professor Mark Swan. Their paper, "Reconstructing Forest History from Live and Dead Plant Material," published in Ecology, advanced Fisher's arguments that ecological interpretation was strengthened by historical understanding. Following that burst of activity, interest in Pisgah seemed to wane.

Research renaissance

When I arrived in Petersham in 1983, I was surprised and disappointed to learn that only a single permanent plot existed at Pisgah, despite three-quarters of a century of research. (Spurr's plot data remained in the archives, but the field markers were lost through the years.) That solitary 20 by 20 meter area was established in 1967 by David Henry. After nearly two decades of neglect, it was barely defined by a few wire stakes. With the help of Peter Schoonmaker, who conducted his Ph.D. research at Pisgah, we added 12 similarly sized plots across the Harvard tract and reanalyzed all of the historical data. Schoonmaker found all of the former old-growth stands across the greater Pisgah area and studied how they had survived the hurricane and the ensuing 50 years. He then turned to the 25-acre Harvard tract and spent nearly two years establishing permanent transects and examining landscape-level variation in the forest and site. To complement these efforts, Schoonmaker applied pollen analyses to swamp sediments and small boggy hollows in order to explore the deep history of the area.

DAVID FOSTER

For well over a century, both before and after the hurricane, Pisgah has provided researchers with a better understanding of how forests change naturally over time. Here, core samples are taken from a downed white pine.

The results of this work would have fascinated Professor Fisher, but it wouldn't have surprised him. Fisher would certainly have anticipated the rapid way that the forest regrew after what appeared to be catastrophic destruction. And now, eight decades later, the new woods have emerged as a maturing forest landscape. What has surprised everyone – and would have shocked even the first director – however, is that, while hemlock has recovered superbly and emerged as the dominant tree, there is but a single white pine on the entire 25-acre tract. Pine, which once reigned here as the largest and most visible species, has disappeared. Natural processes alone caused this remarkable change, confirming how kaleidoscopic our forests really can be.

Over time, the general appearance and broad composition of the regional forest remain relatively steady, but the details regarding the size of trees and types and distributions of individual forests may change considerably. The dramatic shift in composition has major consequences for the ecosystem. White pine grows faster and larger than most other species, and its longevity allows it to reach superlative heights and girth. This meant that Fisher's old-growth stands at Pisgah had among the greatest amounts of standing timber of any forest in New England. In contrast, the new stand – with its smaller and slower-growing hemlock and beech and much shorter-lived birches and red maple – will never support such massive trees or staggering amounts of wood. The rapidly regrowing forest will become increasingly impressive and may one day assume old-growth qualities, but it will never be the one that Fisher saved.

Another aspect of Pisgah that never fails to amaze those of us who visit it frequently is the persistence of the immense downed trees, root masses, and associated pits and mounds of earth. Despite, and in large measure because of, the ravages visited by the hurricane, the forest continues to support features once common but rarely seen in New England today. A 2012 trip to identify and core these downed trees revealed an even greater surprise: every one of the remaining immense prostrate logs is a white pine. The branches and trunks of all of the other species that once constituted this ancient forest have decomposed, leaving only pine, whose old-growth wood is extremely resistant to the action of insects and microbes. These downed trees will persist well through the centennial of the hurricane as a legacy of the ancient stand and the storm. Although this new forest is dominated by hemlock, pine will remain an important but subtle part of the forest for decades to come.

David Foster is an ecologist and director of the Harvard Forest. He is author of *Thoreau's Country – Journey Through a Transformed Landscape* and editor of *Hemlock: A Forest Giant on the Edge*, from which this article is excerpted.

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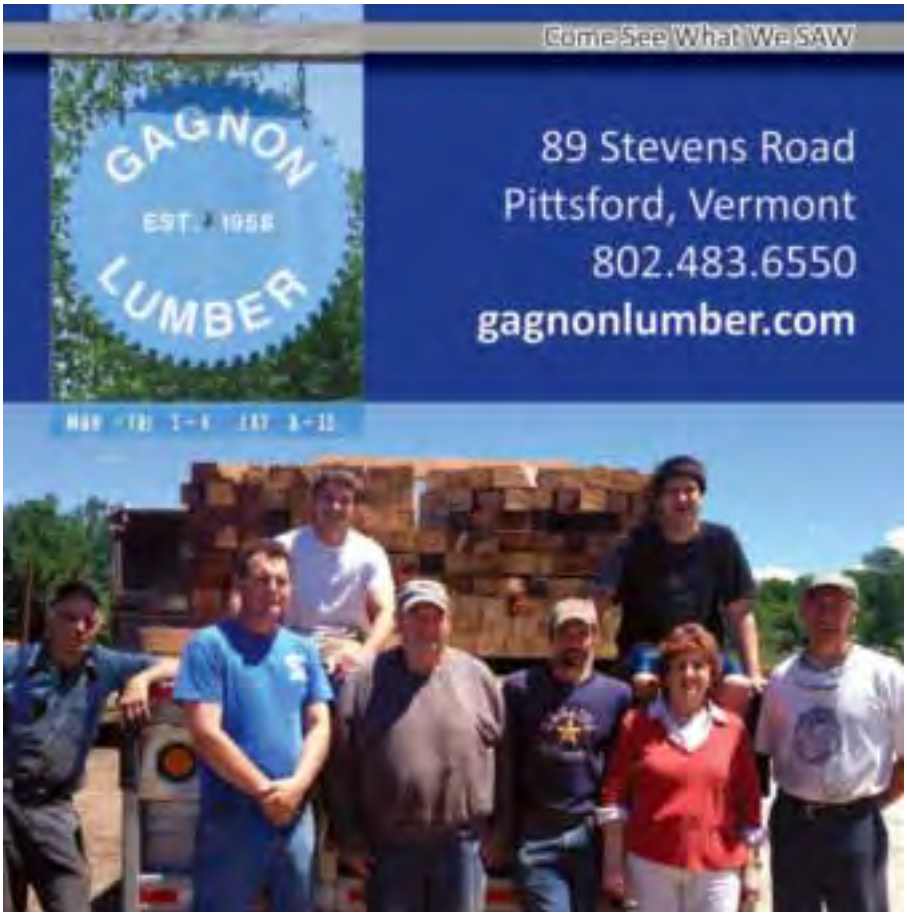


Story by Virginia Barlow

Illustrations by Adelaide Tyrol

Silver Maple

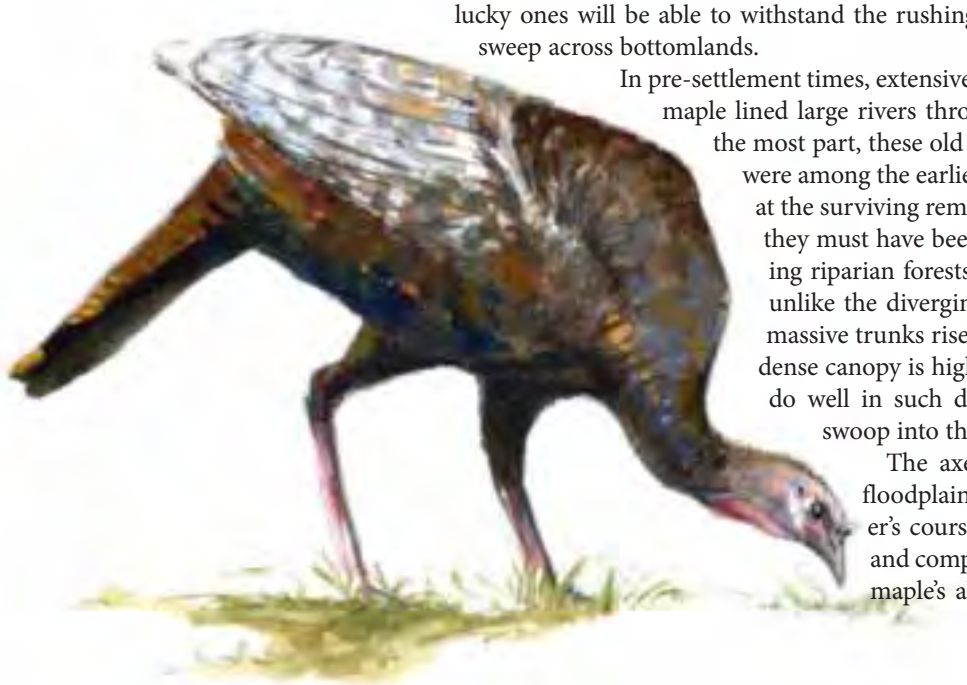
Acer saccharinum

The sight of a big silver maple in a breeze, when the shining white undersides of its leaves momentarily face outward, is as beautiful as anything an urban tree has to offer. Despite this, landscape architects have complained about the use of silver maple as a street tree for as long as there have been landscape architects, starting perhaps with the Arnold Arboretum's first director, Charles Sprague Sargent, in 1891: "It is this rapidity of growth that has made the Silver Maple a favorite with people who are in a hurry to obtain immediate effects and do not care to look too far ahead." In the decades since, issuing warnings against this tree has become practically a requirement of the profession.

Indeed, silver maple's vigorous roots do push up sidewalks and invade poorly constructed sewer lines. The mammoth multiple trunks are constructed of weak, brittle wood that, in windstorms, can be relied upon to smash into any house or power line within reach. And, yes, the autumn color is usually a bit lackluster.

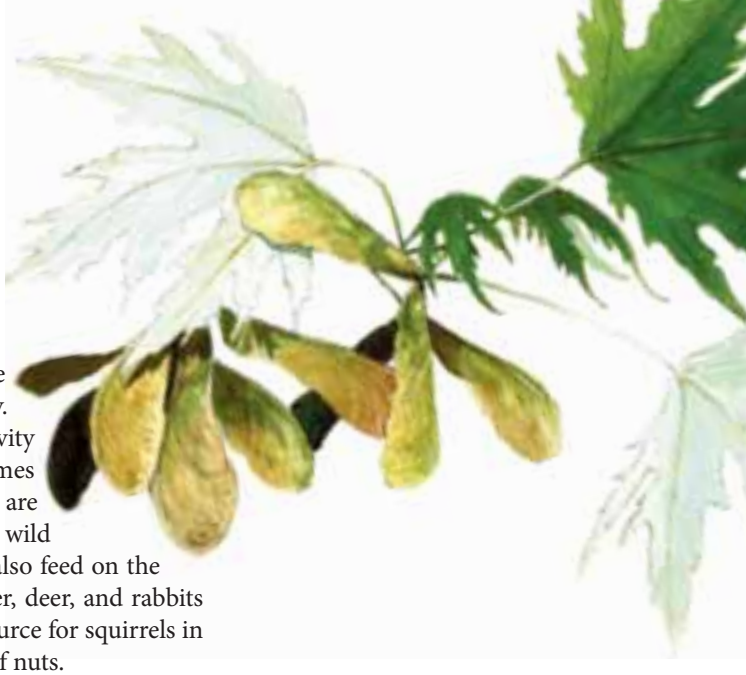
But thank goodness at least a few people have ignored sensible advice. The tree grows to enormous proportions, with large ascending branches that ultimately sweep downward, not unlike the great elms of earlier times. The very tips of the branches rise again, giving a graceful feathery look to the tree's outline in winter. It is our largest maple, and the earliest to flower in spring, beating out red maple by a week or more. The tinge of yellow that the flowers produce, though admittedly not spectacular, is welcome in April, a break from a long winter ruled by gray.

This early flowering is followed by an equally early seed fall, just three weeks later, when the winged samaras helicopter to the ground before the tree's leaves have finished expanding. The large seeds germinate right away. Silver maple naturally grows along rivers and in floodplains and, after a single growing season, the best seedlings will have developed that vigorous sewer-penetrating root system in miniature. Then, in spring, the sturdy and lucky ones will be able to withstand the rushing waters that periodically sweep across bottomlands.



In pre-settlement times, extensive forests of nearly pure silver maple lined large rivers throughout the East and Midwest. But, for the most part, these old forests, on fertile, rock-free alluvial soil, were among the earliest to be cleared for agriculture. Looking at the surviving remnants of this forest type makes me think they must have been magnificent. The trees in the remaining riparian forests are more than 100 feet tall and – very unlike the diverging trunks of planted street trees – their massive trunks rise to a great height before branching. The dense canopy is high and the understory low, for only ferns do well in such dim light. At the river's edge, branches swoop into the open, almost reaching the water.

The axe and saw are not the only threats to floodplain residents. Ice jams, or changes in a river's course, can wipe out large numbers of trees, and competition in the aftermath is intense. Silver maple's ability to sprout from the stump comes



in handy here, as does its ability to grow very quickly. However, one result of speed is weak wood, for no tree can do everything perfectly. In addition, the wood is susceptible to decay, not a plus usually, but cavity nesters, especially the wood ducks who share its habitat, often find homes in silver maples because of it. Wood ducks also eat the seeds, which are produced in abundance nearly every year. Evening grosbeaks, finches, wild turkeys, squirrels, chipmunks, and other birds and small mammals also feed on the seeds, which come early, when good food is otherwise scarce. Beaver, deer, and rabbits prefer the bark. The expanding flower buds are an important food source for squirrels in April, for by then many squirrels will have gone through their store of nuts.

In winter, silver maples look a lot like red maples, though the bark of large silver maples is even shaggier, for the long, narrow flakes are attached only at the center and thus free to curl at both ends. The wood, too, is similar to red maple; both are often called "soft maple" and sold together. The young trees of both species have smooth bark, though typically a silver maple will be a bit darker and browner than a red maple. The two are closely related and natural hybrids do occur. One cultivar, the Freeman maple, is popular because it combines the fast growth of silver maple with the stronger wood and less invasive roots of red maple.

Most silver maples bear both male and female flowers in roughly equal numbers, but some trees have all male or all female flowers and the odd tree may have almost all male or almost all female flowers. Pollen is produced in abundance, as is the case with most wind-pollinated trees, and warm days will bring out insects, especially bees.

There is no mistaking a silver maple in full plumage. The deeply cut leaves are so beautifully lacy and delicate you would think a nurseryman had dreamed them up. They have the usual five-lobed maple format, but unlike any of their cousins, the sinuses are so deeply cut that the middle lobe is narrowed at the base. The long, slightly flattened petioles allow the leaves to fly around in the gentlest breeze.

Silver maple leaves feed many native insects, many of which end up in the mouths of feathered nestlings. The green-striped mapleworm, which grows to a mouthwatering two inches, is partial to bottomland maples and once in a while it defoliates trees and gets called a pest. Its adult form, the rosy maple moth, is one of the most beautiful of all the moths, perhaps second only to the luna. In the case of the Baltimore bomolocha, the caterpillar, green with yellow between the segments, is more striking than the brown-on-brown adult. It, too, gravitates to the bottomlands where silver maple is most at home. Many smaller animals, such as mites, scales, leaf rollers, and aphids, also convert leaves into the proteins that are essential for baby birds.

And, for the woodpecker tribe, Columbian timber beetles, flatheaded appletree borers, maple callus borers, and pinhole borers are on the menu at their local silver maple.

In 2002, I planted a little slip of a silver maple near our pond and, after 13 growing seasons, it's now just shy of 17 inches in diameter – not at breast height, but at the base. Just imagine: that's close to three inches of diameter growth a year. At breast height, there are five chubby stems. All of this tree's branches are intent upon drooping. I prune the lower ones each winter to reduce the lawnmower operator's ire, and by the end of the following summer the next highest tier of branches has descended to eye level.

As any landscape architect would no doubt have predicted, and much to my dismay, the whole middle of our tree broke off in a snowstorm. But the gaping hole filled in so rapidly that it looked like a wreck for only one year. Ours is not within reach of sewer pipes and, though it does have quite a lean to it, heads away from the nearby cabin. I knew I had made a good choice, even before last fall when this tree's leaves turned a lovely rosy pink instead of the usual buttery yellow.

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Where the Wood Flows North

By Joe Rankin

Wood knows no boundaries. Not just wood as forest, which straddles arbitrary political boundaries throughout the globe, but wood as logs and lumber.

Since humans first learned to turn trees into useful products, there's been a brisk trade in wood between tribes, empires, and civilizations. The massive cedars that once grew on the mountains of the Middle East disappeared more than two millennia ago, incorporated into Phoenician ships and temples and palaces all around the Mediterranean.

Not long after that, Egyptians imported huge quantities of wood for buildings and furniture. The ancient Romans imported exotic woods from Africa. The Dutch loaded ships with teak from Indonesia. The British imported huge pines for masts from the North American colonies. Central American mahogany became the wood of choice for high-end colonial American furniture. Whether by pack mule or ship, railroad car or tractor trailer rig, wood has been flowing across the landscape for millennia.

Today, wood continues to flow around the world, most notably toward China, where the products made from it continue on their globe-trotting way. Wood flow: that's what utilization foresters, biometricians, and forest economists call it. But "flow" is a little

Logs roll by rail through White River Junction, Vermont. Access to ports or rail lines is one factor in determining where and how wood moves.

KEVIN BURKHOLDER/STEEL WHEELS PHOTOGRAPHY

(And south. And east. And west.)

misleading, implying a riverine unidirectionality. A better word might be "churn." Like all things capitalistic, the flow of wood is chaotic, self-organizing, and constantly changing. Following a truck loaded with logs down a highway in rural New Hampshire only to have another truck loaded with seemingly identical logs pass you going in the opposite direction can leave you shaking your head.

"There are all these little stories about why wood flows the way it flows. There is a lot of common sense to it if you can drill down enough to take a look at it. It's economics. To a large degree it's market driven," said Maine Forest Service biometrician Kenneth M. Laustsen.

Some key determinants in the wood flow equation include: what's in demand, where it's cut, and what local prices are compared to those elsewhere. But the path wood takes

also hinges on where the roads and railroads go, and where the ports are. Not to mention the price of diesel fuel, the cost of insurance and labor, weather, and geography. And don't forget currency exchange rates or the health of regional, domestic, and global economies. Even relationships factor in. People don't necessarily see the doctor closest to them; they're just as likely to drive farther to see a doctor they feel comfortable with. It's the same way with wood sellers and buyers.

How far is too far?

When looking at how wood flows in the Northeast, you can't restrict your vision to New York, Vermont, New Hampshire, and Maine. You have to broaden your perspective, because wood flows into and out of each of those states, as well as Pennsylvania, southern New England, Quebec, and New Brunswick on a daily basis. Some even goes into containers headed for Asia or Europe. There are no firm boundaries.

Maine, the most forested state in the country, is, interestingly enough, a net importer of wood. But most of Maine's hardwood sawlogs are sold out of state. Some go to Europe, where top quality logs are turned into veneer sheets as thin as a paper clip. New Hampshire, which has no pulp mill, finds markets for its pulpwood in Maine and New York. Vermont imports around 324,000 cords of wood and exports around 379,000.

All of the northeastern states are shipping logs to Quebec, where a string of sawmills and paper and pulp mills are draped like Christmas lights along the province's southern border.

"Between 20 and 25 percent of New York's logs go to Canada," said Sloane N. Crawford, who oversees the forest stewardship and use programs for New York's Department of Environmental Conservation. While that rate has dropped because of the global recession, Canada still has a high demand for certain woods, like white pine and spruce. "Canada gets nearly all the spruce from plantations on state lands," Crawford said.

Sometimes, when you're trying to wrap your head around the concept of wood flow, it helps to boil it down. Consider a theoretical woodlot in northern New Hampshire with 200 acres of mixed woods. Where would that wood flow to?

Sarah Smith, a forest industry specialist with New Hampshire Cooperative Extension, said the white pine would likely stay in the state, white pine mills being fairly numerous. "You would have to have a real beef with a lot of white pine mill owners to want to truck it out of state," she quipped. The pulpwood – both hardwood and softwood – would likely go to Maine, since New Hampshire no longer has a pulp mill, she said. Spruce and fir logs would go to mills in New Hampshire, Maine, or Quebec. Hardwood logs would probably go to Quebec. (Hardwood harvested south of the White Mountains would probably stay in the Granite State.) Whole tree chips would be used in-state.

"The markets are fierce and competitive," Smith said.

Despite high diesel prices, today wood from the Northeast tends to travel farther from stump to mill than it has in the recent past.

"A lot of people are hauling wood 100, 120 miles and hardly batting an eyelash anymore. And hauling it right past the woodyards of other people who are buying the identical product. And this is true of the lowest-value product – topwood that's been chipped for biomass. We used to say it was the high-value stuff that was hauled long distances. Today, even the lowest-value stuff is going long distances," said Lloyd Irland, a forest economist and president of the Maine-based consulting firm The Irland Group.

Paul Frederick, a wood use specialist with the Vermont Department of Forests and Parks, said, "It's actually more pronounced when you get into the lower-grade markets. In pulp, particularly, we're seeing wood moving farther than we did in the past." Pulpwood is moving from Vermont to pulp mills in Ticonderoga and Glens Falls, New York, for instance.

One big influence on how far a load of logs or chips will travel is whether there's a haul-back opportunity. "You have to look at the distance and ask, 'Is there an opportunity to bring something back?'" said Smith.

Three recent trends.

The movement of wood, like that of other products, is affected by events large and small; some near, some far away. But three recent trends have had profound effects on the northeastern U.S. wood markets and will likely continue to play out for years to come.

One is globalization. In the recent past, lower manufacturing costs in China essentially gutted the U.S. furniture industry, with jobs and hardwood logs flowing across the Pacific in increasing numbers. While rising wages and higher shipping costs have allowed the U.S. to regain some of this market share, other countries, like Vietnam, have become major players in the log buying and wood manufacturing arenas.

The second is the recent recession. In a 2012 article in The Forestry Source, W. Brad Smith and Richard W. Guldin crunched numbers from a variety of sources and found that, since 2005, the U.S. has lost 1,008 sawmills, 15 pulp mills, and 148 other mills. The shutdowns were accompanied by "slowdowns or closures in hundreds more secondary manufacturing facilities," and the loss of 294,000 jobs. That number has since been updated to 322,805. Of the mill closures, more than 500 were in the north, along with 100,000 lost jobs. That is a lot of mills, a lot of destinations, a lot of flow points for wood that are no longer there.

In Vermont, harvest and wood production peaked in the late 1990s, said Frederick. "Since then, we've lost a fair amount of production capacity. In some cases, that's from having mills go out of business, and in others the lack of demand for lumber caused people to cut back. That's particularly true in the economic crisis of the last few years."

The recession seemed to be particularly hard on mid-size sawmills.

"The last five to seven years it has plain been the economy,"

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The landing is often just the beginning of a long journey for logs. The maps show wood flows in and out of various states in 2011 (in 1,000 cords).

MEGHAN BOUPLON

said Smith, the New Hampshire wood use specialist. "It has, on so many levels, just hammered the forest industry. Everything from fuel costs to lumber demand. One of the reasons that the larger mills survived is that they had invested, before the drop in the economy, in efficient and high-tech equipment."

Crawford said that the number of New York sawmills with a production capacity of at least one million board feet dropped from a couple of hundred to less than one hundred over the past 15 years. Most of the loss was in those sawing between one and three million board feet a year. Much of that lost production, however, drifted to a handful of really big operations. And New York still has roughly 1,800 very small portable and fixed-location sawmills that together saw some 60 million board feet a year, almost all of it in-state timber production, he said.

The third trend affecting the movement of wood in the Northeast has been the rise of biomass energy, seen as a competitive green alternative to oil and coal for generating electricity. Ironically, this often means trucking low-grade material long distances in order to supply biomass plants.

While New York's log harvest has been trending down since the late 1990s, the state's pulpwood and chip harvest has been trending up, to 2.5 million green tons in 2011, according to the New York State Industrial Timber Harvest Production and Consumption Report.

"We always seem to be able to find someone to backfill," said Crawford. "Harvest and consumption of logs in New York has been going down. Starting in 2008, it took a dive. But even during the recession, pulpwood and biomass harvest went up a little."

In Maine in 2011, wood harvests for biomass amounted to 2.4 million green tons, with 86 percent of it produced in state and the rest imported, according to the 2013 report titled Maine's Forest Economy, by the Maine Forest Products Council. Much of the imported material came from southern New England states, which don't have as many biomass plants.

While grateful for the market, most in the forest products industry note that biomass is no panacea. Consultant Lloyd Irland said he was stunned when, paging through a wood flow report for 2009 or 2010, he saw that biomass production had eclipsed sawlog production.

"We're going downmarket fast. That's scary," he said. "And it's extraordinary how far biomass travels. It would knock your socks off to see the distance that stuff is traveling now. And that seems blooming crazy."

Forest industry analysts caution that loggers cannot build successful businesses solely around wood chips. Without higher-value products like sawlogs and pulpwood, the logging and trucking sectors won't survive.

In his more than three decades in the wood trade, Earle D.

Chip truck rocket launchers like this one may someday supply lunar colonies with biomass. (Really this is a chip dumper at the NewPage paper mill in Rumford, Maine.)

LLOYD IRLAND

Wood rarely flows in one direction. There may be strong demand for pulp in one area and biomass chips in another.

LLOYD IRLAND

"Chip" Bessey, the president of E.D. Bessey & Son, a Maine-based buyer and seller of logs, has pretty much seen it all.

"There are fewer sawmills and fewer paper mills. The ones remaining are quite strong. They're the survivors. Nonetheless, whenever you lose a mill you are losing some demand, which in the long run could adversely impact landowners who would like to have people competing for wood and keeping the prices at a good level," Bessey said.

"The new markets are biomass, fuel chips, pellets. All these things are low-value items. It's nice to have a market for low-value material, but we always thought pulpwood was a low-grade material. This is several steps below pulpwood in value to the landowner. As a landowner, I'm concerned as we lose the opportunity for adding value on the high end because it means the overall value of the timber we produce is lower."

Bessey said the lesson for timberland owners is simple: never assume that the value of your trees will go up. "If you own enough woodland to worry about, I'd just keep up with it," he said. "If there is something that is mature or dying or decaying, I'd keep it moved. It's like housing. People thought the value of houses would never go down. The value of wood may remain steady. It may not."

Reply hazy, try again.

There are many who lament the fact that wood flows out of their states or countries at all. Why, they ask, can't we build the sawmills, paper mills, and factories to process it at home and export the finished products?

This approach seems to make sense, but the issue is complicated by consumer demand for a seemingly endless variety of wood products, from laminated flooring to two-by-fours, from butcher block tables to plywood, from wood pellets to wooden spoons. Each of these products is made of different woods and each requires different (and expensive) equipment. So to be profitable, a mill has to specialize.

"There are folks who want to see local use of wood. They talk about the little guy down the street. But that guy doesn't necessarily have a full range of products and species. He may not have, for example, kiln-dried flooring," said Sarah Smith.

These days, setting up an I-joist plant or a robotic truss plant requires an investment of millions of dollars. Once that investment is made, Smith said, you still have to break into the market. Competing against even a handful of entrenched competitors can be an uphill battle.

Irland agrees that the investment in machinery and technology – the optimizers, the scanners, the sorters – imposes its own kind of tyranny: you can't compete unless you invest in the technology, but once you make the investment higher and higher volumes are required to pay for that technology

But Irland believes that there is a place for the small mill operator in the Northeast, and that the high cost of hauling logs works in favor of the local guy, particularly if the product doesn't require a tremendous investment in expensive machinery. "I talked to a guy who was telling me he imported a hundred loads of landscape ties a year from Ontario or Quebec or somewhere. Why couldn't somebody local make landscape ties and sell them locally?" Irland asked.

"We just have to go back to being more market-oriented and more innovative. We should recognize that there are some products, like two-by-fours and kiln-dried, appearance-grade hardwood lumber that you aren't going to compete on unless you're big. But that doesn't mean you can't do anything," Irland said.

Two trends that could have a profound effect on how wood flows in the coming 20 years, he said, are the current U.S. natural gas boom and the rise of China's middle class.

If natural gas remains absurdly cheap, it could mean "all these biomass electrical plants will be gone. It will change a lot of things. It will be impossible for them to sell their power. From society's point of view, cheap energy is good, but it will mean a lot of ripple effects in the wood market," Irland said.

As far as China goes, that country already uses about two-thirds of the furniture it produces, he said. Further growth in China's middle class could dictate more demand for logs, but also could reduce competition in the U.S. from Chinese imports, he said.

Predicting future wood flows is problematic because of the many variables involved. Long-term wood timber outlook studies are sprinkled with caveats, what-ifs, and alternative scenarios. Changes in geopolitics and the world economy will undoubtedly alter supply and demand, as will yet unforeseen uses for wood and replacements for wood.

How will the plantation forestry trend in places like Brazil affect pulpwood prices in Maine, where natural regeneration is the norm? What about pests like the mountain pine beetle, emerald ash borer, spruce budworm, or gypsy moth? Will biomass energy remain competitive? Will its use grow? What will climate change mean for timber production, not just in the northeastern U.S., but elsewhere in the country and around the globe?

If you feel like you can't get a clear picture in your crystal ball, join the club. If there's one thing that history has taught us, it's that the forest products industry is resilient and the wood will continue flowing, but where and how are impossible to predict.

Joe Rankin is a forestry writer. He lives in central Maine.

Story and Photos by Dave Mance III

At Work Starting (and putting out) Fires with Fire Management Services.

Last year, May first was about as nice a spring day as you could ask for. Dawn broke cool, maybe a touch of frost in the cold spots, but the sky was high – just blue jay blue – and it was warming up fast.

Up on a hillside in Rupert, Vermont, Thomas "Nort" Phillips, his colleague Silos Roberts, and about 12 other hired hands were starting a forest fire. The team had arrived the day before to do the prep work: poring over the burn site, noting topography and terrain, busting up piles of slash that might burn too hot, and hacking and leaf blowing a five-foot-wide firebreak around the perimeter of the 60-acre management unit. Most had camped out and were now assembled on the uphill side of the property, getting ready to light the first match and push the fire down into the valley.

The workers wore yellow jackets and carried backpacks full of water or powder expellant. Safety helmets. Radios. Day packs. Many wore kerchiefs around their noses and mouths like outlaws from the Wild West, though instead of six-shooters they carried shovels and fire rakes and McLeod tools. One wielded a wand nozzle hooked to a length of hose that ran to a water tank in the back of a UTV.

Phillips gave the word, and the men in front spread out and started dropping globs of flame onto the forest floor with drip torches. The sun-baked duff lit instantly and a light breeze spread the flame. At first there was a stark demarcation, as the smoke and fire proceeded from the bare fire break in a perfect orderly fashion. But then the wind swirled, and smoke blew back, and suddenly everything was white.

Phillips started Fire Management Services with partners Silos Roberts and Rick Redin in 1993, after working for decades as a fire management officer with the U.S. Forest Service. "We were always hearing from private forestland owners, or non-profits, who were saying: 'I've got oak, or pine, and I've got this problem. How can I do a controlled burn?'" Phillips said. "And at that point, there just wasn't anybody in the private sector doing this sort of work. I recognized the opportunity to broaden the use of prescribed fire in the Northeast, and I took it."

This underuse of fire has roots in federal policy – specifically the "10 a.m. Policy," instituted by the Forest Service in 1926, which mandated that all fires be extinguished before 10:00 on the morning following their first report. This reflected the thinking of the time that all forest fires represented unacceptable threats. Aldo Leopold started publicly questioning the policy in the 1960s, but it wasn't until 1995 that the Forest Service officially recognized fire as a "critical natural process." By then, several generations of Americans had grown up thinking of fire as a plague, not a silvicultural tool.

"Until fairly recently, the culture in New England and New

York was for total suppression," said Phillips. "What's interesting is that a lot of the burns we're doing today, especially out in western New York, are designed to encourage fire-adapted natural communities, which exist because Native Americans used to do a lot of burning in those areas."

Today, Fire Management Services works with landowners to conduct prescribed burns around the Northeast. This could mean a shrubland habitat burn in Connecticut designed to help New England cottontails, a regeneration burn in a commercial lowbush blueberry patch in Maine, or a forest burn in southern Vermont to discourage beech. Fire can also be used to promote certain tree and plant species and to help control some invasives.

Estimating the cost is difficult, since every job is so different.

"We have to look at the site," said Phillips. "In a woodland setting maybe you're looking at $300 an acre, but to give you something firm I have to figure out logistics, the control line, general strategy. If it's a volatile area, the price is going to reflect this."

Permitting can be another complicating factor. "We turned down a phragmites control job in New York City recently because the politics just got too cumbersome. There were a dozen city agencies to go through to get permits – it just got too complex."

Back on the job site in Rupert, there was a sense of ordered chaos, the workers' yellow slickers glowing amidst a heavy blanket of smoke. The goal was a fire that was hot enough to reduce the organic material on the forest floor and kill the thinned-skinned beech trees that were dominating the understory, but not intense enough to kill the mature trees in the stand, which included some nice hard maple – a species not known for its fire tolerance. That's why Nort and company set the fire in spring, when the duff was dry but the soil temps low and the water table high. To help keep things from getting too hot, about a third of the crew was on mop-up duty, spraying down slash, smashing out pockets of lingering fire with shovels and rakes. They worked in a seemingly post-apocalyptic landscape where everything smoked and hissed.

Another third of the crew was taming the fire: guarding the line, radios buzzing constantly, shouts emerging from the haze. "Get up to those two maples! There's shit behind you, too, so watch out." Guys scampered back and forth, congregating at the trouble spots where the fire had hopped the firebreak to beat or rake it out.

The rest of the crew kept advancing the front, receiving updates from behind that the fire was in control; waiting for word from their flank before applying more flame so the line advanced in an even fashion.

Phillips presided over it all in an energetic, jocular manner. He has the gray ponytail of an aging hippy but talks like a cross between a football coach and a biology professor. The crew was this same mixture of tough and smart. They used phrases like mucociliary transport and cuss words in the same sentence. Some were professional forest firefighters who later that summer would be fighting the big fires out West. Others were part-timers with day jobs, but they get together to conduct burns a few times a year. The company is a member of the National Wildfire Suppression Association, and all the workers are required to complete a number of training and physical certification requirements and renew those certifications annually.

The first match was lit around 9 a.m., and the crew worked until one o'clock the next morning on account of an unexpected wind that kept the fire going. That next day, anyone walking the woods road that traces the west line of the burn unit would have been astounded at the sight: everything to the east was black and harsh; everything to the west was brown and soft. The fire followed the road so perfectly it was as if an artist had painted on the char. I asked one of the foresters affiliated with the burn when they might see results, and he said in May or June of this year. Five to seven years from now the verdict will really be in.

Fire Management Services has two forest fires booked for this spring, with more in the planning stages. "This is the best job in the world," Phillips told me when we first met. "We get paid to start fires and then we get paid to put them out."

Dave Mance III is the editor of *Northern Woodlands.*

Wagner Forest Management, Ltd. is pleased to underwrite Northern Woodlands' *series on forest entrepreneurs. www.wagnerforest.com*

By Robert Kimber

Winning the Ice Out Prize

Unless you live right on the shore of a pond or lake, you've got to be on your toes to catch ice out, and even then you may get fooled. The retreat of ice proceeds by fits and starts, by melting and refreezing, by dawdling along in a cold snap and rushing ahead under a pounding spring sun. It all begins with a narrow little strip of water appearing around the shoreline. Then the snowpack starts turning to mush and water wicks up in ski and snowshoe tracks. Before too long you're looking at a black, waterlogged honeycomb, and if you turn your back on it today, you may find open water when you look again tomorrow.

The closest pond to us here in Temple, Maine, is Drury Pond, just a little under a mile from our house. I ski to it and on it nearly every day in the winter, but come spring, when the snow on my ski trail gives way to mud, my visits there become rare, and ice out is likely to sneak by on me. If I and my neighbors fail to note the passing of the ice on this little pond – not even half a mile long and less than a quarter wide – no one is likely to care, much less to chide us for our inattention.

But on Maine's big lakes like Moosehead and Rangeley, folks don't turn their backs on the lake for a minute. In Greenville and in Rangeley village, ice out is a major event; from early April on, everyone watches longingly for the telltale signs of it. Rangeley's twice monthly newspaper, *The Rangeley Highlander*, publishes in its early April edition an invitation to take part in the annual Ice Out Contest: "Tell us when you think ICE OUT will be declared!!" You can submit your guess on the date and time of day to the *Highlander* either by U.S. Mail or email.

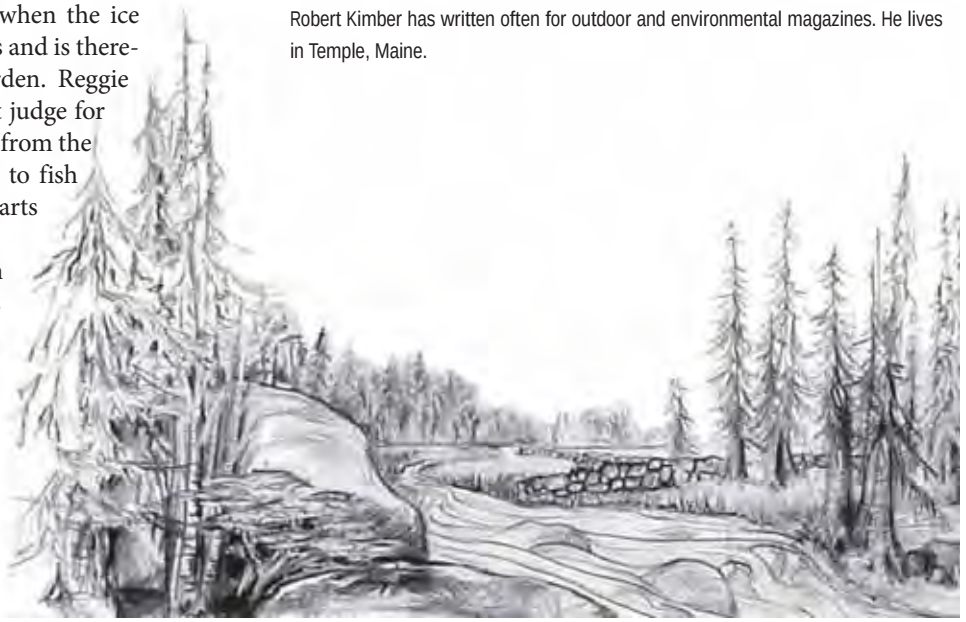
Because anglers starved for the sight of open water are itching to get out there and start trolling streamers for landlocked salmon, determining just when the ice has, in fact, gone out is serious business and is therefore delegated to the local game warden. Reggie Hammond has been Rangeley's ice out judge for the last twenty years, a job he inherited from the wardens before him. "Everyone wants to fish ice out," Reggie says, "so my phone starts ringing constantly."

The traditionally accepted criterion for declaring ice out in Rangeley is whether you can travel by boat the roughly eight miles from Oquossoc village at the west end of the lake to the tip of Greenvale Cove at the east end. "Most times," Reggie says, "I jump in a boat to check it out, but not always. I keep a pretty close eye on the lake, and I have some pilot buddies who watch also."

Reggie is the first to admit that determining ice out is not a precise science. "I'm certainly not down there the exact second, minute, or even hour the ice goes out," he says. People understand that a game warden has plenty of other business to attend to, so no one has ever dreamed of quibbling with Reggie's judgment. This is, after all, a contest conducted in a spirit of fun and good will. The folks taking part in it aren't competing for glory or a megabucks-style prize, and though there are prizes – first, second, and third – awarded to the winners whose guesses come closest to Reggie's call, there are no real losers in this contest. Whether your guess was a mile wide of the mark or you didn't even bother to enter one, you still win the biggest prize of all, which is ice out itself. Of course, we may get another solid snow storm or two, and of course, we may not be frost free for another month or more. But for all that, it's ice out that tips the balance from winter to spring more dramatically than anything else.

That holds as true on our little neighborhood pond here in Temple as it does on Rangeley or Moosehead Lake, and though I may miss seeing the ice actually go out most years, every once in a while luck is with me. I'll be at the pond at that magical moment when the honeycomb starts warping and undulating under a brisk breeze and breaking up into countless chimes of candle ice. If there's a canoe handy, I and anyone lucky enough to be with me can launch that boat; and as we paddle from one end of Drury Pond to the other, our paddles play on those chimes our serenade to the warmth of the sun on our backs, to the redwings calling in the outlet bog, to this first full-blown day of spring.

Robert Kimber has written often for outdoor and environmental magazines. He lives in Temple, Maine.



By Todd McLeish

Surveillance for Survival

For more than a dozen years Ken Schmidt has been studying how animals eavesdrop on one another. The Texas Tech University professor said that one of his study subjects, the veery, changes its singing behavior when owls are hooting to avoid becoming potential prey.

Veeries, which are close relatives of robins, have a beautiful flute-like song they often sing well after sunset. That's a risky behavior when in the presence of hunting barred owls, which are known to feed on songbirds.

At three sites on the Cary Institute of Ecosystem Studies research campus in Millbrook, New York, where several pairs of barred owls are known to be in residence, Schmidt played three owl songs over the course of 25 minutes shortly after sunset. A microphone recorded all bird vocalizations for 30 minutes after the owl calls. He found that the veeries sang less after the owl sounds were played, and they stopped singing for the evening much earlier than when no owls were heard.

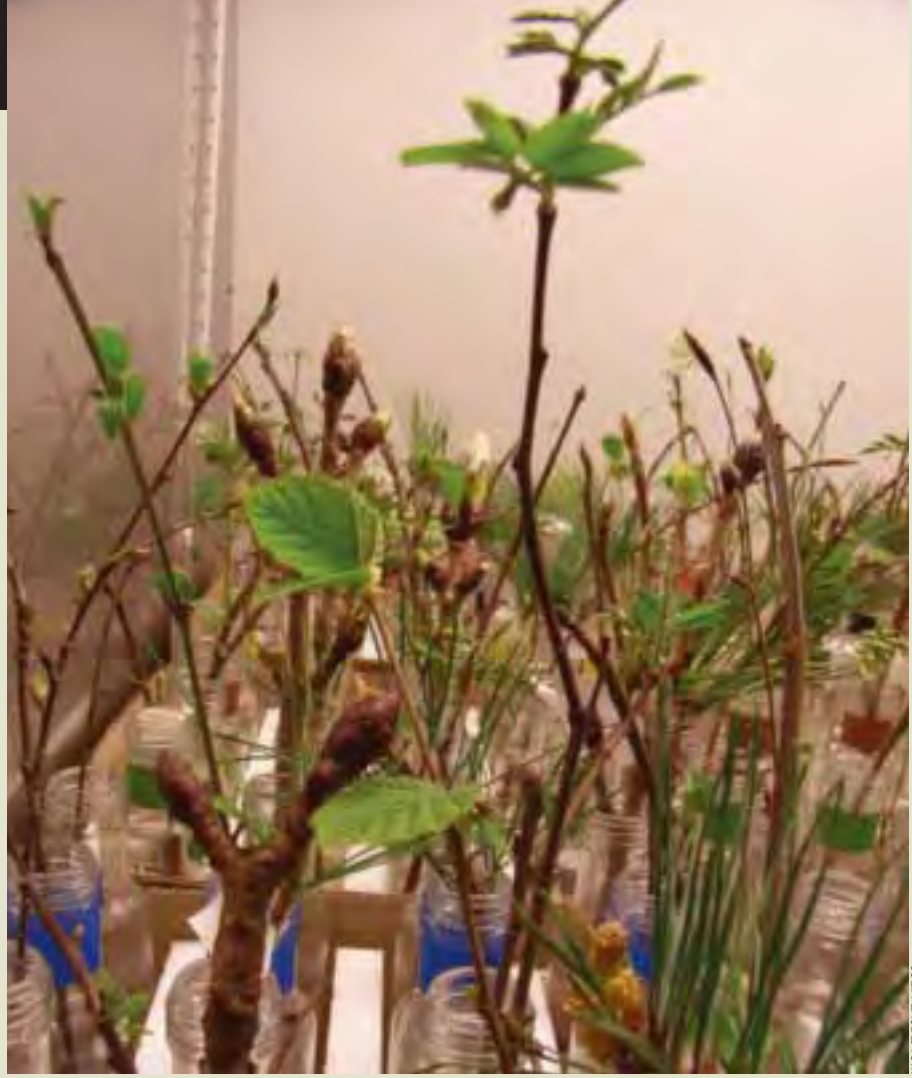
"Singing becomes much more risky in the low light of dusk when owls are around," Schmidt concluded. "However, by eavesdropping on owls, veeries can adapt their singing behavior to decrease the risk of predation."

The changes in veery singing behavior make sense to Schmidt, who said that prey must be somewhat flexible in their behavior if that behavior might attract predators: "Prey perceive signals of predators that tell them when it's riskier to sing, and predators are perceiving cues of prey to find out where they are."

The findings of this study, which were published in 2013 in the *Journal of Behavioral Ecology and Sociobiology*, likely apply to singing behavior during the dawn chorus, as well, but Schmidt said this study is especially notable because so little research has been conducted about the dusk chorus. "Further studies of dusk chorus singing may reveal how the risk of being attacked by predators has contributed to the evolution of singing behavior at dusk," he said.

He also notes that eavesdropping behavior occurs in many species, and not just among birds. Schmidt found, for example, that chipmunks eavesdrop on the alarm calls made by tufted titmice that warn when predators are in the vicinity. He is also curious whether birds may change the structure of their songs in response to predators.

"If you're a bird that sings at dusk, you want to sing to advertise your territory and to attract a mate, but that exposes you to the threat of getting killed," Schmidt explained. "Maybe their song has evolved a certain structure that makes it hard to find where the bird is, like a cloaking device. So our next studies will try to measure and analyze the structure of their songs. Do they simply change how frequently they sing, or are they actually changing their voices?"



JULIA LAUBE/TUM

Researchers at the Technical University of Munich in Germany tested twigs from 36 different tree and shrub species by exposing them to different temperature and light conditions in climate chambers for six weeks.

Temperature and Timing

The scientific process is a long and complex trail that sometimes leads to dead-ends and conflicting results before clear conclusions can be drawn. Throw in a dose of climate change to muddy the waters, and environmental research can be downright complex. That appears to be the case with recent studies of how the changing climate is affecting the timing of leaf emergence in the spring.

Anecdotal evidence has suggested for some time that warming temperatures are causing trees and other plants to bud and leaf out earlier. An 18-year study by the Vermont Department of Forests, Parks, and Recreation at the Proctor Maple Research Center has found that to be true of sugar maples. While the researchers observed considerable variability from year to year, they found that, on average, budding occurred three days earlier in the 2000s than in the 1990s, and

average leaf out was five days earlier.

Those observations seem to agree with experiments conducted at Duke Forest in North Carolina and at Harvard Forest in Petersham, Massachusetts. Scientists there examined a mix of native trees growing in open-topped, temperature-controlled chambers, some of which were heated three to five degrees above ambient temperature. Not only did the warmer temperatures produce earlier budding in the spring, "There is a certain time of the year when warming has the most impact," said James Clark of Duke University.

Clark's team found that unseasonal warming during the late winter and early spring – just a few weeks before the buds would be expected to open – has more effect on budbreak than at any other time of the year. They noted that some species are more sensitive to warming temperatures than others, and some advance their budding to match the earlier season, while others do not.

A team of German researchers has come to nearly the opposite conclusion, however. In a study of twigs from 36 different tree and shrub species that were exposed to different temperature and light conditions in climate chambers for six weeks, they found that plants tend to delay their spring growth following a warm winter. "An ample 'cold sleep' is what plants need in order to wake up on time in the spring," said Julia Laube of the Technical University of Munich.

As a result of the warming climate, the German scientists predict that the spring growth of many forest trees may start later and later, which may provide an advantage to shrubs and invasive trees that are not dependent on the cold. Like the Duke study, the German results varied by species, with beeches, sugar maples, and hornbeams affected the most and birches, lilacs, and hazels the least.

More studies are obviously needed before scientists can say with certainty how climate change will affect the timing of spring growth.

Conflicting Carbon Conclusion

Most New Englanders would agree that one way to reduce our environmental impact is to reduce our use of fossil fuels. And most would also agree that switching to wood is a step in the right direction, especially since it is a local resource that provides local jobs. But Dartmouth College Professor Andrew Friedland warns that, while wood is a better choice than fossil fuels, it may not be as environmentally sound as once thought.

"All energy choices are bad when it comes to the environment," he said, "and even wood has some problems."

According to Friedland, the calculations used to quantify the carbon dioxide released when trees are burned for fuel neglect to account for the carbon released from deep in the soil as a result of the logging process. It has long been believed that carbon in the mineral soil two feet or more beneath the surface remains stored there after logging, but Friedland's recent research says that may not be true.

"It seems like the disturbance at the surface changes conditions deeper in the mineral soil, causing carbon that had been content to sit there to end up in the atmosphere," he said. "So when we say we're going to use wood, there may be additional carbon dioxide resulting from our use of wood that we're currently not accounting for."

In a research paper published in the journal Global Change Biology: BioEnergy, Friedland studied sites at the U.S. Forest Service's Bartlett Experimental Forest in New Hampshire that had been logged at various times over the last 75 years. By comparing the physical and chemical properties of the soil at these sites to uncut sites, he found evidence of reduced carbon in the deep mineral soils where logging had occurred. Friedland concluded that this is because carbon was released due to logging.

"We're not exactly sure how it works," he admits, "but something is taking place at the surface – maybe decomposition of organic matter – that is allowing the downward transport of greater quantities of nutrients or microorganisms that is stimulating bacterial growth and microbial activity down below, which releases the stored carbon."

While it's easy to imagine how industrial-scale logging might disturb the deep mineral soils, Friedland says that his results came from sites that used "relatively gentle logging practices on level terrain with all attempts being made to take care and log responsibly."

Based on his calculations of carbon released from mineral soils, Friedland says that logging and burning wood for fuel releases 5 to 10 percent more carbon dioxide than previously estimated. And he believes the slow release of carbon after logging probably continues for about 50 years.

"It's a phenomenon that could last for a while, so when we're doing things to try to improve the situation with carbon dioxide in the atmosphere in the future, we have to be cognizant of the unintended consequences of our actions," he said. "Biomass is not a zero-emission fuel source." But it's still far better than fossil fuels.

ELI BURAKIAN/DARTMOUTH COLLEGE

Dartmouth College Professor Andrew Friedland believes that soil disturbance during logging leads to deep carbon being released. He is joined here in the research by students Chelsea Vario (center) and Taylor Hornig.

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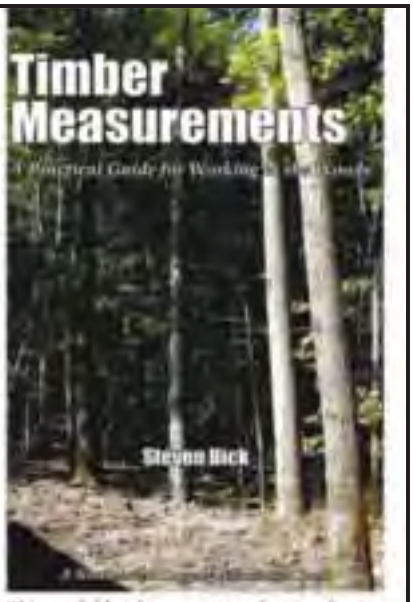

This useful book was written for non foresters by author and forester Steve Bick and published by the Northeastern Loggers' Association. Its spiral binding allows for easy reference in the field in such topic areas as *Measuring individual trees; Estimating tree volumes from tables, by grade, and from stumps; and Quick estimates of volume per acre.* Learn more about this publication and others on-line at:

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By Brett R. McLeod

Building a Better Peavey

While the mighty axe rightly receives credit for felling most of the timber of the eighteenth and nineteenth centuries, it was the peavey that took the work out of moving these logs, on both land and water. This often used and perennially abused tool was the creation of blacksmith and inventor Joseph Peavey – an industrious Mainer with a penchant for problem solving. Among Peavey's inventions were the spill-proof inkwell, the wooden screw vice, the hay press, and the impressive Peavey Hoist, capable of yanking even the most stubborn oak stumps.

As the story goes, Peavey developed the namesake tool after watching several river drivers try to free a log jam on the Stillwater Branch of the Penobscot River in the spring of 1857. By modifying a cant hook so that it had a sharp point and a swinging dog (hook), the peavey gave lumbermen a more efficient way to skid, deck, turn, and pry logs.

As fine an example of practical engineering as the peavey is (literally unchanged for 157 years), there's still room for a couple modifications that will yield greater efficiency on the landing and in the woodlot. I've experimented with a few design improvements that I can recommend:

Modification One: More spikes mean more contact with the log, ultimately making each stroke more efficient. By adding a second spike below the primary point, the user can confidently develop an efficient rhythm yielding more push per stroke. The secondary spike can be constructed out of an old railroad spike or a ¾-inch bolt that's about 5 inches long. Tack weld the point and check to make sure it's in line with the primary point before welding it the rest of the way.

Modification Two: By bending both the original point and the second spike (described in "Modification One"), you'll create an angle that requires less bending by the user, and more contact with the log. Each of these four-sided points can be created, and kept sharp, using an angle grinder.

Modification Three: Make it a razorback. This modification has its roots in competitive lumberjack sports. The multiple points allow you to roll logs along the ground or up a log deck with ease. Like the pushing spikes, the razorback may be sharpened using an angle grinder. This alteration is particularly useful when rolling hardwood logs.

Brett R. McLeod is an associate professor of Forestry & Natural Resources at Paul Smith's College.

1. This photo shows a standard peavey that has received an additional spike below the primary point, and matching 40 degree bends for both points (Note: The handle was removed from the peavey head prior to welding to avoid making firewood.)
2. A quarter-inch steel plate is used to construct the razorback, which can be cut with either an acetylene torch or plasma cutter. The razorback should be 8-9 inches long; 3-4 inches high on the back teeth; and 1.5-2 inches high on the front teeth. The tooth angle should be approximately 45 degrees.
3. This photo illustrates the razorback addition, as well as the secondary point, before and after grinding.
4. Comparing the modified version (red) to a stock peavey.

The Sugarmaker's Companion: An Integrated Approach to Producing Syrup from Maple, Birch, and Walnut Trees

By Michael Farrell
Chelsea Green Publishing, 2013

Maple sugarmaking, as an endeavor, has not suffered from a lack of literary coverage. If you make syrup, chances are you already own Helen and Scott Nearing's *The Maple Sugar Book*, which is a remarkably thorough, albeit a bit dated, look at the history and process. You probably also own the scientific *North American Maple Syrup Producers Manual* – this one's the kind of book you consult when someone asks you what, specifically, the sugar sand on the bottom of your pans is. Besides these two pillars, there are dozens of first-person meditations on the pursuit, some decent, some awful.

We're currently experiencing a maple boom in the Northeast, where everybody and her brother is becoming a sugarmaker, so we can expect another wave of books to hit the marketplace as publishers try to capitalize on this zeal. I'll admit that when Michael Farrell's *The Sugarmaker's Companion* hit my desk I was a little skeptical, but I found it interesting and useful. It's not going to replace either the Nearing book or the producers manual as my go-to resource, but it's found a place on the bookshelf nestled somewhere in between the two.

Farrell manages Cornell University's Sugar Maple Research Station, where he works on applied research and extension projects and oversees a 5,000-tap sugaring operation. The book is written in simple, straightforward prose, but the author's academic background is evident in the scale and tenor of what he covers and how he covers it. Most of the time, this is what makes the book good. He introduces us to sugarmaking around the world. (In Korea they tap Gorosoe (*Acer mono*) trees for the sap; in the Midwest some people tap black walnuts.) He devotes a chapter to progressive marketing techniques, like adopt-a-tree programs, and nonsyrup maple products. One of the most welcome sections was a chapter on climate change, where he debunks the simplistic but oft-repeated idea that maples are going to disappear in the next 100 years and be replaced by oaks and hickories. We learn that, in fact, there are a lot of factors besides climate that dictate species abundance and distribution.

At times, the author's academic background can be a hindrance, especially when the information drifts away from the practical. He's a relentless cheerleader for all things sugaring, but things sometimes get a little la-la; for example, when we're told how we might start a butternut sugaring operation. I guess you could apply for and receive a grant to establish a butternut bush in academia, but no one in the real world will ever do this on a commercial scale (or, one could argue, ever should in light of butternut canker). Still, the little tonal problems in the book are ultimately overwhelmed by the interesting information. I didn't even know you could tap butternuts.

Overall, the book delivers. It's full of sidebars and designed to be easily skimmable, almost a magazine format. It covers a lot of ground, so even if a section drags, you're soon on to something else. If you're new to sugaring, it's going to help you get up and running. And if you're an established sugarmaker, it's going to help you think outside the box when it comes to what's possible with your operation. Farrell's optimism is infectious – so infectious, that I'm going to have to end this review here and go out and work on my tubing system.

Alex Sullivan

The Hungry Hiker's Book of Good Cooking

By Gretchen McHugh
Illustrations by Susan Gaber
The Hungry Hiker LLC, 2012. Originally published by Alfred A. Knopf, 1982

If you can remember when backpacking meant hiking with an external aluminum frame pack, when hi-tech fabric meant those navy, long-sleeved polypro funk sponges with the little white horizontal stripes down the sleeve, and when dessert probably meant some god-awful dehydrated neapolitan ice cream, then you might also have fond memories of the culinary revelations in the *Hungry Hiker's Book of Good Cooking*.

Originally published in 1982, this tome is bit like the backpacker's version of the *Moosewood Cookbook*. With its folksy drawings and wholesome, healthy recipes, it's a book from a different time. But don't be fooled by the throwback feel: this book is full of great backwoods recipes and tips on what to bring with you into the woods that should resonate with a new generation of health-conscious hikers. (There's also a design for a great food dehydrator, which I built myself back in the late 1980s and had good luck making jerky with.)

Those who started backcountry cooking more recently might not know that when this book was originally published the freeze-dried, prepackaged options for backpackers were grim at best. Of course, a hungry hiker will eat nearly *anything*. *The Hungry Hiker's Book of Good Cooking* came along and offered scratch-cooking alternatives to the dreaded freeze-dried turkey tetrazzini and other foul "entrees" wrapped in foil packets.

The good news is that over the past 30 years a number of small companies have sprung up, using the sort of healthy and wholesome, minimally processed ingredients found in many of the recipes in the book. What makes this book still relevant is that those updated, prepackaged options for backpackers are expensive. This book can assist you in putting together some great meals at an affordable cost.

As with most culinary endeavors, there is a bit of an art to preparing fine food in the woods. A certain amount of what you can do in your home kitchen won't translate to eating out of your backpack, and this book provides some great, practical tips for making sure that you avoid the pitfalls of cooking in the woods.

The Hungry Hiker's Book of Good Cooking includes a great section on breads and meal planning that can be helpful to just about anyone. Some of these recipes require long cook times and therefore might necessitate more fuel than many hikers are willing to carry. But even these

dishes would undoubtedly be of interest to homesteaders, car campers, hunters, and anyone who wants a great meal but doesn't have a full blown kitchen at their disposal. The recipes are clearly written, which I greatly appreciate. There are some modern considerations missing: You won't find a long treatise on leave-no-trace camping in this book, or even a mention of the WhisperLite stove (yes, this book is that old). But take a walk down memory lane and enjoy

Carl Demrow

American Canopy

By Eric Rutkow
Scribner, 2012

Ever since the deserved success of Mark Kurlansky's *Cod: A Biography of the Fish That Changed the World,* readers have faced an avalanche of titles seeking to show how a seemingly banal commodity — salt, spices, potatoes, bananas, oysters, sugar, rum, cotton and, yes, white bread — profoundly shaped America or the world. These biographies of the inanimate allow us to examine history from a refreshing vantage point, from which we might see important things in our past we'd missed before.

Eric Rutkow's *American Canopy* is a case in point. It explores how trees have shaped American identity and how Americans have reshaped the continent's forests. Rutkow makes some hyperbolic assertions at the outset – that "nowhere else has the culture been so intimately associated with wood" (what of Russia, Finland, and Canada?) and that trees shaped America more than other nations (even Brazil and Central America's banana republics?) – but the general arguments are sound and enlightening. Our country and national character were profoundly shaped by the presence of an immense and seemingly inexhaustible supply of trees, and our changing attitudes toward trees and forest reflect our no-longer-young society's gradual acceptance of limits.

For most seventeenth century Europeans, wood was an expensive and often scarce resource. The English filled in their buildings' wooden frames with plaster, stone, thatch and other materials, and sourced their warships' masts and other components from the Baltic. Firewood had become so expensive that the poor could no longer afford winter heating.

By contrast, early colonists of our Eastern seaboard confronted seemingly unending forests, which hampered farming efforts and sheltered a frightening array of opponents, real and imagined. Rutkow shows how this surfeit of trees conditioned Americans to become heavy resource consumers, "always happy to save a day or a dollar by chopping down another trunk." New Englanders could build English-style houses with wooden walls, clapboards, and shingles. Appalachian frontiersmen took a page from the Swedish playbook and built homes, barns, and even fences out of interlocking logs, a method that, in terms of board feet consumed, would have given an English baron pause back at home. Southern longleaf pines can be tapped for turpentine in ways that won't kill the tree, but they were so common that settlers didn't bother to make the extra effort. As late as 1840, 95 percent of the nation's heating, lighting, and transport fuel came from trees.

Rutkow argues that this seemingly endless supply of building and energy materials engendered a throwaway culture. Things didn't need to be built to last or even to be efficient. Fireplaces wasted 90 percent of heat, but fuel was so cheap that few had an incentive to buy one of Benjamin Franklin's new metal woodstoves. As railroads expanded in the mid-19th century, they not only used wooden ties, trestles, and rolling stock; their locomotives were powered by dry pitch pine, producing what Charles Dickens once described as "a whirlwind of bright sparks, which showered about us [passengers] like a storm of fiery snow." These wood demands prompted the stripping of timber along rail routes, and the locomotives' dangerous exhaust created forest fires that wiped out thousands of acres at a time. Only once lumber titans, paper companies, and forest fires depleted the East's mature forests did a conservation movement take form in the late 19th century. Appreciation of forests' recreational and ecological functions took even longer.

But intellectual arguments aside, *American Canopy* is, at its core, a collection of tree tales, many of them wonderfully enjoyable. There's the Horatio Alger story of teenage immigrant Frederick Weyerhaeuser, founder of the continent-spanning lumber company of the same name, who transformed the way timber was owned and harvested. There's the unlikely story of the founding of Southern California's orange industry, which relied on the chance importation of cuttings from a mutated Brazilian tree that produced seedless oranges.

Readers above a certain age will remember the tragic destruction of the stately elms that once wrapped our streetscapes in a sun-dappled canopy, but Rutkow also brings to life the chestnut blight epidemic that permanently diminished the commercial and ecological value of Eastern forests. We're also reminded that protecting forests was, not that long ago, a matter of national security. In World War I, the military simply took control of the Pacific Northwest's lumber sector to ensure the supply of Sitka spruce, then essential for the construction of military aircraft. Japanese planes, balloons, and submarine-based artillery tried to burn these same forests down in World War II, and Washington was so worried about accidental fires that it enlisted Madison Avenue to create a campaign that ultimately gave us Smokey the Bear. (The original tagline: "Careless Matches Aid the Axis.")

These are vignettes well told, and readers will come away from this, Rutkow's first book, with a greater appreciation of the role of both forests and trees in our ongoing national story.

Colin Woodard, adapted with permission from a review that ran in *The Washington Post*

Brief Note for April's Departure

Since you will be leaving
tomorrow (or actually tonight,
just after midnight),
I wanted to jot a few words to you
while I still have the chance,
and not simply to repeat
the common accusation of cruelty,
though the way you are warm
for a week then suddenly
cold again does seem unkind,
and it is sometimes hard
not to resent those friends
who lead us on with sunny smiles
only to withhold their feelings
or parcel them out leaf
by leaf, as if saving them
for others, elsewhere.

But perhaps you were just waiting
for the right moment to open
up to us, the delay teetering
between heightening delight
and simply coming too late …
until finally you gave us crocuses
pecking out of the earth's shell,
the rabbit ears of daffodils
and their self-trumpeting flowers,
forsythia going haywire
in electric yellow, then leaves
in amazing miniature
like the fingers of infants,
and coiled ferns beginning
their slow unfurling – enough
so that we start to miss you
just before you leave.

JEFFREY HARRISON
From the book *Into Daylight* (Tupelo Press, 2014).
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By Adelaide Tyrol

Up in the Pine – Great Horned Owl, 32" x 48", acrylic on board, 1971

Fifteen years ago, on its centennial anniversary, The National Audubon Society recognized 100 "Champions of Conservation" in the twentieth century. All are individuals who have worked passionately to raise awareness of our threatened planet. Robert Bateman is one of these giants, along with the likes of Rachel Carson, Aldo Leopold, John Muir, and Ansel Adams.

Bateman is known as one of the most celebrated wildlife artists in the world. He balks at the moniker "wildlife artist," however, feeling that it's too restrictive. He is, rather, a painter of nature; of the organic forms and atmospheric conditions that he studies, loves, and wants to protect. "For me, the preservation and celebration of the natural world is a continual concern, and it is the underlying motive for virtually all my art," he has explained.

Bateman is interested in showing how wildlife and the environment are interwoven, specific, and complex. This esthetic is evident in *Up in the Pine – Great Horned Owl*. He admitted that it was very difficult to render the dizzying interlacing of branches; to get a better look, he hauled the canvas up a ladder to more fully understand the perspective. The large owl, cryptic on its perch, seems to almost be witnessing the artist straining to understand.

For six decades as an artist, naturalist, and spokesperson, Bateman has made it his mission to reconnect people with the outdoors. Raising awareness to bring about change is his life-long pursuit. He believes that children need to know the basic nature lexicon of the place they live in: "If we are able to identify things, we are more likely to be responsible citizens of the planet."

Robert Bateman has been awarded 12 honorary doctorates and numerous honors. Along with his tributes from the National Audubon Society, he has been given the Member of Honor Award, World Wildlife Fund, (1985); the Rachel Carson Award (1996); the Golden Plate from the American Academy of Achievement (1998); Queen's Jubilee Medal, (2002); and Human Rights Defender Award from Amnesty International (2007). He has also been the subject of several films and television programs. In May 2013, The Robert Bateman Centre that houses and exhibits his work was opened in Victoria, British Columbia. His work can be seen at http://batemancentre.org.

Call for entries: Send us your Outdoor Palette submissions. Contact Adelaide Tyrol at (802) 454-7841 or atyrol@ostudio.com for details.

A PLACE in mind

Sarah Kilch Gaffney

Toward the end of a long Maine winter, my husband Steve and I bought our first house. We were young and short of cash, so we were unable to realize our dream of an idyllic homestead complete with an extensive woodlot, fields, and burbling stream. What we did find, however, was a snug little house with a sizable yard and a few acres of woods. An expansive marsh abutted the property, which was a two-fold blessing: it made our property affordable and gave us a fascinating environment to start exploring. As the world hovered on the edge of spring, we signed the papers and moved in.

When the snow receded, we found piles of asphalt shingles, countless motor oil containers, beer bottles, and other relics of the previous owner interspersed among the trees. But we also discovered peepers, which produce a symphonic wall of sound around the house each spring, and both painted and snapping turtles, which came to the yard to lay eggs. The marsh simply teemed with life: birds, insects, frogs, and sometimes the yips of coyote pups from the woods beyond.

We cleaned up the trash and planted apple trees, rhubarb, and asparagus. Each year the vegetable garden expanded a little more. We brushed out a path through the woods and our border collie burned her own track through the trees, connecting with the main path here and there. In the winter, the dogs bounded across the frozen marsh, delirious with the freedom of an unhindered run. We found pitcher plants, their intricately veined flesh frozen in the ice, wild cranberries, and beaver lodges taller than our heads. The woods were full of hemlock and cedar, with birch lining the yard, alder edging the marsh, and here and there maple, fir, and oak.

Then, at the age of 27, Steve was diagnosed with a brain tumor. It was large, challengingly located, and incurable. His doctors gave him five to ten years, if lucky, and our world spun to a halt. Treatment after treatment left him exhausted and, eventually, permanently disabled. Soon, favorite activities like backpacking, long hikes, and maintaining our section of the Appalachian Trail were things of the past.

As we adjusted to our new reality, I'd remind myself that we still had our land. On good days, Steve and I could walk down the path hand in hand; on bad days, I knew the perfect rock on which to sit and get away from the world.

When our daughter Zoe was born, our perception of what is truly important changed. Our focus became accepting and tackling the difficulties of Steve's illness while embracing the time we had left as best we could. We also discovered that there are few things in this life more hopeful than a child: she embodies more hope and strength of spirit than we ever could have summoned on our own.

When Zoe was two weeks old, we bundled her close to my chest and took her snowshoeing through the woods to the edge of the marsh. By 16 months, she insisted on tackling our beloved path on her own two slightly trippy feet. Soon, she was on her own set of snowshoes meandering down to the marsh. One winter, following an impressive January thaw, we all traipsed out to the marsh together. It was a good day. Sprawled on our bellies, we looked down through the clearest ice I'd ever seen. There were air bubbles suspended mid-ascent, lily pads, and little fish frozen just beneath the surface. Zoe was enthralled, her eyes filled with wonder, and she threw a mighty temper tantrum when it was finally time to head back home.

Though we had only an inkling of its importance that first winter, our little piece of land has now become the backbone of our life. It keeps us grounded and happy. It feeds us, challenges us, and provides adventures and life lessons. It is a playground for Zoe (not to mention for the dogs, cats, and chickens), a work in progress, and home for all of us. Most importantly, perhaps, it is a constant in our decidedly tumultuous life. In times of crisis, there is little more comforting than the mundane, the normal: splitting wood, weeding the garden, walking to the marsh. Zoe is at the age where she asks about everything she sees, and we tell her as best we can as she wanders down the path and weaves herself between the trees: birch, hemlock, alder. Peace.

Sarah Kilch Gaffney lives in Vassalboro, Maine, with her family.

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BRANDON – 28,120 ± ACRES
The Adirondacks, NY

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OTTAUQUECHEE HEADWATERS – 862± GIS ACRES
Killington & Bridgewater, VT

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