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Northern Woodlands' mission

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

From the center

For some time now, the board and staff of the Center for Northern Woodlands Education have been working on a plan to increase our organization's capacity so we can reach many more people with our message of stewardship. We're pleased to share with you the news of how this expansion will unfold.

Walter Medwid has joined our team in the role of executive director and publisher. Walter comes with extensive nonprofit management experience gained from work with the Adirondack Mountain Club, the International Wolf Center, and most recently at the North Woods Stewardship Center. In each of those organizations, he has served as executive director, and we are pleased to have someone with such strong executive leadership credentials take on this important job. We know we will benefit from his new ideas, enthusiasm, and deep commitment to education and the forests of the Northeast. Please join us in welcoming Walter Medwid to the Northern Woodlands family. You will get to know him as he writes this column in the future and takes the reins of the organization.

Dave Mance III, who has been managing editor of *Northern Woodlands* for the last two years, will be promoted to editor. Dave is a fine writer and has been learning the editorial ropes under the supervision of founding editors Steve Long and Virginia Barlow. Beginning with the Summer issue, he will take over the role of editor and will benefit from the continued participation of the founders as senior editors.

Virginia will continue to write her columns, so you'll still be treated to her Species in the Spotlight, Under the Microscope, and her quarterly look at the Season's Main Events.

Steve will also continue to write for *Northern Woodlands*. In addition, because he will be turning over the organizational management role to Walter, he will be able to devote more time to other publications and media. As you probably know, the Center for Northern Woodlands Education does more than publish a magazine. We publish a weekly ecology column syndicated to many newspapers, and we have published a book called *The Outside Story*, a collection of these articles. To date, we have published three versions of a magazine-format owner's manual for landowners called *The Place You Call Home,* one each for the Upper Valley of New Hampshire and Vermont, the Catskills, and a statewide version for Vermont. In addition, we have developed a strong website at www.northernwoodlands.org and deliver a weekly newsletter to a devoted audience.

These efforts reach thousands of people who might not subscribe to a magazine, so they are crucial to our mission of fostering a culture of stewardship. Building on our legacy and expanding the ways that we provide information to people has long been a dream of ours, and Steve will now be able to focus on these efforts. We have several book projects that are in various stages of development, and we will now be able to bring these to completion. And we will redouble our educational outreach efforts to influence an even larger audience through the magazine and our growing family of media offerings.

Northern Woodlands magazine is our flagship and will continue to be our most visible offering to thousands of readers across the Northeast and beyond. Be assured that we maintain our strong commitment to its high quality coverage of all aspects of our woodlands.

From its beginnings in 1994, Northern Woodlands has always been a lean organization, and we don't increase staffing levels often. To help make this possible, we have secured dedicated funding from foundations and individuals. The strength of this organization is a direct result of the confidence you've shown in us through your generous support. Thanks to you for helping us become even more effective.—Julia Emlen, President, Board of Directors

Northern Woodlands is the trade name of the Center for Northern Woodlands Education, Inc., a 501(c)(3) public benefit educational organization. Programs include *Northern Woodlands* magazine, Northern Woodlands Goes to School, and Northern Woodlands News & Information.

In this Issue

Cover photo by Roger Irwin

Photographer Roger Irwin has a special affinity for *Acer rubrum*: the red maple. "The beautiful spring blossoms, the seeds with their reddish colors, and the bright red leaves in the fall make it a delight to photograph," said Irwin. The tree has practical uses, too. Irwin has been improving his woodlot by cutting and using red maple for firewood.

A Look at the Season's Main Events

By Virginia Barlow

	MARCH	APRIL	MAY
First week	The 1- to 2-inch fruiting bodies of the scarlet cup fungus develop their intense red color in late winter. Look for them as soon as the snow melts, usually on fallen hardwood branches / Not too many migrants are back, but local residents, such as cardinals, are more vocal now / Meadow voles breed almost year-round. The first of their 4-10 litters has probably been born. At 4-5 babies per litter, it's no wonder that they are such abundant mammals	There may still be some snow on the ground when mourning cloak butterflies begin flying. If it is cold, they will bask on dark surfaces to warm their flight muscles / Spring peepers begin peeping in earnest. Isolated peepers will peep from now until November, but only now is there a deafening chorus / Turkey vultures are arriving from parts south. They ride storm fronts, sometimes gliding four miles high / Mourning doves are cooing away at the crack of dawn	Alder flea beetles, ¼-inch long and metallic blue-green, are evident on swelling alder buds and will soon begin laying eggs / Male whitetails are quickly regaining the fat they lost over the winter and during last autumn's rut / Warbler arrivals may include ovenbird, magnolia, parula, Blackburnian, and northern water thrush / Several invasive species leaf out early. The pale green leaves of non-native honeysuckles are visible before those of most other shrubs
Second week	Look for early robins, bluebirds, and song sparrows / Stone flies are hatching. Look for them resting on rocks near streams / Short tailed weasels are losing their white winter coats / Earliest migrating ducks, if the weather is reasonable: black, mallard, greater scaup, lesser scaup, ring necked, and common merganser / Chickadees prefer birdhouses that are in or near woods. On their own, they use rotten stubs, tree cavities, and abandoned woodpecker holes	Male winter wrens returning now are extremely vocal. The soon-to-come winter wren nests will be hidden among the roots of overturned trees / Female spotted salamanders hold their fertilized eggs for several days before depositing them in large spherical masses / As soon as snow melts from the bases of trees, hepatica will flower. The delicate pink or lavender flowers look too fragile to withstand harsh April weather / Look for ospreys along big rivers	The dark-colored eggs now being laid by American toads contain melanin, which helps protect them from over-exposure to ultraviolet light / Bank swallows are digging 2- to 3-foot-long burrows in steep sand or gravel banks. They are colonial nesters: usually there are from 10 to 100 other burrows nearby / Don't be discouraged by your lawn: dandelion flowers can be dipped in flour, fried, and eaten / Queen bumblebees are laying their first clutch of eggs
Third week	The tiny new leaves of big-toothed aspen give a distinctive gray-green tint to wooded hillsides / Muskrats may be mating. Up to eight little muskrats, each weighing less than an ounce, will be born in about a month / Crows may be seen carrying nesting material / Whitetail bucks begin growing antlers, nourished by a system of veins and arteries within the dense marrow. Developing antlers are so well supplied with blood that they would feel warm to the touch	While the weather may still be conducive to sap flow, by now the sugar content of maple sap is usually below 1 percent. At 1 percent, it takes 86 gallons of sap to produce a gallon of syrup. Time to quit boiling / Barn swallows may be returning, somewhat earlier than was normal 20 years ago / Bears have left their dens but will continue to lose weight until succulent vegetation becomes available. Wetlands are important because they green up early	Very young plantain leaves are good in salads; soon they will become stringy / Tree bats are returning; migration may be synchronized with the first moth hatches of spring / The veery nests being built now incorporate a base of dead leaves and are large compared to the size of the bird / Baby opossums will be weaned soon. Their first 60 days were spent in the mother's pouch / Starflower, a low plant that is found in the north all around the globe, is blooming
Fourth week	Saturn will be at its closest to Earth on March 22. This is the best time to view the ringed planet and its moons, although the rings will be nearly edge-on this year and not so easy to see / Wood frogs are arriving at ponds to breed. Egg laying is synchronized, and adults will return to the woods within a week or two / Grouse drumming begins. It will continue for many weeks / Hooded mergansers stay in rivers until ice disappears from their breeding ponds	Moose hair is in raggedy patches, for they are molting their thick winter coats / Porcupines are successful animals, even though each female gives birth to only one offspring per year. The babies are born from April to June, usually in tree cavities or fissures in rock outcrops / Listen for the first evening songs of the hermit thrush / Balsam shootboring sawflies, a bit larger than blackflies, may be abundant in Christmas tree plantations at midday if it is warm	White-spotted sawyers are beginning to fly. They will be out through the summer and are often mistaken for Asian longhorned beetles. They have a white spot at the top of the wing covers, where the covers meet in the center of the body, which the Asian beetles lack / The season's first spotted fawns are born. Mature does that entered winter healthy and well fed will produce twins / White ash leaves are finally opening, well after most other trees

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.

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The Long View

By Stephen Long

Let's go back to the good old days. Let's go back to the days when all was well, when life was pure, when music filled the air.

Chances are good that every one of us is drawn to an image of a golden age. The golden age of rock and roll, for instance, could be (depending on your age and taste) the 1950s of "Rock Around the Clock" or it could be the British invasion of the 1960s. It couldn't possibly be the 1970s, though if you are an aficionado of punk, the golden age of punk was indeed the late 1970s. I lived in Manhattan at that time, and I saw The Clash and any number of lesser punk bands. But when I think of punk's glory days, I see Wendy O. Williams, the originator of the spiky Mohawk as the rebel's coif of choice. In her live shows with The Plasmatics, she blew up cars and ripped guitars apart with a chainsaw. Now that was punk.

Other, more decorous domains have also had their golden age: flyfishing, landscape painting, furniture making, sculpture. Today can't help but pale in comparison. Sometimes, as with rock and roll, there is argument over when the golden age occurred, but there's no argument that today isn't it. Life was better, more perfect back then. Squint hard enough and you can recall less antagonistic public discourse, a culture built not on egotism but on community, neighborhoods where kids could safely play without adults supervising every move. I'm guilty of all of those romanticizations.

When building our vision of the future, we use the cornerstone of the past. And the past that we long for can be something that passed away long before our time.

One of those idealistic visions is that of the New World as a promised land, filled not with milk and honey but with stupendous mountains, primordial forests, and rushing rivers cascading to the sea. Oh, to breathe in just one twilight in spring at that time, to listen as the late afternoon stillness gives way to dusk's cacophony of frogs, toads, and thrushes, and to watch a darkening sky fill up with sparkling heavenly bodies. No intrusion of planes or traffic, no glow of streetlights, no sullied air: what a remarkable place it must have been.

Much of our environmental movement has been built on a longing to return to that world. And that longing is powerful. People with that vision have in the last fifty years brought about cleaner air and water and the restoration of habitat for many species that had been on the brink. These are magnificent triumphs, accomplished by the hard work of visionaries, many of whom were driven by a thirst to return to Eden, an Eden in which Adam and Eve had not yet transgressed.

I can understand that thirst, because I spent all of my childhood summers in the Adirondacks, where wild places are just a hike away. My love of the natural world began on those hikes, and climbing Bald Mountain was one much-anticipated annual event. It's been my experience that any place there are mountains, one is likely to be named Bald Mountain. The one that means so much to me was between Old Forge and Eagle Bay.

What we rather grandiosely called "climbing a mountain" was in reality nothing more than a long uphill hike. Sure, there was some scrambling up rocks to be done, but we're not talking about technical climbing here: no precarious fingertip holds, no belay lines. Still, what opened up before us as we climbed out of the woods and onto the bare rock top that gave it its name was no less awe-inspiring to us than was the view from Mt. Whitney to John Muir. It was sublime.

The granite top had a fire tower perched on it, and even though I had a horrible fear of heights, my brother Tom encouraged me to make my way up the five flights of open-air stairs and on into the cab at the top with views in all directions. A ranger manned the tower, and he had a cool map that helped us see which mountains and lakes we were looking at. To the south, we could see three lakes of the Fulton Chain

(Second, Third, and Fourth), then out beyond were the Moose River Plains and Little Moose Lake; to the east but tucked out of sight,was our camp on Sixth Lake. This was big country, country that people disappeared in, country that caused the jaws of city folks to drop in stunned silence.

Other day hikes led to back-country lakes: Cascade, Bubb and Sis, and my favorite, Bug Lake. Bug Lake was no more buggy than any other, and we loved it because along its shore we discovered two rowboats that had been stowed in the underbrush. Neither boat had oars – evidently, the owners carried their oars in with them – but that didn't stop us from launching them. We could always find long branches to pole with while pretending to be Huck Finn on the Mississippi, though I don't believe Huck would have returned the boat. Those were the good old days, but they were more than that. This was the awakening in me of an environmental consciousness, though I didn't know it as such. All I knew was that these wild places were treasures. They were quiet and remote and pure. Except for the fire tower and the trails, there were no other signs of man's presence, and it felt like going back to the Garden. Today, I realize that these lands are not wilderness, that more than a century ago the forest had been logged heavily, and that the present-day trails likely came about as logging roads.

As I grew old enough to have a job in the summer, I worked at cottage colonies that served the tourists, the main economic engine of this lightly populated dot on the map. The owners, Mary Evans and then Ed Stiefvater, were self-reliant Adirondackers, and from them I learned how to improvise solutions from the materials at hand; we would reuse the hinges from the broken door stowed in the shed and a selection of screws saved for decades in a coffee can on the oil-soaked work bench, and make that screen door good as new. I was a handyman and proud of the skills I picked up – replacing electrical switches, cutting glass to fit a broken window, persuading a flooded Evinrude to start, replacing a washer on a dripping faucet. All summer long, I'd fix this and refurbish that, though those tasks were simply the punctuation marks on a run-on sentence of raking the beach, mowing the lawn, and painting cabins. You could never catch up – there was always a cabin with blistered paint.

Ed Stiefvater taught me to tie a rope of oakum around my neck to ward off the black flies. From him, I also learned to drive a truck with a 3-speed on the column, and when I drove the week's accumulation of trash to the dump, I milked the opportunity for all it was worth, rolling slowly through town at the helm of the green 1951 Chevy.

The last year I worked in the Adirondacks, it was not a student's summer job. It came after five years of living in Manhattan, where I'd been driving a moving truck and lugging sofa beds up to 5th-floor walkups, and, yes, listening to punk bands. All this was in service to my dream of becoming a writer. But I was in bad need of a break from the city, and I found it in the employ of Ralph Murdock.

I'd graduated in a way from being a handyman, and now the work was harder. Instead of fixing things and painting things, we were building things: roads and foundations and septic systems. Ralph was masterful with the equipment. When installing septic systems, I would be down in the hole with my shovel, and Ralph would be on his backhoe lowering the concrete septic tank that dangled on a chain above my head. My job was to guide it into place as he lowered it and make sure it ended up level. I was never afraid. As someone else on the crew once said, Ralph was so good, he could comb your hair with his backhoe bucket.

The year I worked for him, he spent his off-hours converting a school bus into a truck to pull his 5th-wheel RV. He cut off the back of the bus, shortened the driveshaft, and mounted a receiver plate to the frame. When it was done, the cab was like a living room and could fit the whole family for a rolling party.

These inventive people were direct descendants – maybe even literally, but at least figuratively – of the mountain men and the pioneers who settled this wild land. Their resourcefulness and their skill were an art form. Just as climbing the fire tower on Bald Mountain brought me back to a natural Eden, working for Ralph brought me back to the sturdy souls who'd made their way into this wild land. It's not only historical re-enactors dressed in buckskin and toting flintlock muskets who consider this era of settlement a golden age. So my image of the good old days includes wolves, huge trees, and five-pound brook trout, but it is also populated by mountain men and pioneer families who somehow coaxed a living out of the wilderness. I wish I could live in the world of a Winslow Homer painting with his trappers, hunters, loggers, and surveyors. The ethereal landscapes of the painters of the Hudson River School call attention to what has been lost, but Homer's image of a guide rowing a blue boat speaks just as clearly to my core.

Believe me, I don't fail to see the irony of lamenting the loss of the garden while admiring the people who inadvertently set its destruction in motion. I recognize that the wolves, the trees, and the trout – indeed, the whole forested system – suffered dramatically as these men did the bidding of those who sent them.

Philosophers and policymakers both ponder the question: Does nature have intrinsic value or is it in the service of humankind? To me, that poses an artificial choice, because it supposes that we are outside of nature, that nature is an abstraction that exists on its own. Not so. We are part of nature. We cannot survive without making use of the plants, animals, and minerals that we turn into everyday products.

We cannot put a fence around nature and leave it alone. But we can develop a humble reverence for the gift we've been given and make a solemn vow to take better care of it. Let the golden age of stewardship begin. NW

By Tim Wilmot

When Tapping, Don't Disregard Red Maple

At a recent meeting of maple producers in New England, I asked the question, "How many people would never tap a red maple?" Half the audience raised their hands. There were a number of reasons given, including fear of low sugar content or bad-tasting syrup; it's been theorized that since red maple buds swell earlier than sugar maple, the syrup might taste buddy. And yet, when I've talked to people who actually tap red maples, it seems that many of these fears are unfounded. Add to this the fact that the existing red maple resource in the Northeast is huge and expanding – Vermont has 40 million live red maples at least 10 inches in diameter; Maine, Pennsylvania, and New York have far greater numbers – and it seems that many sugarmakers would be wise to give red maple a second look.

There are several reasons why red maple is flourishing throughout the region. Red maple grows fast and will usually outstrip the growth of sugar maple and beech in abandoned farm fields. Human-caused events – the introduction of chestnut and elm blight, high grading, and fire suppression (fire is more damaging to red maple than most other hardwoods) – have all caused red maple to become more competitive in our forests. Red maple is more resistant to ozone and acid rain, and in some areas where air pollution contributes to mortality of mature sugar maple, the canopy is being replaced by red maple. Although red maple is susceptible to several unsightly leaf diseases, insect defoliation is usually less severe in red maple than in sugar maple. Forest tent caterpillars avoid it altogether. Keeping red maples in a sugarbush adds to its diversity, and a diverse sugarbush will experience less insect and disease damage than a stand of pure sugar maple.

Red maple and sugar maple differ in several other respects. Sugar maple is usually confined to moist but well-drained soils, while red maple will develop a root system suitable for almost any site – from dry ridges to swamps and bogs. Sugar maples may live to 300 years or more, while red maple rarely exceeds 150 years. Red maple flowers almost every year and the seeds fall in the late spring; sugar maple flowers less frequently, and the ripe seeds drop in the fall. Red maple stumps often sprout to yield a clump of poles from the same base; often these have defects and are not destined to become full-sized trees. Large wounds, as well as branch stubs, are more readily subject to decay in red maple than in sugar maple. Sugarmakers who tap red maple report that tapholes usually close rapidly, but spouts driven hard can cause a considerable split in the cambium above and below the hole. Red maple branches break more readily from wind and ice.

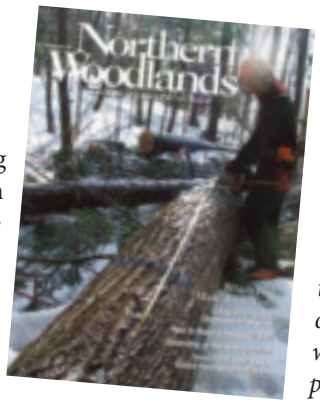
So what about red maple as a tree for sap collection? I spoke to several people whose sugarbushes consist of a large proportion of this species. Some described their syrup flavor as "more maple," some as "more caramel;" all claimed that their customers were very happy with it. The differences in flavor seem to echo the vast differences also found among sugar maple syrups from different soils and regions. Haven King, who buys syrup from sugarmakers all over the Northeastern U.S. and Canada for Maple Grove Farms of Vermont, told me that some of the best-tasting syrup he buys comes from sugarbushes that are mostly red maple.

Sugarmakers had varying descriptions of the niter produced from boiling red maple sap, with the yearly range from white to black and from light to heavy – just as is typical with sugar maple. No one described problems with buddy sap; apparently most red maples shut down sap production as the buds begin to open, or the sap turns buddy at about the same time as that of sugar maple. Sugar content was typically lower, but only by a couple tenths of a degree brix. Some stands of red maple ran earlier than sugar maple stands, some did not. Syrup made from a predominance of red maple is often a bit darker than sugar maple syrup, but not dramatically so. Sugarmakers who collect with buckets describe some red maples with very shaggy bark as poor sap trees but said that other trees were often very high-yielding. Trees growing in a swampy area often have large heartwood centers, necessitating shallow tapholes.

Many maple producers are poised to expand their operations. With the vast amount of untapped red maple in northeastern forests, it makes sense to take advantage of this species. While tapping a stand that is largely red maple may scare some people, there is no reason to avoid these trees when they are growing in your sugarbush.

Tim Wilmot is a University of Vermont extension maple specialist.
A version of this column appeared in *Farming, The Journal of Northeast Agriculture* in April, 2009, and is used with permission. Please visit www.farmingmagazine.com for more information and a free subscription.

Letters to the Editors



Deer Yard Paradox

To the Editors:

With great regard for Susan Morse's Tracking Tips article in the Winter 2009 issue of Northern Woodlands, I find it accurate with my experience in winter deeryards, except for one thing.

I have passed through many deeryards on my trap lines here in the south-central Adirondacks. We also have deer wintering in our sugarbush woods. As a keen observer of weather, I've noticed a colder "microclime" in the softwood deeryards. The softwoods are usually in a lowland. Cold air puddles into the area. Less snow under the evergreen canopy, but it's still there later in spring when upper hardwoods are nearly bare.

In our normal six-week-plus sugar season, I travel from home to the bush out back on an ATV. As I pass through the low softwoods, I feel the cold. I don't need a thermometer. It is colder. Great, accurate article, but for that. Am I wrong?

Jack Leadley, Speculator, New York

Editors respond: *What we have here is an example of dual truths. Softwood stands do hold snow and cold longer in the spring than hardwood stands do, as Mr. Leadley observes. In the depths of winter, however, they provide better cover and warmth than hardwood stands because conifer needles make superior snow and wind breaks.*

Need More Beetle ID

To the Editors:

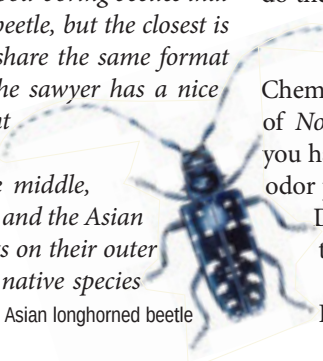
I am concerned about positive identification of the Asian longhorned beetle. Either there are species here in Addison County, Vermont, that look very similar, or possibly the beetle has already arrived. Perhaps you could provide some detailed information to your readers (or is that information available elsewhere or in a previous issue?) Also needed are detailed examples of what an infested tree would show as symptoms.

George Reynolds, Addison, Vermont

Editors respond: *There are a number of wood-boring beetles that look somewhat like the Asian longhorned beetle, but the closest is the whitespotted sawyer. The two beetles share the same format and similar color and size. Fortunately, the sawyer has a nice little diagnostic feature that can bring instant reassurance: it has a small, white spot at the very front edge of its wings, right in the middle, just aft of the thorax. Both the whitespotted and the Asian longhorned may have numerous other spots on their outer wings, but the position of the spot on the native species allows for instant identification.*

The whitespotted sawyer prefers conifers (the larvae munch on dead softwood logs), while Asian longhorned beetle larvae damage living hardwoods. An infected tree will show perfectly round, 2-centimeter-wide exit holes. We've written extensively about the insect, and if you'd like to learn more, a search of our web site (www.northernwoodlands.org) would be a good place to start. Otherwise, the University of Vermont maintains a nice site: www.uvm.edu/albeetle/identification/index.html, as does the U.S. Forest Service: www.na.fs.fed.us/fhp/alb

Whitespotted sawyer beetle



Asian longhorned beetle

Best Yet

To the Editors:

We always look forward to your new issue, and we are never disappointed. But the Winter 2009 issue is the best in our memory. Thank you.

George and Antonia Grumbach, New York, New York

Spring Tale

To the Editors:

Thanks to Alan Pistorius for his springtail article in Knots and Bolts. Here is something I wrote 30 or so years ago after finding thousands of them coating melting snow:

Spring Tale
On ice in sun made puddle
The Springtails formed a scum
And left for us to muddle
From where on Earth they'd come

Pike Messenger, Middleton, Massachusetts

It's a Poor Memory That Only Works Backwards

To the Editors:

Back to the future? One can speculate on the return of the wood chemical industry. Can research and modern technology do the nearly impossible and bring it back? The environmental and economic hurdles are countless.

The odor! Hugh Canham's article "The Wood Chemical Industry in the Northeast," in the Winter 2009 issue of *Northern Woodlands*, revived memories. The odor! Once you have smelled a working acid plant, you never forget it. The odor permeates nearly everything and everyone in the vicinity. Downwind you get the enriched version. And some folks think outdoor boilers smell bad.

Glenfield, New York, was the location of the short-lived Keystone Wood Chemical and Lumber Company plant. As

a youngster growing up in Glenfield, the odor was a fact of life. The plant in Glenfield was supposedly the most modern and innovative wood chemical operation in the world at the time (possibly one of the last new plants built in the Northeast).

Interesting information about the wood chemical industry and the Glenfield plant can be found in *Sawmills Among the Derricks* and *Tanbark, Alcohol, and Lumber* by Thomas T. Taber III. These books are numbers 7 and 10 in the series: Logging Railroad Era in Pennsylvania."

Patrick H. Kelly, Scipio Center, New York

Straight Scots

To the Editors:

Northern Woodlands always instills admiration in me, but invariably I feel the urge to add in a little extra information that may be of interest to other readers.

Virginia Barlow's Species in the Spotlight is always instructive. My comment is related to the common name that she gives the species *Pinus sylvestris*. "Scotch" is a beverage concocted by the Scots – and a very enjoyable one it is. But the species is more appropriately named "Scots pine." The crooked stems she writes of are certainly characteristic of most, but not all, Scots pine. The genetic variation in such a geographically widely occurring tree does seem to govern stem form. Southern European/Maritime varieties are usually as crooked as a dog's hind leg. Northern European varieties tend to be straighter – some quite imposing. Stands of these may be seen in the Adirondacks (at Axton) that were planted by Bernhard Edward Fernow on what was then Cornell Forestry School land back around 1901-02. He obtained seed stock from Northern Europe, probably from near Regensberg in Germany. Some of these trees may be seen south of Tupper Lake on Route 30. One gets the idea of why Scots pine is considered to be a good timber tree in parts of Europe.

The Christmas tree trade, on the other hand, prefers the Southern/Maritime varieties, since the needles remain green or blue-green in the winter, whereas the Northern varieties turn a yellowish green. Needle retention of both is good.

I would also add that the book review section names a "Fearsome Creature of the Lumberwoods" that I myself have experienced – the Agropelter. Although the book describes this ropey-armed, fiendish primate as hurling rocks at travelers, my experience is that the creature lives in the forest and during times of high wind hurls lethal-sized branches at unwary loggers or woods visitors. The best defense is a sturdy hard hat. I wrote up my encounter (and with other strange creatures) back in 1962 in the *New York State Conservationist* (Volume 16).

Larry Hamilton, Charlotte, Vermont

We love to hear from our readers. Letters intended for publication in the Summer 2010 issue should be sent in by April 1, 2010, and should be addressed to Letters, Northern Woodlands, P.O. Box 471, Corinth, VT 05039. Or fax to (802) 439-6296, or e-mail to dave@northernwoodlands.org. Please limit letters to 400 words, and include a name, address, and daytime telephone number. Letters may be edited for length and clarity.

DON'T MOVE FIREWOOD

Our forests are threatened by nonnative insects that can kill large numbers of trees. Three recently introduced insects–emerald ash borer, Asian longhorned beetle, and Sirex woodwasp–are wood-infesting species that can be transported long distances in firewood. Once transported into new areas, these insects can become established and kill local trees. We must **STOP THE SPREAD** of these insects and protect our forests and trees.

How you can help:

- Leave firewood at home–do not transport it to campgrounds or parks.
- Use firewood from local sources.
- If you have moved firewood, burn all of it before leaving your campsite.

Inset photo: Asian longhorned beetle larva (courtesy of Thomas B. Denholm, New Jersey Dept. of Agriculture, www.forestryimages.org)

HELP STOP INVASIVE PESTS

For more information, visit the following Web sites:
www.emeraldashborer.info
www.na.fs.fed.us/fhp
www.aphis.usda.gov/ppq/ep

USDA Forest Service
Northeastern Area
State and Private Forestry
NA-PR-02-06
April 2006
www.na.fs.fed.us

By Michael Snyder

What Is Forest Stand Structure and How Is It Measured?

Once upon a time, forest stand structure meant age structure. Areas of forests containing similar-aged trees were called even-aged stands, and areas with trees of multiple ages were considered uneven-aged stands. It was all quite straightforward. Stand structure was defined by how many trees were present in each age class within a given stand. It was beautiful.

This view of stand structure saw tree diameters as a surrogate for something more difficult to measure: tree age. Foresters then set about trying to manage the number of trees in each diameter class according to some target age structure. Typically, each age class was supposed to occupy an equivalent proportion of the forested area in a way that was thought to ensure a regular output of wood over time. This was known as a "balanced age structure," but of course it was really more a balance of tree diameters than tree ages. Remember, age and size are not the same; sometimes, small trees are surprisingly old, and many large trees are surprisingly young. Nevertheless, for years this was how foresters referred to and managed a stand's structure.

While a lot of good came from this method, conventional management approaches have changed. Today, foresters are increasingly aware of, interested in, and asked to manage for more than just the sustained output of wood. We are asked to sustain the forest itself and its capacity to serve many additional functions, such as providing habitat for a diversity of organisms. Accordingly, our current definition of stand structure is far more complex. We now see structure as the physical form of a stand, with particular emphasis on what you might call the *verticality* of the woods – the extent to which both living and dead plants occupy horizontal layers from the ground to the tops of the tallest trees.

JIM BLOCK

Picture the three-dimensionality of a forest stand, from the forest floor and the herb and shrub layers, into the understory, and through the canopy to the tree tops. See all of that space and the varying amounts of vegetation within it and then look from side to side to see its full horizontal extent. That's stand structure. It is the vertical and horizontal arrangement of plants, dead and alive. Structural complexity is the combination of it all. Stands with more complex structures are thought to be more resilient and potentially even more productive. They assuredly provide valuable habitat for a greater diversity of plants and animals than do stands with less structural complexity.

But still, how to measure it? Structure is not like tree diameter, height, or even tree age – all of which can be readily measured. Instead, structure is a stand-wide feature, and there is no one measure or even a good index to quantify or express it, at least not yet in use. And so foresters measure a variety of stand attributes – tree diameter, trees per acre, basal area, live crown ratios – that each contribute to a stand's overall structure but do not, individually, describe it completely. It is therefore insufficient, even meaningless, to simply add together our varied measures to produce some average quantification of stand structure. In this way, forest structure is like a good rock band: the whole is always much more than the sum of its parts. This is reflected in one of Webster's definitions of the very word, structure: "organization of parts as dominated by the general character of the whole."

The forester's job then is to assimilate all of our various individual measures into an integrated, coherent sense of the whole. In particular, we seek an understanding of a stand's full volume of growing space and the extent to which it is occupied. We often express this in generalities like *patchy*, *dense*, or *multi-storied*. It's not mathematical, but it begins to paint a more telling picture of the stand and its growing space and opportunity.

Sure, we still try to optimize the growth of useable wood in managed stands, and we still use diameters to approximate age when appropriate. But our view of a stand's structure has evolved to include vertical stratification and development through consideration of tree shapes, heights, spacing, and arrangement in addition to diameter and age. It's far more difficult, but even more beautiful.

Michael Snyder is the Chittenden (Vermont) County Forester.

When spring ice melts, lakes are able to breathe again.

When Ice Melts, Lakes Spring Back to Life

The onset of spring brings many changes to our part of the world. The longer days and higher temperatures entice plants to emerge and trees to bud. On our lakes, the ice begins to melt. We anticipate the water activities we'll soon be enjoying: swimming, boating, and fishing. But the spring thaw is more than just a launching pad for recreational activities; it also triggers spring lake turnover, a critical phenomenon on which aquatic plant and animal life depends.

Spring lake turnover is the process by which a lake mixes itself, thereby replenishing its oxygen supply. Oxygen is vital for life within a lake – it is the gas that drives the life cycles of aquatic plants and animals. Algae, fish, aquatic insects and crustaceans are sustained only in waters that contain adequate oxygen. Trout, in particular, require consistently high levels of oxygen for survival.

So how does a body of water accumulate oxygen? To understand, we must first be aware of the temperature-density relationship of water.

The density of water changes with temperature. We know that 212°F is the boiling point for water, and 32°F is freezing. A third significant number regarding water chemistry is 39°F – the temperature of maximum water density.

We'll begin our spring lake turnover story in autumn. In the fall, a lake cools until it reaches a uniform 39°F. As the lake continues to cool it becomes stratified – the heavy, 39°F water stays on the bottom, while the water near the top is chilled by the below-freezing air temperatures. Ice, less dense than water, forms when the lake's surface temperature reaches 32°F. The ice acts as a barrier to wind, which, along with the stratified water column, prevents the lake water from mixing; it also inhibits the lake's exchange with oxygen in the atmosphere. Once a lake is frozen, the depletion of oxygen by the lake organisms begins.

Just when the lake's oxygen supply is nearly exhausted, spring arrives and the ice cover slowly melts, exposing the surface to warmer temperatures and vigorous vernal winds. The lake's surface water begins exchanging gases with the air. When the surface water warms to 39°F, it sinks, pushing through the deeper water and infusing it with oxygen. This process creates a powerful convection current that continues to

GERRY LEMMO

churn until all the lake water is an even 39°F, top to bottom, and the water has reached its oxygen saturation point.

In late spring and early summer, solar energy warms the water's surface. Warmer water, being less dense than colder water, remains on the surface and the lake once again begins to stratify. Swimmers routinely experience the phenomenon of summer stratification, usually preferring the warm layer of surface water to the more frigid depths below. Trout have the opposite preference.

Once summer stratification occurs, the lake water no longer mixes, and the depletion of oxygen reserves begins. The oxygen levels will continue to be depleted until fall, when the air temperatures drop, the surface cools, and the lake water is again blended – and reoxygenated – at 39°F. The cycle continues.

Kathryn Lund Johnson

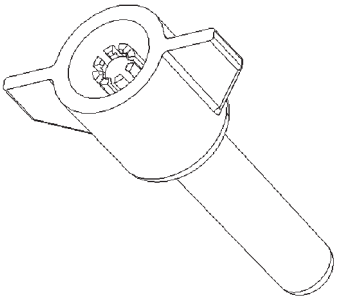
New Spile Increases Sap Flow

The big buzz this spring in maple sugarmaking circles involves the new check-valve spouts that many sugarmakers with vacuum systems are trying for the first time.

The spiles were invented by Tim Perkins at the University of Vermont's Proctor Maple Research Center. According to Perkins, in the spring of 2009, the spouts produced a seasonal total of 44.6 gallons of sap per tap on high vacuum (23.5 inches). This sap boiled down to make 1.09 gallons of syrup per tap – a 50 to 70 percent increase from what the bush had produced the year before. Conventional wisdom holds that an efficient producer should make between 1 quart and ½ gallon of syrup per tap in a good year.

It should be noted that the sugarbush these spouts were tested in was a top-of-the-line operation (brand new drop lines, only one to three taps per lateral), and that last year was a great sugaring year in the Proctor microclimate. There's also at least a perceived conflict of interest in the fact that Proctor both produced and tested the spouts. Still, sugarmakers are excited about the promise of the new technology; even if a layman only gets 30 to 50 percent more sap per tap, we're still talking large production gains.

The science behind the new spout is surprisingly simple. As the name suggests, the spout contains a check valve – a tiny plastic ball that rolls forward and backward within the unit. When the sap is flowing, the ball lies between plastic fingers on the dropline side of the spout, thus allowing sap to flow around it and into a tubing system. When the sap's running backwards, however, the ball valve

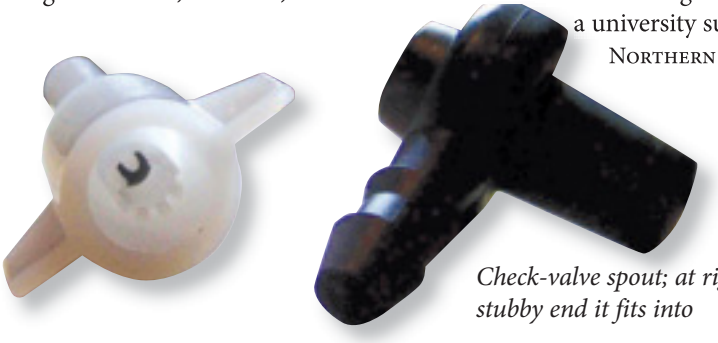


shoots forward, towards the tree, and seals the operating end of the spout, thus keeping sap from backwashing into the tree. This prevents microbial contamination in the taphole. A cleaner taphole extends the sap-flow period, thus the big production increase.

If you're not familiar with vacuumized tubing systems, you'll wonder why sap would run backwards through a sap line. What happens is negative pressure develops inside the tree after a vacuum pump has been running for an extended period of time. At the end of the day, if you shut off the pump before freeze-up, any liquid that's in your lines will be drawn backwards into the tree. This can happen on a smaller scale if a leak develops in a line, or each time your releaser dumps, as it does regularly in normal operating conditions.

Other spile buzz involves nano-particle technology. Inventor Tom Kaufman is working with Agion Technologies Corporation to manufacture plastic spouts that contain silver – reportedly a natural anti-microbial agent. Some of these spouts are already on the market, but there's some question among sugarmakers as to whether the anti-bacterial properties are effective for more than one season. Kaufman says he's at work tweaking the spile design, and that an updated version is being tested this spring by a university sugaring program.

Northern Woodlands staff



Check-valve spout; at right, stubby end it fits into

Out by the Roots

They've been compared to oversize antlers, bones, or fantastic teeth. If you've ever seen the remains of a stump fence, you probably have your own description. The stump fence is an unlikely mix of bulky form and delicate, almost lacy design – whorls and striations that once hid underground now put on display for all the world to see. Thoreau admired root fences, mentioning them more than once in his journal. "No line of fence could be too long for me to study each individual stump," he said.

Clearing forestland for agriculture means displacing massive stumps. Centuries ago, it wasn't easy. There was no excavator to rip a stump from the ground and shove it out of the way. Instead, men used a giant tripod rigged with a screw; the machine, skidded in place over each stump, required four men and as many horses to operate. With this method, 15 stumps could be extracted in a day. Other inventions incorporated windlasses and levers or plain-old fire. Later, dangerously, dynamite was employed.

Ingenuity didn't stop there. Where to put the exhumed stumps? The extricated roots were often laid close along property lines, forming a rudimentary fence. The twined roots served as boundary, corral, and windbreak. The result, though functional, was, according to some, aesthetically lacking. The fences of freshly upturned roots became a byword for the unfortunate in appearance, said to be "homely as a stump fence."

Others had a more favorable view of this unique rural architecture. In 1869, travel writer J. T. Trowbridge noted, "a picturesque feature of the country which has not been often enough described [is] the root-fence. I am not aware that justice has ever been done to these by pen or pencil. What astonishing stereoscopic views they would make!"

I feel the same way, 140 years later, when I lift my point-and-shoot camera and try to record at least a semblance of the color and shapes and fantastic grain of a stump fence near my home in western New York state. The shapes of the stumps are the fantastic thing, until I realize I'm also looking at a slice of history. For three generations or more, this row of upended trees has guarded the fields, now dotted with good-sized hardwoods. I try to imagine the trees that grew here, giant makers of shade and oxygen. I hope some of the fine, old houses in the village have timbers and polished floors made from these trees.

Swathed in lichens, the roots shrink imperceptibly, each winter's ice forcing deeper clefts in the crooks and burls. The fence is no longer a barrier; a deer or rabbit has hardly to alter its course to get through. It's tempting to drag one of the old stumps out of the woods and into the front yard for display. Like an old wagon wheel, it reminds us of the past and makes a handsome backdrop for the marigolds. But like a patch of trillium or an old stone wall, the fence charms us most – and tells its story more convincingly – when it's at home in the woods.

Janice Horton

HENRY SHELDON MUSEUM

Working stump fence, circa 1931.

JANICE HORTON

The remains of a stump fence today.

Growing Willow for Fuel

As communities in the Northeast look for green fuels to replace coal and oil, they are exploring options in woody biomass, including plantings of shrub willow. Our forests will certainly play a key role in sustaining regional biomass plants, but what about on a smaller scale? Might it become feasible for landowners to grow their own short-rotation woody-biomass crops? Proponents of willow fuel say yes.

In the same way that switchgrass is being cultivated as a low-maintenance agro-fuel on marginal southern farmland, shrub willow may become a viable crop for northern tree farmers. Shrub willow is grown in plantations and coppiced after the first year. By the third or fourth year it reaches harvestable size, and it can be harvested every three years for up to seven cycles before replanting.

With a per-acre growth rate 5 to 10 times that of natural forests, willow could help stabilize supply as demand rises for sustainable-source woody biomass.

Middlebury College in Vermont is experimenting with growing its own willow as supplemental fuel for its wood-chip heating plant. "We're doing it not only to be carbon neutral by 2016, but also to help supplement wood that's produced by the forest products industry," says Tom Corbin, director of business services. "When the heating season starts, willow can take pressure off the chip market to keep prices from spiking."

The college, aided by SUNY-College of Environmental Science and Forestry and Cornell University, has planted nine acres of test beds. They hope to generate enough volume per acre, at the right moisture and Btu levels, to work in their gasifier. Their first harvest is scheduled for 2010.

Research conducted by SUNY-ESF and Cornell suggests that the trial has promise. Larry Abrahamson, senior research associate at SUNY-ESF, reports that willow plantations can yield 4 to 5 oven-dried tons per acre per year. When dried, willow is roughly half (45–48 percent) its green weight. Larry Smart, associate professor at Cornell, summarizes: "On a small scale, you can cut and chip five acres in a day with one tractor and two trucks, harvesting at least 120 green tons, enough to supply heating fuel for a farm for an entire season." This could serve facilities such as rural schools, dairy and greenhouse operations, and hospitals and municipalities that own land.

LAWRENCE B. SMART

Spring willow harvesting with a New Holland FR series forage harvester outfitted with short-rotation woody crop cutting head.

Three years worth of willow growth.

LAWRENCE P. ABRAHAMSON

"On a larger scale, 10 acres is the lower limit to be worthwhile for bringing in harvesting equipment," notes Abrahamson. Because willow is harvested after leaf-fall, the same equipment used for forage crops can move on to willow by simply changing the cutting head. Willow grows on both unused and marginal crop land, opening up options for farmers and local supply chains.

Growing willow for fuel began in Sweden after the 1970s oil crisis. The British Isles followed suit. Cultivation in the Northeast started in 1986 at SUNY-ESF as part of a research grant for alternative fuel crops. Although work continues on developing willow for liquid fuel, phytoremediation (soil decontamination), erosion control, and snow fencing,

A finished vernal pool

Creating a Vernal Pool

In the fall of 2007, with support from the U.S.D.A.'s Wildlife Habitat Improvement Project (WHIP), we installed seven vernal pools of varying sizes on our 410-acre property in North Bennington, Vermont. Our goal was to enhance our property for all sorts of wildlife, including amphibians. The construction was done with an excavator and, in some cases, the front-end loader of my tractor.

The excavations took only three days. Some of the pools were put in the woods and some of the pools were sited at wet areas on the edge of the woods. After the dirt work, we "brushed in" the pools with willow wisps and patches of red osier; willow cuttings were taken in spring and inserted into the wet ground at the edge of the vernal pools. We planted these pool-side plants to provide shade to keep the water cool; they'll also serve as cover for the amphibians traveling to the pools to breed. We added some aquatic plants from our pond to the pools, mainly coontail, which provide some cover in the water and a source of nutrients for the inhabitants.

Some of these pools will probably not dry up, unless the late summer is particularly dry, because they are fed by small springs. The area where the pools are sited is surrounded by wooded ridges, and there is an underlying soil layer of clay. Thus, ground water is often near or on the surface. Some small brooks that drain into the hollow where our property lies contain small brook trout, but we took care to ensure that the pools were not sited nearby so that fish would not become established.

The vernal pools are shallow, with the deepest sections in a few pools only between 2 and 3 feet deep. The smallest pools are only about 100 to 200 square feet, and the largest is about 6,000 square feet, with a small island in the middle.

The first spring (2008), we were already seeing tadpoles, presumably from some green frogs that had colonized the pools shortly after we'd built them. Some of the egg masses that spring were attached to the large sticks that we threw into the water for that purpose. In the spring of 2009, we were hearing wood frogs and spring peepers singing.

Amphibians are experiencing a worldwide decline, and improving your own land as habitat for them is rewarding for both you and the species that will benefit. It is wonderful to experience the chorus of singing frogs and toads each spring on a warm and wet evening. —SOLON RHODE

A version of this story appeared in the Vermont Coverts newsletter.

Send us your stories! We know that many of you are engaged in projects that improve your woods. We'd like to provide examples to our readers of these stewardship projects. Submit stories to mail@northernwoodlands.org, or snail-mail them to Stewardship Stories, *Northern Woodlands* Magazine, PO Box 471, Corinth, VT 05039

willow shows greatest promise for combined heat and power generation. "It's a feedstock that can be used for any of them," says Tim Volk, Senior Research Associate at SUNY-ESF.

Volk believes that willow for heating will come on strong in the Northeast. "But I don't see it as competing with forestry products," he says. Rather, "we need to develop the biomass industry together."

New York and Vermont have an abundance of agricultural land, so it makes sense that these states are looking into dedicated energy crops like willow to supplement their working forests. New Hampshire and Maine have less open land, but people in both states are expressing interest. Recently, says Smart, "there has been commercial interest in using willow for local power production in Maine, and we've had conversations with a pellet manufacturer with a plant in New Hampshire." Organizations in Michigan, Minnesota, Wisconsin, Virginia, Pennsylvania, Connecticut, and Canada are also exploring willow's potential. SUNY-ESF has licensed a New York nursery, Double A Willow, to provide commercial planting stock.

Research is focusing on high-yield breeding stock for colder climates. Early SUNY-ESF trials with Swedish stock revealed a susceptibility to potato leaf hopper, which, says Smart, "highlighted a need to develop alternative species suited for North America." Successful plantations mix four to six species. "We're still sorting out which perform best in different climates," Smart says.

Corbin adds: "Although initial cultivation is very intensive, after the first year there's relatively little to do. You need a lot of land and cash to get started, but it pays back after the third harvest."

The biomass industry will be watching Middlebury's results with interest. Assuming the trials perform as expected, the college plans to expand to 400 acres per year for 3 years. Their goal is 25 green tons per acre at each harvest.

"Even if it doesn't work for us, it might work for somebody else," Corbin says. "The concept of energy independence is high on the radar right now."

CAROLYN HALEY

By Virginia Barlow

Giant Ichneumon Wasp, *Megarhyssa macrurus*

When an insect develops on a single host, and kills the host in the process, it is called a parasitoid. Parasites, on the other hand, tend to nibble on their hosts without killing them. And predators kill more than one of their prey items.

Because most parasitoids spend much of their lives buried within the bodies of their victims, they don't attract a lot of attention. But they are abundant and serve an important role in natural ecosystems – especially in agriculture, where they influence or regulate the population density of many of their hosts.

When a parasitoid kills its host, it can indeed be a grisly business. Typically, an adult female parasitoid lays an egg on the surface of or into the body of a living larva of another insect. When the egg hatches, the parasitoid proceeds to systematically consume the host. Like a cat with a mouse, it keeps its victim alive as long as possible. Dead larvae rot quickly, and this ruins the meal. First the parasitoid eats the fat bodies of the larva, then the digestive organs, keeping the heart and central nervous system intact for as long as possible. Finally, these are consumed as well and the long-suffering victim dies, leaving an empty caterpillar shell in which the victorious insect may choose to pupate.

ADELAIDE TYROL

The slow death inflicted by parasitoids that attack other insects (and sometimes spiders) tested the concept of a benevolent God for 19th-century theologians who discussed this practice at length.

Even Darwin had trouble with the largest parasitoid family, as he wrote to Asa Gray in 1860: "I cannot persuade myself that a beneficent and omnipotent God would have designedly created the Ichneumonidae with the express intention of their feeding within the living bodies of Caterpillars…"

The female giant ichneumon wasp is a striking animal, two inches long, boldly patterned in brown, orange, and yellow. Her two- to four-inch long ovipositor with its two protective filaments looks like three long tails. Some parasitoids can choose to lay their eggs on a variety of host species, but giant ichneumon wasps need to find a larva of a pigeon horntail (*Tremex columba*), which is also a kind of wasp. Nothing else will do.

There is intense selective pressure on both of these insects to outwit the other. When a horntail female lays her egg in a tree, she includes both a fungus and a mucus secretion that promotes fungal growth, thus enabling her larva to burrow deeply into the wood. While this defensive strategy may once have given the horntail an advantage, the clever ichneumon soon figured out how to zero in on the very fungus that the horntail has enlisted. Once a female *Megarhyssa* arrives at the promising tree, she appears to use her antennae to sense the vibrations of her potential host.

She walks slowly over the bark, her antennae busily going back and forth, before drilling commences. Drilling might take half an hour, as the ovipositor is slowly pushed through up to 4 inches of solid wood.

The ichneumon ovipositor is incredibly slender, not much thicker than a horse hair, and the egg that passes though it is, by necessity, deformed into a slender, threadlike shape. But the process of finding a horntail, drilling a hole, and inserting an egg does not always result in a next ichneumon generation.

Other ichneumon wasps, of species that are unable to drill such holes themselves, may use *Megarhyssa* holes to insert their own eggs. When these hatch, the larvae destroy the *Megarhyssa* eggs and proceed to consume the horntail larva themselves.

An appealing host larva may have several parasitoid species competing for its nourishing tissues. In addition, many parasitoids have evolved to prey only on other parasitoids; these are called hyperparasitoids. And, amazingly, some hyperparasitoids are themselves attacked by parasitoids – making an extremely long food chain.

There is great variation in the behavior, shape, and size of insects who survive by consuming their brethren in this way. A tiny egg parasitoid in the wasp family Mymaridae, at one eight-thousandth of an inch long, may be the world's smallest insect.

It is thought that this lifestyle may have developed in the distant past from insects that consumed dead prey. Some entomologists believe that around 20 percent of all insect species now living are parasitoids. The insect order that includes wasps and bees has the greatest number, but there are many parasitoid flies as well, along with the occasional beetle or moth.

Story and Photos by Bryan Pfeiffer

Little Brown Birds

For those of you struggling to learn bird identification, here's an innovative system to help you name any species you encounter. That's right. No more pesky field guides. Your avian aggravations are over. Simply locate the bird, then name it – either "big brown bird," "little brown bird," or "other." It's that simple! And once you've learned this method, here's the advanced system: "big brown bird," "little brown bird," "other," and … "duck."

OK, I recognize this system won't satisfy all of you. So for those of you seeking more detail, here are some tricks to help you differentiate the little brown birds.

First, recognize that many LBBs are streaked or speckled on the breast, belly, and sides. Many are also roughly the same size – smaller than an American robin. So focus less on plumage and size. Instead consider the bird's shape, bill, behavior, and habitat. I'll illustrate with four examples.

LBB #1 is somewhat elongated and sort of pot-bellied. It is relatively slim below the neck, particularly compared to LBB #2 and #3. Its bill is longish for a songbird. I photographed this bird in the woods, which is where it prefers to nest.

LBB #2's proportions are relatively compact. It is shaped more like a football (with a tail) than LBB #1. It has a thicker neck. And its bill is conical, stubbier than LBB #1's bill. I photographed this bird in shrubs near a clearing. You won't find LBB #2 nesting in the woods.

LBB #3 is similar to LBB #2, with the same overall proportions and bill. Photographed on turf during spring migration, it also nests in open, scrubby areas, never in the woods. Your gut might be telling you by now that LBB #2 and #3 are sparrows.

LBB #4 is an oddball. Although this photo doesn't capture its posture well, this bird is long and thin, particularly around the head and tail. Although it resembles a sparrow, that bill alone betrays it as a sparrow impersonator. And no photo will show one of the best clues to its identity: it has a silly walk, bobbing its head forward and back with every step. All other LBBs here hop rather than walk. It is also notable that this LBB is on grass (near a lighthouse in Maine). It nests in tundra and other open areas.

So, what have we got? LBB #1 is a hermit thrush. Its rusty tail helps distinguish it from other closely related woodland thrushes. LBB #2 is a Lincoln's sparrow. The ultra-fine streaking on the breast and flanks is a great mark on this species; most other sparrows show wider streaks than this, if they have them at all. LBB #3 is a clay-colored sparrow. One hint on sparrow identification is to note first whether your bird is streaked or clean below. Then look at the face for distinctive markings. LBB #4 is an American pipit. No self-respecting pipit will be found in the shrubs among sparrows.

And if you're still struggling, fear not. You are free to call them "little brown birds." At the very least, you can be sure they are not ducks.

Bryan Pfeiffer is an author, wildlife photographer, field guide, and consulting naturalist who specializes in birds and insects. He lives on Bartlett Hill in Plainfield, Vermont.

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Flower Show in the Woods

By Dave Mance III / Photographs by Andrew Crosier

For six wintry months, trees have appeared as woodblock reliefs or iron sculptures, their bare limbs framed against a cold horizon. But as spring unfolds, stark branches morph into soft beauty. It's as though one night the woodland fairies that Irish poets so readily imagine came and decorated every tree branch with a bouquet of flowers.

Spring foliage doesn't usually get the glossy photo coverage that fall foliage does, but looking up into a tree's crown this time of year can be similarly spectacular. All deciduous trees flower, and while forest trees may not have the wow factor of a dogwood or a flowering crab, each one wears a subtle boutonniere of stamens and sepals, petals and pistil.

Last spring, photographer Andrew Crosier took his camera for a walk among the river bottoms and hedgerows of western New York and southern Vermont to capture some of this beauty. He shot dangling poplar catkins that offered hillsides their first blush of pale green, sycamore globes that hung like inverted alliums among piebald limbwood, red maple flowers with matryoshka doll blossoms – flowers rising out of flowers.

From hundreds of his photographs we selected these 12 shots, a nice sampling of tree flower elegance and grace.

Happy spring, all. Here's to the end of a long winter and the promise of summer days to come.

1 Pussy willows are often the first trees to flower in spring. Hungry bees depend on this crucial, early pollen source.

2 Wind-pollinated trees, like this hophornbeam, have long, drooping catkins that contain millions of pollen grains. Why so many? Wind is a fickle pollinator, especially compared to a reliable insect, and the stigma (pollen receptor) of a tree flower is small – about the size of the head of a pin. Botanists estimate that it takes about a million grains per square meter to assure that a one-square-millimeter area of stigma can be pollinated. This, allergy sufferer, is the mathematics of your misery.

3 Balsam poplar catkins look almost like tiny sumac bobs.

4 There are plenty of imported trees and shrubs with screamingly beautiful white flowers, but the understated beauty of humble, native *Amelanchier* has a way of making its showier brethren look a touch tarty. You may know this tree as "shadbush," as its flowers were said to coincide with the shad run in Northeastern streams, or serviceberry because it comes out just after the ground thaws, when the winter's dead people can be buried.

5 **6** Red maple female and male flowers. See sidebar on page 27 for a more detailed explanation of how to distinguish between the two. Citizen scientists around the country are tracking when red maples blossom in their area as a way of studying how trees respond to climate change. To participate, visit the National Phenology Network at www.usanpn.org

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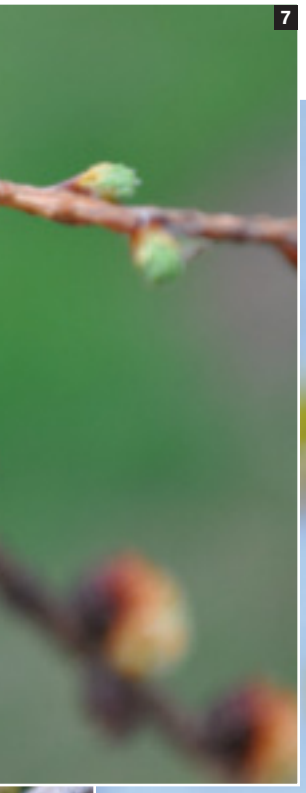

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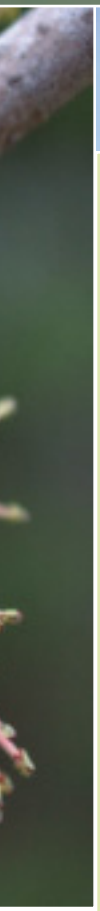

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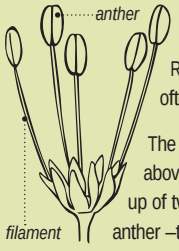
HOW DO YOU SEX A TREE?

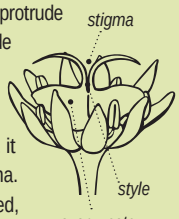
Generally speaking, tree flowers have up to four parts: sepals (the green parts that protect the flowers), petals (the showy parts that attract pollinators), a pistil (the female part that matures into fruits), and stamens (the male, pollen-producing parts). If both male and female parts are present, the flower is said to be perfect.

If a flower has only one of the sexual parts, it is said to be imperfect; in this case, the male and female flowers grow separately. If male and female flowers are found on the same tree, the species is said to be monoecious, from the Greek meaning "one house." If male and female flowers grow on separate trees, the species is dioecious ("two houses"). Many of our northeastern tree species are wind-pollinated, and many wind-pollinated plants are dioecious – this strategy promotes outcrossing.



Red maple is usually a good example of a dioecious tree (although every so often nature throws a curve ball and a male tree will produce a few female flowers).

The flower at left is male; you can tell by the spiky parts that protrude above the petals – these are called stamens. A stamen is made up of two parts, the filament – the long, thin stalk – and an anther –that little bump on the end. Each anther is full of pollen.



ovary: note seed formation is underway

The image at right shows a female flower. It doesn't have stamens; instead, it has a pistil, the female part that is made up of an ovary, a style, and a stigma. The ovary is where eggs (technically "ovules") are produced – when fertilized, they become the tree's seeds. The style extends from the ovary and supports the stigma, a sticky or hairy pollen-receptive surface. In the case of red maple, the stigma is pollinated by both insects and the wind.

7 Conifers are gymnosperms – their seeds are not produced in an ovary as they are in the flowers of deciduous trees but are instead born naked on cone scales. A conifer cone is not technically a flower, but the exquisite form of this tamarack cone is as lovely as a rose.

8 Norway maple flowers with developing leaves. Note the bowed bud scales, the petal-like structures from which the flowers emerge.

9 Elm flowers are perfect – that is, each flower has both female (pistil) and male (stamens) parts. When the pistil matures, it stands above the stamens to catch foreign pollen, thus promoting cross-pollination and genetic diversity. Later in the flower's development, the stamens grow and surround the pistil. If cross-pollination has not occurred, self-pollination takes place.

10 **11** The red, banana-shaped anthers of this male boxelder flower are poised on the edge of explosion. See 11 for the aftermath.

12 Black locust, a member of the legume family, is one of the last trees to flower. The gorgeous blossoms are a great visceral example of why naturalists sometimes carry on scandalous love affairs with invasive species. On the one hand, locust is native to southern states – not the Northeast – and yes, on some woodlots up here it does exhibit invasive-like tendencies. But on the other hand, the woodstove loves it, it's aesthetically interesting, and both bees and humans are enraptured by the blossoms.

FieldWork

By Kristen Fountain

At Work Procuring Wood for Biomass Plants with Hunter Carbee

KRISTEN FOUNTAIN

Hunter Carbee stands on top of 12,000 tons of chips at the Concord Steam Co. in Pembroke, New Hampshire.

Every community has its hubs: those people who tie disparate strands of the network together, who collect and distribute information. For the forest products industry in northern New England, one of them is Hunter Carbee.

The former logger, forester, and advocate now makes his living coordinating the wood chip supply for biomass energy facilities, which are increasing in number in the region as demand grows for renewable energy. Carbee is in constant motion. On his way to visit log yards across New Hampshire and Maine in his 2000 silver Ford Focus, he is usually either talking on his cell phone or it is ringing.

"Hey there," Carbee answers, projecting enthusiasm at seemingly any time of day. "How are we doing?" On the other end might be a logger with chips to sell, a supervisor at the Pinetree Power plant in Tamworth, New Hampshire, or one of the two co-owners of North Country Procurement, Inc. in Rumney, New Hampshire, his bosses.

At his busiest, Carbee covers a thousand miles in a week, traveling from his home in Bristol, New Hampshire, to logging operations from the shores of Sebago Lake in southern Maine to New Hampshire's southeast corner. He likes to keep both hands on the wheel, so he sets his phone into a cradle and uses a Bluetooth headset. He pulls over to the shoulder to listen to voice messages, scribbling names and phone numbers on a yellow notepad clipped to a plastic arm that is anchored by a suction cup to the bottom center of the windshield.

North Country Procurement ensures the supply of wood chips to eight biomass-fueled facilities in Massachusetts, New Hampshire, and Vermont. The company sets up contracts between the facilities and 250 logging companies around northern New England that generate 1.2 million green tons of chips annually. Carbee is responsible for on-time delivery of 330,000 of those tons to two energy plants in New Hampshire. He pulls that amount together using more than 40 suppliers, from one-man operations that bring in five tons a few times a week to a company that moves more than 900 tons every week.

The majority of the wood chips Carbee tracks are burned at the 23-megawatt Tamworth power plant, which receives 10,000 truckloads a year – an average of 40 loads every weekday. A plant owned by Concord Steam Corporation takes the other 30,000 to 40,000 tons, primarily in the winter, to heat 200 buildings in downtown Concord. The demand in Concord is expected to grow significantly after the plant expands in a new location and begins year-round co-generation of both heat and 15 megawatts of energy.

Carbee says he gets a charge from seeing the steam rising over the golden dome of the statehouse and billowing out of street-level grates around the capital. They are tangible signs of success in his daily mission.

"The bottom line is 'don't run out,'" said Carbee. That was the directive he received from his boss and long-time mentor Bob Berti upon joining the company in 2004. It is a simple idea that can become a logistical challenge, depending on the current combination of weather, electricity prices, and demand from regional paper companies, the other primary buyer of low-grade wood.

This winter the supply of chips has been plentiful, partly because the recession has slowed production at some paper companies and put others out of business. Power plants have set strict buying quotas, and Carbee finds himself turning away extra loads. But a glut can quickly become a famine.

A bout of wet weather brings logging and, eventually, chipping to a halt. Most wood-fired utilities fill their property with stacks of round logs and hills of reserve chips. Those stores, however, also have to be managed. Even in dry conditions, they should be used up and replaced every three to six months. The energy content of the wood degrades over time as the bits of wood decompose, a process that speeds up when the chips are damp.

Carbee believes his biggest asset in maintaining the delicate balance between supply and demand is the hundreds of people he has met during 35 years in the forest industry. Now 54, Carbee has held jobs in practically every sector. At 19, he fell in love with logging while working at Monadnock Forest Products in Jaffrey stacking the finished lumber. One of the men who delivered logs to the company took him into the forest one afternoon.

"I saw the skidder come up out of the woods crawling with these big pine trees in the back," said Carbee. "The guy came driving around the corner and let the hitch go and it just clicked. I said, 'That's what I want to do.'"

He found an outfit that would take him, learning the trade on the job. He expected to be behind the chainsaw for decades. Then a near-fatal accident on Mount Kearsarge in early May 1987 changed the course of his life.

Carbee was cutting apart two intertwined trees when wind blew them both over. He tried to scramble away and avoided being hit by the bigger tree, a beech. But the smaller one, a birch, struck him across the back. The blow sent him to the ground. His

leg and pelvis were broken and he was bleeding internally. The other loggers on the job freed him, carried him out and drove him in the bed of a pick-up truck to Concord Hospital where he remained in traction for seven weeks. Walking again took months. Doctors advised him against highly physical work.

Determined to continue working in the forest, Carbee began forestry classes at the University of New Hampshire in Durham, graduating first from its two-year, then its four-year program. He was offered a position with Forest Resource Consultants in Rumney where he was one of three consulting foresters who collectively managed around 50,000 acres of woodlands. In 1999, Carbee was dispirited by the ice storm that devastated forests across the state the previous year, including those he managed. Surveying the damage was "brutal work, depressing work," Carbee says. So when he was approached by the New Hampshire Timber Owners Association looking for a program director, he was interested.

In that position for five years, Carbee gave testimony to lawmakers in Concord and represented the association at meetings. He also ran the state's professional logger certification program, which NHTOA offers in cooperation with the University of New Hampshire and the UNH Cooperative Extension. Every year, he told groups of loggers the story of his accident, warning them not to be complacent about safety even inside the cabs of their large machines. The NHTOA offices are in the energy-efficient complex in Concord that was built by the Society for the Protection of New Hampshire Forests, known as the Conservation Center. Another hub, the Center is also home to branches of other organizations, including Project Learning Tree and the New Hampshire Wildlife Federation. Carbee's time there extended his already wide range of contacts.

It is not only his forestry background that makes him suited to his current work. Growing up in Greenfield, New Hampshire, Carbee spent time behind the counter at the family business, a combination general store and gift shop. "Dealing with the general public for all those years, you really learn people," he said. These days, Carbee works a small Christmas tree farm on a corner of his 70-acre childhood home on weekends. He, his parents and siblings are working with the Monadnock Conservancy to place a conservation easement on the rest.

During his calls and visits to the yards throughout the year, Carbee learns about the sites where loggers will be working next and how many tons of wood chips they expect to produce. Meanwhile, he tells them about new legislation and about federal or state incentive programs that could provide additional income. An avid conversationalist, Carbee says the most important skill he has learned over the years is how to listen.

He wants to hear about whatever a logger is dealing with, whether a production issue or regulatory concern. "When somebody calls, sometimes they just need to get stuff off their chest," he said. "I may have to say 'No, I can't buy your wood.' But at least I can take the time to hear what they have to say."

Carbee maintains close relationships with his suppliers. A few of them, such as D.H. Hardwick & Sons, Inc., out of Bennington, New Hampshire, are operations he worked with as a logger and a forester, now being run by the children of people he originally knew. He enjoys catching up with them. Plus he knows those relationships will pay off in lean times. He has seen those suppliers he has a personal connection with do whatever it takes to get chips to his plants when there is a shortage.

KRISTEN FOUNTAIN

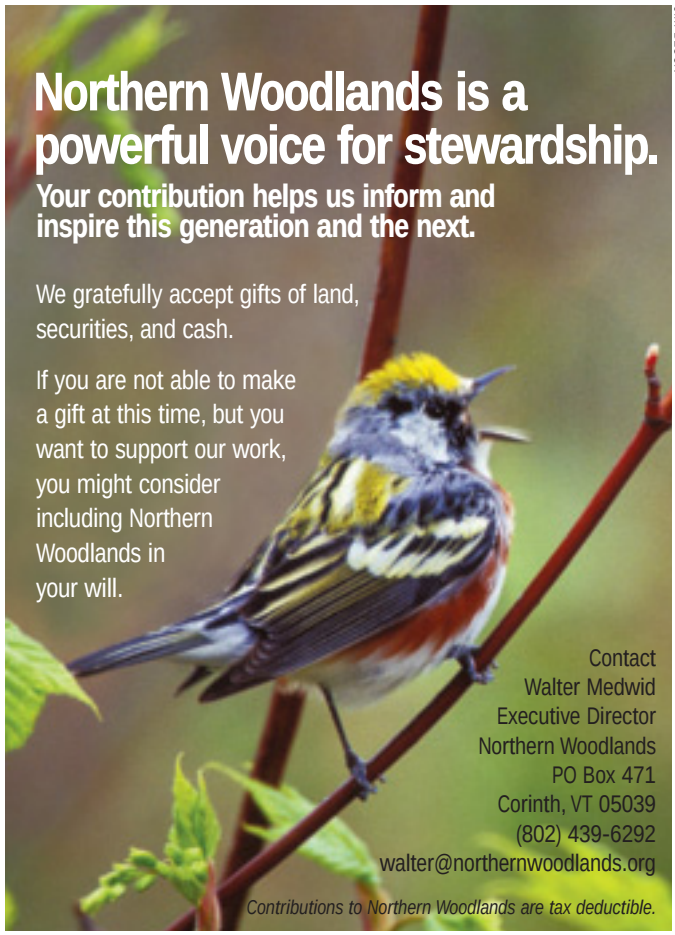
Carbee, at right, checks in with loggers Joe Hardwick, left, and Ben Hardwick, right, at a log yard in Nelson, New Hampshire.

Trying to meet the needs of both the power plants and loggers is not always easy, or even possible, Carbee says. At times, he admits, "I feel like an elastic band."

To relax, in the rare moments of quiet on the road, he turns to music. Compact discs by classic rockers like Levon Helm and The Marshall Tucker Band are tucked next to his seat. Recently his youngest son, in high school and the only one of his three children still living with him at home, loaded his iPod with classical music, which he has come to appreciate.

At the end of a day of connecting, instrumental music is a treat, he says. "Sometimes it's so nice not to hear voices."

Kristen Fountain, formerly a reporter for The Valley News, a daily newspaper based in Lebanon, New Hampshire, writes out of her home in Norwich, Vermont.



JIM BLOCK

Story and Photos by Susan C. Morse

Hungry as a Bear? Try Browse and Salad

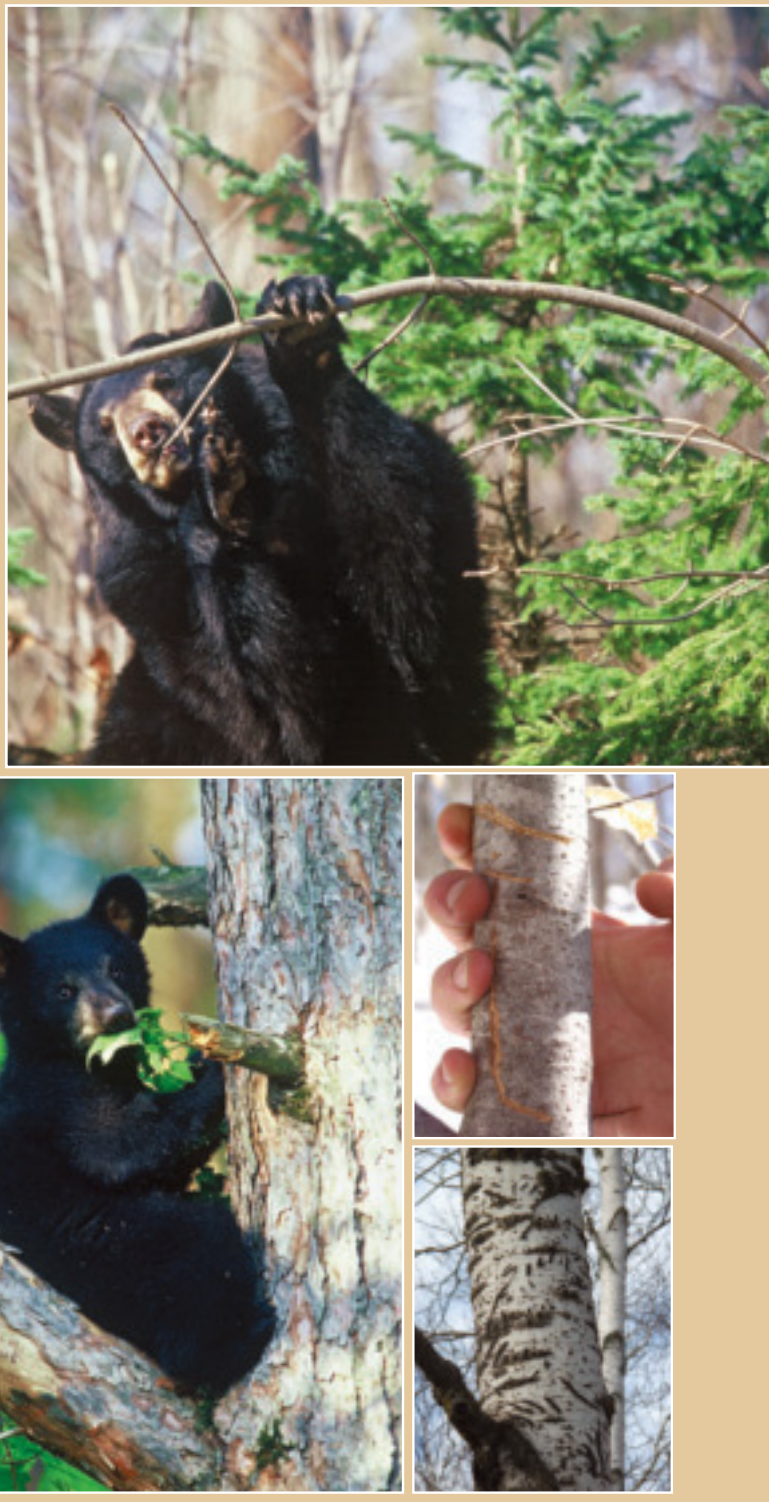
I once came upon a meandering duo of bear trails – a mother and her yearling cub walking out into a heavily frosted meadow. Their warm feet melted perfect tracks upon the sparkling expanse of frozen grasses and forbs. Everywhere the tracks led me, I noticed that dandelion flowers had been delicately plucked and consumed. Bears love spring flowers, too!

Black bears are technically carnivores and recognized to be omnivores, yet they are darn close to being herbivores, especially in spring. More than 90 percent of their diet consists of plant leaves, buds, flowers, stems, cambium, sap, seeds, roots, tubers, bulbs, corms, fruits, and nuts. The occasional winter-killed deer or newborn fawn is an uncommon bonus in an otherwise vegetarian diet. (Bears don't typically plunder ant, wasp, and hornet nests for their protein-rich foods until early summer; 'til then, it's greens.)

Other evidence of bears' springtime foraging includes browse and what I call "salad" – newly emerging spring leaves. Browse includes full-sized trees as well as saplings that have been climbed or bent down by a bear so that the animal could access and eat spring buds. In the northernmost parts of our region, quaking aspen boles will readily reveal that bears have climbed to the topmost branches for catkins. With time, the claw scars darken and contrast with the pale bark, resembling the sign we more frequently see on beech trees.

Look for bent willow and aspen saplings along field-edge and beaver-flowage habitats. Overgrown skid trails choked with sapling regeneration are other good places to look. If you find a broken or bent tree, closely examine the stem for tooth marks and nearby claw marks that show where the bruin grasped the tree and, using its mouth as a fulcrum, levered the stem until it broke. Other times a bear will climb a somewhat larger, pole-sized tree and break the top by using its weight to bend it down – sort of like Robert Frost's swinger of birches, except the bear uses teeth and claws for an extra good grip.

Spring salad favorites include the unfolding buds and brand-new leaves of maples, American beech, and eastern hophornbeam. According to Michigan black bear biologist Terry DeBruyn, the new, developing leaves of hophornbeam provide as much as 7 percent nitrogen, the equivalent of 40 percent protein. Not bad for salad.



Clockwise from top: Bruin bending sapling to eat buds; bear claw marks on young beech; bear claw scars on poplar bole; tree salad.

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

PAUL O. BOISVERT

To Tap or Not to Tap

By Andrew Fast & Steve Roberge

When visitors arrived at Ed Lanigan's 309-acre tree farm in Alton, New Hampshire, he waved them over to a row of sugar maples he had tapped a couple of weeks earlier. The March breeze had a chill to it, but that didn't bother him. He grinned as he lifted the cover off a sap bucket, revealing a great run from the day. It is Lanigan's enthusiasm, warmth, and interest in sugaring that bring friends and neighbors to his tree farm, where they watch great billows of steam rise from the evaporator and purchase pints of fresh maple syrup.

Every spring, in sugarhouses across the region, people are hypnotized by the steam, smell, and process of making maple syrup. Many find themselves seduced, convinced that they should join the ranks of sugarmakers and tap some maples on their own property. But since maple trees are a valuable timber species, anyone who wants to drill holes into their trees must first consider the financial implications of the act. How does a landowner decide whether to tap a tree or grow it for timber? And can you do both?

There are some similarities in managing your woods for timber or for sugaring. In both timber and sugarbush management, a primary goal is to favor vigorous, fast growing, well-formed trees with healthy crowns. In a dense stand of trees, with either objective,

a landowner should remove the poorest-quality trees (forked trunks, damaged crowns, obvious rot), allowing the remaining trees to thrive by occupying more space and capturing more sunlight and nutrients.

But the similarity ends there. A well-managed sugarbush will feature mostly maple trees; the trees themselves will have large crowns and short trunks. To achieve this, aggressive thinning is often necessary so that light can reach the lower branches. Well-formed trees that may one day grow up to be quality sawlogs will have to be sacrificed. An ideal timber stand, on the other hand, will be more highly stocked; that is, the trees will be more densely spaced. The trees will have smaller crowns and long, self-pruned, straight trunks with little taper, and there will be greater species diversity.

Is it possible to manage for both? Yes, but there are inherent trade-offs. In a stand that is stocked for timber growth, some sugaring value will be compromised because the individual maple crowns do not have enough space to fully develop, capture the most sunlight, and produce the maximum amount of sugar. If other tree species are also present in the timber stand, the sugaring potential is further reduced.

The timber value, meanwhile, is reduced the moment you bring out the drill and pierce the tree. Taps are placed in what would be the first sawlog (lower 16 feet of the stem). After a tap is removed, the hole will cover over in one to three years in a healthy tree. It will, however, leave a residual scar above and below the taphole that reduces the potential sawtimber value of the tree when it is cut and manufactured into boards. When approaching a maple tree with a drill in hand, the financial tradeoff is the annual return from maple sugaring as opposed to the marginal difference in the value of the first sawlog before and after it is tapped.

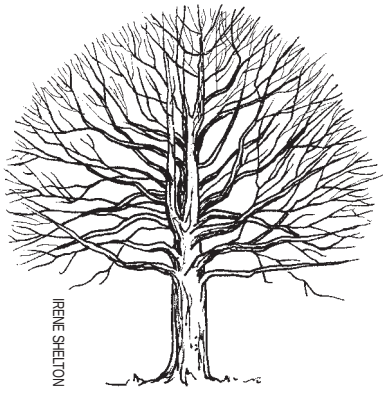
If you're managing your woodlot for the highest economic return, you shouldn't tap trees with veneer potential. Veneer logs, which are perfectly straight and completely free of defects, can demand $2,000 or more per 1,000 board feet (MBF). These logs aren't sawn to make boards; they're peeled on a lathe or sliced into thin sheets of wood. For this reason, even the slightest defect devalues them.

If the stumpage value of a mid-quality veneer sugar maple log is $2,000/MBF, a butt log of 140 board feet will have a value of $280. Once the landowner taps it, it becomes sawtimber and not veneer; the value of that butt log drops to $42, assuming a price of $300/MBF. In exchange for that loss of $238, the landowner could put two taps in it each year, expend a lot of time and energy, and gross somewhere between $20 and $40.

Even though most landowners would like to think

STEVE LONG

otherwise, veneer logs are not that common, usually constituting no more than 5 or 10 percent of a total timber sale volume, and many woodlots have no veneer logs growing on them. If your maples are less than perfectly formed, tapping may yield the highest rate of return; there may be little harm in tapping a tree that has already been valued as low-grade sawtimber or pulpwood, and in such cases, sugaring could eventually produce a higher financial return. Some higher-value sawlogs can be removed immediately or over subsequent decades when they are financially mature, when it benefits the sugarbush, or when it benefits the residual stand. By simply flagging the veneer trees as off limits, and then tapping the other maples in the bush, a sugarmaker can have his cake and eat it too.



IRENE SHELTON

Ideal sugaring trees have large, healthy crowns. Trunk shape is not important.

An investment of labor

When considering whether to manage your maple stand for sugaring or timber, it's important to note the differences in the nature of the investments. Producing maple products is a labor-intensive business providing an annual return, while growing timber is an investment aimed at long-term appreciation and a deferred return. Both are subject to widely fluctuating market conditions and, as any landowner knows, there are both financial and emotional returns to be considered.

In 1999, Ed Lanigan established a small sugaring operation. Despite owning over 300 acres, the soils, species composition, and his own land-management objectives dictated a small-scale operation. Ten percent of his acreage had sugar maples growing on it, and most of them were at the base of a moderate slope close to his house and existing access roads. As a full-time engineer, Lanigan wanted to be realistic about his time commitment; he tapped the most accessible trees along the roadside and his backyard, keeping the operation under 100 taps.

Like so many individuals getting involved in sugaring for the first time, he was not motivated solely by profit; nonetheless, he tried to maximize the profitability of his venture by keeping costs down. He purchased all the supplies that he needed for under $1,000 and built his own evaporator.

Total production the first season was approximately 15 gallons, which today would be worth around $30 per gallon if sold in bulk (retailing syrup involves extra work packing and marketing, but it can significantly increase a sugarmaker's return). He used 1–1½ cords of wood and spent countless hours, often Thursday through Sunday, boiling down the sap he collected during the week.

Lanigan's experience illustrates the conundrum facing small-scale producers. On one hand, there is a strong sentiment in support of sugaring: "We have people who come up every year and want to see us do it. It's fun. A lot of people enjoy it," he said. Unfortunately, that sentiment cannot be willed into a meaningful financial return. When Lanigan evaluates the financials, he candidly states, "If you don't include my time, I make money. If you account for time and wood, I make about 11 cents an hour doing this."

As a general rule, smaller producers, defined here as operations with fewer than 1,000 taps, have a difficult time being profitable if labor costs are taken into account. A small hobby operation can gross $4.50 per tap, while a highly efficient commercial setup could gross $15 per tap.

Owners of larger operations can achieve economies of scale, investing in efficient technology such as reverse osmosis, preheating systems, larger evaporators, vacuum systems, and oil burners. By making capital investments in their operation, landowners assume greater financial risk. In return, these operations are more profitable on a per tap basis. In pursuing a viable commercial operation, the small-scale producer should be careful not to inadvertently over invest and still not achieve a scale that justifies the investment.

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Aesthetically speaking, a sugarbush is always a working forest. Trees are thinned relatively aggressively to allow for crown growth, and lines are often left up year round.

An Alternative to Making Syrup

Peter Rhoades, a forester and sap producer on 275 acres of land in Alstead, New Hampshire, has a 3,000-tap operation. He developed a profitable business model in which he sells sap rather than taking it to the next step of manufacturing syrup, and this market niche meets his personal goals. "My interest was in being a forester, working out in the woods with the taps and with the tubing systems, instead of being tied up in the marketing of syrup and such," Rhoades said.

In 1972, Rhoades took over his family's small-scale sugaring operation and has expanded it dramatically. Recognizing the exhaustive labor required in large-scale bucket collection, he shifted his operation toward a tubing system and retired his last bucket in 2008. Originally, Rhoades had plans to boil sap into syrup. He was going to size and locate his sugarhouse after he finalized the number of taps, or total amount of land that he was going to allocate for sap production. Ultimately, he decided the potential return on investment for a sugarhouse did not justify the risk; the required scale for a profitable operation was larger than he wanted to take on.

In Rhoades's forest, most of the maples have been tapped already, so any previously tapped tree – of high or low value – is managed for sugar. "Once you drill the first hole, there's no decision from that point on," he said.

There are some stands that haven't been tapped, and in these areas, each tree is evaluated on its merit as a potential sawlog. If it has good sawlog potential, he doesn't tap it.

Lanigan's and Rhoades's stories illustrate important considerations for anyone contemplating a venture in commercial sugaring. There needs to be enough production or efficiency to be profitable. Lanigan said, "When I realized that I was not making any money, I tried to figure out what was going wrong. It turned out I was doing everything right." Making a profit often requires significant capital investment in each stage of sugaring (sap production, evaporation, packaging, and retailing). The decision to establish a small commercial operation should be founded on knowing the financial tradeoffs of each management option: not tapping at all, tapping some maples, or tapping all the maples of a tappable diameter in a stand.

A commitment to sugaring is a commitment for the life of the equipment. As Rhoades explains, "With timber, you can time the harvest to the market. Once you buy equipment for sap production, the depreciation cost is the same every year, so you have to use it."

Once you have made the decision to tap, you are at the whim of the market price. The market may be generous and work in the sugarmaker's favor, as it did in 2007 and 2008, when Rhoades saw a 44 percent increase in maple sap prices and a 16 percent decline in the stumpage of sugar maple sawtimber. Alternatively, maple sap prices may remain flat, as they did for Rhoades for 18 years between 1987 and 2005, when he saw the real value of sap plummet more than 50 percent. Sawlogs, of course, are not immune to dips in the market. In the last three years, the prices paid for sawlogs have plummeted, and that $42 sawlog mentioned above would now bring $32.

Ultimately, landowners need to find an investment – timber, sugaring, or other – that meets their goals while assuming an acceptable financial risk. While most people would find it hard to manage a 2,000-tap sugarbush and maintain a full-time job, there are thousands of smaller, hobby-style operations across the Northeast. And each spring, as the steam billows from the sugarhouse, those sugarmakers will look beyond mere dollars when calculating their return on investment.

Andrew Fast is the Belknap County Extension Forester with the University of New Hampshire Cooperative Extension. His colleague, Steve Roberge, is the Cheshire County Extension Forester. The University of New Hampshire Cooperative Extension provides New Hampshire citizens with research-based education and information.

IRENE SHELTON

Ideal timber trees have smaller crowns, long straight trunks with little taper, and a defect-free trunk.

VT DEPT OF FORESTS, PARKS & RECREATION

A forest that's being managed for timber has a different look. Here, the woods are left to grow for long stretches of time, but the periodic harvests create dramatic, temporary changes.

AL HICKS, NYDEC

Little brown bat with fungus on muzzle.

by Madeline Bodin

Bats on the Brink: White-nose syndrome hits home

If this story were a movie, it might best begin with a flashback. After the opening credits, perhaps backed by an ominous soundtrack, we'd be transported back two years, to a happier time before white-nose syndrome had wiped out roughly 90 percent of the local bat population.

It is September 2007, and Scott Darling, the bat biologist for Vermont's Fish & Wildlife Department, is leading a group of 20 bat enthusiasts, including me, up a steep, mile-long trail. It's a warm autumn evening, and we're venturing to the Mount Aeolus bat cave in Dorset, Vermont, the largest known bat hibernation site in all of New England. About 23,000 bats have been counted hibernating there.

At an overlook on the trail, Darling gives us a lesson on bats. He says that despite their reputation, bats are not flying mice; in fact, they're more closely related to primates. He explains that a female bat rears just one pup per year and can live 20–30 years. He says that there are nine species of bat in Vermont. (New York has the same nine species; the other New England states have eight, lacking the Indiana bat.) Six of these species are called "cave bats," because they spend their winters hibernating in caves and mines. The other three species are called "tree bats," and they migrate as far south as Mexico to spend the winter in warm places where bugs are still flying.

We reach the cave opening just as darkness falls. About a dozen bats swirl overhead.

This is a mating swarm, Darling explains. The bats meet and mate on autumn evenings near hibernation sites. One of Darling's assistants scoops a bat from the swarm with a net. Darling holds the bat, spreading its wings to show how it is made up of a membrane of skin stretched across delicate hand-bones, how its teeth are tiny, but pointy to catch insects, how the intricate folds of skin on its nose and ears likely aid echolocation.

One woman asks if she can touch the bat. "Well, you could," Darling replies, "but then I'd have to kill it." He explains that about one-half of one percent of all bats carry rabies. Darling has been inoculated, but public health protocol demands that any bat that comes in contact with an unvaccinated human be killed and tested.

In groups of about five, members of the expedition accompany Darling into the mouth of the cave where we sit on rocks in front of a bat gate. The gate's metal slats keep human visitors out while allowing the bats to fly freely. The bats are more concentrated in this entryway, weaving among us, sometimes brushing close enough that we can feel the breeze from the down-flap of their wings on our cheeks.

There are no squeals at these close encounters – these are bat enthusiasts, after all. Most in attendance already know that the bats will not get tangled in our hair, that echolocation allows them to navigate the darkest night with precision, just as their excellent eyesight lets them see in the daytime.

As we leave, maybe 80 bats flit over the cave entrance.

"This may be the top wildlife experience in the state of Vermont," Darling said.

The syndrome strikes

Today, this experience no longer exists. White-nose syndrome has killed more than a million bats in the Northeast in the past two years. Today, Darling visits the Mount Aeolus cave only for research. There are no field trips to the cave, and it is closed to recreational cavers. It is no longer a place of wonder.

White-nose syndrome was first discovered in Hailes Cave, near Albany, New York, in the spring of 2006. Bats there were found dead and dying, their faces and wings dusted with a white, powdery fungus. Soon, dead bats were found in 18 other sites in the area. Initially, biologists thought it was a regional problem restricted to bats in the Albany area.

Five months later, this thinking changed. Darling got a phone call at home from New York State Department of Environmental Conservation wildlife biologist Al Hicks. A caver had discovered white-nose syndrome at Morris Cave in Danby, Vermont, less than 10 miles from Mount Aeolus. This was a big leap in the spread of the disease. Morris Cave is nearly 50 miles from the epicenter of the caves previously known to be affected, and is in a different state, which adds to the complexity of managing the situation.

Within months, the syndrome was discovered at bat hibernation sites in Massachusetts, Connecticut, and New Hampshire as well. White-nose syndrome had quickly become a regional problem.

Darling immediately began a systematic search of Vermont's known bat hibernation sites to check for white-nose syndrome. He left Morris Cave for last. If something contagious were causing the syndrome, he didn't want to spread it to other Vermont caves.

On February 14, 2008, Darling returned to the Mount Aeolus bat cave, this time with a Vermont Fish and Wildlife staffer and Peter Youngbaer, a caver active in many caving organizations who had helped Darling with cave work at Mount Aeolus in the past.

It was a cold, sunny day, Youngbaer reports. As the three men donned white haz-mat suits at the end of the trail to the cave, they noticed bats flying around. This was not a good sign. While bats may rouse briefly during hibernation, and may even fly around on warm, winter days when there are flying insects about, there were no flying insects for these bats to eat on this cold day. The bats were using up the energy reserves they had built up to last through the whole winter.

Before the team even unlocked the bat gate, Youngbaer says, they counted 85 bats huddled in crevices outside the cave and several dead bats lying in the snow. Another bad sign. As they explored the cave, the usually agile bats would sometimes crash into them. The men would gently remove the bats from their protective suits and allow them to grasp the cave wall with their feet, where they would cling, safe for the moment. Without traveling very deep into the cave, the team found another 25 dead bats and 50 bats clearly stricken with white-nose syndrome – white fungus on their wings, ears, or faces. The team did not have to search farther. [Editor's note: Come to www.northernwoodlands.org for links to videotapes showing bat biologists exploring infected bat caves.]

A fungus that prefers the cold

What followed was a frantic scrambling within the biology community to figure out what, exactly, this white-nose affliction was. Darling took many trips to Mount Aeolus that winter to collect data. Al Hicks and his staff were collecting similar samples from affected caves in New York, and other scientists were doing the same work in Connecticut, Massachusetts, and New Hampshire. Darling collected bat guano for a study on contaminants and guided a scientist who took scrapings from the cave wall for an environmental study.

But mostly Darling and the other scientists collected dead bats, packed them in ice, and shipped them to various labs. Many of those bats wound up at the U.S. Geological Survey's National Wildlife Health Laboratory in Madison, Wisconsin. There, microbiologist David Blehert was trying to get to the bottom of the many mysteries surrounding the white fungus.

While the white noses were the most obvious symptoms of the fungus, the fungus isn't a symptom; scientists initially had reason to believe that it wasn't the primary cause of the bat deaths. Fungal infections rarely kill mammals, but they often take advantage of animals whose immune systems are already weak from disease, starvation, or some other cause. And one thing all of these bats had in common was very little or no body fat. They had starved to death.

When Blehert found the same, previously unknown white-nose fungus on 10 bats in different caves in different states, the idea that the syndrome was indeed caused by the fungus suddenly became more likely.

Blehert's further study showed that the mysterious fungus grows best at cold temperatures, about 41–50°F and doesn't grow at all at temperatures over 68°F. He found that it was most closely related to a group of soil fungi that often grow in caves, in the genus *Geomyces*.

Working with other scientists at the National Wildlife Health Lab, he found that this fungus was dermatophyte, a fungus that grows on skin, like athlete's foot or ringworm. The Wildlife Health Lab researchers saw, however, that this fungus was not stopping at the outermost, dead layer of skin like those infections do but was burrowing deep into the bats' living lower layer of skin.

With this discovery, the mystery of white-nose syndrome made a little more sense. When they hibernate, bats lower their body temperatures to within a degree or two of the temperature of the cave. For bats at the Mount Aeolus cave, and other northern hibernation sites, these temperatures are often a little over 40°F, the perfect growing temperature for the fungus that has now been named *Geomyces destructans*.

Only the Northeast's hibernating bats – the little brown bat, the northern myotis, the big brown bat, the Indiana bat, the eastern pipistrelle (once known as the tricolored bat), and the small-footed bat – have been seen with the fungus. This may be because their body temperature drops low enough for the fungus to take hold. The tree bats that migrate south in winter – the silver-haired, red, and hoary bats – have not been seen with the fungus.

A cold-loving fungus as a cause of the syndrome could also explain why people seem not to be affected, even the cavers who had stumbled into infected caves unprotected, and why no other animals, from the dogs and cats that live near affected caves to the raccoons and weasels that feast on the dying bats, have shown any symptoms or effects.

Most scientists familiar with the syndrome now believe that the fungus is the cause, but research continues as they work out the details. For example, it is not known exactly how the fungus kills the bats. Some scientists believe that the fungus irritates the bats to death. Athlete's foot can be itchy, even painful. Every time a bat scratches, or tries to groom the fungus away, it must rouse from hibernation and use up fat stores that will just barely allow it to live until spring under the best conditions. Because they are waking much more frequently than normal, they burn

Bats of the Northeast

MIGRATING

Silver-haired *Lasionycteris noctivagans*
Red *Lasiurus borealis*
Hoary *Lasiurus cinereus*

YEAR-ROUND RESIDENTS

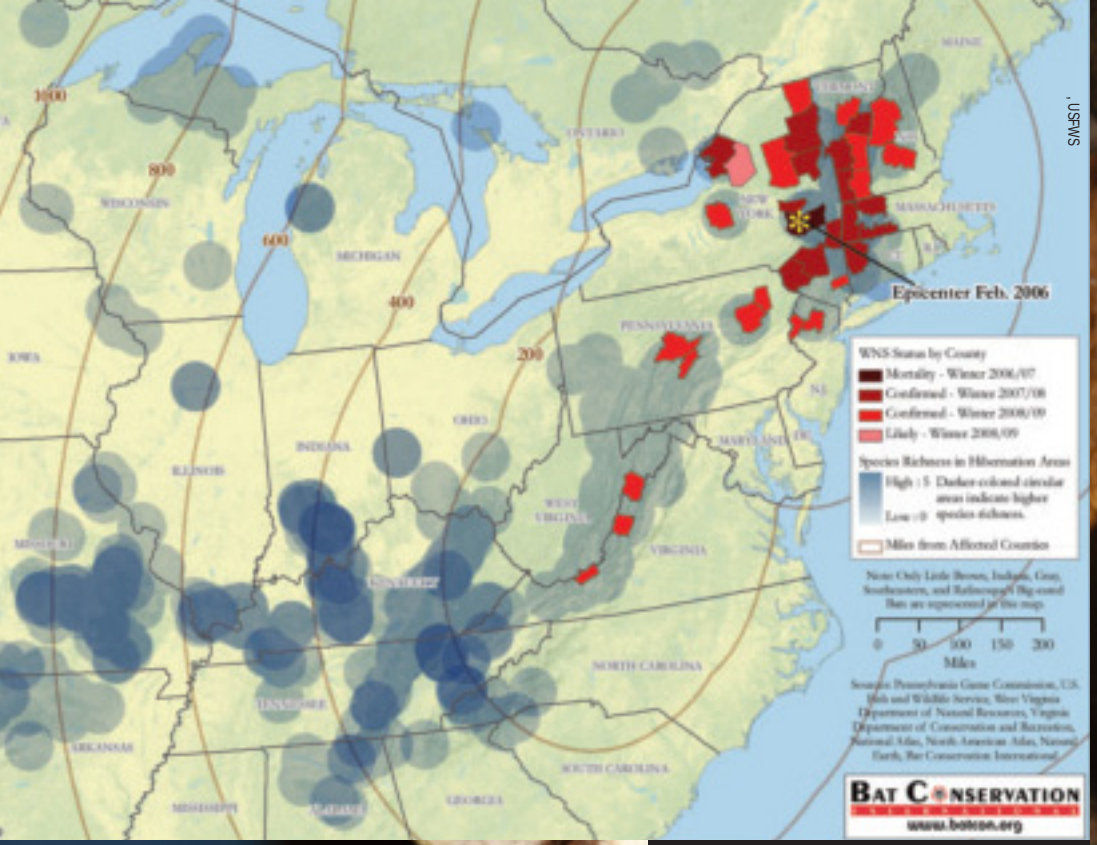
Northern long-eared *Myotis septentrionalis*
Little brown *Myotis lucifugus*
Indiana *Myotis sodalis* (federally endangered)
Eastern pipistrelle (tricolored) *Perimyotis subflavus*
Big brown *Eptesicus fuscus*
Small-footed *Myotis leibii*

COURTESY SCOTT DARLING

Left: Biologists surrounded by dead bats at the Aeolus Cave in Dorset.

Below: Hibernating bats in a Vermont cave.

USGS



, USFWS

GREG TURNER, PENNSYLVANIA GAME COMMISSION

RYAN VONLINDEN, NYDEC

Right: Hibernating bats with attached temperature-sensitive radio transmitter.

Left: Fungus on bat wing.

Below: A sick bat.

GREG THOMPSON, USFWS

away their fat reserves and starve to death before flying insects return to the landscape to feed them.

Further studies are needed to prove this hypothesis, however. A stricken cave in New York State that still has bats hibernating in it was outfitted with video cameras last winter so that scientists could observe the bats throughout the winter without otherwise disturbing them.

Other studies are being conducted to unravel some of the fungus's remaining mysteries. A study in Vermont is testing how the fungus is spread – is it strictly from bat to bat, or does the cave itself become infected? Healthy bats from a robust population in Wisconsin were brought to an infected mine in Vermont, with many precautions taken to assure that the bats didn't escape from the Vermont mine and fly back to Wisconsin. (The precautions included a series of three framed-in screens, each with its seams sealed with spray-foam insulation.)

In the lab, scientists are investigating the fungus's origins. Bats with a similar, fuzzy white fungus on their wings and faces have been seen in Europe, but the fungus does not appear to kill bats there. Is it the same fungus reacting differently in different species of bats? Has the fungus mutated? Or is it a completely different organism? A genetic analysis of the North American fungus and the European fungus should show the relationship between them.

Right now, Blehert and other scientists suspect that most of the spread of white-nose syndrome comes when the fungus is transmitted from bat to bat. Bats mix and mingle while mating, while hibernating, and while raising their young in maternity colonies. But people likely play a small but significant role in the syndrome's spread.

It might have been a human, possibly a caver, who brought the fungus from Europe to North America on contaminated clothing or gear. People have the potential to spread the fungus between regions by hopping on a plane or driving a car. For this reason, hibernation sites throughout the eastern half of the country have been closed to cavers, although commercial caves remain open, since people are unlikely to have contact with bats there.

The natural consequences

By May 2009, white-nose syndrome had been confirmed not only in New York, Vermont, Massachusetts, Connecticut, and New Hampshire but also in New Jersey, Pennsylvania, West Virginia, and Virginia. Losses of 60–90 percent of the bats in each affected cave means that most of the hibernating bats in the northeastern United States have died in the last several years. Bats are not a well-studied group of animals, and no one knows for sure what their loss will mean. One thing seems likely – there will be more bugs. Bats weighed before and after their night-time foraging runs have been found to be up to 50 percent heavier after they've eaten, meaning that the bats eat up to 50 percent of their weight in insects each night.

While much has been written about an impending mosquito boom, the effect of fewer bats on local mosquito populations is not clear. "Bats are key consumers of moths and beetles," says Darling. Mosquitoes are too small to be worth the effort of hunting them, at least most of the time, Darling believes. "People say the mosquito populations will change because of the bats, but I think it's more likely that moth and beetle populations will change."

Could the loss of these bats lead to an increase of forest pests like gypsy moths and forest tent caterpillars? Forest insect pest expert Douglas Allen, Professor Emeritus of Environmental and Forest Biology at Syracuse University, says that it is unlikely that bats eat gypsy moths. "The female moth does not fly and males are active only during the day." He says that bats almost certainly eat the moths of forest tent caterpillars.

He also says, however, that bats eat so many different species of flying insects that their impact on the population of any one species is unlikely to be significant.

None of the bat species found in the Northeast is expected to go extinct immediately due to white-nose syndrome, because all the species that live around here are widespread elsewhere in North America. The same is not true, however, for bats in other areas of the country. The Virginia big-eared bat hibernates in only five caves in Virginia, West Virginia, and North Carolina. Last winter, white-nose syndrome was confirmed in a cave close to a known Virginia big-eared bat hibernation site.

Wildlife managers fear that the syndrome will continue to spread south and west to the huge bat hibernation sites in Kentucky, Tennessee, Indiana, and neighboring states. These caves hold millions of bats each and are home to complex ecosystems that operate completely in the dark.

Will shorter winters, and warmer caves mean that white-nose syndrome will be less devastating in the South? Wildlife managers can only wait and watch to find out. If the syndrome spreads to that region of the country, and proves to be as lethal as it is in the Northeast, the Ozark big-eared bat, one of the rarest mammals in North America, will also be at risk of extinction.

A silent spring

In our region, it's possible that the disappearance of bats from our landscape won't be noticed by the average person. After all, our region has lost, or nearly lost, animal species in the past. Turkeys and beavers came back. Passenger pigeons and heath hens did not.

But scientists worry that the bat's problems are part of a larger decline in ecosystem health. One important aspect of white-nose syndrome, Darling points out, is that it is only one of several slights our local environment has suffered in the last several years. White-nose syndrome has been compared to the decline of amphibians and colony collapse disorder in honey bees. "The parallels are scary," he says.

Darling compares these events to potholes in our ecological infrastructure. Just like a highway, he says, there are only so many the system can bear before it crumbles. "I'd like to be optimistic for bats, but it's harder to by the day," says Darling. There is more than our region's bats at stake, he says. "The lesson is not just about bats, but how we take care of these ecological potholes."

Madeline Bodin is a freelance writer from Andover, Vermont.

By Virginia Barlow

Pitch pine, *Pinus rigida*

In forestry circles, monocultures don't get high marks. Most planted forests have just one kind of tree, and because of this they are often looked down upon as biological Levittowns: boring forests that are of little interest to other species.

Sometimes, however, nature does a pretty good imitation of a plantation, even if she does a poor job at keeping the trees in rows.

Pitch pine forests, like those that make up the New Jersey Pine Barrens, are a good example of a natural monoculture. The New Jersey forest is roughly 30 by 80 miles and has been dominated by pitch pine since the retreat of the last glacier.

How can one species dominate for so long? In this case, fire, and pitch pine's adaptations to fire, have kept the forest in a state of ecological inertia. Continuous cycles of burning and resprouting prevent the progression of what would normally be considered a pioneer forest to one with more typical climax species.

Even when all of the needles on a pitch pine are burned, the crown can recover and be almost back to normal in just a few years. If the leader is killed, a new one may grow, and if most of the tree is killed, new sprouts will emerge from the trunk or the base of the trunk. The ability to sprout from the trunk is common in hardwoods but rare in a conifer. Dormant buds buried deep in the thick bark of a pitch pine come to life after a fire or other injury to the crown.

Like the more boreal jack pine, another "fire pine," a percentage of a pitch pine's cones are serotinous, which is another way of saying that they remain closed until the heat of a fire melts the resinous glue that holds the scales of the cone together. Only then are the seeds released. Pitch pines seem to spend their lives preparing for fire: they begin to produce cones when very young, and they hang on to them year after year. A tree crown with hoards of blackened cones is not pretty, but the abundant seed supply serves the tree well when bare, newly-burned land cools.

In the absence of fire, the monoculture breaks down. Most of Cape Cod and much of Long Island were once pitch pine forests, but because of development and the exclusion of fire, oaks, red maple, and other species have lately joined pine in the canopy.

By no means is pitch pine confined to pure stands. Throughout its range – from southern New England south to northern Georgia – small patches can be found among other trees on the rocky, dry, wet, or shallow soils that other species find challenging.

At present, uses for pitch pine are limited, but in early Colonial times it was an important source of pitch, tar, rosin, and turpentine, all vital to keeping sailing ships afloat. The tree has an unusually high concentration of these compounds, which were also important as exports. Sheila Connor, in her book *New England Natives*, writes that in 1628, the residents of Plymouth requested that "men skyfull in making of pitch" be sent from England. Indeed, this was a skill, involving the slow, controlled combustion of pitch pine wood for two weeks, with the pitch collected in ditches that circled the pitch kiln. Resin was gathered by cutting a channel in the trunk of a pitch pine with a hatchet and channeling it to a container.

In the early 1800s, a booming bog iron industry in New Jersey Pine Barrens used pitch pine wood to fire the smelters and forges. Each of the many furnaces used a thousand acres of pines each year; at the same time, pitch pine charcoal was being shipped to New York City by the schoonerful. The ability to recover from human abuses is another pitch pine trait. It can regrow from the stump and from seeds that do not depend upon heat to be released. Depleted soil is a plus – it helps keep other species out of the picture.

These survival mechanisms do take a toll on appearance. Pure, natural stands that have been burned repeatedly tend to consist of short-bodied, misshapen trees. Their irregular profiles include heavy, lopsided lower branches, and many years' worth of aged cones blacken the crown.

ADELAIDE TYROL

KIM RANTA

This article is adapted from a brochure originally written by William B. Leak, silvicultural research scientist at the Northeastern Forest Experiment Station's Forestry Sciences Laboratory in Durham, New Hampshire, and Jane R. Riddle, public information specialist with the Northeastern Station's Information Services office in Broomall, Pennsylvania. The illustrations are by New Hampshire artist Marilyn Collins.

Why Trees Grow Where They Do in Northeast Forests

Have you ever been hiking through a stand of maple, beech, and birch, and as you walked along, gradually realized that the mix of species had changed to one dominated by spruce and fir? Ever wondered why certain trees grow in one place and not another?

There are a number of factors that influence species composition. Climate has an impact, as does the recent history of disturbance (see sidebar below for more on these), but the most significant factor is not recent but older and can be found not up in the treetops but beneath your feet. The area's bedrock and glacial history hold the key to forest composition today. Past glacial activity determines the characteristics of soil, and certain soil characteristics favor certain species of trees.

This doesn't mean that trees can't grow almost everywhere (almost any species grows well on nice, rich soil) but rather that certain species are more competitive on one soil versus another. Nearly all of the soils of New England and New York originated from activity of the great glaciers, which moved in from the north thousands of years ago, ground up bedrock into variously sized particles, and then deposited the soil material in several ways: some was dumped in place, some compacted under the glacier, and some deposited by water. The way that history played out makes it hospitable today for some species and not for others.

Bedrock provides the basic material that the glaciers worked on, and the more nutrient-rich the bedrock, the more nutrient-rich the soils. The extremely numerous types of bedrock found in the Northeast lie on a broad spectrum, ranging from the nutrient-rich (the Hudson and Champlain Valleys of New York and Vermont; the western flank of the Connecticut Valley along its entire length; and northern Maine) to the nutrient-poor (the high peaks of the Adirondacks, the Greens, the Whites, and western Maine; and the coastal areas of Rhode Island, Massachusetts, and Maine.) The remaining bedrock lies somewhere in the middle, nutrient-wise, with eastern areas (central Maine, southern New Hampshire, eastern Massachusetts, and eastern Connecticut) being generally less nutrient-rich than western areas (the Taconics, Catskills, and Tug Hill Plateau; and New York's southern tier.)

Consulting a bedrock geology map of your particular area will help you predict what sorts of tree species you can expect to see in the field. For the purposes of this article, species will be divided into two groups: those more common on nutrient-rich bedrock and those more common on nutrient-poor bedrock.

Climate and land use

In addition to glaciers and bedrock, there are other factors to consider in discussing which trees grow where.

Climate has a noticeable effect on tree species in our region. Northern latitudes, and upper elevations in the mountains, tend to support a spruce-fir forest regardless of the bedrock composition because conifers are more competitive in harsh weather than most deciduous species. Mid latitudes support northern hardwoods and hemlock, while southerly latitudes push toward white pine and red oak. Hillside aspect accentuates the effect of climate, with north- and east-facing slopes tending more toward northern species and south- and west-facing slopes toward the southern species.

Land disturbance also affects tree species distribution. The most well-understood impact is stand-level disturbance (harvesting or heavy windthrow), which changes stand composition from late-successional species (sugar maple, beech, hemlock, for example) to early-successional species (aspen, pin cherry, paper birch). The effects of past agricultural use, which affected the majority of forestland in the Northeast, are more variable depending on the specific use. Old-field white pine, for example, is a typical result of former pasturage.

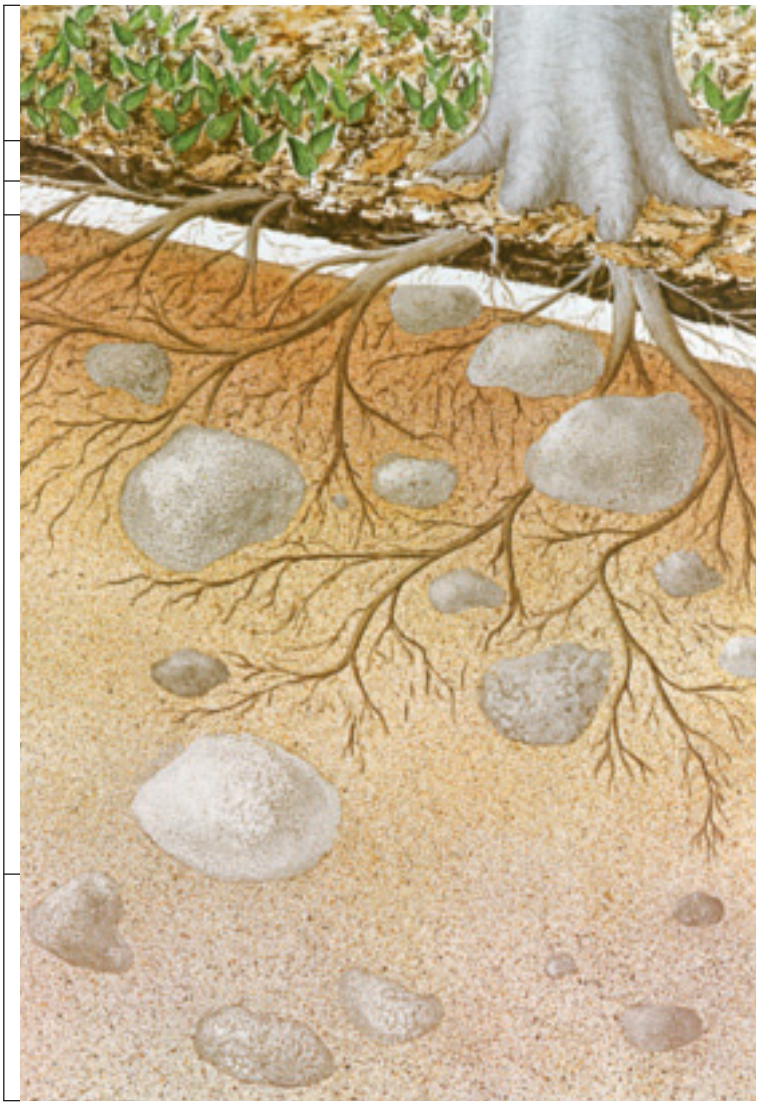
Glacial history

Between 10,000 and 20,000 years ago, the small corner of North America that would someday be New England and New York was just emerging into the post-glacial dawn. Vegetation that had been pushed south by the icy advance was slowly moving north to reclaim land relinquished by the glacier.

The melting ice revealed many changes in the earth's surface. Mountains were rounded off, rocks were cracked and buried and ground down. Where before one tree species would have flourished, another took root.

Soon, the history of the glacier would be revealed as much by the vegetation that replaced it as by geologic evidence. The type and arrangement of plants serve as a mirror for the mixture of clay, silt, sand, and rock lying beneath them. And the explanation for why certain species grow where they do, and why they grow better in some places than in others, can always be found in the soil beneath them.

Knowing that trees differ in their requirements for nutrients and moisture, and that sites differ in their ability to supply these needs, we can correlate species to habitat and produce descriptions of various typical combinations. Using this knowledge, foresters, landowners, and interested laymen can identify tree habitats by examining the topography and the soil materials that lie beneath the surface.



The topmost layer is **Litter**, and is composed mainly of twigs and leaves.

Next is **Humus**, a black organic matter formed from decomposing litter.

Beneath the humus there often lies a white leached layer designated **E**.

One layer down, the **B Horizons** begin. The "Bs" are red, brown, and yellow layers of soil transpierced by tree roots.

At rock bottom are **C Horizons**, gray and yellowish layers not yet penetrated by tree roots.

Soil Profile

Generally speaking, soil can be thought of as having distinct layers, some of which might not be found everywhere. The topmost layer is litter, and is composed mainly of twigs and leaves. Next is humus, a black organic matter formed from decomposing litter. Beneath the humus, there often lies a white leached layer that is designated E.

One layer down, the B horizons begin. The B's are red, brown, and yellow layers of soil transpierced by tree roots. At rock bottom are the C horizons, gray and yellowish layers not yet penetrated by tree roots.

For our purposes – identifying tree habitats – the most important layers in the soil profile are the deepest ones, the B and C horizons. Habitat descriptions are based on the evaluation of four factors: water relations and enrichment in the B horizons; and particle sizes and compaction in the C horizons.

How can you determine what soil you have on a particular piece of ground? Dig several pits, using hand tools or excavation equipment, to a depth of about three feet to make sure you are seeing well into the C horizon. The pit only needs to be large enough to enable you to see everything that's in there. Also be sure to take advantage of places where the soil profile has already been exposed, such as road cuts or excavations.

Once your hole's been dug, the first thing to look for is evidence of moisture in the B horizon. If the soil is dry, you'll see no evidence of standing or moving water, and no gray, olive, or rusty mottled areas that indicate excess water.

The next distinction to make in the B horizons is the presence or absence of enrichment. Enriched B horizons are dark brown due to heavy organic matter content. The soil can be either dry or moist. Enriched areas include coves, benches, or other places where deposits collect.

In non-enriched soil, you'll see no strong evidence of added organic matter.

After examining and noting the B horizon, move down and look at the C horizons.

In the C's, you should first determine which soil particle size or sizes are present. The three basic classifications are rock, gravel/sand, and silt/clay.

You'll find that some soil materials consist primarily of particles of one size. For example, glacial outwash areas contain mostly sand and/or gravel. Soils classed as sediments hold mostly silt and/or clay, with some very fine sand mixed in. Other soils, such as glacial till, contain a mixture of all particle sizes.

The second characteristic to consider in the C horizons is the amount of compaction. Compacted soil will look like interlocking plates. You will have difficulty digging here. Stones will be firmly embedded, especially when the soil is dry. The soil will be hard enough to support free-standing water, although you may not actually find water there.

Non-compacted soil will be easy to dig. The soil here won't be much firmer than that in the B horizons and will be permeable to water.

Don't confuse compaction in the C horizons with the red-brown-blackish cementation you'll sometimes find in the upper B horizons.

From soil profile to tree habitat

Once you've noted the area's soil profile, you can use your notes to correlate the soil with nine distinct habitat types.

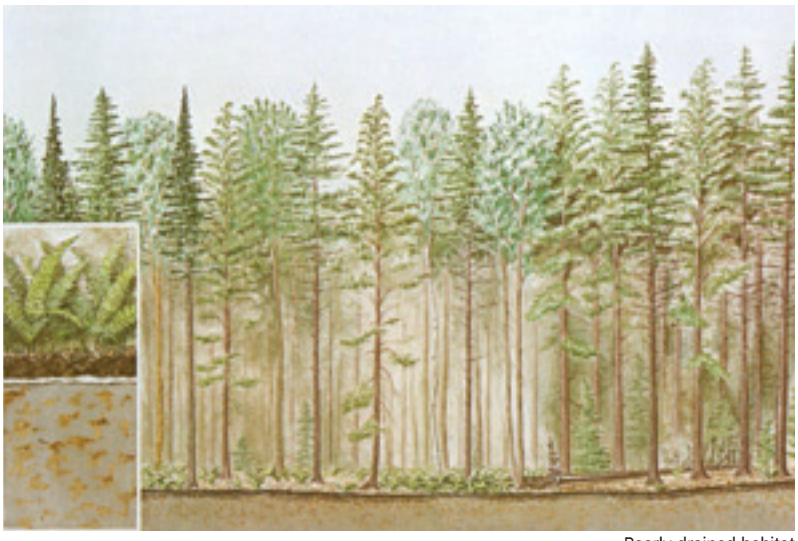
Poorly drained habitat

Wherever a poorly drained habitat now stands, a swamp once existed in the wake of the glacier. Water still lends these areas their distinguishing features. The land is usually flat and wet, with obvious pools of water on the surface. Ferns and other plants that like or tolerate water are often found here in abundance. The trees are shallow-rooted and may blow over easily. Logging may be difficult on poorly drained areas, except in the winter or in very dry seasons, because the equipment tends to sink into the ground.

CHARACTERISTICS: Flat areas; grey or mottled subsoil.

SPECIES: Red spruce, hemlock, balsam fir, red maple, and birches in young stands; red spruce and hemlock in old stands.

GROWTH: Slow for softwoods and hardwoods.

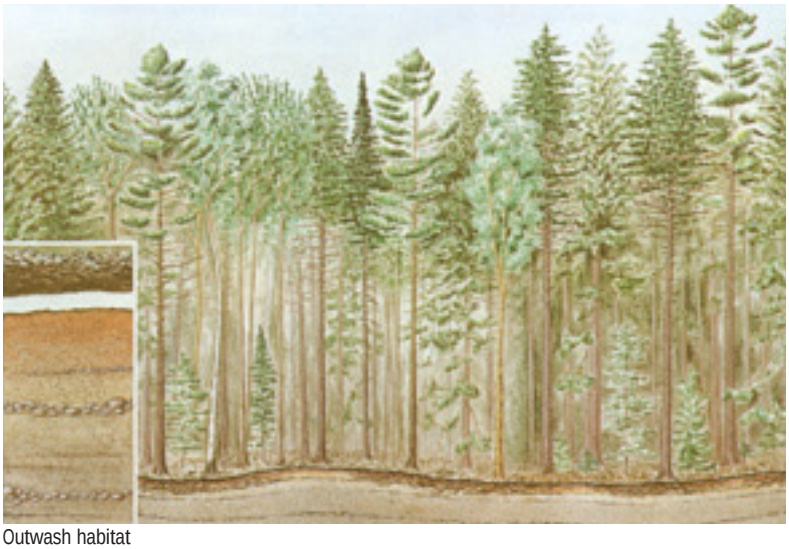


Poorly drained habitat

Rock habitat

As the glacier passed through areas now classified as rock habitat, it scraped over the bedrock, tearing away some large fragments and leaving little or no soil in its wake. The rock fragments torn loose by the glacier were dropped nearby before they could be worn smooth, so the area is punctuated with square or sharp-angled rocks. These are frequently found at higher elevations, and blueberry bushes are a common sight. They grow especially well in openings in the forest. Because of the scarcity of soil, there is a tendency for trees to blow over easily here. Another type of rock habitat is found at lower elevations, where a bed of boulders is all that remains after some prehistoric stream or river swept away the soil.

Rock habitat



Outwash habitat

Moist compact habitat

CHARACTERISTICS: B horizons shallow with coarse rock fragments; underlain with bedrock, rock fragments, or stones. Occasional rock ledges at surface.
SPECIES: Red spruce, hemlock, red maple, birches, occasional oak in young stands; red spruce and hemlock in old stands.
GROWTH: Slow for softwoods and hardwoods.

Outwash habitat

The quintessential outwash habitat is a sand or gravel pit. Such an area is a sink for soil material deposited in the wake of streams and rivers formed by melting glacial ice. Coarse particles – sand and gravel – will settle first, while fine particles – silt and clay – traveled farther downstream. Outwash habitats usually occur at medium to lower elevations. Blueberries often adapt better than other plants to this coarse, dry soil.
CHARACTERISTICS: C horizons predominantly sand and gravel; few surface boulders; buried stones appear clean and washed; flat to rolling topography.
SPECIES: Red spruce, hemlock, white pine, red maple, birches in young stands; spruce, hemlock, and a few white pine in old stands.
GROWTH: Medium for softwoods and hardwoods; white pine is the most productive species.

Moist compact till habitat

Subjected to thousands of tons of glacial pressure, the compact C horizons, undisturbed by tree roots, were pressed into one tightly packed layer that now forms a watertight barrier on moist compact till habitats. The tremendous pressure can be more vividly imagined when one considers that the ice was almost a mile thick in places. Even the boulders that escaped the glacier's hold were pressed into the soil so that only their topmost layer shows above the surface. Because of the wet soil, gullies form easily here and loggers sometimes find it hard to build and maintain roads or trails.
CHARACTERISTICS: Glacial till; hard, compact C horizons; some mottling and/or water in B horizons; topography flat or depressed; surface boulders level with or pressed into surface.
SPECIES: Red spruce, hemlock, red maple, birches in young stands; hemlock and red spruce in old stands. Atop nutrient-rich bedrock, sugar maple instead of spruce or red maple.
GROWTH: Medium for softwoods and hardwoods.

Dry compact till habitat

It is tempting to think of dry compact till habitats as just moist compact till areas without the water, but the situation may not be that simple. Some scientists believe that soil there may be held together by a chemical cementing agent. But they also recognize the part possibly played by the great weight of the glacier in compacting the C horizons into hard, plate-like layers. These habitats often go incognito, since on the surface they resemble many other areas. Their identity becomes obvious when a probing shovel or spade encounters the impervious C horizons.

CHARACTERISTICS: Glacial till; C horizons hard and platey; stones difficult to dislodge; no evidence of water or mottling; topography rolling, ridge-like, or convex.
SPECIES: Red maple, beech, birches, red spruce, hemlock in young stands; hemlock and red spruce in old stands. Atop nutrient-rich bedrock, sugar maple instead of beech or red maple.
GROWTH: Medium for softwoods and hardwoods.

Dry compact habitat

Lake sediments habitat

Picture a cool, still lake surrounded by slowly melting ice. Mist forms on the surface as water evaporates into the warmer air. At the lower end of the lake, a temporary ice dam detains the meltwater on its way to becoming a stream or river. Fine particles of sand and silt drift lazily toward the bottom of the lake.

Thousands of years later, early settlers found these lake sediment habitats, being fairly free of rocks, to be ideal places for farming. Pure sediments like this are not too common in mountainous regions. The smooth layers of sand or silt are interrupted only occasionally by a larger boulder. Perhaps it floated across the lake on an ice barge and then settled to the bottom in a cloud of silt.

These habitats are usually found at lower elevations, in valleys or ravines where a stream or river follows the ancestral path.

CHARACTERISTICS: C horizons are uniform fine sand and silt; loose and dry (sandy sediments) or moist and sticky (silty sediments); few stones; topography flat to gently rolling.
SPECIES: Red maple, beech, birches, some red spruce and hemlock in young stands; hemlock and red spruce in old stands. Sugar maple instead of beech or red maple on nutrient-rich bedrock.
GROWTH: Good for softwoods and hardwoods.

Lake sediment habitat

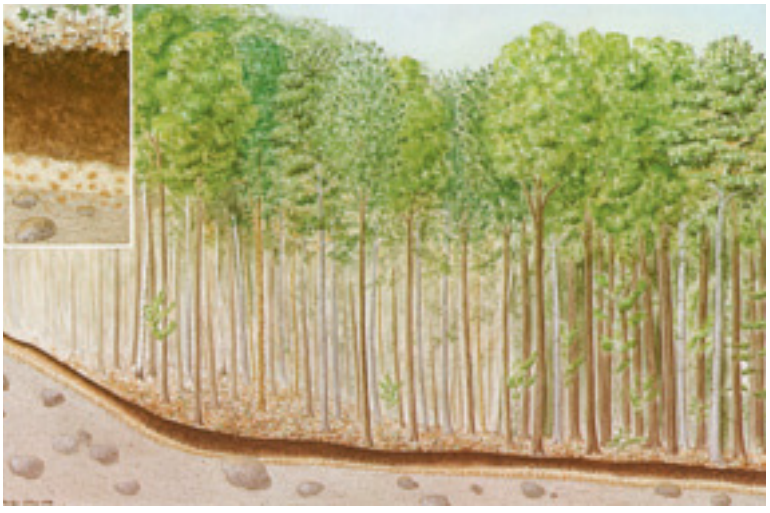
Washed till habitat

Like a Grim Reaper of soils, the glacier gathered everything in its path and then scattered it like so much chaff. Where glacial melt formed a river, stream, or lake, soil was sorted into layers of particles of different sizes. Areas classified as washed till habitats were merely rinsed by water so that much of the finer material was swept away. The remaining soil came to rest as the glacier melted. These habitats occur most often at lower elevations.

CHARACTERISTICS: Glacial till but very little silt and clay; loose, sandy material; buried stones are dirty or silt-capped; rolling topography with a few surface stones.
SPECIES: Beech, red maple, birches, a few softwoods in young stands. Beech is abundant in old stands on nutrient-poor bedrock; sugar maple more prevalent than beech on nutrient-rich bedrock.
GROWTH: Good for hardwoods; softwoods not too common.

Washed till habitat

Fine till habitat



Enriched habitat

Fine till habitat

Fine till habitats might be called the dustbin of the glacier. Everything that has been picked up along the way was unceremoniously dumped here with little if any washing or sorting. The land is often steep and irregular. Fine till is probably the most common habitat in mountainous areas.

CHARACTERISTICS: Glacial till with all particle sizes; firm, not loose; irregular topography and numerous surface stones.

SPECIES: Beech, sugar maple, yellow birch common in young stands; beech and sugar maple in old stands. Relative prevalence of beech versus sugar maple dependent on bedrock nutrients.

GROWTH: Very good for hardwoods; softwoods uncommon.

Enriched habitat

In certain coves or benches in the forest, leaves and fine particles of soil have washed in year after year and turned the glacier till into a sort of compost pile. The soil in these enriched habitats is often so laden with organic matter that the layers lose their identity, merging into material resembling a rich potting soil. On these small but fertile areas, trees grow extremely well.

CHARACTERISTICS: Topography is a cove or bench; B horizons brown; soil layers or horizons indistinct; A_2 horizon usually missing; moving water sometimes present; C horizons usually fine till or compact till.

SPECIES: Sugar maple, white ash, miscellaneous species in young stands; sugar maple, some beech in old stands.

GROWTH: Very good for hardwoods; softwoods not common.

Out in the field

When you take your knowledge of habitats to the field, use the following suggestions to aid in the process of identifying habitats:

1: When deciding on the boundaries of an area you wish to identify, look for uniform forest and topographic conditions. The size can range from a few to many acres in size.

2: Softwoods tend to be more prevalent in areas that have been farmed or used for pasture than in similar, un-pastured areas. To determine whether an area was once farmed, look for evidence of old roads, stonewalls, and cellar holes.

3: If you can, determine what type of bedrock is prevalent in the area. Your local Natural Resource Conservation Service office or state geologist's office should have both local and regional soil and bedrock maps.

4: As noted earlier, dig several pits or take advantage of places where the soil profile has been exposed, such as road cuts or excavations. Examine the pits or road cuts to a depth of about three feet. Note the tree species and the topography, and determine whether the stand is young or old.

5: For a final identification, use the descriptions in this article. Make sure that the characteristics of topography, soil materials, and species composition point toward the same habitat. Remember that some areas are best described as a combination of two or more habitats.

By Todd McLeish

Hope on the Eastern Front

Eastern hemlock forests are under siege by the invasive hemlock woolly adelgid, but a University of Massachusetts researcher thinks there is reason to be optimistic that the invasion may be brought under control. Dave Mausel, a forest entomologist, has been seeding 15 hemlock study plots with a promising variety of the predatory beetle *Laricobius nigrinus*, which feeds exclusively on adelgids.

US FOREST SERVICE

L. nigrinus *larva eating hemlock woolly adelgid eggs*

Mausel said that a variety of the beetle found in the Pacific Northwest, where western hemlock grows, has been used successfully to colonize hemlock forests in the middle and southern Appalachians and fight the adelgid, but the variety does not fare well in the colder temperatures in the Northeast. So Mausel sought out a more hardy variety to test in forests in Pennsylvania, New York, and northern New England.

"We discovered a population of the same beetle from northern Idaho and northwestern Montana that is better adapted to the climate in New England," Mausel said. "We have data that suggests that it is clearly more cold-tolerant for our more severe winters. We fully expect the Idaho beetles to colonize well here, which will mean that the beetles will be able to colonize the entire range of the adelgid."

The hemlock woolly adelgid is a non-native insect introduced accidentally from Japan to Virginia in 1953. In the intervening decades, it has become the single greatest threat to the health of eastern hemlocks, especially in the south, where winters are not cold enough to stop it from defoliating entire forests. Adelgids use their piercing mouthparts to drill into a tree's twigs and suck away its stored carbohydrates and energy. As the adelgids feed, the tree is unable to produce new growth, and the needles already present may fall prematurely. An attack may be small initially, Mausel said, but once the insect numbers explode, a tree can soon be overwhelmed and may never recover.

In 2007, Mausel began releasing 500 to 1,000 cold-tolerant predatory beetles at each of his 15 study sites. Last fall, he returned to find that some of these initial colonists had successfully reproduced and that the succeeding generations in at least one site were surviving. "We've only confirmed their presence at one site so far, but just because we didn't find anything at other sites doesn't mean they aren't there," he said. "All indications are that we just need more time to document their success."

It may take as long as 20 years to know for sure whether the *Laricobius* beetles are going to help the eastern forest, but Mausel and colleague Joe Elkinton say that the time to act is now. Because it's warmer in the south, infested trees can die in as few as four years there. In the north, winter slows adelgid population growth, and it might take 15 years for a tree to die. "In the south it's already too late," Elkinton noted. "But here, if we can get the beetles established and it turns out they're helpful, we might be able to bring the adelgid population down to where it's innocuous."

Red maple jumps to an early lead

Red maple trees are becoming increasingly dominant in forests throughout the eastern United States, and that worries Kim Steiner. A professor of forest biology at Penn State University, Steiner said that "not only is red maple less valuable as a timber tree, but it doesn't offer anywhere near the ecological advantages of oaks. Acorns are important food for squirrels and deer and mice and turkeys, so oak is the breadbasket of the woods."

Steiner has investigated natural regeneration processes and silviculture practices in central Pennsylvania to try to model what has been taking place in historically oak-dominated forests. He and his colleagues examined the development of seedlings and stump sprouts from red maple and oak following timber harvests on state forest lands, and they found that red maples have a remarkable ability to quickly capture growing space at the expense of oaks.

In their study plots, where mature oaks were three or four times more prevalent than red maples in the canopy before harvest, red maple seedlings were nevertheless far more abundant both before and after harvest than oak. And while maple seedlings don't grow as fast as oak seedlings on average, the tallest red maple seedlings were still as tall as the tallest of the oaks early on. "Through age seven, red maple is pretty much equal to or even a little superior to oak, from seed regeneration alone after having been a subordinate species in the prior stand," Steiner said.

The tipping point for the changing dominance in the forest, he said, came

when they examined red maple regeneration from stump sprouts. He noted that in oak-dominated forests, there are often far more red maple tree stems than oaks – those stems are just much smaller than the oaks – so, because smaller diameter stumps tend to sprout more vigorously than larger stumps, there is greater potential for sprouts from maple. Steiner found that, of those that were cut, more red maples sprouted than oaks, and the maples had a higher survival rate over time and grew a little faster, too. Seven years after harvest, the growing space occupied by red maple stump sprouts exceeded that of oak sprouts by a ratio of 3.5 to 1. An examination of older forest stands found that this red maple dominance after harvest continues for more than 20 years.

Several factors have set the stage for this regime change: fire suppression, which leads to an increase in red maple as light levels decline in the understory; invasions of gypsy moth and other exotics that have negative effects on oaks; and the increasing abundance of deer, which prefer to browse on oaks over red maple. But the biggest factor, according to Steiner, is logging.

"If we didn't do anything to the woods, the increasing dominance of red maple would be a very slow process," he said. "But the balance tips dramatically when we cut the stands. When we harvest a mixed oak stand that has all these small red maple trees in it, perhaps what we should do is kill those red maples with herbicide before doing the harvest. Our study indicates that silvicultural practices need to be modified if oak is to be favored."

Clearings for courtship

Two wildlife biologists in Rhode Island studying how forest-dwelling game birds make use of their habitat found that the birds unexpectedly exhibited what one described as "the bar scene phenomenon" – spending most of their time feeding and resting in one habitat and then "commuting" to a very different habitat to engage in courtship.

University of Rhode Island Professor Scott McWilliams said that the woodcock he and colleague Brian Tefft studied at the Great Swamp Management Area in southern Rhode Island made use of clearings in the forest to perform their courtship flight, but that they then flew to more wooded or swampy areas for the rest of the day.

"The forest cutting that is done on a routine basis to provide habitat for woodcock is clearly important for courting birds, but many of the birds are commuting elsewhere to feed," McWilliams said. "Maybe the clearings are good for courting, but they don't provide the earthworm eateries that the birds need for feeding. It appears that we may want to manage the forest in a variety of ways to provide appropriate habitat to satisfy all of the birds' needs."

Tefft, a biologist for the state of Rhode Island, has been cutting 10–20 acres of the forest at the Great Swamp about every five years to create habitat for the woodcock and other species of wildlife that prefer early successional forest. McWilliams, Tefft, and several students have tracked the birds' use of the cut parcels in each of the last two breeding seasons. They observed woodcock exhibiting their elaborate courtship flight, circling high in the sky and then plummeting to the ground in a series of zigzags, in these forest openings.

"Clearly they need these open, cut areas for courting, because their displays are designed to be seen by potential mates," said McWilliams. "The open areas are also good for avoiding some predators." The new growth that follows the forest clearing also provides an increasingly rare habitat for a wide variety of other declining species, including the New England cottontail, the ruffed grouse, and numerous songbirds such as the golden-winged warbler, eastern towhee, and field sparrow, he added.

The researchers are now expanding the woodcock research project to other locations in Rhode Island and collaborating with biologists in other states in the Northeast to learn how best to manage forests for these species. McWilliams and Tefft are beginning by surveying other lands throughout the region that have been managed in a similar way.

"This will give us a historical perspective so we can understand which forest management practices have been done in the past and which steps have been successful in creating ideal habitat for woodcock," said McWilliams.

The biologists will then track woodcock year-round to learn more about their breeding success and their health on their wintering grounds in the southeastern U.S. Their results can then be compared with the results from other biologists who are using the same protocol to study the birds elsewhere.

Woodcock with egg and, if you look closely, chick.

GERRY LEMMO

A Sharp Ax is a Safe Ax

By Carl Demrow

Sharpening an ax is not difficult, but it does require a basic understanding of how the business end of an ax works. An ax is almost never used to cut perpendicularly through wood fibers; instead, the tool is used to slice into wood at an angle. When an ax strikes a log, the ax head needs to do two things: cut the wood fibers, and eject the chips it creates.

A properly sharpened ax takes both actions into account. To cut the wood fibers, the leading edge of the ax must be sharp. To pop the chips out, the part of the blade just behind the leading edge must have a wedge shape. An ax with too sharp an edge and not enough bevel will cut too deeply and be difficult to remove. An ax with sufficient bevel but not enough edge will be too blunt to bite and will simply glance off the log.

Too thin

Correct

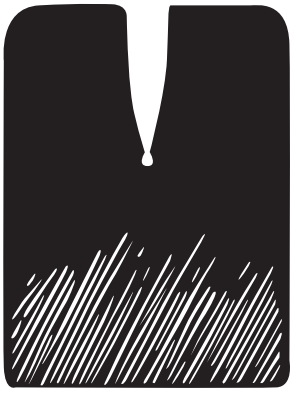
Too thick

The way to determine the bevel on an ax is to look straight down the bit from the top of the head. The profile should look like a bulging V whose sharp point tapers so that the sides become more parallel.

An ax with a good bevel should only need to be touched up from time to time, but an ax with a poor bevel will require some time and elbow grease to restore. High-speed grinders should be avoided religiously for bringing dull axes back, as the heat they generate will change the temper of the harder steel found in the ax's bit. A mill bastard file is a far better tool to use.

Start the process of sharpening your ax by clamping the ax head down on a flat surface. Then, while wearing gloves, run the file into the cutting edge at the desired edge bevel angle – 15 degrees is a good goal. Since you're running your hands toward the sharp edge of the ax, it's a good idea to make a guard by sliding a piece of leather or stiff cardboard onto the tang of the file; this will protect your fingers.

Proper sharpening strokes will take some practice, and it is important, as with most filing, that your stroke be smooth, steady, and, most critically, straight. Each fan-shaped stroke should start at one of the bit corners and end at the center of the bit. Keep count of your strokes, and after ten or so, do ten strokes from the other corner toward the center. Unclamp the head and examine the bevel profile. The filed side will be shiny, and you'll see a slight burr pushed over to the unfiled side. Then turn the bit over and do the same number of strokes on the other side at the same angle and in the same manner. Unclamp the ax head and, looking down the bit from the top, examine the bevel profile. Are you getting the angle right? Are you filing evenly on both sides? To assist in these determinations, you can make yourself a filing template out of a piece of wood or cardboard. Use the illustration provided here to get started. Fit the template over your bevel to check your work.



Ax-bit gauge
cut out and use as template

Once the filing is done, hone and polish the bit with a whetstone. Start at the edge and rub the stone along the edge in a circular motion, then turn the ax over and do the other side. Be sure you use either oil or water with your stone to float away the metal particles (generally oil for man-made carborundum type stones and water for natural stones).

When you've done both sides, place your fingernail against the edge. The edge should be sharp enough to bite into your fingernail.

Carl Demrow is a trail consultant and carpenter when he's not busy tending his woodlot in Washington, Vermont.

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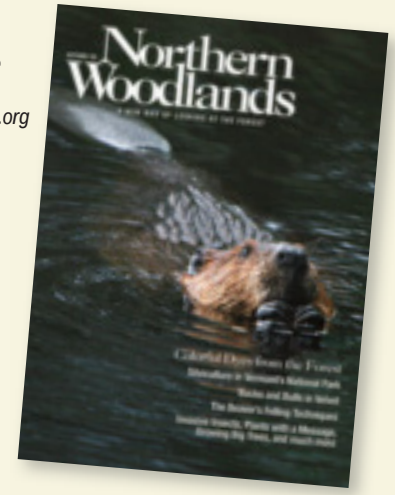

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By Robert Kimber

A Fine Woodworker

When Rita and I left the fleshpots of Boston and Cambridge and moved to Temple nearly forty years ago (forty years!), we made that move with the blessing of our friend Molly Gregory. Molly lived in a modest little apartment she had constructed for herself in the barn of hospitable friends in Lincoln, Massachusetts. Underneath the apartment, on the ground floor in the barn, she had a fully equipped woodworking shop, and outside the barn she had built a smaller barn where she kept a Jersey cow and a flock of chickens. She also had a black poodly mutt officially named Griselda but whom she usually addressed as "Grum." Grum adored Molly, and so did we, though had we even hinted at such a notion, Molly would probably have made one of her many funny faces and said something like, "Oh, gawrsh, don't be so silly."

Although she had grown up on a farm and wound up running the farm at Black Mountain College, where she had gone to teach in 1941, she was, first and foremost, a woodworker, the very best of several first-rate ones it's been my good luck to know. She could do it all, from designing and building a house to fine cabinetmaking to intricate carvings for a church altar. And along with everything she knew about woods and their properties and tools and their uses, she had an artist's eye, which she had developed to a high level working with Josef Albers at Black Mountain. Whatever she built, whether barn or sideboard, had clean, simple lines and seemed just made for whatever setting it was in.

Knowing that Rita and I had bought an ancient farmhouse we would have to practically rebuild from the sills up, Molly recruited us to apprentice with her on a couple of renovation jobs, one of them constructing a new living room to add to her own apartment. In retrospect, I wonder if she hadn't invented that job as much for our benefit as for her own so that we'd get a little more practice in framing and putting up dry wall.

When the time came for us to make our final run to our new home in Temple, Molly gave us three house-warming gifts: a superb Spear & Jackson panel saw, a black cherry cutting board we have used practically every day of our lives ever since, and half a dozen of her chickens to provide us with breakfast eggs in our first year and stew meat in our second. So with a couple of cartons full of chickens in the back of our VW beetle, we moved to Maine. Molly had of course unknowingly given us still another gift: When we knew we would soon have a child to name, we didn't have to peruse any lists at all. If the baby was a girl, she would be Molly; if a boy, Gregory, and so he turned out to be.

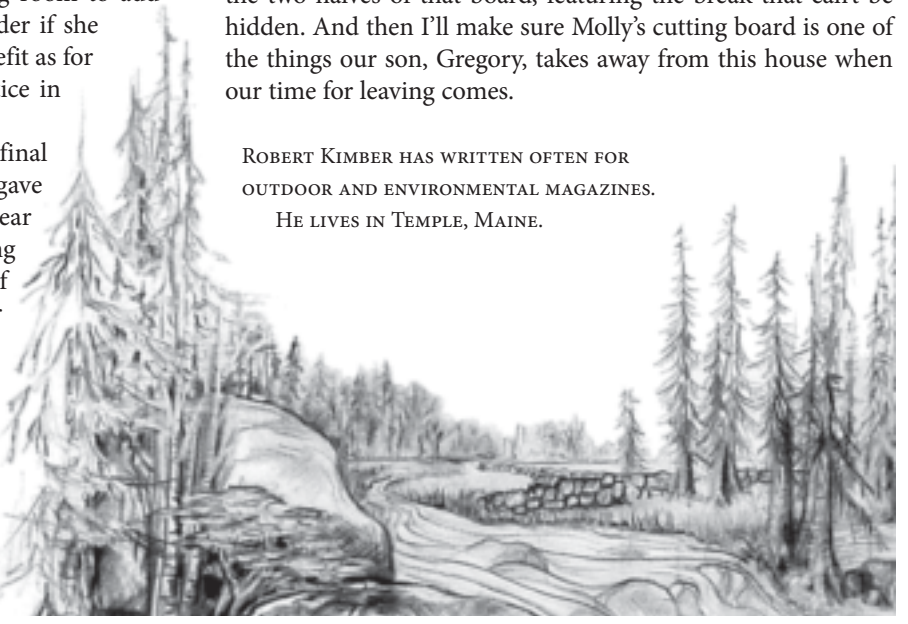
But then, 55 plus 20 makes 75, and 10 more makes 85. Molly had to give up the barn, the Jersey cow, and her "girls" (the chickens), and move to a retirement home where she was not allowed to keep any animals but managed to anyhow. She built a small-scale fire escape, not for herself but for her cat, Sophia, who used that unobtrusive structure to leave and enter Molly's second-story room day or night, unseen by other residents or the staff. Sophia occasionally brought red squirrels along, too, some alive, who would often find refuge in Molly's closet.

Work, she believed, was one of life's great privileges, and unable to run a table saw in her new home, Molly turned to sewing gorgeous quilts and painting her own Christmas cards and note cards in watercolors. They usually had barns and cows and chickens in them.

Molly could, in short, turn old age into art, the approach of death not something to waste time fretting about. Often faced with tough problems, she had always solved them elegantly. Once, when she'd been installing a set of classy and expensive kitchen counters and cabinets, a knot broke out of the middle of one of the counters. What to do? She made an inlay in the shape of a leaping dolphin, converting a disaster into a beautiful decorative detail. "If you can't hide it," she said, "feature it."

The other night, cleaning up after supper, I realized that a crack that had started in Molly's cutting board was getting longer and deeper. Soon the board will break apart. Molly died two years ago at ninety-three. I can't ask her to repair that board with her inimitable touch, but what I can do is remember what she told me. I'll laminate a contrasting strip of wood in between the two halves of that board, featuring the break that can't be hidden. And then I'll make sure Molly's cutting board is one of the things our son, Gregory, takes away from this house when our time for leaving comes.

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



WoodLit

The Sibley Guide to Trees

By David Allan Sibley
Alfred A. Knopf, 2009

Who knew? David Allan Sibley's natural history interests do not end with birds. Nearly a decade after the appearance of the landmark *Sibley Guide to Birds*, we now have a bookend volume – same layout, same pliable cover, nearly identical dimensions – devoted to North American trees. And given the typographical dominance of the author's name in the title, it looks as if the publisher hopes that Sibley will reprise for Knopf in this century the role Roger Tory Peterson played for Houghton Mifflin in the last: namely, that of a cash cow that – hold for the mixed metaphor – lays golden egg after golden egg.

Peterson and Sibley approach the art of field-guide illustration with distinctly different assumptions. Peterson, who essentially founded the field-guide genre, believed in paring to essentials; the guides he illustrated (or edited) rely on flat, schematic drawings. George Petrides's leaf illustrations in the Peterson tree guide are two-dimensional, monochromatic outlines. Sibley's leaves, aiming to be naturalistic, add topography, texture, and color. To be fair, the Petrides illustrations, augmented by text, will enable one to do the work of identification as well as Sibley's; but you won't lose much money betting that most people will prefer a guide that works at being visually pleasing as well as useful.

Every tree-guide author begins with a definition problem. Everybody knows what a bird is or what constitutes a snake, but what is a tree? Peterson/Petrides avoided the issue by adopting the big-tent approach: any woody plant would do. And so that guide treats shrubs and vines as well as trees. Sibley limits his subject to "any plant species that is commonly over 30 feet tall with a trunk at least one foot thick," which means that a cactus (the stately saguaro) qualifies while smaller woody plants do not.

Shrub lovers will be dismayed at the short shrift given the dogwoods and viburnums, but tree-watchers who pursue their hobby in parks, on college campuses, and along residential streets will be delighted at the generous selection of exotics, whether naturalized or not, treated here. (Most tree guides, whether on principle or in response to space constraints, largely or entirely ignore introduced species.) Northerners can use this book to identify not only ginkgo and Scotch pine and Russian olive but also downy birch and shantung maple, and even an obscure member of the rue family called the beebee tree. Indeed, Sibley's inclusiveness for most tree families is remarkable for a one-volume work; while Peterson/Petrides treat 27 oaks and the Brockman/Merrilees Golden guide includes 40, Sibley features 77 species, including *Quercus carmenensis*, known in this country from a single specimen discovered in the Chisos Mountains of west Texas. With a few exceptions – a suite of native species unique to south Florida is omitted, and a large, tangled complex of hawthorn species is generalized and sampled – the user of this guide can expect to find any native tree found in North America north of Mexico.

In addition to the handsome leaves, flowers, fruits, barks, and a sprinkling of full-tree silhouettes, Sibley writes useful introductions for each tree family, gives us tips for discriminating similar species (are those hitherto generic trees growing along your riverbank white ash, green ash, or black ash?), and adds an occasional note introducing tree problems and bird/tree associations. In addition to the usual tree-guide helps – a general subject introduction, an index, hardiness-zone and ecoregion maps – this volume features a full species checklist and a time-saving, back-of-the-book, one-page quick index.

Finally, a couple of caveats. The book jacket's claim that the Sibley guide is "small enough to take into the field" is rather a stretch. At four times the weight of most field guides, this book is unlikely to be schlepped far afield. It will probably serve most users as a home- and car-based reference guide. And the Pennsylvania outfit responsible for the book's color separations needs to explain why, all too often, tree parts correctly described as yellow in accompanying text appear on the page a bold, unapologetic orange.

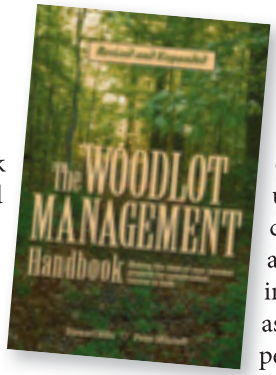
Alan Pistorius

The Woodlot Management Handbook: Making the Most of your Wooded Property for Conservation, Income, or Both

by Stewart Hilts and Peter Mitchell
Firefly books, Second Edition, 2009

When I first became involved in forestry in the 1970s, information on woodlot ownership and management written for forest landowners was generally limited to publications that focused on traditional timber management or creating wildlife habitat for game species. In the thirty-some years since then, more holistic approaches to forestry, based on the principles of ecosystem management, have evolved, and there has been an explosion of information available on the internet and in traditional book form.

Today, the challenge is to select useful information from the many gigabytes and pages that are available. This revised edition of *The Woodlot Management Handbook* is useful, and it fills a niche for woodland owners who are new to forestry and for those contemplating a



woodland purchase. The book includes chapters on woodland ecology, how to map and inventory your woodlot, conserving ecological values and wildlife habitats, as well as harvesting firewood and timber. It also covers many other forestry practices such as reforestation, developing trails, woodlot protection, and preparing a stewardship plan. Practical advice on buying woodland property, non-resident ownership, and the range of long-term conservation options to protect your woodland's values for current and future generations is also included. The book's geographic focus is on the Eastern deciduous forests from southern Canada to the Cumberland Plateau and southern Appalachians.

While this book covers much ground, I found some of the information to be inaccurate. For example, while many species use tree cavities excavated by woodpeckers and chickadees, there are no warblers among them. More significantly, the book fails to note that most, if not all, of the species it lists as being found in old growth forests may also be found in younger forests that are being managed primarily for timber.

The book is also biased toward high-value hardwoods growing on very good soils. As a result, the economic information presented may have limited applicability to many landowners. For example, the income reported from case studies in southern Ontario came from a period that included very high prices for sugar maple that far exceed typical stumpage values in much of the Northeast. The book also downplays the potential economic value of coniferous species, whereas in the Adirondacks as well as much of New England and the Maritimes, natural stands of softwoods or mixed softwoods/hardwoods may produce equal or greater financial returns than hardwoods, depending on the species present and relative tree and site quality.

While the book has a helpful chapter on mapping your woodlot using aerial photographs, compass, and pacing, the authors were remiss not to include internet sources such as Google Earth and inexpensive handheld GPS units as tools to be considered for mapping a woodlot. The book would also have been improved by tighter editing to consolidate redundant material found in different chapters, and in some cases moving sections to more applicable chapters.

Despite its shortcomings, *The Woodlot Management Handbook* is a useful introduction to the concepts of ecologically based forest management, ownership, and long-term conservation. If reading this book does pique your interest in forestry, then be sure to take the next step and gather forest ecology and management information from sources such as state and provincial forestry agencies, Cooperative Extension, the U.S. Forest Service or Canadian Forest Service, and non-governmental conservation groups. And, of course, maintain your subscription to *Northern Woodlands*.

Rob Bryan

The Coming of the Train: The Hoosac Tunnel & Wilmington and Deerfield River Railroads and the Industries They Served

NJD Publishing, 2009
By Brian A. Donelson

The danger of reviewing a regionally focused book in a widely distributed magazine is that most readers aren't going to care about the industrial history of a place they've never heard of. And even if they care a little bit, they're probably not going to care enough to drop 50 bucks on it.

Let's just put that out on the table before we begin.

Let's also be up front about the fact that I've spent an inordinate amount of time in the forests of the upper Deerfield River Valley, and so I'm predisposed to find historical anecdotes about this place interesting where a casual reader might not.

But after considering these biases, I'm still compelled to introduce a wider audience to Brian A. Donelson's *The Coming of the Train*, if for no other reason than the fact that it's probably the most ambitious self-published history book I've ever seen. The nearly 400-page document – containing 350 meticulously assembled pictures, 45 maps, and 1,800 hours worth of historical research – is clearly a labor of love. I respect that. The sad truth is that there's no place for small-town history books in big-city publishing houses. That Donelson had the drive, passion, and follow-through to produce this book on his own is itself worthy of attention.

The book is also noteworthy because it's a great read. *The Coming of the Train* exemplifies the very best of the self-publishing genre. If commercially published histories are filet mignon with wine

Webs

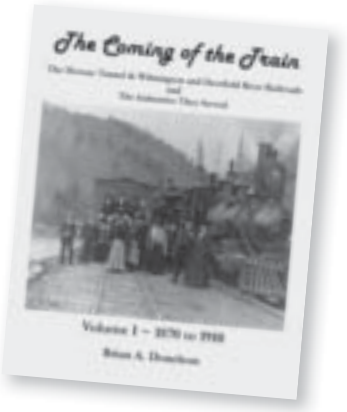
Unkempt webs,
Like disheveled beds,
Hint that the wasp
Has won.

Each mud dauber's tube
Requires an egg –
And a spider
To nourish its kin.

But in spring,
While the waif wasp
Is pumping its wings,
A spiderling learns how to spin.

Laurie DiCesare

demi-glace, Donelson's offering is shepherd's pie at a church supper. It's full of simple prose, great old logging photos (including many from the Bill Gove collection), dry wit, grammatical errors, fascinating historical tidbits, train-geek arcana, random historical ephemera – in short, it's real and rambling and raw. If you have any connection at all to the mountain towns of southern Vermont and northwestern Massachusetts, you'll find at least $50 worth of value in this compilation.



The book opens by detailing the building of the Hoosac Tunnel, Massachusetts' original "big dig," where, in 1851, delegations of politicians gathered and cheered as a $25,000 piece of equipment broke ground on the project, tunneled 10 feet, then died, never to run again. It didn't get any easier.

Twenty five years, $20,000,000, and 196 lives later, the longest train tunnel in North America was completed. Where this relates to a *Northern Woodlands* audience is that most of the local industries the railroad subsequently served revolved around wood. The tunnel opened the virgin spruce forests of southern Vermont to the industrial world, and the loggers, speculators, and con men who followed created a brief boom era. The book details a great number of steam-powered sawmills, lumber yards, wood pulp mills, and paper box companies. It also takes us into the region's logging camps, where hard-working men cut and drove vast quantities of logs down the "dirty" Deerfield River, a notoriously dangerous run.

Today, with a few notable exceptions, the mountain towns between Bennington, Brattleboro, and North Adams give little hint of their wood-industry past. Wilmington is a resort town that caters to skiers – the snow kind in the winter, the water kind in the summer. The town of Mountain Mills doesn't exist anymore – the water skiers on Harriman Reservoir are actually skiing over the old company houses and wood digester and brothel. Glastenbury has been dis-incorporated as a town – 26,000 acres of land in the former township is today National Forest, a significant portion of which is federally mandated wilderness.

Donelson, to his credit, is too good an historian to let even a hint of judgment creep into his accounts. Whereas lesser histories written about this region double as pro- or anti-wilderness screeds, Donelson steers clear of politics. Through his lens, the late 1800s were neither the good old days nor the bad old days; they were just the interesting old days. The ringing of a "gut hammer" calling loggers into camp for supper was just a steel triangle ringing. A 25-ton rail car pitching over a 50-foot high bank into a river was just another day at the office. Your imagination fills in the rest.

Dave Mance III

Ad Index

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Mill Prices

These prices are for #1 hardwood logs, at least 8 feet long, with three clear faces and a minimum 12-inch top diameter. In the timber world, this is a log of average quality, not a prime sawlog and not a poor one.

Landowners should remember that the dollar amount here indicates what is being paid for logs that have been felled, limbed, skidded, bucked, and delivered to a mill or buyer. The cost of logging and trucking need to be subtracted from these figures to arrive at the price paid to the landowner. Because every job is different, these costs vary widely.

Negotiating a fair price requires an understanding of markets and job conditions. It's recommended that landowners without this knowledge use a forester as an agent. A forester's fee will add to the cost, but their representation will often result in a higher payment for the timber.

These data are compiled from interviews with suppliers and buyers and from the most recent print and on-line versions of the *Sawlog Bulletin*, and are used by permission. For more information on the *Sawlog Bulletin*, call 603-444-2549 or go to sawlogbulletin.org. Please note that many of these prices were reported three months prior to our publication date, and current prices could be higher or lower.

	NY	VT	NH	ME
DOLLARS PER THOUSAND BOARD FEET				
White Ash	253	275	283	273
White Birch	293	203	195	255
Yellow Birch	321	400	425	430
Black Cherry	494	370	442	N/A
Sugar Maple	453	475	442	413
Red Maple	284	248	313	265
Red Oak	400	360	419	382

Prices compiled February 1, 2010

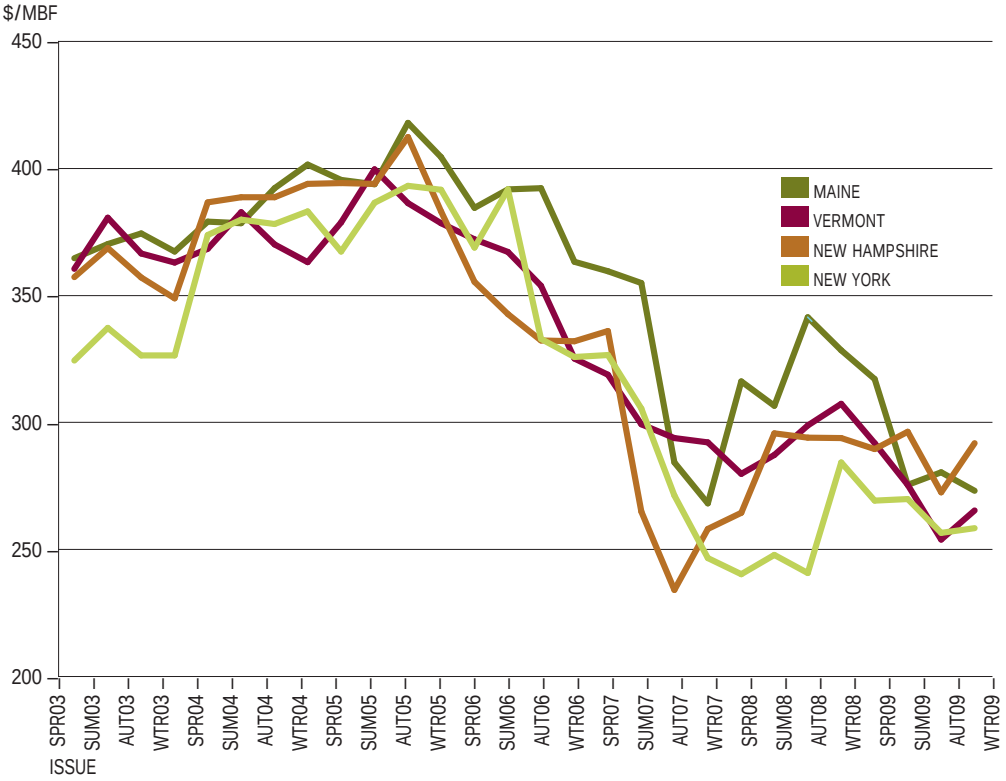
Highest Hardwood Prices

Our unofficial quarterly reporting of mill prices across the region seems to beg the question: Which state is the best for hardwood prices? This chart shows the average price paid to landowners over the past six years for white ash, white birch, yellow birch, sugar maple, red maple, and red oak logs. No weight is given to volume, just price. And the answer is Maine.

Though not by much. The four states track quite closely together throughout the period, with the exception of mid-2007 through 2008, when high volatility accompanied the falling market. The markets in Maine and New Hampshire show the strongest correlation, perhaps because these states are heavier to softwood, and the hardwood market is small and overlapping.

New York's prices bring up the rear most of the time, but lest New York's landowners despair, black cherry prices are not included in the calculations. (Maine does not have a sufficiently consistent cherry market to allow for analysis.) When cherry is figured in, New York leads the pack most of the time, meaning that, from a revenue perspective, you'd rather own a typical woodlot in New York than any other state.

Average Hardwood Price By State



Common Goals

These six membership organizations have more in common than a commitment to good forestry. They also provide *Northern Woodlands* to their members as a benefit of membership.

Northern Woodlands is proud to support their work and that of all the conservation organizations and landowner associations that are helping to maintain the ecological integrity and economic productivity of our forests.

There are many reasons to join these organizations. A subscription to *Northern Woodlands* is just one.

The mission of the New York Forest Owners Association (NYFOA) is to promote sustainable forestry practices and improved stewardship on privately owned woodlands in New York State. NYFOA is a not-for-profit group of landowners and others interested in the thoughtful management of private forests for the benefit of current and future generations.

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Since 1981 THRIFT has worked closely with landholders, citizens, local government, and forestry organizations to share good ideas, and to make others aware of the uniqueness of Tug Hill and its land resources.

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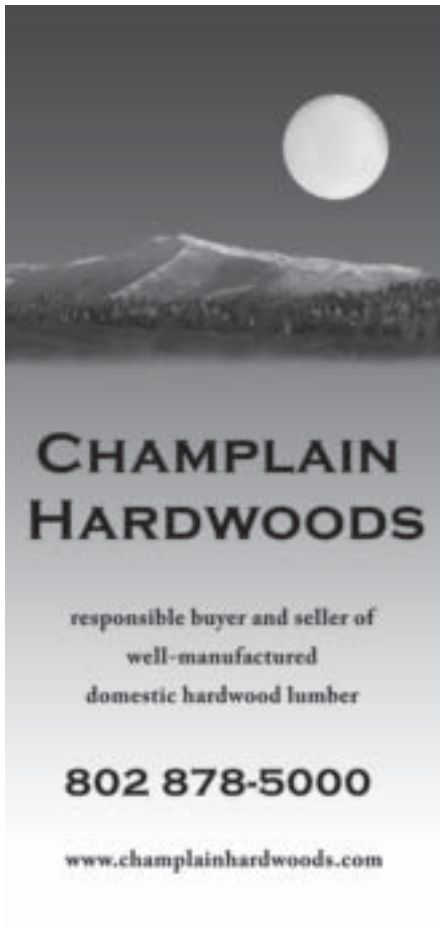
More information at:
www.tughillresources.org



Sarah Knock, Pembroke Reflections, 42" x 32", Oil on canvas, 1999

I like to think of Sarah Knock as a topographer. She records the surface features of water as light purls across it, showing us with amazing verisimilitude the fusion of light and liquid. Knock explains that for her, "Water is a vehicle to explore the abstract qualities of patterns and reflections." How difficult to convey the nature of something so transitory, so ephemeral, so full of pure energy.

In Pembroke Reflections, the painter's presence is evident, but perhaps this is because I know that Knock kayaks along the coast of Maine for inspiration. The ripples that scintillate upwards toward the shoreline emanate from the hull of her boat. It is her presence that causes the visual braiding together of land and sea into a honeyed amalgamation.

As do most artists, Knock paints until she experiences a sense of resolution. She draws and redraws on the canvas throughout the painting process: changing color relationships, re-organizing shapes, and continually manipulating the composition. Perhaps this is one reason that Pembroke Reflections feels so deliciously mercurial.—*Adelaide Tyrol*

Sarah Knock is represented by Greenhut Galleries in Portland, Maine. Her work has been exhibited at the Portland Museum of Art, the Farnsworth Museum, the Center for Maine Contemporary Art, and Colby College. Her work has been featured in Paintings of Maine, The Art of Monhegan Island, and The Art of Maine in Winter. She can be reached through her website: sarahknock.com or through her gallery: greenhutgalleries.com.

Call for entries: The deadline for Summer Outdoor Palette submissions is April 1, 2010. We will return all materials by July 1, 2010. Call or email Adelaide Tyrol at (802) 454-7841 or atyrol@ostudio.com for details.

By Catherine Tudish

Working outside on a sunny afternoon in early March, I'll catch the scent of something like burnt sugar, and it will take me a minute to remember what it is. It will have been a year since I caught that first whiff of boiling maple sap. The smell will lighten and sweeten over the course of the afternoon, but it starts off a little sharp. If I look to the south, I will see a cloud of steam rising above Chris Kendall's sugarhouse, a snug structure he built close beside Old City Brook. When I walk by later with my dog, there will be pickups parked nearby, and if the day is especially fine, someone catching the sun in the open doorway will wave and call hello.

A little farther down the road, I'll see another cloud of steam above the Phelps sugarhouse, where I first learned about making maple syrup. Fifteen years ago, I was that most pathetic of creatures – a newly arrived flatlander. I had read somewhere that blueberry muffins and iced tea were the traditional fare in Vermont sugarhouses, so I knew what to do when the family invited me to stop by for a visit. Somewhat perplexed when I presented them with a paper bag of freshly baked muffins and a jug of tea, they thanked me politely and set them aside. That day, after they had explained the basics, they gave me a job to do. Equipped with a long-handled strainer, I stood beside the stainless steel flue pan and skimmed off the brownish foam that rose to the surface of the boiling sap, tiny bits of bark and wood pulp, I was told. As friends arrived throughout the afternoon, and I was introduced as the new neighbor, I began to take a certain pride in my skimming technique. I might not know enough to join in on the gossip, I might not get the jokes, but I was a pretty good skimmer.

The Phelps sugarhouse sits at the base of Bear Mountain, a good-sized hill with caves near the top where bears hibernate. The floor is packed dirt, hard and smooth, and there are a few old lawn chairs for sitting. If Sunday afternoons are good for socializing, much of the real work in a sugarhouse goes on at night, after the day's sap run has been collected. Fifteen years ago, the Phelps boys and their friends would meet after school to gather the sap in buckets from about 900 taps. They worked fast, fanning out in the sugarbush, pouring the sap into a collection tank on the back of a tractor-drawn wagon driven by Delwin Lewis, whose grandson and great-grandson were part of the regular sugarhouse crew.

At some point, once the fire was burning steadily in the arch, and a bit of local news had been chewed over, and the hot dogs had been roasted on sticks (traditional fare, it turned out, was cold beer and hot dogs), there would be four or five people left for the long hours of boiling. By my second year I had been promoted to the job of "drawing off," keeping an eye on the gauge at the front of the syrup pan that lets you know when the sap has reached a temperature of 7.1 degrees above the boiling point of water. When the needle tips past the 7 at the top of the gauge, the person drawing off opens a valve, releasing the syrup into a stainless steel bucket, and then shuts the valve when the needle dips back below the 7.

It's crucial to draw off at the right moment, before the syrup burns. And you don't want to draw off for too long, or else the syrup will be watery. After you have drawn off, though, it will be a while before you need to do it again, and you are free to move about. I liked to go outside and walk a short distance away so I could look back at the sugarhouse, to see yellow light pouring through the windows and the ghostly cloud of steam hovering above. Overheated from standing near the arch, I relished that first breath of cold air. Because sugaring takes place at the intersection of two seasons, it's possible to experience both in a single day. The mud that had sucked at my boots in the afternoon would crunch underfoot at night.

In 1997, the year I learned to draw syrup, the comet Hale-Bopp's long orbit brought it close enough to be seen from Earth. In March, at its nearest point, the comet was 122 million miles away, and though it was tearing along at breakneck speed, it seemed to hang suspended in the spring sky. Night after night, we would stand outside the sugarhouse to watch it, fascinated, as the sap boiled inside. The comet wouldn't be back around for another 2300 years, someone remarked. If Bear Mountain and the sugarhouse and all of us grew smaller in the silence that followed, there was a kind of glory, too, in just being there at the right time.

Catherine Tudish is the author of two books of fiction, *Tenney's Landing,* a book of short stories, and the novel *American Cream*. She lives in Strafford, Vermont.

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New England Forestry Foundation

Conserving Forests *for* Future Generations

Join Us for the New England Wildlands and Woodlands Conference!

Friday, June 4, 2010
Grappone Conference Center
Marriott Courtyard
Concord, New Hampshire

New England Forestry Foundation is hosting an all-day, regional conference featuring the Harvard Forest report, ***New England Wildlands and Woodlands—A Vision for the New England Landscape***.

Hear keynote speaker Dr. Alaric Sample, President of the Pinchot Institute, and participate with fellow professionals and landowners in workshops on the science of forest preservation, the future of conservation funding, and more!

Especially beneficial for landowners, land trusts, conservation groups, foresters, forest industry, government and other officials. For more information or to inquire about sponsorship or partnering opportunities, visit our web site at **www.newenglandforestry.org**.

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