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Cover Photo by Nathan Lovas

"Timing is everything when trying to photograph wood ducklings leaving a nest cavity. Once the eggs have hatched, the chicks will leave the nest within 24 hours, so you had better be ready. When the first chick leaves the nest, the rest will follow; the entire event can be over in seconds."

on the web WWW.NORTHERNWOODLANDS.ORG

THE OUTSIDE STORY

Each week, we publish a new nature story on topics ranging from the possibility of fracking in the Northeast to the comeback of the marten.

EDITOR'S BLOG

When we think of non-timber forest products, we tend to think of fiddleheads or balsam fir needles. We certainly don't think of a forest growing multi-million dollar fine art pieces. And yet that's exactly what I found a few weeks back while pulling taps in our sugarbush.

WHAT IN THE WOODS IS THAT?

We show you a photo; if you guess what it is, you'll be eligible to win a prize. This recent photo showed a leucistic red-tailed hawk trapped in a chicken coop. Visit our website to learn more about this avian oddity.

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VOLUME 19 | NUMBER 2
SUMMER 2012

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CENTER FOR NORTHERN WOODLANDS EDUCATION, INC.

Northern Woodlands Magazine (ISSN 1525-7932) is published quarterly by the Center for Northern Woodlands Education, Inc.,
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Subscription rates are $21.50 for one year and $39 for two years. Canadian and foreign subscriptions by surface mail are $26.50 US for one year. POSTMASTER: Send address corrections to *Northern Woodlands* Magazine, P.O. Box 471, Corinth, VT 05039-0471 or to mail@northernwoodlands.org. Periodical postage paid at Corinth, Vermont, and at additional mailing offices.

Published on the first day of March, June, September, and December.

For subscription information call (800) 290-5232

Northern Woodlands is printed on paper with 10 percent post-consumer recycled content.

Northern Woodlands magazine

The Center for Northern Woodlands Education, Inc., is a 501(c)(3) public benefit educational organization. Programs include *Northern Woodlands* magazine, Northern Woodlands Goes to School, *The Outside Story*, *The Place You Call Home* series, and www.northernwoodlands.org.

from the Center

In April, I submitted my resignation to the Center for Northern Woodlands Education board after a great deal of soul-searching and examination of options. Since joining the staff in January 2010, I've divided my time between the office in Corinth, Vermont, and my home upstate in Derby; the challenge of maintaining that schedule was the major factor in my decision. It has been an honor for me to have been associated with an organization that affects so many people and so many woodlands.

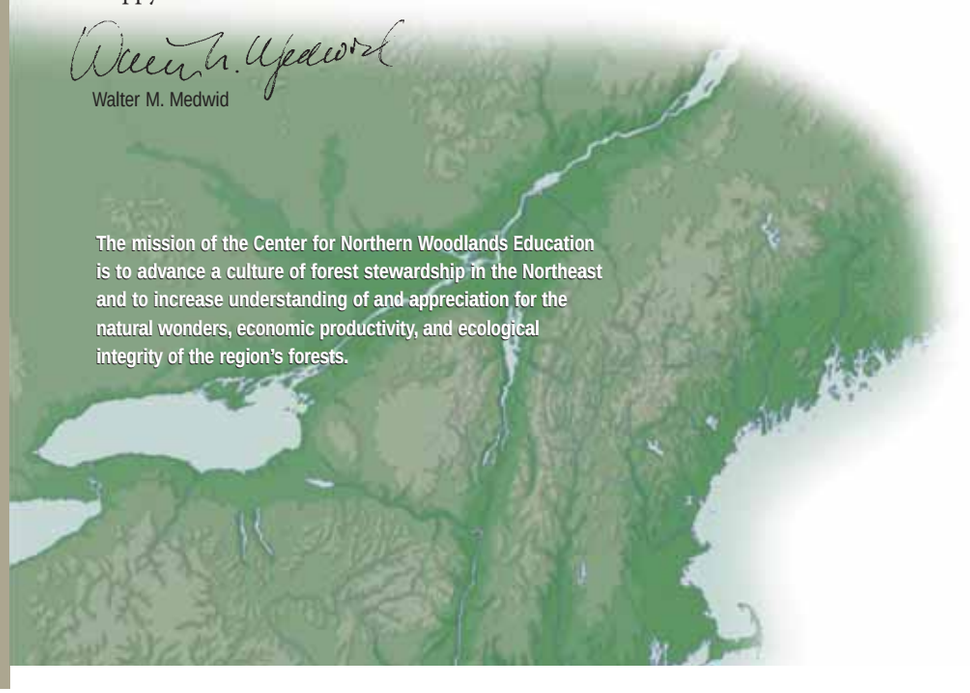
Transitions like this produce mixed emotions. One aspect that feels good is the fact that *Northern Woodlands* is on solid footing. Organizational consultants will point out that the transition period following a founder's departure is often filled with turmoil, but thanks to the hard work and goodwill of everyone involved, we've had smooth sailing. I'm pleased that in my tenure, two long-standing publishing projects – the New York edition of *The Place You Call Home* and the recently released *More Than A Woodlot* – came to fruition. Staff members and a new web consultant have upgraded much of our website's infrastructure and positioned us to make the site a greater resource for our readers. We established the half-time position of assistant editor to strengthen our capabilities with both print and online media. And with thanks to a number of generous donors, we created the Northern Woodlands Research and Reporting Fund that will support the editorial team in taking on special projects that a slim operating budget would not otherwise permit.

What feels less positive is the realization that I'll be ending the phone conversations and connections with readers who made contributions and who kindly took my calls of thanks. Whether in California, Texas, North Carolina, New York City, or closer to home in New England, our readers have stories to share about the land and wildlife they care for. I'll miss these stories, and the meetings that I've had with readers at the various venues and conferences I attended to promote the organization. Within minutes of establishing the *Northern Woodlands* connection with a visitor to our exhibit booth, a stranger became a friend – we belonged to the same tribe. Those brief encounters always offered a meaningful boost.

Transitions may present difficulties, but they also offer an organization the opportunity to fine-tune its infrastructure to meet an ever-changing landscape; this can be especially important for organizations in the publishing and non-profit worlds. Like a rare plant, *Northern Woodlands* fills a special niche that thousands of you value and support. That's the vital foundation of our work. I can report that the Board of Directors is fully engaged in guiding the transition and that a remarkably talented staff is geared up to carry on operations in full-speed mode and to keep the alchemy bubbling.

Happy Trails!

Walter M. Medwid



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

features

departments

A Look at the Season's Main Events

By Virginia Barlow

	June	July	August
FIRST WEEK	June 6: Transit of Venus across the Sun. In North America only a partial transit will be seen, around sunset. This rare event will next occur in 2117 / Hatching time for Hexagenia, our largest mayfly and a trout favorite / Several tiny white spring flowers are blooming: false Solomon's seal, baneberry, starflower, foamflower, and sarsaparilla / Loons are laying eggs. Survival of eggs and nestlings is better from nests that are on islands in lakes or ponds	Asian longhorned beetles begin flying on about July 4th / As caddisfly larvae grow, they add new material to the front ends of their cases / Wild leek leaves have faded away. The white star-like flowers are out now, in a cluster on a single stalk / American elderberries are blooming. The flowers can be dipped in batter and fried / Ringneck snakes are laying eggs, usually 3-4, but occasionally as many as 10 / Fireweed peak bloom	Curiosity, a large NASA rover, is scheduled to land on Mars between August 6 and 20. Its high definition color cameras will photograph the Martian surface while other instruments sample the soil and air and search for organic compounds / Many female ducks are molting now and are unable to fly / Striped skunks can sometimes be seen lounging in front of a beehive, catching and eating the bees as they prepare for takeoff / Turtlehead is blooming
SECOND WEEK	Sometimes more food is available for black fly larvae in water that is moderately polluted, but if dissolved oxygen is low, they won't survive. / Beautiful tiger swallowtails – yellow, black, and large – are flying. Their larvae feed on a variety of trees, especially aspen, birch, and willow / For their first week or so, until they get their flight feathers, downy grouse chicks are wettable and losses from cold are severe in rainy years / Peak of alpine bloom in the White Mountains	Honeybees are gathering bright orange pollen in the asparagus bed / It's mice, not milk, that bring milksnakes into dairy barns / Ring-necked snakes are laying eggs in and under rotten logs. Several females may use the same nest / Basswood is flowering. The nectar-rich blossoms are likely to be full of insects / Yarrow blooms all summer long. The leaves can be chewed to relieve toothache / Broad-winged hawk chicks are almost fully fledged. They often stand on the edge of the nest.	August 12 & 13: The Perseids meteor shower is one of the best, with up to 60 meteors per hour. Look to the northeast after midnight / On hot days the beautiful blue flowers of chicory will fold up by noon / During the Dog Days, chipmunks stay below ground and live on stored nuts and seeds / Green frogs that hatch from the second clutch of eggs, laid late in summer, will spend the winter as tadpoles / Goldenrods will be the most noticeable flowers for the next month or so
THIRD WEEK	Male smallmouth bass are guarding their eggs in the sandy shallows of lakes and ponds / Six-spotted green tiger beetles use speed and their sharp pincers to nab other insects / On a sunny day the sweet white clover now flowering along roadsides will be full of insects, most notably honeybees / Millipedes have lots of legs, but not 1,000. They've been around for 350 million years / Most red-winged blackbirds were sitting on eggs by late May and now their young have fledged. Only a small percentage will raise a second brood	Most mallard, blue-winged teal, and pintail young from early nests are flying / St. Johnswort begins to flower / The black-throated blue warbler concentrates its foraging on foliage in the understory / Basswood leaves are the top choice of porcupines in summer. Big-toothed and trembling aspen leaves are also eaten in abundance / Brook trout prefer to feed when the water temperature is lowest, usually at night or early in the morning	Red-bellied snakes give birth to four to nine snakelets, each one 3 inches long, in late summer. They mostly feed on slugs, but spice up their diet with worms and soft-bodied insects / Look for puffballs, edible in the hard white stage / Infant spiders, attached to strands of gossamer, may drift through the air for up to two weeks. You can sometimes see their silken threads when they are backlit by the sun / Chimney swifts are gathering in flocks and will migrate soon / New England asters are starting to bloom
FOURTH WEEK	By now most blue-winged teal and shoveler eggs have hatched / Common daylilies are in flower, a mark that spring has changed to summer / Turkey hens are squiring their poults about in forests and fields. The robin-sized young ones are now about two weeks old / The earliest wood frog tadpoles transform into one-third-inch-long subadults and take to the woods. Some will go to different ponds to breed when they mature, ensuring genetic diversity	Toads are tiny, just 0.3 to 0.4 inches long, when they transform into adults and leave their breeding pools / Spotted salamanders are rarely seen in summer. They don't dig burrows from scratch, but use cracks, crevices, or abandoned small mammal tunnels to keep out of sight / Wood turtles eat lots of mushrooms in July and August / Shorebirds are migrating. For the first three or four weeks, it's just the adults; the young will follow later	The nodding flowers of the ghostly Indian pipe have turned upwards and will persist through winter in a blackish, stiffened form / The males of some katydid species will soon pass a protein-rich meal to the female, along with a packet of sperm / Look for painted turtles basking on rocks and logs next to water / Robins are switching from a predominantly insect diet to their winter fare, which is 80 percent fruit / Kingbirds and great crested flycatchers are migrating south

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

By Dave Mance III

Over the past several months there has been a spate of interesting cases involving media ethics. In January, theater artist Mike Daisey's one-man show highlighting Apple's unsavory manufacturing processes in China was broadcast on the public radio show "This American Life." Problem was that Daisey made up many of the sensational details in the show – a fact that, once discovered, caused "This American Life" to run an episode-long retraction. You may have also caught the bizarre news story about Jason Russell, the producer of a viral video about Ugandan warlord Joseph Kony, which had Russell being detained by police after he was found running around naked and yelling incoherently in his California neighborhood. Russell had also recently come under attack for blurring the line between activism and journalism.

It's easy for people in this business, myself included, to rail against theater that masquerades as hard news, but this instinct is not very productive. Like it or not, traditional media has taken a backseat to YouTube videos, blogs, and podcasts. Today, everyone with a cell phone and Internet connection is a journalist – that's just the world we live in.

But while it's pointless to fight it, it is worth stressing, whenever possible, the fact that news and information that come from advocates is not journalism. It's propaganda. Even if it supports a cause we believe in. And it's in everyone's best interest to recognize this distinction.

A perfect example of all this unfolded over the course of our abnormally warm spring, as global warming activists took the news of a poor sugaring season and ran with it, blurring the lines between weather and climate, turning sugarmakers into polar bears, making complicated issues simple to suit the (well-intentioned) narrative they were promoting. Over the last few months, I read separate news stories that told me that sugar content in sap is lower today than it was in the 1950s due to stressed maple trees, that the sugaring season is coming 11.4 days earlier than it used to, and that in recent years sap has been off flavor because of tree stress.

None of this jives with my experiences as a sugarmaker. The sugar content of our tree sap varies from year to year, tree to tree, run to run, and always has, and I'm not sure how I'd compare it to the sap my grandfather was collecting from different trees in the 1950s, especially since he didn't own a fancy refractometer that spits out data to the nearest tenth of a degree Brix. And, yes, the season was early this year. But a sugaring season has no fixed start and stop dates, and never has. So if something has an amorphous beginning and end (that varies widely from region to region), how can we make a blanket statement that it's starting 11.4 days earlier than it used to? And as far as taste is concerned, the syrup we made this year, despite the wacky weather, was as good as anything we've ever made and a lighter color than usual.

In each of these scenarios – Mike Daisey's exposé of Apple, Jason Russell's exposé of Joseph Kony, and an activist's (or misguided journalist's) invocation of maple sugaring as ground zero of climate change – mistruths are being construed as the lesser of two evils. This justification supposes that since there is good science that indicates that global temperatures are rising, and since there is documentation that some links of Apple's supply chain are unsavory and exploitive, and since there's evidence that Joseph Kony is a horrible human being, then a little hyperbole to bring attention to the problem is not only not bad, it's potentially good.

On some human level, this line of thinking is perfectly understandable. If I'm telling a fish story, does it really matter if the fish was 12 or 20 inches? I mean, I caught a fish, after all. Such lies become even harder to resist when we're arguing about emotional topics we "know" we're right about. Daisey explained his actions this way when asked why he didn't come clean about his Apple lies during fact checking:

"I think I was terrified that if I untied these things that the work, that I know is really good and tells a story, that does these really great things for making people care, that it would come apart in a way where – where it would ruin everything."

But, of course, outside of fishing (and perhaps sports arguments), white, black, or rainbow-colored lies do matter, and they matter precisely because they can ruin everything. In the case of climate change, every time a media outlet reports, as *Mother Jones* did in April, that climate change is killing the maple sugaring industry and "once-flourishing maple trees are shedding leaves too early in the season and producing sub-par sap," a global warming skeptic gets a free pass to say, "See? These people have no idea what they're talking about" – or worse, that the whole idea of climate change is a vast left-wing conspiracy and the planet is, in fact, cooling. BS plus BS equals BS, and this whole important issue gets reduced to a partisan game of who can tell the biggest whopper.

I believe that the planet is warming up, that humans are contributing to this, and as the planet continues to warm there will be negative ecological consequences. But if we're to build any consensus around environmental policy that seeks to address pollution and greenhouse gases, we have to speak to each other honestly.

Old school, fact-based journalism may have taken a backseat to populist internet reporting that blurs the line between theater and news, but journalists can still stand tall as beacons of integrity.

Journalist David Carr opened a *New York Times* piece on the Mike Daisey saga with this thought: *Is it O.K. to lie on the way to telling a greater truth? The short answer is also the right one.*

No.

By Emery Gluck

Finding a Silver Lining

Eastern hemlock is an important component of the forest. Hemlock stands provide nesting habitat for a slew of bird species, such as the blackburnian warbler, and brook trout congregate in stream waters kept cool by the deep shade. And so the forests here have changed dramatically in the past three decades, as the woods have been exposed to and altered by the hemlock woolly adelgid, an exotic insect pest. The heaviest mortality has occurred on upper slopes and dry sites where hemlocks were historically limited due to drought and fire. Hemlocks in ravines and on moist sites have experienced more moderate mortality to date; it's too early to tell if they'll eventually succumb, but many of the remaining trees look healthy.

It's fair to see the widespread hemlock mortality as a terrible thing: the brook trout, the dicranum moss, and all the other plants and animals associated with a dense hemlock stand certainly do. Dead hemlock is useless for lumber and can pose a significant hazard to hikers, hunters, loggers, and other forest users, so we can count ourselves among the affected. But as with everything in nature, kingdoms rise when other kingdoms fall, and while it may be hard to see a silver lining in all this destruction, it's there if we look.

For starters, the adelgid infestation has added a lot of dead wood to a forest that needed it. Standing dead trees provide great habitat for woodpeckers and other cavity-nesting birds. When the snags fall, the downed logs make excellent cover for salamanders and good insect hunting for numerous small mammals and snakes. Large quantities of dead wood are the basic building blocks of a forest food chain, and are a characteristic of old growth forests. Connecticut only has a few small remnants of old growth that escaped the extensive agricultural land clearing from the 1600s to the early 1800s, and the wood cutting frenzy that lasted until the late 1920s. Thus, the dying hemlocks have created old growth structure that would not have occurred for another century or two (or until the next major hurricane). The dead trees also create canopy gaps of varying sizes, which add to the vertical structure of the forest – another old-growth characteristic.

While in some stands the adelgid is accelerating forest succession, in others, succession has been knocked back as the dead hemlock provides tinder for severe fires. Wildfires are relatively rare in Connecticut; only 1 out of every 4,000 acres burn annually. But pre-settlement fires probably burned at least 100 times that. Fire was used by Native Americans to promote habitat for game animals, help clear land for agriculture crops, improve ease of travel, and facilitate firewood and acorn collection. Since fire and its ecological role have almost been extinguished from the landscape, several disturbance-dependent ecosystems are not currently sustaining themselves.

JOE BURNHAM

Dead hemlock fuels a forest fire in Devil's Hopyard, East Haddam, CT.

On a parcel I manage in Guilford, one six-acre fire killed more large oak trees than a normal spring fire because the large amount of dead hemlock increased its intensity. The fire created a large patch (another old-growth attribute) in the forest by killing a concentration of larger trees. This paved the way for a new generation of sun-loving oaks and aspens that would not have been able to survive in the shade of an intact forest. Large new patches often host an increasingly uncommon suite of birds and mammals such as blue-winged warblers, chestnut-sided warblers, and the New England cottontail, currently a candidate for the endangered species list. These animals require dense young seedling and sapling forests that develop after most of the existing trees are killed or farmland is abandoned. These species are declining as the events necessary to create their habitat have long been in shortage.

Insect epidemics, severe windstorms, and frequent fires are among the historic disturbances that have helped sustain the biological diversity of southern New England for thousands of years. Increasingly, foresters are turning to natural disturbance management models to help restore some critical components of biodiversity. Harvests of small and large trees are designed to mimic the effects of natural disturbances at their historic frequencies, sizes, and intensities. Harvests can be planned to greatly speed up the accumulation of old growth structure.

The hemlock woolly adelgid mortality, and subsequent forest fires, have shaken the tranquil ecological trajectory of Connecticut's forests, but the loss of many majestic hemlocks and oaks has opened another chapter of forest succession. It can be hard to watch the old trees go, but death is a requisite part of nature. Ecologically speaking, when foresters in southern New England initiate unnatural disturbances (i.e., harvests) in certain stands, they're simply standing in for insects and fire. Where natural processes are available to adequately conserve biodiversity, it's wise to stand aside and let nature reclaim its realm.

Emery Gluck is a forester with the Connecticut Department of Energy and Environmental Protection.

April Fools

Many readers let us know, after reading the First Week of April calendar entry in the Spring issue, that mice DO NOT lay eggs. We replied that they do, but only on April 1. We're already plotting next year's trick, so beware.

The Editors

Take a Kid Logging

To the Editors:

First off, we love the magazine and are eager as a family to read each new issue. The articles are always fascinating and informative. My husband has just started taking our six-year-old son deeper into woodlots while he is logging. It's rewarding to see another generation appreciating our northern woodlands!

Katie Bowen, Putney, VT

Little Ticks, Big Troubles

To the Editors:

I really enjoyed your article on moose ticks as it explained a lot ("Ghost Moose: Winter Ticks Take Their Toll," Spring 2012). Two years ago while riding snowmobiles, we came across a very small moose dead in the middle of the trail. At first we thought there had been an accident, but on closer inspection there were no signs at all of that – no blood or skid marks in the snow, nothing to indicate the little moose had been hit. We reported the moose to the game warden as he was a hazard in the trail, and we wondered what could have happened to the moose. We saw the warden later and he said it had been covered in ticks. How awful that they actually killed him. Mother Nature seems so cruel sometimes. Thanks for a great magazine.

Hope MacDonald, Millinocket, ME

Safety & Slabs: Covered

To the Editors:

I enjoyed Reid Bryant's views on the value of hands-on education ("At Work and at Play in the Northeastern Forest," Spring 2012). I've worked with youth in farming and forestry settings at Smokey House Center in Danby, Vermont, and currently at Stafford Technical Center in Rutland, Vermont. I believe that responsible land stewardship provides an unmatched environment for personal growth in the young people of today. However, safety must be the foundation of this environment. Some of my students expressed concern over the lack of safety equipment (appropriate footwear, long pants, helmets) being used by the youth at The Farm School in the picture on the cover. Please remember that while a picture is worth a thousand words, a cover photo may be worth more. We need to do everything we can to promote responsible learning in students of all ages, and a positive representation of safety is a good start.

Mark Raishart, Rutland, VT

To the Editors:

A casual reader of the caption for the Spring 2012 issue cover photograph might get the impression that the kids were carrying a slab, but most sawyers would not leave that much good wood in a slab. It is probably lumber sawn through and through (round edged on both sides). Most likely it will be edged and resawn into dimension lumber similar to what is shown in the lower right corner of the photograph.

Ted Cady, Warwick, MA

Chemical Reactions

To the Editors:

Thank you for being a new source of education for us. I have been interested in conservation issues all my life. I became a member of our local land trust because our small town has experienced a major growth spurt in the past few years. My lack of knowledge about forestry inspired me to subscribe to your magazine. I find it fascinating, both online and in print. Because the one parcel of property I steward is infested by oriental bittersweet, I very much appreciated reading the recent article by Dave Mance III ("The Great Glyphosate Debate," Spring 2012). I'm serious about pollinator protection and try to avoid chemical usage in my own yard and gardens, so the subject of glyphosate very much interests me. Thank you for a thoughtful presentation of the facts. We also have a tiny pond with fish and frogs, and live very close to a lake, so we have avoided using chemical fertilizer. As birders, we try to offer our avian residents and visitors healthy fare, as well.

Although we don't go out in the woods with chainsaws, every issue contains articles of interest for us.

The Fay Family, Charlton, MA

To the Editors:

Your two essays about herbicides used to assist forest managers were excellent. Having conducted research with these materials for over half a century, I offer a few additional perspectives.

First, herbicides are the tools of choice where mechanical or biological alternatives have far worse side-effects. Herbicides replace tools that have serious repercussions; think carefully about soil and habitat damage from big machines, injuries from saw cuts, back/knee injuries, puncture wounds in forest workers, including disabling injuries. Consider the advantages of tools with no physical impact, which also control sprouting weeds that otherwise need repeated treatment to meet reforestation or habitat objectives. Many states protect the use of aerial application of herbicides (for example, Oregon's Forest Practices Act). If we do not use herbicides and instead rely on machines, beware of the amount of fuel used, fuel toxicity in water, fuel residual life if spilled, combustion products, habitat destruction, soil erosion, and the effects of noisy machinery on our hearing. Toxicologist Dr. F.N. Dost and I wrote a 424-page environmental analysis for the State of Washington dealing just with managing vegetation. From worker accident records, the cost of medical care for manually controlling brush just for reforestation was over $10/acre! (Blown knees, bee stings, poison oak, back injuries, and saw cuts.)

Contrast that with the cost of $0.001/acre for aerial application of herbicides. Intoxication from chemicals did not occur in two years of statewide records, where 200,000 acres were treated.

Editor Dave Mance III's essay was absolutely correct about glyphosate. He could have written much the same about any of the herbicides registered for use in forests. They all pass rigorous, incredibly costly evaluations for their primary uses and secondary effects on wildlife. Phenoxys, glyphosate, triazines, and many others are very safe for use around animals, but will injure certain (but not all) plants selectively. Sprays will not travel upwind; a little smoke column is quick evidence. Neighbors do need to know that choosing an appropriate chemical will avoid the problems of ineffective and damaging non-chemical treatments. Using the right product and right procedure at the right time is practicing safety, both for user and for neighbors. Foresters need not be defensive about the tools they use.

One final caution: there is much misinformation about chemicals. Advocacy organizations have an agenda. When you read an herbicide label, its only agenda is efficacy and safe handling. Always read the label carefully and follow instructions. Everyone will be safe, except the target plants.

Michael Newton, Professor Emeritus of Forest Ecology, Oregon State University, Corvallis, OR

To the Editors:

The biggest mistake we can make is to assume that a chemical is "safe," as the story of DDT may have never occurred had people not accepted its widespread use. We are fortunate that the spectacular and politically important bald eagle helped show us our mistake.

Dana Loew, Leominster, MA

Still Buzzing

To the Editors:

I found the article, "Bee Lining: The Oldtimers' Way to Find Wild Beehives" (Spring 2010), very interesting, having indulged in that sport in a very limited manner in the past. One thing the author did not mention was that a bee, once caught, could be marked by covering it with either flour or talcum powder; then it could be identified when it returned.

Lining bees was once a very popular sport, so much so that laws regulating the sport were passed. I am enclosing a copy of the law, taken from a 1925-1926 Vermont Fish & Wildlife law book, which states that a landowner could post his land against the taking of wild bees.

Another law (that I cannot locate a copy of), provided that a person locating a wild bee tree could mark it with his initials. It was then his tree. However, he could not cut the tree without first contacting the landowner, who could charge him $3 for the tree. A bee tree, usually hollow, was of little value for timber. The landowner did not have to sell the tree, but if he did not, neither he nor anyone else could cut it and harvest the bees and honey.

Wayne D. Russell, Wilmington, VT

The Stuff of Legends

To the Editors:

The first two articles I read in your fine magazine are Michael Snyder's always informative and well-written column, and then Virginia Barlow's "Overstory," always a delight. I have been collecting these articles over time and have now a fairly thick folder on this topic to pass on to some budding dendrologist (hopefully a grandchild).

Unfortunately for readers, I am often impelled to write in to provide some small additional fact or anecdote that I feel would be of interest to them. So it is with trembling aspen in the Spring 2012 issue.

When I worked in Northern Ontario in a logging camp, French-Canadian wood cutters were of the opinion that this was a "bad luck" tree, and did not like to deal with it. They had picked up the notion that the crucifixion cross had been made of aspen, and at the point when Jesus was nailed to the cross, the leaves on trees of this species had begun to tremble, and they have been quaking since. It is not possible that there are trembling aspens in the Holy Land, so I have no idea where this originated. I wonder if other readers have heard this legend about our most widely distributed tree species. Incidentally, I believe it occurs much more widely in North America than Barlow writes ("New England is in the southern part of the range."), for it is found in Virginia, Kentucky, and south along the Rockies to Mexico. An amazing species, as she clearly points out.

Larry Hamilton, Charlotte, VT

Don't Misread the Deed

To the Editors:

The article "How to Read a Deed" (Spring 2012), contains two errors in the deed description. The sixth call, "Thence east twelve degrees south along west line of Martin's land," should read, "along the north line of Martin's land," as this line runs nearly easterly. Also, this sixth call should run 160 rods to the southwest corner of said Huelet's land, not the southeast corner.

Having been a rural land surveyor for over 50 years, I have read thousands of old deeds and know how difficult it is to read old handwritten deeds. It is very easy to read east instead of west. A call for north 15 degrees west, which, if read as north 15 degrees east, results in an error of 30 degrees in the field.

Also, the second deed call for three rods should be 49.5 feet, and not 50 feet, as shown in the sketch. It is very important to research the chain of title back to the first recorded deed as many times errors can be perpetuated for many years.

Fred A. Huntress, Jr., Poland Spring, ME

To the Editors:

In "How to Read a Deed," you may have left out an important step: accounting for declination, often called variance, between magnetic and true north. Declination changes through the years at different rates for different places. For example, the difference in a compass bearing between when we bought our property in Bristol, Maine, in 1975 and today is 1° 20 minutes. That is not much for a short distance, but is for a long run: I think 30 feet off in 1,300 feet (our northern border).

Since 1878, per the article example, it might be quite a bit more, depending on one's location. I found this site to help calculate the declination for any place during the last 112 years: www.ngdc.noaa.gov/geomagmodels/struts/calcDeclination.

Warren Riess, Bristol, ME

Naturally Neighbors

To the Editors:

Thank you for publishing Joshua Brown's piece ("Remembering Carl Reidel," Spring 2012). I've wanted to write something about Carl, and it has provided a good impetus to do so. I grew up in North Ferrisburgh, Vermont, just a few houses from Carl, in what we call "The Hollow." Thus, my memories of Carl are not of him as professor or legislator or board member, but as neighbor; to reference Brown's article, I knew the flannel Carl, not the tweed Carl.

Carl's environmentalism had a hands-on dimension in The Hollow, and it played a large part in shaping my childhood. Both of our houses backed up to woods and fields descending to Lewis Creek; Carl and his wife Jean owned the land and the network of trails on it. Walking, skiing, and maintaining those trails were integral to my childhood, my love of the outdoors, and my identity as a Vermonter. If I timed it just right, when I got home from school I could ski the loop of trails and watch the sun set right over Lewis Creek. We saw beaver, osprey, grouse, and deer; river erosion in action, spring ice break-ups, and succession in my own lifetime; and, of course, Carl and Jean, with skis and snowshoes and Wellies, in the mud and through chest-high goldenrod. Even earlier memories of Carl include yearly donations to my school's "rainforest run" fundraiser and the infamous Halloween when, seeing me dissolve into tears on his doorstep when offered even more candy, Carl instead gave me an apple and two dried gourds from his garden. The last time I saw Carl was this past July, and it was exciting to tell him that I would be entering a master's of environmental science program at the Yale School of Forestry and Environmental Studies, where he once taught and studied. I was sorry not to make it to his memorial service, but it felt fitting that I was, instead, writing a paper for my landscape and ecosystem ecology class on applying Aldo Leopold's land ethic to the environmental conservation of today.

I don't envy those who had Carl as a professor or who knew him in a professional capacity; I think I knew the best of Carl as a neighbor. I am lucky to count the benefits of his environmentalism in walks, skis, wildlife sightings, and happenstance meetings out back.

Naomi Heindel, New Haven, CT

A Tree Grows in Brooklyn

To the Editors:

I have never before saved back issues of any magazine (intentionally, that is; there are deposits of *The New Yorker* and probably even *Sports Illustrated* here and there in my life) until now. I find myself reading your converted trees even as I walk, which is more dangerous in Brooklyn than western Massachusetts, where the woods of my life grow. Years back, my father and I wrote a book called "The Backyard Lumberjack" for Storey Publications. It may have been advertised in your pages. He and I have spent a good portion of our lives working together in the wet pine swamps and rocky maple groves that make up our land, and yours is the first publication we have seen that honors the beautiful woods of New England properly. Keep up the fine work.

Frank Philbrick, Brooklyn, NY

By Michael Snyder

Can Forests Prevent or Mitigate Floods?

ZACK CLOTHIER

Healthy forests play an absolutely vital role in moderating water movement over our landscape. Although forests cannot prevent large floods outright, they certainly do minimize the frequency, intensity, and extent of all flooding events, which in turn significantly reduces the damage to life and property that serious flooding causes. It's yet another way in which forests work for us.

Water first enters our landscape in the form of rain, snow, sleet, fog, or hail. Forests may influence the occurrence and distribution of local precipitation, but their most significant contribution is in how forested watersheds receive and deal with all the water that falls on them. Forests absorb and reroute water – thereby diffusing its potentially damaging energy – before slowly releasing the water into seeps, ponds, lakes, rills, brooks, streams, and rivers. The net hydrologic effect of the forest is to delay and reduce the size of the flood peak.

Forested watersheds have complex canopies with varied densities of tree stems and branches, additional layers of non-tree vegetation, extensive root systems, deep, loose soils, and fluffy leaf litter. All of these features allow a large amount of water to infiltrate the soil and be absorbed – like a super-capacity sponge. A rainstorm can drop millions of tons of water on the land. When forest vegetation is present, leaves, stems, and downed woody debris intercept, absorb, and reduce the impact of both falling and running water. This allows the water to evaporate from plant surfaces, soak into the soil and its many pore spaces (animal burrows, decayed-root tunnels, or soil voids), or run off in a gradual manner. Soils in healthy forests are particularly porous and absorbent and can hold staggering volumes of water.

Much of the water absorbed by forest soils is drawn up by plant roots and transpired, moving back to the atmosphere as water vapor. During the growing season this "evapotranspiration" reduces the amount of water in the soil; in some forests it removes as much as 70 percent of the incoming precipitation. This, in turn, renews the soil's ability to absorb even more water.

Consequently – and luckily for us – streamflow responses in forested watersheds tend to be slow and small, and they occur predominantly via subsurface runoff. Indeed, forested watersheds yield lower peak flows and smaller volumes of runoff over a longer time than do nonforested land covers. Accordingly, flood damage in forested areas – and in areas downstream of them – is the smallest among all surface conditions. Forests also minimize soil erosion and landslides, and improve stream channel stability and water quality.

There are limits to the flood-mitigating effects of forests. When soils are fully saturated, any additional rainfall will run off the land, whether it is forested or not. Thus, forests can reduce peak flows from storms of short duration and lower intensity. They can downright prevent flooding that would otherwise occur in lesser storms and smaller watersheds particularly sensitive to rain events. They can minimize the damage from large storms. But they cannot prevent the major floods produced by storms of high intensity and long duration.

Clearly, our needs for abundant clean water and healthy forests are important issues for the 21st century, not only because forests provide critical raw materials for people and industries, but also because they are key factors in the normal functioning of the environment. Water and forests are two of the most profound natural forces on the planet, and they are closely linked. Without water, there are no forests. And without forests we are much more vulnerable to erosion and flooding.

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

Thanks to Northern Woodlands' Board of Advisors

A hearty thanks to all of the people listed below who serve as valuable resources to the organization.

Mikael Batten, East Orange, VT
Darby Bradley, Calais, VT
Robert Bryan, Harpswell, ME
Fred Burnett, North Clarendon, VT
Beth Ann Finlay, Chelsea, VT
Peter Forbes, Waitsfield, VT
Robert L.V. French, Hopkinton, NH
Richard Hausman, Ryegate, VT
Jim Hourdequin, Hanover, NH
Sherry Huber, Falmouth, ME
Charles Johnson, E. Montpelier, VT
Eric Johnson, Old Forge, NY
Brendan Kelly, Rome, NY
Robert Kimber, Temple, ME
Barry Schultz King, Ripton, VT
Warren King, Ripton, VT
Eric Kingsley, Portland, ME
Charles Levesque, Antrim, NH
Elisabeth McLane, S. Strafford, VT
Ross Morgan, Craftsbury Common, VT
H. Nicholas Muller III, Essex NY
Eliot Orton, Weston, VT
Richard Rachals, Lunenburg, NS
Bruce Schwaegler, Orford, NH
Peter Stein, Norwich, VT
Charlie Thompson, Pelham, MA
Tig Tillinghast, Thetford, VT
David Williams, Essex Junction, VT
Steve Wright, Craftsbury Common, VT
Mariko Yamasaki, Durham, NH

Story and Photos by Susan C. Morse

Clockwise from left: The handsome, glossy-coated muskrat in its winter pelage; muskrats place their feces on top of prominent rocks and logs; muskrat house; the muskrat's front track, upper right, and a rear track with another front track superimposed on top of it.

The Resourceful Muskrat

Hidden in cattails, I was hoping to photograph moose feeding in a nearby cove. Suddenly a V-shaped wake appeared in the water and a muskrat swam vigorously towards me. The creature resembled an oversized meadow vole, yet acted more like a tiny beaver. At its stern, the muskrat's scaly, long rudder-like tail enabled the animal to swim and steer with remarkable finesse.

The muskrat, *Ondatra zibethicus*, is the largest and most specialized of the arvioline rodents – a subfamily that includes voles, lemmings, and meadow mice. Physical adaptations for a semiaquatic lifestyle, coupled with considerable dietary and denning-habitat flexibility, allow the muskrat to thrive in aquatic environments across most of North America. Ponds, lakes, slow-moving rivers and streams, open swamps, sloughs, fresh and saltwater marshes – even farm ponds and irrigation ditches – are all used by the resourceful muskrat.

Muskrat tracks and their various structures are often easy to find. Smaller front foot tracks show four slender toes, each of which culminates in a clear nail impression. A fifth rudimentary toenail may or may not register. Larger hind feet leave five asymmetrically arranged stouter-looking toes, with the two outer toes pointing out to the side. Stiff hairs fringe each toe and may leave an outer impression encircling the actual toe impression. Don't expect to see evidence of the "partial webbing" that is described in nearly all tracking guides. Unlike the middle or "distal" web impressions one can readily find in otter or beaver tracks, respectively, the muskrat's proximal webbing (meaning close to the body) is analogous to the minimal webbing that exists between our fingers, and it does not register in tracks. My favorite feature to look for is the worm-like pattern of horizontal creases that are present on the naked toes of both front and hind feet. Tail drag marks are often visible in an "s"-like pattern between the right and left foot tracks.

Bank burrows, houses, push-ups, and feeders are evidence of muskrats in residence. Muskrats excavate extensive and elaborate tunnel and denning chamber systems into suitable bank side environments. Underwater entryways provide secure access to several above-water denning spaces. Dome-shaped houses resemble much larger beaver lodges, except that they are made of piled stems and leaves of emergent vegetation and other materials, including cattails, sedges, rushes, grass, mosses, water-soaked leaves, bottom debris, and mud.

Feeder huts, or feeders, resemble houses, but are smaller. Feeders provide safe, warm structures into which food is carried for consumption. Push-ups are piles of vegetation and other materials that a muskrat gathers from beneath the water and pushes upward through a hole or crack in the ice. Once frozen in place, these structures both conceal and protect muskrats as they surface from beneath the ice to breathe.

Finally, feeding platforms are simply floating piles of vegetation. Here, muskrats sun themselves and rest. Dozens of other animals, including waterfowl and other birds, turtles, snakes, frogs, spiders and other insects, and mammals similarly use these platforms to rest, bask, nest, and even hunt.

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

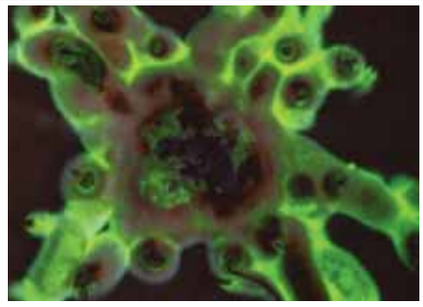
[**BOTANY**]

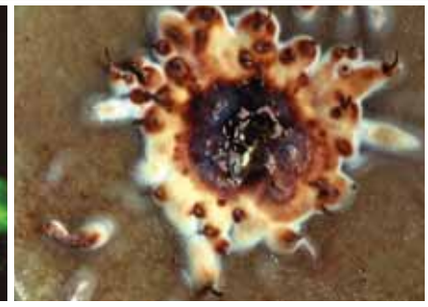
A Light in the Forest

The late summer air is cool and heavy as I reach the trailhead. To hike through a forest at night is to move through a world dominated no longer by sight but by sound and smell. Nearing a spot on the trail I had identified earlier in the day, I stop, click off my flashlight, and allow my eyes to adapt to the inky darkness. I spot a soft greenish glow, appearing like a child's nightlight in the distance, coming from the fallen trunk of a gray birch: here is what I have ventured out to find and photograph this evening – glowing mushrooms or, to put it more technically, bioluminescent fungi.

Bioluminescence is the emission of visible light by living organisms and involves a series of complex biochemical reactions that give off light as a byproduct. It is found in a few species of bacteria, fungi, algae, and insects. The most familiar example of this phenomenon comes from fields and woodland edges during the early summer, when fireflies use their ability to produce light as a means of identifying and attracting a mate. Many ocean-goers are familiar with species of fish and algae that glow at night. But in the woods, there lurks a familiar face whose nighttime glow may not be known: species of fungi that also have evolved the capability to produce living light. These glowing fungi have names such as torchwood, cold fire, fairy fire, foxfire, and fairy sparks, some dating back to the time of Aristotle, who was one of the first to comment on seeing glowing decaying wood.

The total number of fungal species is unknown. Best estimates place the number at upwards of 1.5 million, with less than 100,000 species currently described by scientists. To date, a total of 71 species of fungi are known to be bioluminescent, and of those the vast majority are found in tropical regions, with a few species inhabiting temperate environments. The light emitted is yellowish green or, less frequently, bluish green.





Which part of the fungus glows varies, depending on the species. For some, it's the fruiting body (mushroom) or part of the fruiting body, such as the stalk or gills. For others, the glow emanates from the mycelium, the clusters of thread-like filaments called hyphae that compose the "body" of the fungus. The hyphae penetrate soil or woody substrates, absorb nutrients and water, and produce the fruiting bodies.

Three species of light-producing fungi are commonly found throughout North America: honey mushroom (*Armillaria mellea*), jack-o-lantern (*Omphalotus olearius*), and bitter oyster (*Panellus stipticus*).

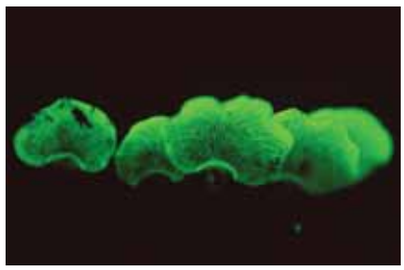
Honey mushroom grows on decaying wood and is a well-known forest tree parasite that can be found from late summer through late fall in forests throughout North America, Europe, and Asia. It emanates a very low light from its mycelium. To see it well, you'll need to let your eyes adjust to the dark for a good 15–20 minutes. When you do see it, the light pattern will appear as a series of patches or streaks and is the most common source of foxfire, a term that came from the French *faux feu*, or false fire. The term comes from the fact that nearly all the energy used in bioluminescence is given off as light and 4–5 percent as heat. By contrast, 90 percent of the

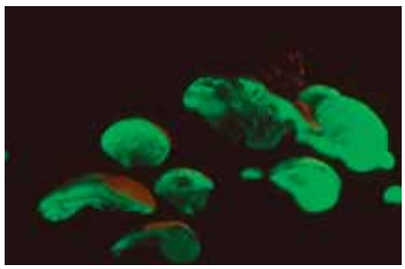
Photos, this page, clockwise from the top: Honey mushroom; a honey mushroom in a visible-light photo; the bioluminescence of a honey mushroom, grown in the lab, has light patterns that appear as a series of patches or streaks.

This page, top to bottom: Bioluminescence is emitted by the mushroom cap of bitter oyster; bitter oyster at night; bitter oyster mushrooms are found in temperate forests on logs, stumps, and fallen branches of various hardwoods.

energy used by an incandescent light bulb is released as heat and only 10 percent results in the production of light. This is why bioluminescence is also referred to as "cold light."

Jack-o-lantern mushrooms can be seen cropping up around the base of stumps or standing dead trees from mid-summer to late fall. This species frequently occurs in large clusters and can easily be spotted by the bright orange mushroom caps, which can measure up to six inches in diameter. Bioluminescence occurs only in the gills of very fresh mushrooms where spores are still forming. The emitted light is generally very weak, although some specimens are reported to be bright enough to read by.





Bitter oyster (my personal favorite) is found in temperate forests on logs, stumps, and fallen branches of various hardwoods. Mushrooms can be found from mid-summer to late fall. The mushroom caps are small, the largest less than two inches in width. The caps are shell- or kidney-shaped, a dull off-white to light tan in color, and often grow in overlapping clusters. Bioluminescence is emitted by the mushroom cap and is best observed in fresh specimens. Of the three species, this one produces the brightest glow.

So what might the adaptive advantage be, if any, of fungal bioluminescence? Scientists really don't have the answers yet, although several hypotheses have been put forward. A glowing mushroom might be useful in attracting certain invertebrates that act as vehicles for spore dispersal, especially in a heavily canopied forest where wind may lose its effectiveness as a dispersal mechanism. Many fungi contain a number of toxic compounds such as alkaloids. The glowing mushroom could serve to advertise its toxicity in an effort to deter potential predators. All of the bioluminescent fungi identified to date are known wood-decayers and have the ability to digest the normally recalcitrant lignin molecule. Peroxides are byproducts of the process that can lead to increasing concentrations of oxygen, which could reach toxic levels in a cell. The chemical reactions involved in bioluminescence consume oxygen, and thus may act as a mechanism to alleviate oxidative stress, with the production of light simply a byproduct.

Regardless of the underlying biological basis for glowing fungi, one cannot help but take delight, as did Henry David Thoreau, in seeing this pale glow in a forest. In his book *The Maine Woods*, Thoreau describes his first encounter with "phosphorescent" wood:

"I little thought that there was such a light shining in the darkness of the wilderness for me … that the woods were not tenantless, but chokefull of honest spirits as good as myself any day … not an empty chamber, in which chemistry was left to work alone, but an inhabited house … and for a few moments I enjoyed fellowship with them."

Text and photos by Frank Kaczmarek

ANN DAVIS

Above: In early fall, Marc Davis mows a meadow at the Woods Without Gile. Below: Ann Davis crosses a sedge meadow.

Working Forest Conservation Easement

Ten years ago, my husband Marc and I sold our business in Chicago and acquired a woodlot in New Hampshire, thus fulfilling a lifelong dream of owning and conserving a large piece of land. The 470-acre parcel sits in the town of Springfield, New Hampshire, and nestles up against the 6,725-acre John F. Gile Memorial State Forest. As a nod to our neighbor, we've nicknamed our land "Woods Without Gile."

Natural features on this rolling terrain include a forested swamp, beaver meadows, peatlands, brooks, and innumerable intermittent streams. Our diverse forest includes northern hardwoods and spruce, fir, and pine.

When it came to a management strategy for the property, we sought the advice of several experts, including a consulting forester. We've since done a salvage cut on a hardwood stand damaged by the ice storm in 1998, a crop-tree release in a mixed wood stand, and a series of 2- to 3-acre patch cuts designed to increase the animal species we see and hear on the property.

Conserving the land permanently was a different story, and involved a different set of experts. A working forest conservation easement is the only option a landowner has that will ensure that forestland remains undeveloped. The conservation agreement must be conveyed to a nonprofit organization that the Internal Revenue Service deems qualified; we chose to work with Ausbon Sargent Land Preservation Trust, our local land trust.

MARC DAVIS

The first step was to get a survey and an appraisal. The survey revealed a minor boundary line discrepancy along our northwest border abutting the Gile State Forest. Although taking care of the details was time consuming (the agreement had to be signed by New Hampshire's attorney general), the state was easy to work with and no conflict was involved. The appraisal fulfilled legal requirements stipulated by the IRS. As a benefit for donating the development rights to our property, we received a deduction on our federal income taxes. The appraisal determined the value of the donation.

Working with our attorney, who was well-versed in transactions of this nature, and with representatives from Ausbon Sargent, we wrote the conservation easement. Ours allows us and future landowners to cut timber, establish trails, and build a rustic cabin. Ausbon Sargent is responsible for monitoring the easement to assure that the landowner abides by the conditions spelled out in the contract.

We still own, manage, and yes, pay property taxes on the land – we only donated the development rights. I note this because some people assume we gave the land to Ausbon Sargent or to the town of Springfield. By donating the development rights, we know the land will be a working forest in perpetuity; it will never be home to a strip mall or a housing complex.

The land is open to hunting, fishing, and hiking. Each summer, Marc and I brush hog and weed-whack six miles of former skid trails that we have cleared and seeded. From these trails, hikers can see cellar holes and other foundations that are evidence of an abandoned hill farm community known as Fowlertown.

We are lucky to be stewards of this special spot. But more important, because the land is protected through a conservation easement, we know future generations will have a chance to enjoy it, too.

Ann Davis

Send us your Stewardship Stories

We know that many of you are engaged in projects that improve the woods. We'd like to provide examples to our readers of these stewardship projects. Please send us stories of your efforts, and we'll share them with our readers, either in the magazine or on our website.

[**IN REMEMBRANCE**]

Cameron Cope

Editor's Note: On December 31, 2011, Cameron Cope passed away. Orange County, Vermont, lost a good logger, and former Vermont State Naturalist, Charles Johnson, lost a good friend. Here, Johnson remembers Cope.

Each time I put a new stick of wood in the stove, I think of him, and I pause for just a moment to watch the flames catch hold. I think of him because it is his wood I am burning. It is his flame I am seeing, his warmth I feel drifting quietly, steadily into the room.

Before he had his big black dump truck, he would deliver our firewood in a pickup, a quarter cord at a time, and he and I would have a friendly competition: I would try to stack the quarter cord before he returned with the next load, to save myself extra lugging. Most often I won the race, only because I had the greater incentive and, no doubt, the easier job. But every now and then, he would arrive before I had quite finished, and he would step slowly out of the pickup, give a little victory smile, then wait patiently until I finished stacking, then would pitch out the load where the previous one had been.

I watched him a few times working in the woods, where he seemed so at home. He moved from tree to tree almost like a forest animal, soft-padding, alert, focused. When approaching a job, he always thought first of what was best for the forest, after that the products it could yield sustainably. He would study the terrain carefully, formulating in his mind what was right to do. (For example, he once asked me about the best time to log a site to protect birds that might be nesting there.) When he felled a tree, it would land exactly where he planned, avoiding other trees nearby, even little ones, and he would de-limb it swiftly with graceful sweeping cuts, then disperse the slash into the landscape where it would not be seen. He would drive his heavy, big-tired equipment softly through the woods, and when he was done you could hardly tell where he had been. Going back to a site years later, you might not think he had ever been there, unless you saw the stumps cut off near the ground. That is exactly what he wanted.

Years ago, before he evolved into a forester and logger, he was a furniture maker of unusual skill and creativity. He made the desk I am writing on right now from black walnut lumber I had stored for 30 years, milled from a tree that had been in the back yard where I grew up. Aware of the sentimental value the wood held for me, he asked me what I had in mind for a desk, but I said I trusted him to design and build it according to his own instincts and vision. So he made this amazing piece, every bit of it from the lumber: all five drawers and dividers, hand-carved handles, curving, tapering legs, inch-thick top as smooth as silk. It does honor to my life, then as now, and to the tree I played under as a boy.

There are so many other things he did well, much better than the rest of us. Preparing incredible food dishes as a trained chef, riding bicycles high and far into the mountains; hunting partridges always to his limit; making perfect stone walls and other structures from giant rocks. I could feel his work-built strength when he shook my hand or wrapped his arms around me in a hug, see it in his muscles filling out his clothes. I admired, even with a touch of envy, his chiseled, dark good looks and soft-spoken, understated manner. I will miss all that, all of him, the man who touched my life with such dignity and beauty.

This evening I have put another chunk of wood in the stove as an offering, or perhaps my way of prayer. Rest in peace, dear Cameron, where you always found peace before, in nature. It is holding you, as it holds all of us, close, accepting, forever.

Charles Johnson

[DISEASE]

Northeastern Bat Update

It's been five years since biologists found the first bats killed by white-nose syndrome in a cave near Albany, New York. It's been four years since the first dead bats were found in Vermont, Massachusetts, and Connecticut.

Since then, the disease has spread throughout the East and Midwest, following a pattern that Jenny Dickson, a wildlife biologist for the Connecticut Department of Energy and Environmental Protection, describes as visible fungus the first year, high mortality the second year, then just a remnant population the third year.

"The good news is that not every bat in caves stricken by white-nose syndrome is dying," said Mylea Bayless, director of conservation programs for Bat Conservation International in Austin, Texas.

On average, 88 percent of all hibernating bat species in caves and mines in New York, Vermont, Pennsylvania, Virginia, and West Virginia have died since white-nose syndrome was first discovered, according to statistics gathered by Gregory Turner of the Pennsylvania Game Commission.

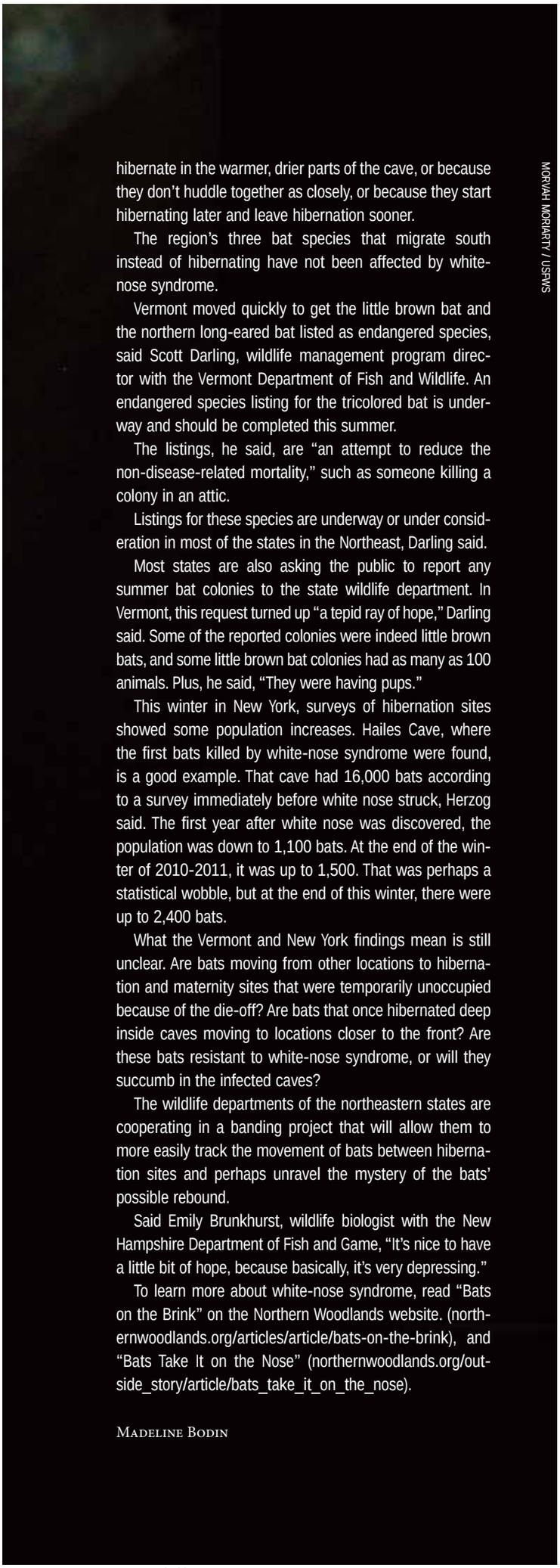
That grim number, however, hides the varying fortunes of the Northeast's bat species affected by white nose syndrome.

Northern long-eared bats have been the most severely affected, said New York State Department of Environmental Conservation wildlife biologist Carl Herzog. "The loss is something like 98 percent." This species is close to being extirpated, or going extinct regionally, in the Northeast.

But eastern small-footed bats, which were rare before white-nose syndrome, and the federally endangered Indiana bat, have fared better than some feared, with the Indiana bat declining 72 percent.

The little brown bat, which before white-nose syndrome was the most common bat in the Northeast, has suffered mortality rates of 90 percent or more in most areas.

In contrast, big browns bats have taken over as the most common bat species in most places in the Northeast, although their numbers have declined by 41 percent. Researchers don't know why big brown bats are not dying at the same rate as the other species. It may be because they



MORYAH MORIARTY / USFWS

hibernate in the warmer, drier parts of the cave, or because they don't huddle together as closely, or because they start hibernating later and leave hibernation sooner.

The region's three bat species that migrate south instead of hibernating have not been affected by white-nose syndrome.

Vermont moved quickly to get the little brown bat and the northern long-eared bat listed as endangered species, said Scott Darling, wildlife management program director with the Vermont Department of Fish and Wildlife. An endangered species listing for the tricolored bat is underway and should be completed this summer.

The listings, he said, are "an attempt to reduce the non-disease-related mortality," such as someone killing a colony in an attic.

Listings for these species are underway or under consideration in most of the states in the Northeast, Darling said.

Most states are also asking the public to report any summer bat colonies to the state wildlife department. In Vermont, this request turned up "a tepid ray of hope," Darling said. Some of the reported colonies were indeed little brown bats, and some little brown bat colonies had as many as 100 animals. Plus, he said, "They were having pups."

This winter in New York, surveys of hibernation sites showed some population increases. Hailes Cave, where the first bats killed by white-nose syndrome were found, is a good example. That cave had 16,000 bats according to a survey immediately before white nose struck, Herzog said. The first year after white nose was discovered, the population was down to 1,100 bats. At the end of the winter of 2010-2011, it was up to 1,500. That was perhaps a statistical wobble, but at the end of this winter, there were up to 2,400 bats.

What the Vermont and New York findings mean is still unclear. Are bats moving from other locations to hibernation and maternity sites that were temporarily unoccupied because of the die-off? Are bats that once hibernated deep inside caves moving to locations closer to the front? Are these bats resistant to white-nose syndrome, or will they succumb in the infected caves?

The wildlife departments of the northeastern states are cooperating in a banding project that will allow them to more easily track the movement of bats between hibernation sites and perhaps unravel the mystery of the bats' possible rebound.

Said Emily Brunkhurst, wildlife biologist with the New Hampshire Department of Fish and Game, "It's nice to have a little bit of hope, because basically, it's very depressing."

To learn more about white-nose syndrome, read "Bats on the Brink" on the Northern Woodlands website. (northernwoodlands.org/articles/article/bats-on-the-brink), and "Bats Take It on the Nose" (northernwoodlands.org/outside_story/article/bats_take_it_on_the_nose).

Madeline Bodin

[**POLICY**]

More Parkland for Massachusetts

"Currently there is no environmental ethic focused on meeting wood needs locally and little criticism of consumption behavior. Instead, an anti-logging ethic reigns and degradation of the global environment ensues. A new environmental effort is needed to expose this illusion of preservation."

From The Illusion of Preservation: A Global Environmental Argument for the Local Production of Natural Resources

In March 2009, under pressure from anti-logging groups, the state of Massachusetts placed a moratorium on management activities on 311,000 acres of public forestland, then set to work crafting a long-term management plan that would placate the interest groups. The results just came in: 60.7 percent of the forestland in question is now considered "parkland" or "reserve," where commercial timber harvesting is forbidden. Forty percent will be managed as "woodlands," allowing selective tree harvesting that creates minimal openings, with an exemption for patch cuts up to five acres in size (in certain cases and after "careful consultation and review").

As might be expected, not everyone was happy with the way the Department of Conservation and Recreation split the baby. Many in the forest products industry feel that years of good forest management have now been wasted and jobs are sure to be lost; some on the anti-logging side feel that any logging is too much, that state land should be for growing hiking trails, not sawtimber.

Missing in most analyses of this decision is any sense of the larger environmental picture, beyond the specific fate of the parcels in question. So let's look at some numbers – some food for thought in the style of Harper's Index. We hope these statistics will encourage discussion about land stewardship in Massachusetts and help to connect local resource use to the global environmental picture. For a list of source material, visit our website: www.northernwoodlands.org.

Number of forested acres in Massachusetts	3,015,000
Percent deemed suitable for timber production	93
Ratio of annual growth to harvest	12.7 to 1
Percentage of forestland in public holdings	34
Percentage of annual growth harvested pre-moratorium	17
Percentage of forestland in private ownership	66
Mean size, in acres, of private forest holdings in Massachusetts	7
Conventional wisdom as to minimum acres needed for effective forest management	25
Percentage of landowners who identified firewood as an important reason for owning forestland in 2008 survey	2
Percentage who identified timber harvesting as important	1
Individual town bylaws that regulate timber harvesting beyond state requirements	>35
Number of sawmills in Massachusetts in 1996	96
Number of sawmills in Massachusetts in 2010	15
Percentage of wood used in Massachusetts that's grown in Massachusetts	2
Percentage of energy generated by nuclear and fossil fuels	80
Percentage of energy generated by wood	1
Gallons of heating oil per year used in Massachusetts	818,841,000
Percentage of every dollar spent on heating oil that does not stay in regional economy	78
Money exported from regional economy when heating oil's at $4.50/gal	$2,874,131,910
Acres of timberland converted to non-forest uses annually	20,000

Photographer Tod Seelie spent last summer in Philadelphia working on the *Miss Rockaway Armada*, a large-scale art project. "During our building phase," Seelie said, "a massive heat wave wrapped the city in a suffocating state, so we searched out the local options for cooling down and discovered this amazing swimming hole in the Wissahickon River. We ended up there at the end of the day, and caught the mugginess in the late day glow as the light disappeared."

By Any Other Name: The Edifying (& Entertaining) World of Scientific Names

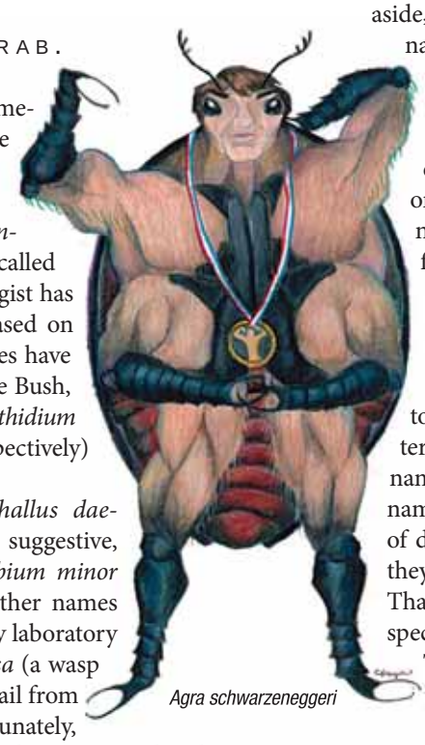
By Benjamin Lord
Illustrations by Carrie Hayes

I first heard about hairy-chested yeti crabs while driving home one night, listening to NPR. Robert Siegel was interviewing Alex Rogers, an Oxford biologist. Rogers led a research team that discovered these crabs (and some dozen other new species) two miles beneath the surface of the Antarctic Ocean. The radio voices were enjoying a laugh about how the team had nicknamed them Hoff crabs after David Hasselhoff, a *Baywatch* star notorious for baring his own hairy chest, when Siegel asked seriously, "Well, if it's a new species, can *Hasselhoffia* somehow make it into the name?" To which Rogers answered, with equal seriousness, "I'll have to talk to my colleagues." Rogers' reply is more than idle banter. Indeed, it is quite possible that *Kiwa hasselhoffi* might just make it as the official name of this shaggy crustacean.

There is a prevailing myth out there that this kind of lightheartedness never mixes with the stuffy, carefully controlled world of science – particularly in the seemingly obtuse field of classification and naming. But as the story of the Hoff crab suggests, there is more here than mere drudgery. There is a certain undeniable poetry and playfulness to the task of naming things. But myths about scientific names abound – that they are difficult to understand, that they are an amateurish pursuit compared to "real" biology, that the work of naming creatures has already been completed, and most perniciously that using scientific names is tedious, boring, and (dare I say it) nerdy. In this article I endeavor to expose some of these myths for what they are.

MYTH NO. 1:
SCIENTIFIC NAMES ARE DRAB.

If Hasselhoff is immortalized as the namesake of some curious shellfish, he won't be the first celebrity to share his moniker with a creeping creature. Harrison Ford shares his with an ant, *Pheidole harrisonfordi*. A beetle with bulging forearms is called *Agra schwarzeneggeri*. Many an entomologist has graced a fetching beetle with a name based on his wife's or girlfriend's. Slime mold beetles have been named in supposed honor of George Bush, Dick Cheney, and Donald Rumsfeld (*Agathidium bushi*, *A. cheneyi*, and *A. rumsfeldi* respectively) – to the delight of Democrats.



Agra schwarzeneggeri

Some names challenge modesty. *Phallus daemonicum* is the name of a particularly suggestive, and intimidating, stinkhorn fungus. *Labium minor* is, I hope unintentionally, an earwig. Other names are the wordplays you'd expect from geeky laboratory dwellers: *Ytu brutus* (a beetle), *Lalapa lusa* (a wasp for concert lovers), and *Ba humbugi* (a snail from Fiji that must dislike Christmas). Unfortunately, one of my favorite clams, *Abra cadabra*, has been renamed in the genus *Theora*. And *La cucaracha* isn't actually a cockroach. It's a moth. I could go on (probably for the duration of the article) but will spare you. The point is that, whether through intentional cleverness or happy accident, scientific names are fun to read.

MYTH NO. 2:
SCIENTIFIC NAMES ARE DIFFICULT TO UNDERSTAND.

Some people are under the impression that scientific names are hard to understand. After all, they are in Latin, aren't they? Isn't that a dead language that no one reads anymore? Still, as intimidating as scientific names may seem to the uninitiated, anyone can learn the few simple rules involved in their use. My daughter is three and she already uses dozens of them. As much as I would like to think she is some kind of naturalist prodigy, the truth is that thousands of kids her age know and use scientific names with as much aplomb. My daughter's first scientific name? *Tyrannosaurus rex*. Yes, dinosaurs are referred to by their scientific names by kids and scientists around the world.

Using scientific names is no more difficult than using the names of the people around you. Scientific names have two parts, just like personal names. In English, last names identify the family to which a person belongs. Part of a scientific name also identifies a group, the genus, to which the creature belongs. Handily enough this is called the *generic* name. Unlike a surname, your first name is specific to you. George Foreman's family aside, it is unlikely that you share your personal name with your siblings. Similarly, the other part of a scientific name is specific to a particular creature. Just as handily, this name is called the *specific* or species name. The major difference between a personal name and a scientific one is the order of the two names. In scientific names, the group name (generic name) comes first and the specific name is written second. So, if I were to change my name (Ben Lord) to the scientific style, I would write it as Lord Ben. (Gee, that has a nice ring to it.)

There are a few other changes I would have to make before my name passed scientific muster, though. In scientific names only the genus name is capitalized (Lord ben). Also, scientific names are made to stand out by using some kind of distinctive text. Usually they are italicized, but they can be in bold or underlined – thus, ***Lord ben***. That's all there is to it: genus first (capitalized), species second (not capitalized), both italicized. That little bit of knowledge is enough to get you through the lion's share of scientific names you might see in print.

MYTH NO. 3:
SCIENTIFIC NAMES ARE LATIN.

Scientific names are often called Latin names, but this is not quite true. Yes, many of these names do come from Latin roots, but names are just as likely to be drawn from Greek. As already discussed, many names are completely contrived or constructed from places or people. It would be more accurate to call these words *Latinized*, rather than Latin, for scientific names are all written with Latin letters and grammar.

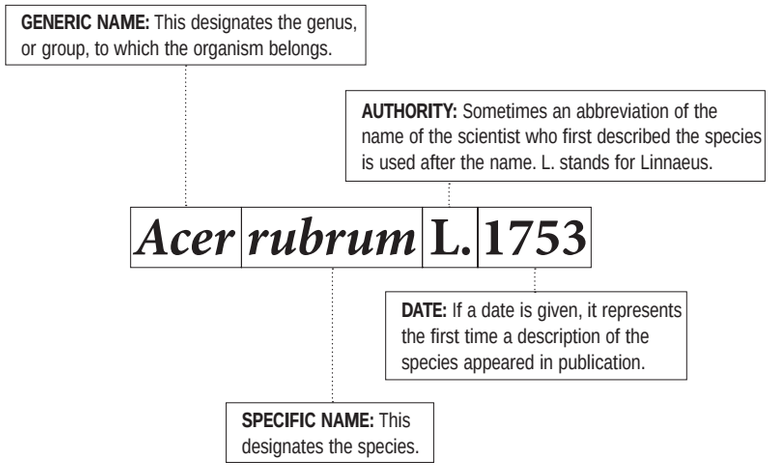
As pretentious as all this Latinizing might seem, it is eminently useful to have a single common system in our world of diverse languages and cultures. Each name must be unique, so that no two species can be confused. Yet once a name is applied, it becomes the accepted name for that species throughout the world. In a world where it seems that humans can hardly come to agreement on any important issue (capital punishment, Red Sox or Yankees, toilet seat up or down), what a triumph that we have agreed on some neutral territory in which we can all discuss our fellow creatures.

MYTH NO. 4:
SCIENTIFIC NAMING IS A DONE DEAL.

To the Europeans of the 1500s, it may have seemed that the number of organisms on the planet was limited enough to be manageably codified – that a comprehensive list of all creatures,

The Anatomy of a Scientific NAME

Usually just a genus and species name are given, but at its most formal, a scientific name can include several other parts.

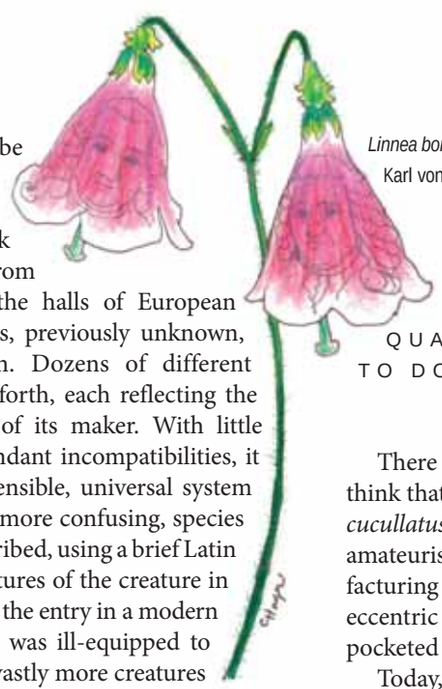


A. rubrum: After a scientific name has been used in print, and it is clear which species is being discussed, the genus (and only the genus) can be abbreviated to its first letter.

Acer rubrum carolinianum: A third name can be used to describe a subspecies.

Acer sp.: The abbreviation sp. is used when the species isn't known or isn't important. (Also used often by those of us too lazy to precisely identify difficult specimens.)

Acer spp.: The abbreviation spp. is used when describing several species in the genus together.



Linnea borealis, or twinflower, was named for the founder of biological nomenclature, Karl von Linné (also known as Carolus Linnaeus).

great and small, might someday be compiled. But as the influence of Europe expanded during the Age of Exploration, so did the task of naming. Strange creatures from new continents began filling the halls of European museums. Thousands of species, previously unknown, seemed to defy categorization. Dozens of different classification systems were put forth, each reflecting the proclivities and idiosyncrasies of its maker. With little overlap between them and abundant incompatibilities, it seemed by the 1700s that no sensible, universal system could be made. To make things more confusing, species were not so much named as described, using a brief Latin essay that recounted the key features of the creature in question. Imagine something like the entry in a modern field guide. Europe's old model was ill-equipped to deal with the fact that there are vastly more creatures in the world than had previously been assumed.

Onto this stage stepped a Swedish botanist named Karl von Linné who, among many peculiar fascinations ranging from religion to numerology, had become engrossed by the scandalous idea that plants reproduce sexually the same way that animals do. Linné's classification system, based on the reproductive parts of flowers, quickly gained notoriety as the most useful, most sensible classification system and was soon expanded to include animals as well. The genius of his system boils down to two key elements. First, it could organize vast numbers of species into hierarchical groups. Second, it trimmed the Latin essays that described each new species to a manageable summary. Originally designed as a personal shorthand, Linné assigned each creature a two word, Latinized label – the scientific name. Many of these names remain unchanged to this day. Linné even changed his own name to its Latinized form, Carolus Linnaeus, the name by which he is known today.

In sum, scientific naming was devised to deal with unexpected diversity. This is fortunate because we seem no closer now to a comprehensive list of the Earth's inhabitants than we were in Linnaeus's day. It is estimated that there are a whopping 1.7 million species currently described, though no one knows for sure because there is no central inventory. To get a sense of the scale, it would take a five-foot shelf of novel-length books just to list the names of the creatures we know – without footnotes or illustrations. Speculations about just how many are out there to *be* found range from 8 to 100 million. In *The Tempest*, Miranda exclaims, "How many goodly creatures are there here!" Miranda, we haven't got a clue. There is a lot of naming left to do.

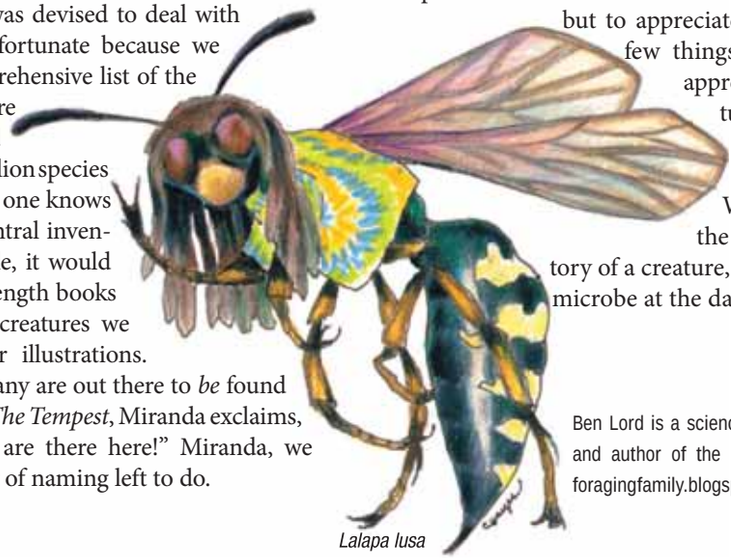
MYTH NO. 5:
SCIENTIFIC NAMES ARE A QUAINT HOLDOVER AND HAVE LITTLE TO DO WITH THE IMPORTANT SCIENTIFIC QUESTIONS OF THE DAY.

There is a disappointing trend in some circles of biology to think that natural history has gone the way of the dodo (*Raphus cucullatus*) and that the collecting and naming of creatures is an amateurish pursuit compared to mapping genomes or manufacturing artificial enzymes. (Imagine an enthusiastic, bearded eccentric bedecked in binoculars, pith helmet, and multi-pocketed vest and you begin to get the idea.)

Today, naming and classifying are about much more than just placing a verbal tag on a creature. They are the building blocks of one of the triumphs of human ingenuity – a family tree of life. Ever since Darwin proposed that Earth's creatures may be the widely divergent members of a single family of life, scientists have struggled to organize living things into their rightful places in a single, gigantic pedigree.

And while this effort was more of an art than a science for nearly a century, today we have the tools and methods to make this grand vision a reality. New genetic evidence and a new logic of classification, called cladistics, are methodically revising (and often confirming) our hypotheses about who are cousins with whom. For Romeo and Juliet, a rose, by any other name, may smell as sweet, but *Rosa carolina* is a name that now represents how closely the pasture rose is related to other roses, even when their evolutionary paths turned away from each other.

As Colin Tudge points out in his book, *The Variety of Life*, "The prime motive of science is not to control the Universe but to appreciate it more fully." There are few things that have enhanced my appreciation of the forest creatures around my Vermont home than the knowledge that they are my cousins. What's in a name? Only the whole evolutionary history of a creature, from its great great grandmicrobe at the dawn of life on Earth.



Lalapa lusa

Ben Lord is a science teacher in Brattleboro, Vermont, and author of the blog, *The Foraging Family*, www.foragingfamily.blogspot.com.

A Brief History of the Brown Paper Company

By Rebecca Rule

BROWN COMPANY COLLECTION, PLYMOUTH STATE UNIVERSITY

BROWN COMPANY COLLECTION, PLYMOUTH STATE UNIVERSITY

Above: During spring log drives in the early 1900s, the mass of logs filling the Androscoggin could extend five miles upriver.

Left: In the beginning, trees were hauled or "twitched" out of the woods by horses.

These days, the talk around Berlin, New Hampshire, revolves around what comes next. Politicians and venture capitalists and community groups are hard at work trying to come up with a second act for this former paper mill town. It's been this way for about five years now.

If you were born before 2007, you know that Berlin and the paper industry were inexorably linked. For 150 years, some version of the Brown Paper Company provided opportunity and steady work for thousands of men and women. The loggers, the truck drivers, the inventors, the mill workers all spent their money locally, supporting local businesses from bars to bowling alleys.

The town revolved around the mill for so long there's nothing else to remember before it, at least in any organized sense. Before Brown, Berlin – the city that trees built – was just trees. In 1851, the Grand Trunk Railway connected the upper Androscoggin Valley – that vast forest north of the White Mountains and south of Canada – to the shipyards and railyards of Portland, Maine. Soon, lumber and lumber products (shingles, window frames, wood ashes, laths for plaster and lath walls, and pickets for fences) were being shipped to distant markets. Businessman W. W. Brown took notice, and in 1868 he established the Berlin Mills Company, later Brown Paper, in Berlin. The town took off and didn't look back.

By 1903, the ever-expanding mill complex housed a wood yard, pulp dryers, newsprint machines, and a hydroelectric plant. The mill was producing 200 tons of paper per day. To feed the hungry paper machine, scouts sought out the best softwood stands and logging camps sprang up like mushrooms on the hillsides in New Hampshire, Vermont, and northwestern Maine. In the beginning, all the trees were cut by hand and hauled or "twitched" out of the woods by horses. During spring log drives, the mass of logs filling the Androscoggin could extend five miles upriver.

BROWN COMPANY COLLECTION, PLYMOUTH STATE UNIVERSITY

In the 1920s, W. E. Corbin invented the first wet-strength towel. These brown Nibroc towels folded into wall-mounted metal cabinets and became one of the most recognizable paper products in the country.

It seems the more wood the loggers harvested, the more the machines demanded. To meet the need, Brown bought 3,750,000 acres in Quebec. A 225-foot ship, the Itororo, hauled pulp wood down the St. Lawrence to Quebec City, where it went on to Berlin by rail. By 1917, the Berlin Mills Company, with three paper mills and 4,250,000 acres of timberland, was the largest pulp and paper manufacturer in the world.

Gradually the company phased newsprint out for higher-grade paper, which required bleaching with chlorine gas. So Brown built a plant to produce the gas – just one of many innovations that maintained the company's prominence in the industry. A cutting edge research and development facility was built on site and run by Hugh K. Moore, a prolific inventor and chemist, who began his career working in the mill yard for $1.50 a day. At its peak, the research and development facility employed 100 scientists and earned 600 patents in a variety of product lines, including Kream Krisp, a lard substitute and forerunner to Crisco. Highly purified alpha cellulose pulp could be dissolved and reconstituted to make rayon, cellophane, cellulose acetate film, celluloid, resins, lacquers, and explosives. Solka floc, cellulose fibers pulverized to flour, was (and is) used in foods and beverages, pharmaceuticals, plastics, and filters – including those for cigarettes. In the 1920s, W. E. Corbin invented the first wet-strength towel. These brown Nibroc (Corbin spelled backwards) towels, folded into wall-mounted metal cabinets, became one of the most recognizable paper products in the country.

The Great Depression brought decline. Demand decreased. Profits shrank. In 1935, Brown Company filed for bankruptcy and the Brown family lost ownership.

At the same time, environmental consciousness was changing, and the transition was especially hard on the paper industry. Sulfite waste liquor and noxious pollutants caused the Androscoggin River to foam and smell. The air for miles around smelled as well.

Donna Larsen played field hockey for Berlin High School. "We used to win all of our home games because of the sulfur. The other teams were coughing and hacking; they all had runny eyes. For home games, we always prayed for a downdraft."

During the 1940s and 1950s, facing increasing public concern and a court order to mitigate pollution, the reorganized company phased out sulfite for more environmentally friendly sulfate processes. The bulk of the switchover occurred in 1950s (although one mill, the Burgess Sulphite mill, continued operating until 1963). Still, sulfite or sulfate, a paper mill town smells like a paper mill town – something like ammonia crossed with rotten cabbage.

As Brown worked to clean up its act, competition from western pulp and paper manufacturers increased and – double-whammy – the softwood supply around Berlin began to dry up. To compensate, the company harvested hardwood for plywood and veneers. The wood operations became increasingly mechanized as the company tried to streamline. Horses, axes, and peaveys were replaced with bulldozers, skidders, and chainsaws.

Relative prosperity in the 1950s and early 1960s came in part from layoffs and the sale of assets. Contrary to the rosy picture painted in the company's annual reports, directors' records detail labor strikes and protracted union negotiations. Instead of being a leader in the industry, by the mid-1960s the company was scrambling to survive.

In hindsight, the devolution of Brown Paper seems steady and inevitable, as it was sold and resold, divided and reconfigured. Its history as an individual company ended in 1968 when it was purchased by Gulf and Western. Brown was sold again and again, first as a division of James River, then Crown Vantage, American Tissue, and Fraser Paper. Gradually, its assets and timberlands were sold off in failed attempts to survive foreign competition and high energy and transportation costs.

When the mills shut down in 2001, 860 workers were laid off. A year later, Fraser Paper purchased them and tried to revive the pulp and paper industry in Berlin, until $10 million in annual losses forced a shutdown in 2006. In 2007, the mills were demolished and 200 years of logging and paper making were truly over.

BROWN COMPANY COLLECTION, PLYMOUTH STATE UNIVERSITY

By 1903, the ever-expanding mill complex housed a wood yard, pulp dryers, newsprint machines, and a hydroelectric plant.

The Voices of the Mills

In the spring of 2007, the Androscoggin Valley Community Partners, in conjunction with the Arts Alliance of Northern New Hampshire, conceived the "Telling Our Stories" project that brought me to Berlin. Their idea: Collect the stories before they are lost.

The mission seemed fairly urgent, with the old mill buildings being demolished day by day, many people out of work, many leaving the city. It seemed as if every third or fourth house had a "For Sale" sign out front. Burned out hulks of houses on Main Street seemed a symbol of loss and hopelessness. Except for a skeleton crew hanging on just across the town line at the Cascade plant in Gorham, the industry that had sustained this place for generations was no more.

This was a city in mourning. On my first day, I walked into an office for directions. The woman behind the desk asked what I was up to. When I told her, her eyes filled with tears. "My husband worked at the mill," she said.

Another woman described how heart wrenching it was to watch the mills go. "My father worked there, my brothers, my sisters, even my granddaughter when she was going to Plymouth State University. When I cross the bridge and look down river, there's so much gone. There's nothing left to preserve."

Maybe it was the realization that this was indeed the end of an era that made people eager to tell their stories. In any case, they talked and I listened. Here's a taste of what I heard.

BROWN COMPANY COLLECTION, PLYMOUTH STATE UNIVERSITY

Cutting wood at a logging camp.

Woods Stories

Medora Snigger worked most of her adult life in the mills. Though long retired, she still got together with colleagues for a weekly meal. In the mills, fellow workers were like family.

But her story begins in the woods.

"I came out of the woods in 1941 when I was 17," she said. Mother cooked, father logged, she and her siblings grew up in the logging camps.

Loggers had a reputation for being rough but, Snigger said, many were fathers themselves and loved having children around. For toys, her father made little buck saws out of broken blades. "We weren't allowed axes, but buck saws, yes."

Asked if it was a dangerous life, she said, "My mother gave us a scare once." To cross the river, a boat was rigged with cables and pulleys, so a person could pull it from one side to the other. Snigger's mother had given a logger a ride across. On the return trip, one of the cables let go and catapulted her into the frigid water. When the little ones told Snigger that her mother had fallen into the river, she said, "I practically sunk to the floor."

But mother wasn't drowned that day. "She went down, but she came right back up and, happily, she was at the side of the boat, so she grabbed hold." Rescuers pried her frozen hands loose, brought her home, and thawed her out by the woodstove.

Helen Burns, a logger, once saved a man from being crushed by a pile of logs.

REBECCA RULE

Helen Burns, a logger, told about the time she saved a man's life:

We was up in Jefferson cutting on government land. Mr. Tyler had a pair of hosses. We done the cutting and he done the hauling out with the hosses on a scoot. They built a big skidway with a road underneath, so they could drive the big truck under and roll the logs onto it. Mr. Tyler was taking the logs off the skidway. He climbed on to free a log that was hung up. All of a sudden the logs behind him started to let go. Well, I grabbed a cant dog and drove it into the log he was holding onto, held the logs back 'til he could pull himself out of the way.

Nicest old man you'd ever want to meet. Just as gentle as he could be. Boy, when I let them logs go, that whole skidway come down through there. Would have squashed him to death.

Afterwards he thanked me and told everybody he knew how I saved his life. You didn't think anything of it at the time, but I did think of it in years later. I was scared to death. When I jumped in there by side of him to hold them logs, I had no idea whether I could or not. We could have both been killed right there.

It's strange how things will happen. At the time you don't realize what you've done. You see it and you have to do it.

He could jump like a rabbit for a man his age. He was very limber on his feet. He was an elderly man, so we always called him Mr. Tyler. If he would have said to call him Clarence, I would have, but he never did.

Leon Hawkinson, in 1953, at age 25, took a job as camp clerk, a multi-faceted position that entailed being the bookkeeper, paymaster, human resources manager, storekeeper, and sometimes doctor. "Their axes were just as sharp as razors," he said. "One guy came in with a cut in his upper leg through to the bone." Hawkinson bandaged him up and said, "You've got to go to Berlin right off. You might get an infection." The guy said, "It looks good to me." He was back at work three weeks later.

It was a rough life, but not without its rewards, including the bountiful food. Some cooks were known for their delicious beans, stews, pies, bread, and cookies. Men vied to work at those camps. But at some camps, cooks were known as boilers. Hawkinson said, "No matter what you sent up for food, they'd boil it. They'd boil a T-bone steak." Men vied not to work at those camps.

Numbers tell a lot about the logging and paper industry: 60 cents for a meal at the logging camp, 700 men and 2,500 horses in the woods around Lake Parmachenee in western Maine, more than 20,000 populating the city of Berlin in its heyday, most employed by Brown Company or providing services (grocers, barbers, teachers) to the mill workers and their families. The population has dropped to 10,000 with crippling unemployment, yet people remember when Berlin boasted the highest per capita income in the state. On a Friday night in the good old days, crowds jammed Main Street – shopping, dining, drinking, enjoying all the amenities of a big little city.

Berlin's heritage is diverse: Norwegian, French, Greek, Jewish, Russian, and more. They came to Berlin for work and they found it. As you walk its streets you still hear, among the Yankee drawls, the precise intonations of second-generation Lebanese, musical French and Italian inflections, the hint of an Irish brogue, Norwegian lilts.

Ola Oleson spoke proudly of his father, Alton: "My father's first job in Bog Brook was loading logs that were bigger around than they were long. In Kennebago, opening up Crowley Brook, they found the King's stamp on some of the pines. The stamp marked mast trees, claimed for the King of England and his sailing ships. In the College Grant, they found the Norwegian hand carved in a stone, thumb and forefinger extended: the sign that somebody had died on that spot. "The Norwegians came first. Squareheads, like me! The French came later."

"Lord," Oleson's mother, Norma, piped up, "The woods were full of them!"

REBECCA RULE

Ola Oleson and his mother, Norma. Ola's father, Alton, worked as a logger.

BROWN COMPANY COLLECTION, PLYMOUTH STATE UNIVERSITY

Mill Stories

Alton Oleson worked in the woods, but his son worked in the mills, where you could learn a skill and have a career. Gina Belanger said, "It was an apprenticeship system. You were scrutinized until you got it right. You might be running an 11-story boiler that could wipe out half the city. A lot of people think we're unskilled labor, but it took a lot of skill to keep those places from blowing up."

Jenny Parent worked in the towel room making those popular Nibroc towels. When I met her, she was 101 years old.

When the towel room first opened, that's when I started. I was 17 years old. It's hard, hard work, but when you're young, you don't mind it. When I started, the towel room had just two machines. After a while, it got up to 14. Men loaded the machines. Women packed the towels.

They ask me, "Jenny, why did you keep doing that hard, hard work for all those years?"

I say, "For the money, same as everybody else!" I was bringing home money for 48 years.

Not only was the work hard, it was dangerous. Everybody has a story about a family member or friend who was injured or killed. Often when there was trouble, Robert Therriault, millwright, got the call.

One time they call me over. They say: "Hey, the belt is off over there." I look. I say, "What is this?" I pick up a finger. "Who owns this finger?"

One guy, I pulled him out of the machine. He wanted to check his reel. But the guard was not big enough and it pulled him right in and that roller grounded up his arm. I had to take the guard off. Pull him out of the machine. Lay him down.

Anyway, I said, "Geez, I hope they'll be able to save his arm. You could see all the nerves and stuff. But as soon as they take him away, the boss says: "OK, get the machine going again. He's being taken care of."

This was the mentality. It was a rough way, but that was our lives at that time.

Therriault worked to make conditions better for the mill workers. He served as head of the union for a time. He and others went to bat for women who, for decades, were allowed only to work in the towel room.

I was familiar with the national law. I went to the union. Some brave women signed the complaint and there was

Women package Nibroc paper towels for Brown Paper Company.

a meeting with Equal Opportunity from Washington and the bosses at the mill. It wasn't just the bosses the women were fighting. It was the union, too.

A friend of mine says to me about my wife: "Why don't she stay home and wash her dishes like everybody else?" But the law was on our side.

The mills were a world unto themselves and a microcosm of the world at large. Women's rights were slow to come to the Brown Paper Company, but they made it. Environmental awareness and pollution control, these too came eventually. In the 1950s, a lot of money went into cutting stream and air pollution. It was bad. The river foamed. The smoke was so acrid there were no mosquitoes. They said if you lived in Berlin, you didn't smell the sulfur. Or if you did, it was the smell of money!

One of Louis Gagnon's first jobs was in the tank room.

These rolls of recycled newspaper would go in the tank, and they'd sink that down in and put tar in, then drain that all out and fill it with water. But when they opened the cover, like a clam steamer, all that haze and mist would come out. They used to give us cold cream to put on our face so we didn't burn. I was walking to work one day. My face was burning just like somebody had a blowtorch on it. I said to hell with this. I said to the guy, "If this is all you got for me, I don't want it."

Went back a year later. They put me in the tube mill. I had my mind made up I'd stick with it. I was married then.

His wife, Rita, said, "Five out of ten in my family had cancer. In his family, three or four, I don't know." How much of that had to do with the mills? Who knows?

Marcel Leveille worked as a chemist in research and development for Brown.

For a while we had to pick up samples of the pulp every two hours. You put it in a baggie. Someone would pick it up and take it to Cascade for a smell test.

We were curious, were they really doing a smell test? So my friend took half a bottle of Aqua Velva and dumped it on this sample. The next day, they called: "Have you changed anything in the cooking process?"

"Why you ask?"

"Well the pulp smells different. It's what we think we might like the pulp smelling like."

The End of an Era

Brown Company never got the pulp to smell like Aqua Velva, but ironically, by the time the mills were closing for good, many environmental problems had been solved.

Normand Caouette recalled the moment he realized his life's work was coming to an end.

My last job at the mill was cooking the wood. One night I was sitting in front of the computer panel and an alarm went off. I wasn't getting enough softwood chips in the mix. I called the guy supposed to be feeding the chips. "Where are the chips?" I says.

"There's no more."

"I only need a couple tons."

"Norm, there's no more."

I didn't know the yard was empty. There really was no more. The mill was shutting down temporarily, they said, but when I walked out, I said to the men: "Take a good look. We may never come back."

We think of September 11, 2001 as a turning point in American history. But for Berlin, September 10, 2001 was also a turning point. That was the day they put the locks on the doors. Ola Oleson said, "The average age of the men laid off was 54. What do men at that age do? No education. Some of them couldn't read or write. The mill – that's all they knew."

The river runs clear these days and the air no longer stinks. The debate about the best use of the old mill site continues: A park? A business center? More industry? An ATV park attracts tourists, so that's good for business. The new federal prison, when it opens, will provide some jobs. And the construction of a biomass plant will require up to 400 workers, with permanent jobs for 40 when it begins producing electricity in 2013.

"Mr. Brown came here with a vision," Caouette said. "He accomplished his vision. But nobody says, 'Thank you, Mr. Brown.' What's sad is 200 years of heritage and paper making history are gone."

"Berlin will come back," the people say. "Maybe not in my lifetime, but it will come back."

Rebecca Rule gathers and tells stories. Her latest book is *Moved and Seconded: NH Town Meeting*. Her collection of short stories, *The Best Revenge*, was named one of five essential New Hampshire Books by *New Hampshire Magazine*.

Wonderful Woodland Ants

By Aaron M. Ellison & Elizabeth J. Farnsworth

WHEN FRIENDS AND COLLEAGUES hear that we've written a book on the ants of New England, their first reaction is always to ask: "I have ants in my ... (kitchen, walls, pants). How do I get rid of them?" It's a fair question, but if you stay fixated on the little black creatures scurrying out of your sugar jar, you'll miss out on a wild, wonderful ant world that exists just outside your door. We tell our friends that there are many fascinating species of ants that inhabit our northeastern woodlands, and they're critical to keeping our forests healthy and growing. At which point they usually nod politely, say something like, "How interesting," and then ask: "So do the ant traps work? Or should I use the Ant-B-Gone spray?"

To those inclined to see it, ant colonies are a lot like human societies. Ants spend their time running from job to job, take time out for meals, and modify the world around them. Like humans – whose workplaces are divided up into CEOs, middle-managers, and technicians – ants are "eusocial" ("truly" social); the labor to keep the colony thriving and profitable is divided up. But there isn't much upward mobility in an ant colony, where the all-female workforce is organized into castes: some workers tend the brood, some forage for food, and others defend the nest. One or more queens lay all the eggs of the colony while being pampered by their worker-daughters. Unlike the work-force of most corporations, all the workers in an ant colony

Bloodroot seeds have a nutritious, fat-rich accessory called an elaiosome that these *Aphaenogaster fulva* workers get to eat in return for dispersing the plants' seeds.

ALEXANDER WILD

are sisters, so it is easy to see why they should work together for the benefit of the colony presided over by their queen-mother. Who among us would not lay down her life for her family?

But what about the males? Males are produced only when the colony is ready to begin a new colony – at most, this happens once a year. The winged males live just long enough to mate with virgin queens. An important part of their job is to mix up the gene pool by mating with queens from unrelated colonies. The queens also have wings, and after mating they disperse near and far. When a mated queen finds a suitable home, her wings drop off and she starts a brand new colony.

How Ants Help Our Forests

Human interactions with ants are often confrontational, but it's important to keep in mind the many things they do that enrich our lives. Consider the soil that underlies our forests and fields and on which all life depends. Soil accumulates as leaves, twigs, branches, and other debris fall, are buried, and decompose into smaller bits. Ants – along with earthworms, mites, nematodes, and fungi – break down large scraps and accelerate soil formation by mixing subsoil with the organic material on the forest floor. Soil scientist and forester Walter Lyford's work in Massachusetts suggested that soil movement by ants can create an inch of topsoil every 250 years. Likewise, omnivorous ants clean up a lot of carcasses, from dead caterpillars to fallen nestlings, removing them from sight, recycling the essential

Capenter ant worker.

The citronella ant, *Lasius claviger*.

Repletes of the winter ant, *Prenolepis imparis*, store liquid sugar in their distended abdomens, providing food for the colony when it is otherwise hard to collect.

We call the beautiful *Pyramica pergandei* the Lady Gaga ant because of its flamboyant outfit featuring a lacy "skirt" around its abdomen.

nutrients wrapped up within them, and blending it all together into fertile soil. In short, it's the ants that mulch our soils and stock our larders. Perhaps we can spare them a teaspoon of sugar!

Ants help forest plants, too. They disperse the seeds of many of the sedges and spring wildflowers, such as the bloodroot, trillium, violets, Dutchman's breeches, and gaywings that grace our woods before the trees leaf out. These plants endow their seeds with an elaiosome: a fleshy package of fats, proteins, and nutrients that is a smorgasbord for ants. The ants bring the seeds back to their nest, eat the elaiosomes, and leave the seeds intact to germinate in the nutrient-rich topsoil the ants themselves have created.

Being among the tiniest forest creatures, ants are food for many other insects, as well as spiders, birds, frogs, and mammals: just about anything bigger than an ant will eat one. Black bears feast on carpenter ants when berries are scarce, and woodpeckers drill into trees looking for ants. Even pitcher plants and sundews make meals of ants.

The Diversity of Ants in the Northeast

From a distance, all ants look alike (little red or black things with way too many legs). But peer more closely, and you'll notice they come in a rainbow of colors: yellow, red, black, and even multi-hued. Some sport lustrous silver or gold hairs; some even have bizarre "skirts" around their abdomens. Northeastern ants range in size from the barely visible (1/25 inch long) to the impressively stocky (over 1/2 inch long).

We have documented over 140 different species of ants living in New England, New York, Québec, Nova Scotia, and New Brunswick. Fourteen of these are non-native, most of which are tropical tramps that only survive New England's climate by living in basements, greenhouses, and other warm buildings. Other species may move into our region as the climate warms, including *Lasius murphyi*, *Camponotus subbarbatus*, *Pachycondyla chinensis* (the exotic "needle ant" named for its sting), and the prairie ant, *Formica dakotensis*. Some of the

PHOTO CREDITS CLOCKWISE FROM TOP LEFT: GARY D. ALPERT, AARON M. ELLISON, GUSTAV W. VERDERBER, GARY D. ALPERT, AARON M. ELLISON

Ant tending a herd of aphids. She protects the aphids from predators, pastures them on sugar-rich plants, and in exchange gets to drink the honeydew they excrete.

native boreal species, however, may not be able to tolerate the warmer summers we expect to see in the coming years: *Formica hewitti*, *Myrmica brevispinosa*, and the aptly named *Formica glacialis* may all be forced to relocate further north.

Even though amateur and professional ant-geeks (or more technically, myrmecologists) have been collecting ants in New England for over 150 years, we still have a lot to learn about their distribution and habitat preferences. After analyzing nearly 30,000 records from New England ant collections, past and present, we determined that we know much more about the ant fauna of some areas and much less of other areas; even the number of species in the Northeast is uncertain. We are sure that 132 different species have been collected in the six New England states alone, but with reasonable confidence (95 percent), we predict there are at least 21 species yet to be found. We are most confident about our estimates of ant diversity where ants have been most frequently collected: Massachusetts, the Waterboro Pine Barrens and the Down East region of Maine, parts of Connecticut, and around Burlington, Vermont. But gaps in our knowledge are most apparent where ant collecting has been rare: Maine's Great North Woods, Vermont's Northeast Kingdom, most of New Hampshire, and Rhode Island.

As you pay more attention to ants, you'll notice that different ants live in different habitats; some are picky specialists and others are cosmopolitan generalists. Ecologists use these differences to quickly assess changing habitat qualities as forest stands age. Of all our habitats – from beaches to mountain summits – we find the highest diversity of ant species in uneven-aged woodlands that have an assortment of microhabitats: forest edges, patches of open ground, fallen and rotting twigs and logs, and denser stands of aging trees.

Ant species diversity is especially high in forests growing on dry, sandy soils, such as open oak/pine woodlands, scrub oak balds, and pine barrens. Hiding under rocks and nesting deep

HELP INCREASE OUR UNDERSTANDING OF ANT DIVERSITY IN NORTHERN WOODLANDS.

Collections of ant specimens form the basis of knowledge about their distribution, abundance, and responses to changing environmental conditions. If you spend some time in the woods looking on bark and leaves or turning over rocks and logs, you'll find ants; get your kids outside looking for and chasing them, too. With only a few inexpensive supplies, you can build an ant collection. With a hand lens or microscope, patience, and a handy field guide, you can learn to identify them. And if you meticulously take down information on when and where you collected the ants – the date and time, latitude and longitude – and make detailed notes about the habitat in which you found them, you can help us better understand regional patterns in the diversity of ants. While your friends are out birding, you can create a "life list" of ants. For more information on collecting and archiving ants for scientific study, visit our website at http://NEants.net.

These very large ant hills on Mount Grace in western Massachusetts were created by Allegheny mound ants (*Formica exsectoides*).

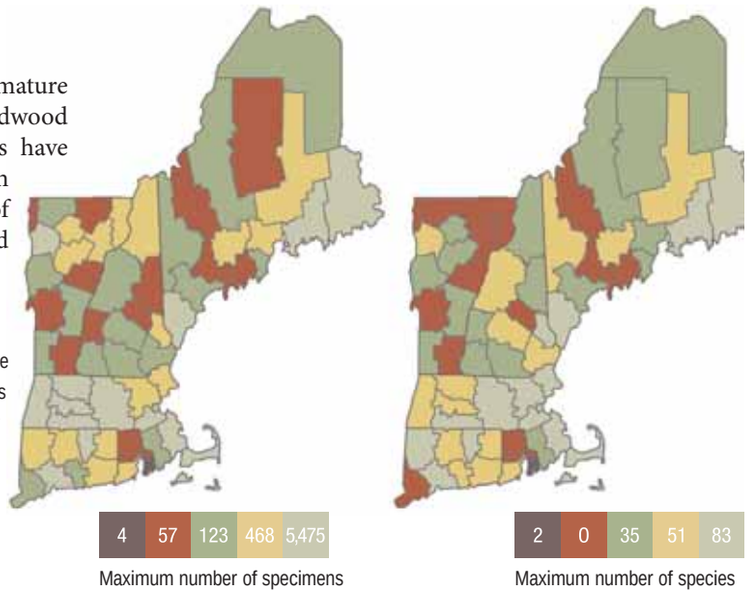
underground in many of these forests lurk the citronella ants, a unique group of *Lasius* species. These beautiful, golden-yellow ants are easily identified by the lemony, citronella-like smell they exude when disturbed. They tend herds of root-feeding aphids and related insects, slurping up the honeydew these plant-sucking insects produce (much like the barfly personified by Woody Allen in the movie, *Antz*). Like many ant species, citronella ants are social parasites on other ants. To found a new colony, the queen first moves into an existing colony of another *Lasius* species, kills the host queen, assimilates the queen's odor so she smells like the old queen to the subterranean workers, and begins laying eggs. The duped host workers care for the parasite's brood, rearing them as sisters. As the host workers die off, they are replaced by the parasite's offspring, who enlarge the nest. Citronella ant colonies can be enormous, with more than 10,000 workers in a single nest. The colonies produce males in late fall, and many colonies often swarm in synchrony, filling the forest with sweet-smelling ants.

Look under small rocks and downed wood for the winter ant, *Prenolepis imparis*. Its common name reflects the fact that this species is very tolerant of cold weather – its workers are the earliest out in the spring and the last to disappear in the fall. It is also the only "honeypot" ant in New England: some of the workers store sugars they collect from flower nectar and insect honeydew in their distended abdomens. When food is scarce in the colony, these honeypots (also called repletes) regurgitate this sugar to feed the rest of the colony.

It's harder to find ants in mature forests. As the canopy closes, the humidity at the forest floor increases and the average temperature drops. Such conditions are less favorable for ants in general, and only a few ant species remain in old-growth hemlock forests. On the other hand, three arboreal species – *Camponotus caryae, Aphaenogaster mariae*, and *Temnothorax schaumi* – are found almost exclusively nesting in large (18-

AARON M. ELLISON

inch diameter or larger) oaks, walnuts, or hickories in mature hardwood forests of the Northeast. As old-growth hardwood forests have disappeared from our region, these ants have become quite rare. In fact, out of nearly 30,000 collection records of ants in New England, we know of only one of *Aphaenogaster mariae*, eight of *Camponotus caryae*, and 31 of *Temnothorax schaumi*.



Collection history and species richness of ants across New England. In these two maps, the number of specimen records (left) and number of species found (right) in each county are color-coded from white (fewest specimens or species) to dark purple (most specimens or species). Although ant species richness is highest on the coast and in southern New England, these maps illustrate that these areas also have the highest number of samples. Will we find more species as we look in counties that have been sampled less frequently in the past?

From the Forest to Your Floor

It takes a great deal of exploring for us to find the uncommon woodland ants, but the more common woodland ants have no trouble finding us. The two ants we most frequently see in our region are the ones that end up in our kitchens and walls. The sugar ant, *Tapinoma sessile*, is better known as the odorous house ant, because it smells like overripe bananas when it is disturbed or pinched. This native ant prefers to nest outside, and the workers marching across your counters are likely following well-marked trails that can extend for tens of yards. They'll nest indoors, though: under sinks, in the basement, or in an open bag of sugar, wherever there is enough moisture to keep the colony well hydrated. The best defense against *Tapinoma* is preventive maintenance. Rather than spraying with Raid, just make sure the sink isn't leaking, the basement is dry, and the sugar is well sealed in a glass jar.

Like the sugar ant, the eastern carpenter ant, *Camponotus pennsylvanicus*, makes its primary nests outdoors, in dead wood or decaying tree stumps, often as much as 300 yards away from a domicile. Most carpenter ants will not venture into houses, but the common *C. pennsylvanicus* uses your house as a satellite outpost, established to gain more space, food, or shelter in which to rear more brood. The queen stays outside while the workers move food and brood back and forth in the thin, moist channels next to pipes and wires. Moisture is key: *C. pennsylvanicus* needs it, and unless your timber frame is beginning to rot, carpenter ants will stay away. So if you see carpenter ants, check the structural integrity of your house – and if you find damage, the ants are most often the symptom, not the cause. Once again, prevention, not poison, is the best means of control. And by keeping the pesticides away from your house, you'll be able to see many more kinds of ants, too.

So leave the ant baits in the box. When you shoo those ants off your counter and send them packing, follow them outside and back to their nests. Poke around the leaf litter, look under stones or bark, and settle down to watch the wonderful world of ants. As you come to know these hard-working denizens of the woods better, you'll appreciate all that they do for us and for the forests around us.

Aaron Ellison is senior ecologist at the Harvard Forest in Petersham, Massachusetts, and Elizabeth Farnsworth is senior research ecologist at New England Wild Flower Society in Framingham, Massachusetts. Together with Nicholas Gotelli and Gary Alpert, they wrote *A Field Guide to the Ants of New England*, to be published this summer by Yale University Press.

Carpenter ant queen with brood.

GARY D. ALPERT

By Bryan Pfeiffer

BRYAN PFEIFFER, STEVE BYLAND, BRYAN PFEIFFER, STEVE BYLAND

All in the Family

The northern cardinal, crimson and crested, is an avian icon, one of the most recognizable birds on the continent. But the rose-breasted grosbeak is also a cardinal. So is the scarlet tanager. Even the indigo bunting is a cardinal. And you thought you knew cardinals.

Each of those birds belongs to the Cardinalidae, the cardinal family. In life and in science there is harmony in families. Their member species share certain characteristics. For birdwatchers, the family and its features can be a sunny path to bird identification.

Well, sometimes.

Color isn't necessarily one of those family traits. Consider our cardinals. A bird need not be red to be a cardinal. The same goes for blackbirds, in the family Icteridae. The Baltimore oriole is a blackbird. So is the eastern meadowlark.

Size doesn't always help either. The blue jay and the common raven belong to the same family, the Corvidae.

Shape? Not always. The greater roadrunner, a gangly, long-legged ground bird, is actually a cuckoo in the family Cuculidae, the majority of which are slender, tree-dwelling birds.

How about vocalization? Nope, sorry. The songs of different warbler species, in the family Parulidae, vary from buzzy to melodious.

So by now you're asking, "Where's the harmony? Why bother?"

Stay with me.

In many cases harmony comes from within. Biologists who organize birds into families often rely on skeletal structure, muscle shape, or the shape of internal organs, such as a bird's voice box (the syrinx), to bring order to the diversity.

Sometimes the harmony is subtle – and visible. Check out the bills on the northern cardinal and rose-breasted grosbeak. Thick and heavy. Those are cardinal bills. Now look at the daggers on the Baltimore oriole and boat-tailed grackle. Those are blackbird bills.

So for some family traits, a naturalist need only know where to look. A towering black locust is no less a member of the pea family (Fabaceae) than the sugar snap creeping in your garden. Their flowers are alike. Harmony resides in those flowers.

And sometimes the family can be a birdwatcher's friend in the field. Consider the flycatchers (Tyrannidae) and the vireos (Vireonidae). Beginning birders often struggle to distinguish these two groups. Many flycatchers, and all vireos, are small, drab olive-gray, and subtle in their field marks.

But harmony prevails in each family.

Flycatchers share a shape and posture. They have relatively big heads that seem to be squished down onto broad shoulders. Their pose is upright. Their feeding style is distinctive: they launch from a perch, snatch an insect mid-air, and return to the perch to complete the meal.

Vireos differ in so many ways. Their heads merge into a short, stout neck. They lean forward in their posture. And vireos are gleaners when feeding: they hop sluggishly among tree leaves grabbing insects, mostly small caterpillars, along the way.

Seeing these kinds of family traits is no different than being away from your home woods and encountering a tree with thin twigs, opposite branching, and a familiar leaf. "I don't know this tree species," you may say to yourself, "but I'm certain it's a maple" (in the family Aceraceae).

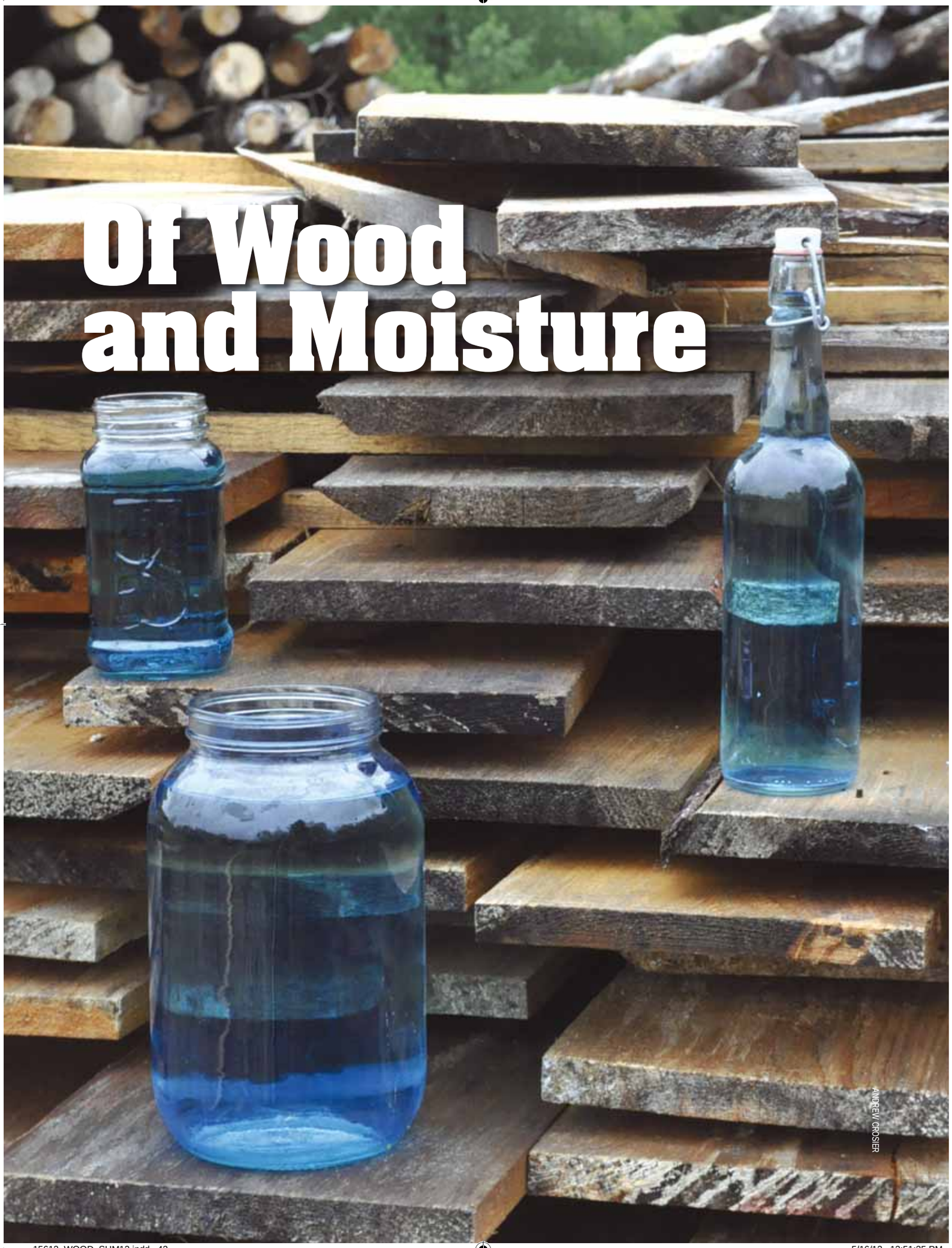
Do recognize that the taxonomy of birds (and other groups) can be in hot dispute and flux. Biologists now work at the molecular level, using DNA sequences, to determine the evolutionary relationships among organisms. It's what recently brought our tanagers, for example, into the cardinal family.

Yet for our purposes, at least for now, a flycatcher will always be a flycatcher and a vireo a vireo. As you learn family features, subtlety wanes. Vireos and flycatchers become as distinctive as, say, warblers and woodpeckers. So, in the field, when you encounter some drab olive-gray bird perched upright, you may say to yourself. "I don't know this bird, but I do know that it is a flycatcher." From there you will know where to turn in your field guide.

That's what I call family values.

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

Of Wood and Moisture



ANDREW CROSIER

By Irwin Post

Have you ever air-dried a stack of pine boards and wondered why some bowed and some didn't? Or noted that perfectly constructed joints swelled to a not-so-perfect fit in the summer? Or found that your dining room chairs wobbled more in the winter? If so, you've begun to puzzle over the dynamic relationship between wood and water.

Trees, of course, need water for their life processes. When they're felled and brought to a sawmill, they're still full of water and very heavy. At the mill, the boards are stickered – stacked with spacers – so that air can flow between them and dry them out, although, as we shall see, "dry" is a relative term.

Moisture content varies from species to species. In some softwoods, green boards can be three times heavier than oven-dried ones. That's a moisture content of 200 percent, which seems counterintuitive. I'll explain that number in a bit. But contrast it with white ash, which has a moisture content of about 45 percent, and it's easy to see why white ash is the wood of choice if you need to burn green wood in your stove.

When wood dries, interesting and sometimes frustrating things happen. To understand why, we'll look at what's going on at the cellular level. Water is found in two distinct places in the cells: in the lumens (cavities) and in the water that is bound in the cell walls. As wood dries, the water in the lumens, sometimes referred to as free water, is the first to leave.

When all the free water in the lumens is gone and only the water bound in the cell walls remains, wood has reached what is called its fiber saturation point. The moisture content at this point varies a bit, both between and within species, but averages about 30 percent. There is no change in the wood's size and shape as long as it is above the fiber saturation point. It is only when the cell walls start to dry that we begin to see changes in the size and shape of the wood.

The amount wood can dry is influenced by the temperature and relative humidity of the surrounding air. There comes a point where a piece of wood will neither gain nor lose moisture. This is called the equilibrium moisture content, or EMC. In general, the higher the humidity at any given temperature, the higher the EMC, and the higher the temperature at any given relative humidity, the lower the EMC.

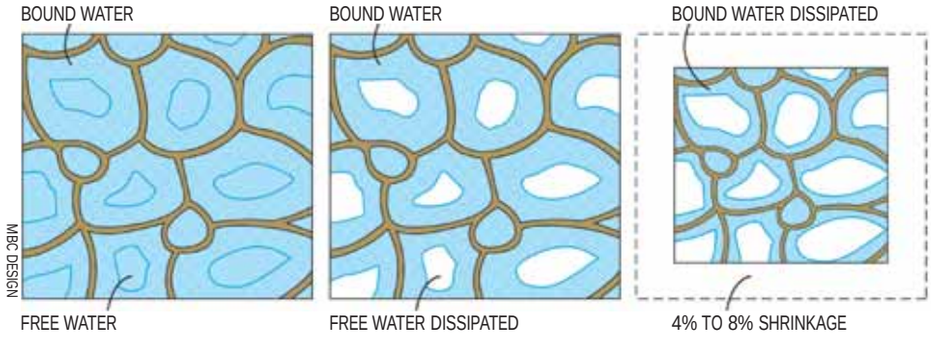
We all know, however, that the relative humidity and temperature are always changing, both through the day and seasonally, so we speak of a year-round average EMC. In the Northeast, this is about 8 percent inside buildings and 12 percent outside, but the variation over time can be considerable. For instance, a wood floor laid over a radiant heat system can have an EMC in winter of 2 to 3 percent, whereas the EMC on a hot, muggy summer day can be 20 percent or more. One of the purposes of wood finishes is to slow down the transfer of moisture between wood and the air, thereby slowing down changes in the moisture content of the wood as the temperature and humidity of the surrounding air changes.

Machining properties also change as wood dries. Most hardwoods machine quite well with a moisture content in the range of 6 to 8 percent. Since this is the same as the average EMC for inside buildings, hardwoods are typically planed and otherwise shaped at this moisture content. Softwoods, however, generally machine poorly at a low moisture content – there is lots of grain tearing and other machining defects – but they machine quite well with a moisture content in the range of 12 percent. Therefore, when destined for interior finish uses, softwoods are typically dried to about 12 percent moisture content.

Size and Shape Change

When you go to the lumber yard to get some two-by-fours, you find that some are straight while others are bowed or twisted. If you're a woodworker, you are familiar with boards that are cupped (bowed across the width of the board) and otherwise warped. What causes boards that were straight and flat when they came off the sawmill to change shape when they dry? It's because wood is anisotropic, meaning that it has different properties in different directions.

We can think of tree trunks having three directions: length (up and down the tree; parallel to the grain), tangential (parallel to the growth rings), and radial (from the center of the trunk to the outside; perpendicular to the



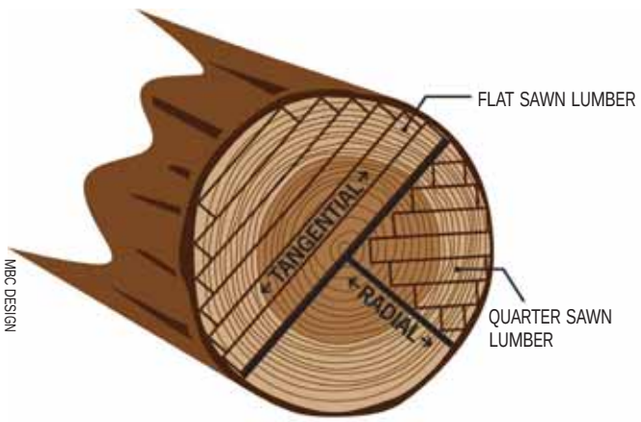
As wood dries, the water in the lumens, sometimes referred to as free water, is the first to leave. When all the free water in the lumens dissipates (second image), wood has reached its fiber saturation point. When the cell walls start to dry, we begin to see changes in the size and shape of the wood (right image).

growth rings). As the moisture content of normal wood dips below the fiber saturation point, it shrinks differently in these three directions.

Shrinking that occurs along the length of the board is called longitudinal shrinkage, and it's generally quite small. If a board dries from its fiber saturation point (about 30 percent moisture content) to oven dry, it'll only lose 0.1 to 0.2 percent of its length. For most uses, the moisture content will not vary by more than about 3 percent over the seasons, yielding about one-tenth of this shrinkage and expansion through the seasons. An 8-foot board (96 inches) would change in length by only 0.01 to 0.02 inches, which would be imperceptible in almost all uses.

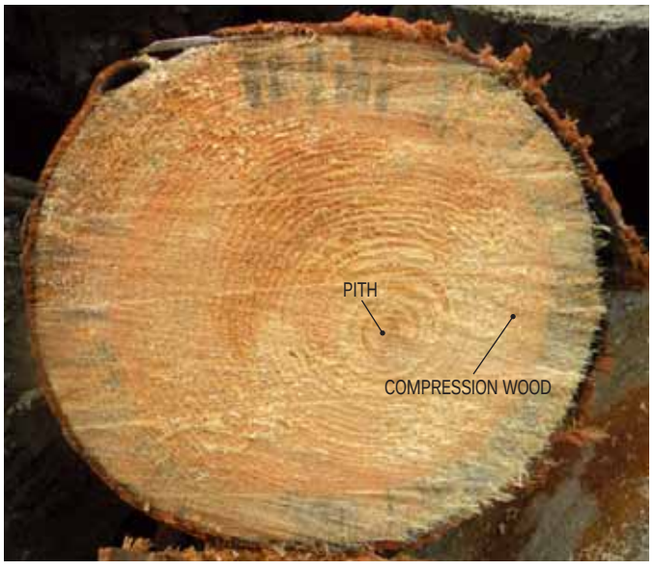
Tangential shrinkage is a different story. Wood shrinks markedly in this direction as it dries from the fiber saturation point to oven dry, in the range of 7 to 12 percent for most of our northeastern hardwoods and 6 to 8 percent for our softwoods. Thus, a 10-inch-wide board, with a seasonal moisture content variation of 3 percent, could be expected to change in width by up to 1/8 of an inch. This will certainly be noticeable in many applications.

Wood typically shrinks roughly half as much in the radial direction as in the tangential direction: in the range of 5 to 7 percent for our northeastern hardwoods, and 2 to 4 percent for our softwoods. This explains why quarter-sawn lumber (boards where the width is in the radial direction) is often considered more stable than flat-sawn lumber, and is sometimes specified for premium products.



Wood typically shrinks roughly half as much in the radial direction as in the tangential direction, which is why quarter-sawn lumber is often considered more stable than flat-sawn lumber.

Note that the above information applies only to normal wood. There are four types of wood that do not behave normally: compression wood, tension wood, juvenile wood, and wood with sloped grain. Compression wood and tension wood are referred to as "reaction wood." They form in the trunks of trees that are not vertical, with compression wood grown in conifers under the lean (as if it is trying to push the tree upright) and tension wood in deciduous trees on the upper side of the lean (as if it were trying to pull the tree upright.) Reaction wood also forms on branches, and at the junction of branches with the trunk. Juvenile wood is



Compression wood, which forms in the trunks of conifers under the lean as if it is trying to push the tree upright, is considered a reaction wood.

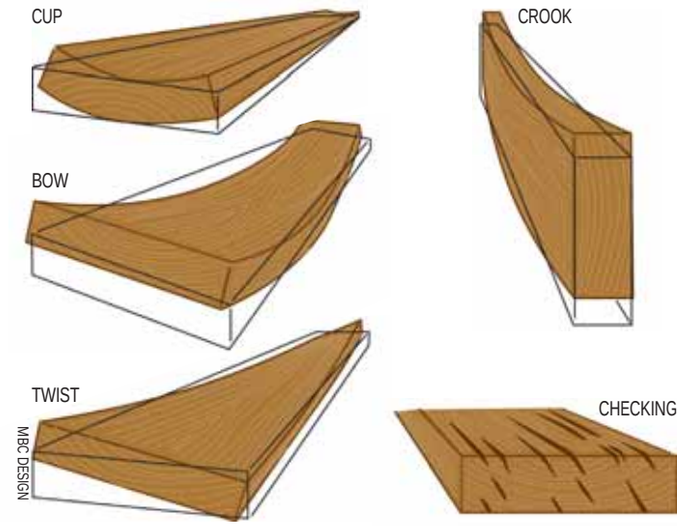
the wood that is within five or ten growth rings from the pith. And wood with sloped grain is wood in which the direction of the grain is not parallel to the length of the board. It occurs near the ends of boards where there was a large butt flare in the log, and in trees with spiral grain, where the tree's cells are not oriented straight up and down the tree, but rather spiral around it.

All these types of wood shrink markedly in length upon drying below the fiber saturation point. Note that reaction wood and juvenile wood are likely to be present in only part of any given board. This means that the board will try to shrink in length in some parts and not in others, which leads to bowed boards. This is quite common in preservative-treated boards at lumberyards, which are often made from plantation-grown southern pine. These trees have a lot of juvenile wood because they grew so rapidly: each growth ring is large. While the wood is excellent for pressure treating (it absorbs the preservatives readily), the large amount of juvenile wood causes problems. When the moisture content is above the fiber saturation point (and the wood comes out of the pressure-treatment cylinders fully saturated, and is rarely dried before shipment to lumberyards), the boards are nice and straight. Upon drying, however, the longitudinal shrinkage of the juvenile wood can result in dramatic bends. Boards with sloping grain can have a significant hook at the end (where the sloping grain is caused by a butt flare) or twist (where the tree had spiral grain.) In some cases, there can be so much twist that the boards look like propellers.

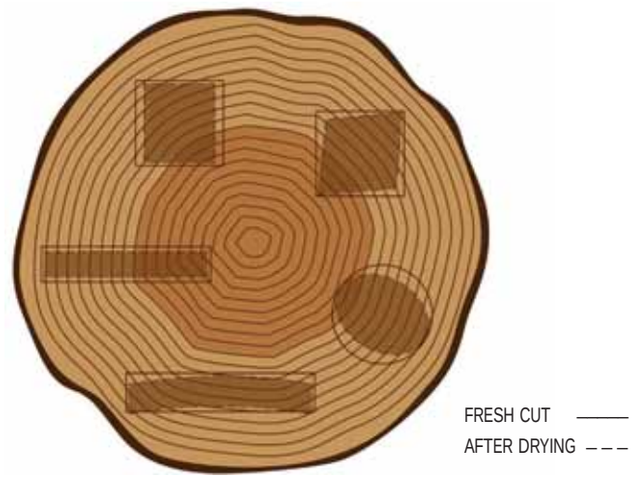
Even normal wood changes shape as it dries. Round cross-sections don't stay round, squares distort, and boards that aren't quarter-sawn cup. The drawing on page 46 shows the shrinkage

At right: Wood with a spiral grain, which forms when a tree's cells are not oriented straight up and down the tree, but spiral around it, shrinks markedly in length upon drying below the fiber saturation point.

For more information about wood and moisture, along with many other topics about wood, the preeminent source is the USDA Forest Products Laboratory's *Wood Handbook: Wood as an Engineering Material*. It can be downloaded from the Laboratory's website at www.fpl.fs.fed.us or can be bought as a hard copy from www.forestprod.org/handbook.



Radial and tangential shrinkage can distort flat, round, and square wood pieces because of the difference in shrinkage and the curve of the tree's growth rings.



and distortion that can be expected in normal wood.

The difference between radial and tangential shrinkage also causes problems. Since the radial shrinkage is about half the tangential shrinkage, the surface is stretched as drying proceeds. When the stress exceeds the strength of the wood, it breaks, creating cracks (called checks) parallel to the grain. Occasionally, a single large check will develop, but more commonly there will be many smaller checks. On square timbers with the pith in the center, it is common to have a significant check roughly centered on each face.

The owners of new log cabins and timber frame homes often notice an interesting side effect of the checking in logs and timbers: sometimes a check forms with a big bang. This is most likely to occur in winter, when the low humidity causes the wood to dry relatively quickly.

Compounding these stresses is the fact that wood dries from the surface inward. The surface has a lower moisture content than the inside. The faster the drying, the steeper the gradient in moisture content and the more checking. This gradient has consequences for lumber, especially thick lumber, as well as for poles and timbers. It can cause problems including surface checks (which sometimes close as the lumber fully dries, only to show up again when finish is applied), honeycombing (where the interior of the board collapses), and case hardening (where boards pinch saws and cup when being re-sawn into thinner material).

Practical Consequences

People who work with wood, whether constructing buildings, making furniture, or laying floors, can do a better job if they consider how the wood may change size and shape as its moisture content changes. Understanding how moisture content is measured in wood is the first step.

For lumber, plywood, and similar wood products, the moisture content of wood is calculated using this formula:

$$\text{Moisture content} = \frac{(\text{wet weight} - \text{oven dry weight}) \times 100\%}{\text{oven dry weight}}$$

This formula is counterintuitive: if more than half the weight of a piece of wood consists of water, you end up with a moisture content over 100 percent, and how can the water in a piece of wood be more than 100 percent? The beauty of this formula, however, is that it uses a constant for any piece of wood, the oven dry weight, as the basis for comparison to determine moisture content.

The most accurate method for determining the moisture content in wood is to cut a sample, weigh it, dry it in an oven at 218°F until the weight stops decreasing, and then use the above formula. Obviously this method has some severe disadvantages: samples must be cut, ruining boards or finished products, and it takes a fair bit of time for the drying, so the results are anything but fast.

To overcome these problems, moisture meters have been developed that measure the electrical or electro-magnetic properties of wood. Since these properties change with changes in moisture content, these meters can calculate the moisture content. When used properly, they can quickly and accurately determine the moisture content of dry wood, though they don't work well at moisture contents above 30 percent.

You *can* build with freshly sawn lumber; some people certainly do. (The squirt of sap when a nail is pounded home is sure evidence that the lumens contain plenty of free water.) But using green lumber has some disadvantages. For one, wet lumber is much heavier than dry lumber. More substantively, it can be difficult to tell which pieces contain reaction wood or spiral grain, and upon drying these will try to bend or twist, potentially causing aesthetic or structural problems. Another problem is that as the wood shrinks, cracks may open between pieces and the load will then be carried in unanticipated ways. Drying lumber first can reduce these problems: in addition to being lighter, any pieces of lumber that behave badly by bending or twisting can be discarded or used where their defects don't matter.

Wood is a wonderful material. It can be renewable, local, recyclable, and has far less embedded energy than most other materials. And it is beautiful. Many of the challenges of using wood are caused by the changes in properties, size, and shape that occur as the moisture content changes. Understanding the effects of moisture in wood makes it possible to factor them into the design of everything from buildings to furniture to toys.

Irwin Post is a forest engineer living in Chester, Vermont. He has extensive experience working with wood, including sawmilling, air and kiln drying, building, and woodworking.

Story and photos by Chris Mackowski

Christmas in July: At Work Making the World Smell Better with the Maine Balsam Fir Company

Imagine a life that smells like Christmas – that rich, deep-woods aroma of balsam that fills living rooms every December. For Jack and Wendy Newmeyer, it's the cozy smell of livelihood. Working among the boughs of their Western Maine woodlot, the Newmeyers harvest fresh balsam and sew the scent of Christmas into little decorative pillows, draft stoppers, and other housewarming gifts. It's their business to share the smell of Christmas all year long.

"I never get tired of it," says Wendy. "It's very uplifting, very energizing – it's a stress reducer, but it's an energizer."

Since 1983, the Newmeyers have been packaging Christmas in hand-sewn four-by-four-inch squares, building a company literally from the forest floor up. They handle some 40 tons of balsam annually, generating a quarter of a million dollars with a product line that now includes neck rolls, trivets for teapots, and draft stoppers.

"This has become our most important product because it functions," Wendy says, holding up one of the draft stoppers, a 42-inch cloth tube with an evergreen print on it. Handling it sends a fresh plume of balsam scent billowing through her showroom. It's the scent of nostalgia.

"The sense of smell is very powerful. It's tied in with memories – usually good memories," she says. "Christmas, or spending time in the North Woods, or at camp, or at Grandma's. I think everyone's grandmother in the Northeast had at least one balsam pillow, and so people remember Grammy as soon as they smell the scent."

With her silvery hair and ebullient energy, Wendy could be a cottage industry unto herself. She's always had an entrepreneurial spirit, she says: lemonade stands and pet-sitting services as a kid, macramé as a teen. She is the driving force behind Maine Balsam's explosive growth over the past 30 years. In 2000, the Small Business Administration named her Maine's Small Businessperson of the Year.

Jack, with a voice as quiet and careful as a door creaking open, provides the steady guidance for Wendy's dynamism. They make "complementary opposites," they say. Jack manages the couple's 123-acre woodlot while Wendy manages the store and the sales. Six employees help them stuff and sew.

The Newmeyers came to Maine in 1979 after a search that first took them to a dozen other states. "Our view of Maine was that it would be too cold and rocky, and not a lot going on," Wendy admits. "But as we looked at other places, we couldn't find the vibe we were looking for."

Jack had nearly a decade in as a police officer; Wendy worked as a newspaper carrier. Together, they dreamed of a place away, out in the country, where they could work the land and grow

Top: Jack Newmeyer stands in the drying room next to wooden trays of shredded balsam fir branches. Four hundred pounds of balsam are dried here each day. Bottom: Wendy Newmeyer in her shop.

their own food. "We didn't know what it would look like exactly, but we knew what the elements would be," Wendy says.

"We did know we wanted big, old trees," Jack says. "We wanted something that hadn't been cut over recently."

To build their nest egg, they each plunked down $20 on the kitchen table every week. They didn't eat out. They lived thriftily.

By the fall of 1977, they settled on a piece of property in West Paris, Maine, and in 1979, they made their move. They set themselves up in a camper, a frugal existence with no electricity and no running water, so they could invest their money and effort in their property.

"We originally thought we'd be farmers, but the property didn't really lend itself to it," Wendy says. "We noticed that other people in town who were making a living off their land were getting it out of the woods."

So Jack bought a 1967 John Deere 350 bulldozer with a

winch and fixtures to pull logs out of the woods, and soon he was harvesting trees for pulp. The branches, which collected in heaps on the forest floor, became waste.

Wendy soon found a use for them. She started selling the stripped branches to an incense factory in nearby Lewiston. "The branches had to be fully needled, no thicker than a pen, nothing longer than sixteen inches," she says. "We didn't mix in spruce or hemlock like some of their other suppliers did, either. You can't do that. Balsam has a very distinct smell."

Soon, she was making as much from selling the branches as Jack was making from selling the pulp. And then, Wendy says, came "the blinding flash of the obvious."

"I realized this was more than just a nice scent," she says. "It had a lot of potential."

Indeed it did – so much so that, by 1995, the Newmeyers had grown their company so dramatically that it was pulling in half a million dollars and handling 90 tons of balsam annually. That forced a gut check. "Too much business isn't really a good thing," Wendy realized.

"It didn't really seem like we'd accomplished what our original goal was: to come to live in the country and live a nice little calm life," she explains. "We weren't even gardening for a few years, and that was one of our main goals."

Not wanting to become victims of their own success, Jack and Wendy put the brakes on their balsam boom and began to scale back. It's hard to enjoy the scent of balsam, they realized, when you can't even catch your breath.

An employee at Maine Balsam Fir Products scoops dried balsam into a pillow.

Before even building a home, Jack built a multi-purpose barn, still in use today. He cut the logs, milled the boards, raised the building. They affectionately call it their "world headquarters."

A loading door set on a metal track slides open, revealing large bins heaped full of balsam on either side of the loading area. Wendy picks up a branch and points to the flat array of needles. "This one was either young or it grew in the shade," she says. Needles on shaded branches arrange themselves in a flatter configuration than needles that get more sun, which grow in a rounder configuration that looks more like a bottle brush. Flipping it over, she points out the two white lines on the bottoms of the needles – the balsam's distinctive trait.

Inside, the branches will get fed through a shredder and then wheeled into a drying room where towers of wooden trays, stacked 25 high, line the walls. The scent of balsam hangs raw and thick in the air. It takes two heaters, an air exchange unit, and a pair of powerful fans working from four to twelve days to dry the balsam. Four hundred pounds of balsam come in each day; it weighs half as much by the time it's dry.

"It really concentrates the aroma," Wendy says. "It's not the same as just sweeping up the needles from the floor after you make a wreath, which is how some companies do it. You have to break up the needles and the tiny twigs and stems. It exposes the oils in the bark and makes the scent stronger."

Outside the drying room, a woman sits at a workbench and funnels scoopfuls of dried balsam into little pillows made by the company's four seamstresses. The patterns feature what one might call the symbols of Maine – lots of moose, loons, blueberries, and pine cones.

"It's not just how good the scent is. People love the smell, but it has to look good, too," Wendy says. "People buy with their eyes first."

Nearby, another employee sews the pillows shut. In this way, all by hand, the company produces several hundred products a day.

The finished products ship out to wholesale customers that range from small gift shops and museum stores to national parks, although seventy-five percent of their annual business comes from fewer than 100 accounts. They also retail their products through their store, at craft shows and country fairs, and through their catalogue and website, www.mainebalsam.com.

"At this level, we can tightly manage the company," Wendy says. "It's been pretty sweet."

The work days are still long, but they're more manageable now than they were in the mid-1990s. The slower pace gives Wendy and Jack the time to better enjoy the business – and their woodlot. "When I'm out there with my dozer and chainsaw, sometimes I can just shut things off and sit under a tree and enjoy the quiet," Jack says. "I can go from all that noise one minute, then total stillness. It's like another dimension."

They can hear the birdsong, Wendy says, and listen to the crickets. They can enjoy the fresh air and the smell of the forest.

It smells a lot like Christmas.

Story by Virginia Barlow
Illustrations by Adelaide Tyrol

American Basswood, *Tilia americana*

It's hard to find a sizeable basswood tree that hasn't had its bark well and truly hammered by sapsuckers. How the tree survives with so many rings of holes is a mystery to me. The birds seem to choose basswood (also known as linden) sap over all the other trees. Meadow voles, rabbits, deer, and porcupines all eat the bark.

yellow-bellied sapsucker

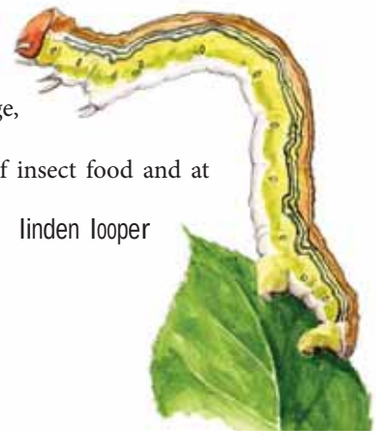
Basswood is also a preferred food for many insects, especially caterpillars. When the subject of leaf-eating insects comes up, it's hard not to take the tree's side. A leaf with holes in it seems to beg us to do away with the chomping culprits. But trees – and just about every other green thing on this earth – have supplied insects with food for as long as there have been insects, and most of the time there's plenty of food to go around. It's not exactly a cooperative arrangement, but it works. Insects and green plants have been in an arms race of sorts and over many millions of years and the chemical defenses of trees and the metabolic strategies of insects to disable these chemicals are closely matched.

Basswood leaves, at 5 or 6 inches long and almost as wide, are among the largest leaves of all the forest trees in the Northeast and, normally, you would never know that they are being converted into insects. Year after year, the big leaves cast dense shade on the ground below. Vast numbers of caterpillars and other insect larvae are getting fat on basswood leaves without creating so much as a pinprick in that shade except during periodic peaks in the tent caterpillar population.

Most birds are more or less made of insects – especially nestlings, which consist of close to 100 percent insect. The other fraction is supplied by spiders. And what do spiders eat? Mostly insects. Well, some spiders do eat other spiders, but they in turn have probably eaten insects.

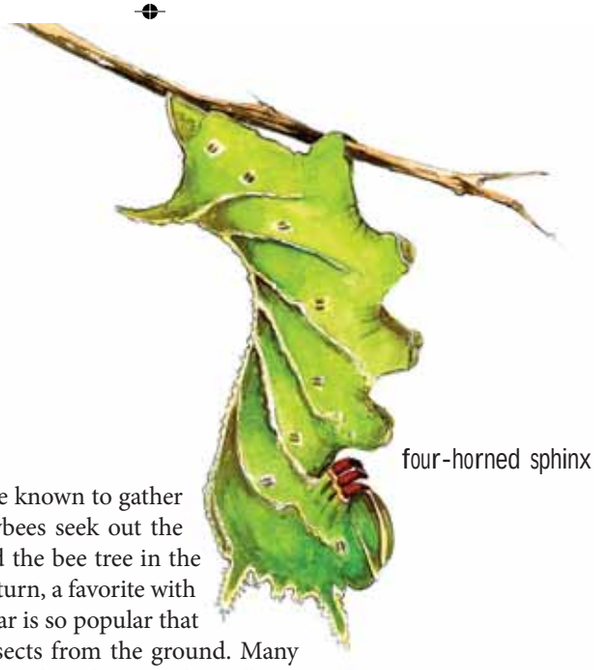
Many migrating birds time their arrival to coincide with the first leaves breaking from their buds. The linden looper (*Erannis tiliaria*) does the same thing; its caterpillars are among the first that a travel-worn warbler will find. Sometimes this species is called the winter moth because it is so well adapted to cold temperatures. And not only are the caterpillars available early in the spring, but the adults don't emerge until October, when it's cold and other insects have disappeared. Flycatchers can fatten up for migration on the hardy moths. Interestingly, like many other cold-adapted Lepidoptera, the females are wingless.

The succession of caterpillars that basswood is host to includes some stunning specimens. The four-horned sphinx caterpillar (*Ceratomia amyntor*), for instance, grows to 3.5 inches and may be either brown or green. In addition to a tail horn, it has four horns near the front of its body. The horns and much of the rest of the body are covered in white-tipped granules. Like many other hornworms, the larvae rear back when disturbed. The gray-brown adults, too, are large, with a wingspan of 4.5 inches. Look for them in July.



linden looper

In early July, basswood flowers are another source of insect food and at



four-horned sphinx

least 66 species – an unusually high number – are known to gather nectar and/or pollen from the blossoms. Honeybees seek out the flowers to such an extent that basswood is called the bee tree in the southern part of its range. Basswood honey is, in turn, a favorite with people. The tree flowers abundantly and the nectar is so popular that sometimes you can hear the hordes of eager insects from the ground. Many kinds of flies join the bees during the day and moths take over the pollinating at night. The flowers, and later the seeds, hang in bunches from the middle of a long, thin, light green bract.

A mature basswood, at 80 feet tall and 2.5 feet in diameter, is a bit large for a normal backyard, but in a more expansive setting, such as a park, it's a stately and elegant tree. The lower branches are shed and the upper ones have a nice way of sweeping downward before turning back up at the tips. If only the sapsuckers could be persuaded to let up on their drilling, this elegant species would win any tree beauty contest.

In the forest, its lovely shape and shade are not as apparent, and basswoods growing in clumps from stump sprouts are more common than single-stemmed, seed-grown trees. It retains the ability to sprout vigorously from a stump even when sawlog-size. When managed for timber, the many sprouts can be thinned to one or two. If this is done early enough, when the sprouts are less than 2 inches in diameter, a basswood has a good chance of reaching the canopy because it can use the existing root system and just concentrate on growing upwards.

It's good that it can grow from the stump because the seeds, although they often are abundant, are very reluctant to germinate, perhaps because they have a very tough seed coat. They sit around for months or even years before sprouting, giving chipmunks, mice, and squirrels plenty of time to eat most of them.

You may find the tree growing in many situations, but rich, deep soils produce the finest specimens. Where nitrogen is scarce, basswoods will grow, but only very slowly. It's a fairly hardy tree, found throughout the Northeast and North-central parts of this country and in southern Canada, but basswoods are quite scattered and almost never in pure stands. Before much of the Northeast was cleared for farming, basswood was much more common.

eastern chipmunk

Although the wood is weak, it is well suited for a number of uses. Lightweight (compare its 26 pounds per cubic foot to sugar maple's 44), it is soft and easy to carve, even-textured, and free of knots, and the annual rings … barely visible. In the old days, it was used for ships' figureheads and berry baskets. It's still used for toys, models, decoys, and comb honey frames. Traditionally, it's been the only wood used for comb honey boxes because thin sections can be bent 90 degrees without breaking. Plus, it is tasteless and odorless and thus won't contaminate the honey – perhaps basswood honey – with which the bees fill the boxes.

The bark is as strong as the wood is weak, a feature well known to American Indians who made it into twine, rope, mats, baskets, and bandages. The name basswood comes from "bast," the woody fibers of the inner bark, which are the strongest of any North American tree. When the bark is soaked in water, the strong inner bark is easily detached from the rough outer layers.

By Todd McLeish

Pitcher plants offer slippery inspiration

Pitcher plant

When it rains, the cupped leaf of the pitcher plant becomes so slick that ants, spiders, and other prey attracted to its sweet aroma slide into the plant, where they drown and are dissolved by plant enzymes and bacteria. A team of engineers at Harvard University analyzed the pitcher plant and created a patented slippery coating that repels blood, oil, and other liquids from a wide variety of surfaces.

"The surface of the pitcher plant has tiny microstructures that help to trap fluid on it," explained Tak-Sing Wong, a postdoctoral fellow at the Harvard University School of Engineering and Applied Sciences. "This thin water film acts as a lubricant, so when insects walk on the slippery surface, they can't grab on and they fall into the plant's stomach."

"The effect is similar to when a car hydroplanes, the tires literally glide on the water rather than on the road," Wong said. "In the case of the ants, the oil on the bottom of their feet will not stick to the slippery coating on the plant. It's like oil floating on the surface of a puddle."

Inspired by the plant, Wong and several colleagues designed a strategy for creating slippery surfaces by infusing a synthetic porous material, containing microstructures with a lubricating fluid. The scientists call their product SLIPS: Slippery Liquid-Infused Porous Surfaces.

According to Wong, some liquids have a chemical affinity to particular materials, which makes them adhere better. The researchers created SLIPS by identifying a lubricant with strong carbon-fluorine bonds that has an affinity for a Teflon-like material.

The new product repels a wide variety of liquids and solids. Wong anticipates that the coating could be used on the inside of oil or water pipelines to speed the transport of their contents and in medical tubing, like catheters and blood transfusion systems, to reduce drag. Other potential applications include self-cleaning windows and surfaces that resist bacteria and other types of fouling, like that which forms on ship hulls.

The nearly frictionless surface of the product persists under extreme conditions, including high pressure, humidity, and cold temperatures. Its ability to repel ice may make it useful on refrigerant coils in freezers, air conditioners, and related equipment.

"The versatility of SLIPS, its robustness, and its unique ability to self-heal make it possible to design these surfaces for use almost anywhere," said Joanna Aizenberg, Harvard professor of materials science and co-author with Wong of a paper describing the technology in the journal *Nature*. "It potentially opens up applications in harsh environments, such as polar or deep sea exploration, where no satisfactory solutions exist at present."

When it acid rains, it pours

Acid rain has long been known to acidify the calcium-poor soils in parts of the Northeast, resulting in declines in sugar maple and other important tree species. New research by ecologists at the University of Michigan has identified another threat from acid rain that could cause an even greater decline of sugar maple forests in coming decades.

Scientists led by Donald Zak have concluded that excess nitrogen from acid rain slows the microbial decay of maple leaves on the forest floor, resulting in a build-up of leaf litter that creates a physical barrier for seedlings trying to reach sunlight and a barrier for their roots seeking soil nutrients.

"We had previously documented that experimental nitrogen deposition at rates that will happen by the end of the century slowed the decay of plant litter," Zak said. He reasoned that if the thickness of the litter layer is increasing, the sugar maple seedlings will struggle to survive.

According to Zak, nitrogen deposition from acid rain is expected to more than double worldwide by the end of this century, due to the increased burning of fossil fuels. For the last 17 years, Zak and his colleagues have added sodium nitrate pellets to three test plots in each of four sugar maple stands in Michigan to simulate the amount of nitrogen deposition expected by the end of the century.

He found that the extra nitrogen increased the amount of leaf litter on the forest floor by up to 50 percent, causing a significant reduction in the successful establishment of sugar maple seedlings. The abundance of second-year seedlings declined from 13.1 stems per square meter under present nitrogen conditions to 1.6 stems per square meter under simulated nitrogen deposition. The abundance of seedlings between three and five years of

age also declined from 10.6 stems to 0.6 stems per square meter.

"Increased nitrogen has a negative effect on the fungi that are the primary agents of litter decay in the forest," Zak said. "It slows their ability to decay dead leaves."

Sugar maples in the Great Lakes region, where this study was conducted, have been spared the type of damage that has already taken place in the Northeast, because the calcium-rich soils provide a buffer against soil acidification. This new threat is raising considerable concerns.

"Increasing nitrogen deposition has the potential to lead to major changes in sugar-maple-dominated northern hardwood forests in the Great Lakes region," said botanist Sierra Patterson, who conducted most of the fieldwork for the study. "In terms of regeneration, it looks like it will be difficult for new seeds to replace forest overstory in the future, so the populations of sugar maples in this region could potentially decline."

Zak said that although his research did not examine forests in the Northeast, the logical assumption is that forests there will suffer from the combined effects of acid rain – deteriorating soils and declining leaf litter decomposition.

Like moths to a short wavelength

Those interested in observing the night sky are often frustrated by the glow of population centers and street lights that makes it difficult to see all but the brightest stars. But stargazers aren't the only ones distressed by excess lighting. As almost everyone with a porch light knows, moths are attracted to artificial lights and may spend hours every night circling lights and bouncing off lamps, where they become easy prey for predators such as screech owls and bats.

Last year, Dutch scientists from Wageningen University, Dutch Butterfly Conservation, and Philips Lighting conducted a study of moth attractiveness to lighting of different wavelengths, which was published in the journal *Biological Conservation*. "The use of street lighting, security lighting, and other urban light sources negatively affects many animal and plant species," the scientists wrote, "and it is considered to be one of the major threats to moth populations."

Different light sources vary in their spectral composition, which plays an important role in determining how attractive a light may be to insects. Previous research suggested that lighting with shorter wavelengths (those with a high ultraviolet component), like high-pressure mercury and sodium vapor lights commonly used for street lighting, attract more moths, while LEDs, which emit no UV, attract fewer insects. But little was known about the species that are attracted by particular wavelengths.

In a six-week study, the researchers tested six different types of light bulbs, including standard incandescent and fluorescent bulbs and the actinic lamps often used in aquariums and photography. The scientists, led by Frank Van Langevelde, set up moth traps in a nature preserve in the Netherlands and analyzed the species composition and physical characteristics of the moths attracted to each type of lamp.

A total of 112 moth species were caught during the study period, with the greatest variety and abundance found at the lamps with the shortest wavelengths. These lamps were particularly attractive to moths with the largest body mass, the largest wing dimensions, and the largest eyes, meaning that areas with high UV lighting may threaten large moth populations. The researchers say that if larger moths are disproportionately harmed by artificial lighting, then the plants pollinated by these moths may be at a greater risk of decline than those pollinated by smaller moths, and those animals that prey on large moths may also be at risk of going hungry.

These findings also suggest that people who make decisions about street lights and other artificial lighting should select lamps with longer wavelengths to reduce the effects of light pollution on moth populations. The next step is to investigate whether the predicted ecological changes are already occurring in brightly lit environments.

GERT GELMERS

White ermine moth (*Spilosoma lubricipeda*)

AB BAAS

Blood-vein moth (*Timandra comae*)

By Carl Demrow

Buying a Chainsaw

ANDREW CROSIER

Unfortunately for this arborist, neither this Stihl 88 or this little Echo with the 12-inch bar is the right saw for this job.

Chainsaws are powerful tools, and you'll work more quickly, safely, and efficiently if you own a good one. But with all the options out there, buying a chainsaw can be an overwhelming experience. Before you plunk down your hard-earned coin, here are a few tips that will help you find the right chainsaw for your needs.

The first question to ask yourself is what you're going to use the saw for, as a homeowner cutting up fallen branches has very different needs than a professional logger. Several chainsaw companies have handy online tools that do a good job of matching saws to the frequency of use and type of work.

You'll need to weigh power and balance. Chainsaw power is measured by displacement, which is the volume displaced by the piston in its upward stroke. Displacement is measured in cubic inches or centimeters. The larger the displacement, the more power generated by the explosion of the compressed fuel/air mixture that drives the piston. If you're harvesting and working up several cords of firewood a year, you'll want a saw with between 45 and 55 cubic centimeters (cc) of displacement. A "landowner" saw in this category will cost between $300 and $450, and weigh between 11 and 13 pounds. If you are just occasionally cutting up limbs and not doing any felling or firewood, you can get a 10-pound, 40cc saw for around $250. Pro saws start at about $500 for 50cc displacement, and go up to over $1,200 for 90-plus cc displacement.

As you see, more power means a larger, heavier powerhead, and saw weight should be a consideration. A logger who works in the woods every day has the back muscles to carry a 15-pound saw for hours on end. If you don't have these muscles, even a few hours of working with a heavy saw can leave you in pain. Purchase a saw powered for the type of work you will be doing, and your back and wallet will thank you.

As for the question of bar length, long bars have both advantages and disadvantages. A longer bar will allow you to cut a wider log or tree with one cut, and it may mean less bending to cut wood on the ground. But longer bars are more difficult to control and place more weight away from your body, which will stress your back. Longer bars also mean more sharpening time when you hit the inevitable rock. A 16- to 18-inch bar should be more than enough for most folks.

If you are going to use a saw regularly, I suggest buying from one of the companies that primarily make saws, such as Jonsered, Husqvarna, and Stihl. Service and parts will be much easier to come by, and these are companies invested in making quality, safe chainsaws, and not much else. They also manufacture a wide array of saws that are right for anyone from the casual brush-cutter to the professional arborist and logger. Buy it from your local dealer, who will also service your saw. Keep in mind that you can't take your saw to a big box store for service, and unless you're a mechanical whiz, sooner or later you'll need help from a professional.

Finally, keep in mind that buying a saw is just a first step. No saw works with a dull chain, so you'll have to learn how to properly sharpen your chain and set your depth gauges. (Editor's Note: See Tricks of the Trade Spring 2006 for chain sharpening tips.) You'll also have to learn how to safely and effectively use it, if you want good results. Take a training course or two, or find a mentor. You may find your saw to be one of the most productive and rewarding tools you've bought in a long time.

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By Robert Kimber

A Kitchen with a View

Rita and I tend to make major life-changing decisions on impulse; then we'll dither over trivia, like buying a new can opener.

"The old one still works, doesn't it?"

"Yes, but I've never liked the handle on it."

"Well, before we rush into something we'll regret later, let me do a little comparison shopping."

But offered the prospect four decades ago of spending our meager life savings on a 100-acre Maine homestead and a wrecky old farmhouse, we reached agreement in a matter of minutes.

On a cold, windstill February afternoon under an immaculately blue sky, we circled the house once on snowshoes and wandered along the course of Temple Stream, winding its way through the bottomland fields.

The exterior walls of the house were festooned with cracked, dangling clapboards; inside, the previous owners, preparing the way for a total renovation, had torn out the walls and ceilings – plaster, lath, and all. A few ancient light fixtures dangled overhead from runs of BX cable. In the kitchen, a lone cold-water pipe stood sentry over the sink. A bleak prospect.

But when we went over to the kitchen windows, which look northwest up Temple Stream's valley, we forgot the bleakness of the indoor scene behind us and reveled in the glory of the outdoor one before us.

"Lovely, isn't it?" I said.

"Yes," Rita said. "Beautiful."

And that was that. We were sold.

Now, before we go any further, I have to add that our view is neither spectacular nor panoramic. There are hilltop locations in our neighborhood where the whole spread of Maine's western mountains – all the 4,000-footers from Saddleback to Bigelow – seem to fill the horizon. Not so here on the Temple intervale. Hills rise right up on either side of this little valley, and Spruce Mountain, which closes off our view and the end of the valley, is only about four miles from our kitchen and 2,600 feet high. Small potatoes as Maine mountains go.

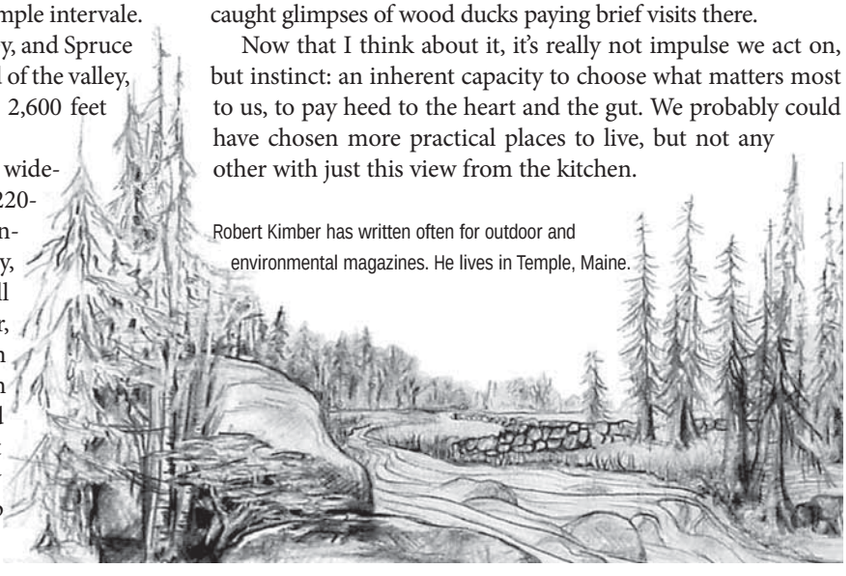
So our view is a modest one, not made for the widescreen. If I lived on a high hill with a 180- or 220-degree view, I might get to thinking I was monarch of all I surveyed. Down here in this valley, where the hills begin at my doorstep and then roll away to the northwest, climbing a little higher, ridge by ridge, I feel instead like a fellow citizen living in close company with those hills and with the trees that cover their sides, the squirrels and deer and bear that roam them, the brooks that rise and flow among them. Our small-scale view discourages megalomania and makes our kinship with this place vividly clear to us.

Because those kitchen windows we first looked through were only two and spaced nearly three feet apart, the first improvement we made was to install a third window between the existing pair. We contemplated a picture window, but then realized it would have been a breach of style for this traditional one-and-a-half-story Cape.

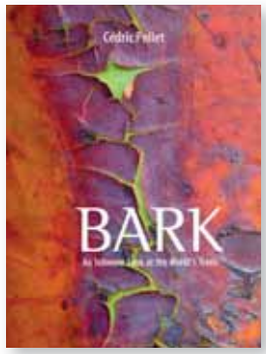
On one level, the new window was a stupid move because the north wind comes roaring down this little valley in the winter hard enough to play our metal roof like a steel drum and drive snow in through the smallest cracks. In our first winter, we often woke to find mini-snowdrifts on the sills of our triple kitchen windows, and we would quickly discover other practical failings of a nineteenth-century farmhouse, like the loose rock foundation that admits ready access to both rodents and heavy rains. But we were not about to let a few drafts lessen our enthusiasm for our view. We fell in love with this place for its beauty and accepted its little failings into the bargain.

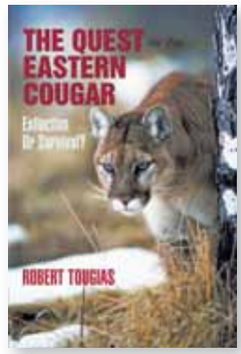
By now, we have eaten approximately 43,800 meals seated at the long table we placed up against those windows. Month after month we take in – with breakfast, lunch, and supper – the gradual shifting of the seasons. Minute by minute, we watch the summer sun drop behind the hills and paint the underbellies of the clouds crimson, then deep purple. The wolf pine growing just to the right of the house, a big tree when we came here, towers over us now and, lit by the winter's rising sun, flings its shadow far out on the snow-covered hayfield. On clear, crisp days in the fall, Spruce Mountain seems close enough to reach out and touch. In mist and drizzle, it's a ghost mountain hardly visible at all. In the spring, with the windows open, we've heard the pile-driving "oonk-ka-chunk" of a bittern in the marshy ditches of the hay field, and sometimes caught glimpses of wood ducks paying brief visits there.

Now that I think about it, it's really not impulse we act on, but instinct: an inherent capacity to choose what matters most to us, to pay heed to the heart and the gut. We probably could have chosen more practical places to live, but not any other with just this view from the kitchen.



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





Bark: An Intimate Look at the World's Trees

By Cédric Pollet
Frances Lincoln Ltd., 2010

Cedric Pollet's *Bark*: *An Intimate Look at the World's Trees* ranks with the day in November 1972 when I walked into Chartres Cathedral and saw the magnificent stained-glass windows. Words – no matter how superlative – cannot do justice. That tree bark is often overlooked and unappreciated beyond its utilitarian functions makes the images in this big, beautiful book that much more breathtaking.

While studying in the landscape design department at Reading University in 1999, Pollet taught himself to take photographs. He was captivated by English gardens and sought to capture them on camera.

"After spending a lot of time visiting gardens in search of what I hoped would be my ideal subject, I realized one day that flowers really didn't do much for me," Pollet admits in the introduction of *Bark*. "But I couldn't leave without some kind of a souvenir. On my way out of that garden, the gnarled trunk of a centuries-old oak tree caught my attention and opened my eyes to a hitherto unknown domain: the world of bark."

In that moment 13 years ago, Pollet found his life's work.

He spent the next 10 years traveling around the world photographing the most unusual, beautiful images of bark he could find. As a result, *Bark* is a magic carpet ride that visits 25 nations on six continents – starting in Europe and ending in Africa. Pollet's tour features more than 80 trees and shrubs.

Each two-page spread stands on its own as a composition. And you don't have to start at page 1 and proceed to page 192 to enjoy this book; the stand-alone photographs and brief text allow you to plunge in anywhere.

Most of the trees merit a two-page spread. On one page you'll find a full-page photograph of bark, while the opposite includes a small block of text packed with the common and scientific names of the tree, its historic uses, lore, other intriguing information, and additional photographs. In a couple of instances, some facts are incorrect; perhaps these minor discrepancies occurred when the book was translated from French to English. It doesn't really matter. If you want a field guide about trees, look elsewhere.

Additional photographs complement the full-page photographs. The images are startling, brilliant. The colors range from gaudy to subtle. Pollet's genius is his acute eye for color, light, form, and texture. He has filled his book with page after page of stunning, breathtaking images – more than 400 in all.

First published in 2008 in France, *Bark* received the *Redouté Prix Artistique* in 2009 for being that year's most beautiful book on plants. And no wonder. *Bark* is a fabulous art show bound within the covers of this luscious, coffee-table book. From pines to palms to oaks to ocotillos – whatever the species – expect the unexpected from *Bark*. Then savor it.

Find a way to see this book. If you cannot justify spending $45 to buy *Bark*, then borrow it from your local library. This magnificent book may forever change how you look at trees.

Ann Davis

The Quest for the Eastern Cougar: Extinction or Survival?

By Robert Tougias
iUniverse, 2011

When I first moved to Vermont, a neighbor told me his wife had seen cougar tracks up and down the ridge behind my home. Every night that winter, as I hoofed it up my long, steep driveway – my car unable to handle the snow-packed drive – I imagined coming face to face with a giant, snarling cat. "Could there be cougars here?" my flatlander mind wondered. While my own fears of running into a cougar have faded with time, to many people in the Northeast, this question remains unanswered.

In *The Quest for the Eastern Cougar: Extinction or Survival*, Robert Tougias takes a close look at the sightings, studies, and history of *Puma concolor*. Tougias, a nature writer and columnist, packs the book with stories of cougar encounters, from the anecdotal tales of locals throughout the East who are sure they have seen the "painter" to the personal accounts of biologists and findings of privately formed organizations that have spent years trying to find proof of the cat's eastern presence. Beyond the stories, Tougias examines the possibility of the cougar's existence from all angles, including its history, habitat needs, prey populations, and the prospect of restoration.

By the late 1800s, cougars were largely believed to have been extirpated from the Northeast. Fear of this predatory animal by early settlers led to killings for monetary reward, and the clearing of land for both farming and logging and the over-hunting of white-tailed deer all led to the eastern cougar's demise, Tougias writes. In 1853, hunters took down the "last known cougar" in New Hampshire, while in 1881, Vermont hunter Alexander Crowell shot the "last" cougar in Vermont.

But with the Northeast reforested in some areas, large tracts of undeveloped land, healthy prey populations (including white-tailed deer), and about 10,000 reported eastern cougar sightings since the 1960s, could there be cougars living among us? Is there a wild breeding, self-sustaining population, or just the occasional straggler from the West or loosed pet? In March 2011, U.S. Fish & Wildlife officially declared the eastern cougar

extinct. Is this the end of the story?

To try to answer this question, Tougias documents the research of numerous wildlife biologists such as Bruce Wright, who claimed to have spotted cougars several times, and Virginia Fifield, a Massachusetts biologist who, in 1972, studied the possible existence of cougars in Quabbin Reservoir – an area of concentrated cougar sightings – and eventually earned the cooperation of state fish and game officials in her research.

More recent findings – including DNA-tested cougar scat found in 1997 near the Quabbin Reservoir, the remains of a cougar found in that same area, and tracks officially reported as those of a cougar in northwestern Maine in 1994 – have revived interest in what Tougias calls "open-minded biologists."

Tougias also addresses the question of habitat. Could a cougar establish a breeding population in the East, where much of the land is fragmented? Tougias writes that reclusive predators, such as the cougar, "can tolerate the roads intersecting their habitat." Furthermore, Tougias says it is a misconception that cougars "require wilderness to live." They need cover for travel and to protect their young, but, he writes, cougars can survive in segmented areas heavy with human bustle, as evident by their activity in Florida and the suburban West, where it is not uncommon to hear of a cougar crossing a lawn.

Tougias also looks at advances in tracking animals, particularly DNA analysis. With DNA testing, biologists can better identify the origin of scat, skin, or strands of fur. But DNA is not always the easy go-to, Tougias writes, as any scat contains "countless DNA" from the animals it ate, as well as the diverse flora in its own digestive tract.

Tougias admits that after several decades of research there has been a "lack of any substantial evidence of a breeding population," but the future is open. He dedicates an entire chapter to ways in which research could be improved, such as employing skilled cougar hounds, more logical placement of remote cameras following a sighting, improving and standardizing the handling of evidence, and encouraging responsible media coverage.

Readers wanting a straightforward answer about the cougar's existence in the East may be left unsatisfied. The writer claims from the get-go, however, that this book is merely a collection of information, meant to provide some insight. The reader, Tougias writes, may draw his or her own conclusion about the animal's status.

Meghan Oliver

Peterson Reference Guides: Behavior of North American Mammals

By Mark Elbroch and Kurt Rinehart
Houghton Mifflin Harcourt, 2011

Once the *Peterson Field Guide to Mammals* has helped you correctly identify the mammals in your woodlot, you may want to take a plunge and unmask their busy and varied activities. Like *Star Trek*, the equally famous *Peterson Field Guides* have begun to morph into the next generation – the *Peterson Reference Guides* – of which there are three volumes. The most recent, *Behavior of North American Mammals*, adds meat to the bare bones of identification. The illustrations alone are worth the $35 price tag.

Behavior of North American Mammals is not meant to replace the classic *Field Guide to the Mammals*; it's a stout complement. As the authors suggest, their book could have been titled *The Secret Lives of Mammals*. And within this comprehensive and readable book is something for everyone, including your reviewer.

This past February, red squirrels frenetically chased each other back and forth across our dirt road, round and round the forest floor. Sometimes more than two squirrels were involved. I wondered whether this apparent seasonal activity was in defense of food caches or territories, or whether it was the initial stage of courtship – a short line of males wearing down a potential but reluctant mate? I consulted *Behavior* and found the answer. Both male and female red squirrels are promiscuous and, during the single day the female comes into estrus, males converge on

Purple Loosestrife

She's headed uphill
against traffic
lugging the plant she's dug
it's hot and her hair's come loose
the weight of it
unbalances
her the magenta spikes bob
so lanky
tufted with blossoms

you've got to admire
them
bright hitchhikers
how they make their way

escaping cultivation
so what if it's invasive
she thinks
it's beautiful
and she knows just the place for it
to go
wild.

Summery poems by Jody Gladding of Calais, Vermont, from her most recent book *Rooms and Their Airs* (Milkweed Editions, 2009)
www.milkweed.org

her territory and engage in "mate chase." The dominant male, positioned directly behind the female, periodically stops chasing her and runs after a subordinate male, attempting to usher him out of the neighborhood.

Each essay looks at a particular species or group of closely related species, and is divided into eight sections: activity and movement, food and foraging, habitat and home range, communication, courtship and mating, development and dispersal, interactions within the species, and interactions with other species. Surprising facts lace every essay. Fisher and marten, for instance, rotate their hind feet 180 degrees to climb headfirst down a tree; a New Hampshire study of 1,000 fisher stomachs found house cat hair in only *one*; should a female marten be in heat and the male not as prurient, she may "go ahead and mount him to jumpstart the process." Not exactly the Gene Kelly or Fred Astaire of the animal kingdom, wolverines nevertheless have the lowest weight to foot-size ratio of any North American predator, and can negotiate *deep* snow. A moose is a "stimulus groomer," driven to groom only by the annoyance of external parasites, while a white-tailed deer, a "programmed groomer," grooms whether it's infested or not.

Behavior of North American Mammals covers more than 70 species and goes well beyond the lives of just northern mammals. If you visit your mother in Florida and become enamored by a nine-banded armadillo, you'd discover in *Behavior* that an armadillo can survive with very little oxygen; when crossing a stream or pool it simply holds its breath and walks across the bottom. For a longer crossing, however, an armadillo gulps air, inflating its stomach to twice the normal size, and then paddles buoyantly across the surface, wind-tossed like an animated and armored bubble.

Ted Levin

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 costs 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.

These data are compiled from interviews with suppliers and buyers and from the most recent print and online 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	286	338	333	340
White Birch	350	228	233	350
Yellow Birch	363	433	482	470
Black Cherry	503	433	338	400
Sugar Maple	525	525	450	410
Red Maple	297	300	325	NA
Red Oak	392	419	400	455

Prices compiled May 1, 2012

Talking Pulpwood with Eric Johnson

Rebecca Rule's story on page 28 made us wonder about the current state of the pulp industry in the Northeast, so we asked Eric Johnson, program director for the New Hampshire Timberland Owners Association, to give us the lowdown.

What's the pulp market like these days in the Northeast?
When speaking of the pulp market in broad terms, it's important to differentiate between the softwood pulp market, dominated by hemlock and pine in southern parts and spruce/fir in northern regions, and the hardwood pulp market, dominated by soft maple, the birches, poplar, and in some regions, oak. Starting in early 2010, the hardwood pulp market has been quite strong. The softwood pulp market has been more volatile over that time, with the market declining heading in to the second quarter of 2012.

How does the current price being paid for pulp compare to other "low grade" wood, like firewood, biomass chips, and pallet logs?
The challenge when comparing pulp to other low-grade markets is that all these markets traditionally use different units in their pricing. Pulp is priced in tons, firewood in cords, and pallet logs by the MBF (thousand board feet). To make this more confusing, markets are very localized. For example, a 32-ton load of hardwood pulp delivered to a local pulp yard at $40 a ton would gross $1,280. That same load, delivered to a firewood producer might have up to 12 cords on it, depending on the straightness and diameter of the logs. Our local market pays $110 per cord, so that load would gross $1,320.

New Page paper mill, Rumford, ME.

As with any commodity, much of the pricing depends on local competition. A strong pulp market puts upward pressure on the firewood market and means that borderline pallet logs, which might have been sorted out in a poor pulp market, will often get sold by the ton as pulp.

How does the pulp being produced in the Northeast fit into the global market?
When a pulp log enters the pulp mill, it gets turned into a product known as "kraft." Kraft can be made from either hardwood, softwood, or a blend of the two. Kraft is sold on the global commodity market by the ton.

At times, a mill will produce more kraft than it needs for its own paper making, and will then sell the excess on the global market. In spring 2011, the global price for many forms of kraft hit near all-time highs. This was fueled primarily by increased demand in emerging economies such as China. As China's population becomes more affluent, its citizens will buy more rolls of toilet paper and paper towels. Some of the kraft used to make a roll of toilet paper sold in China probably came from a log harvested in the Northeast.

What's the outlook going forward?
Softwood pulp markets are pretty plugged up right now, and prices are likely to decline due to oversupply. One procurement forester for a mill said "we have our bellies full right now."

The hardwood pulp market trend is steady and looking to stay that way for the next six to eight months. While global markets do play a significant role in pricing for pulp and other low-grade forest products, it is important not to overlook the role of local weather. A warm and dry spring in 2012 meant that logging contractors were heading back into the woods sooner than expected. This could lead to an abundance of pulp on the market. Yet, all it would take to change that would be a tropical storm like Irene.

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Dianne Shullenberger, *Yellow Peony*, 12" x 11", fabric and thread, 2006

The surprise in Dianne Shullenberger's work is that her "paintings" are not made with paint. Her palette consists of snippets of fabric pinned all over her studio walls and hundreds of thread spools arranged chromatically in subtle gradations of color. She calls her technique "layered fabric collage."

She begins a piece by pinning large blocks of color to a thin paper ground and then overlays finer and finer detail, often applying tiny pieces of cloth with the tip of a pin.

"Fabrics have many different personalities; I manipulate them by wrinkling, coiling, pulling threads, cutting through layers, reversing sides, exposing raw edges, and constantly altering the textures and color combinations," she explains.

Once Shullenberger has set up and pinned her composition, she unleashes her 15-year-old Bernini sewing machine, removing its foot – the small attachment that exerts pressure on the fabric as it is fed under the needle. Without the restraints of this guiding foot, the fabric and thread can be encouraged to turn, stall, hesitate, or leap forward. Shullenberger, like a skilled improvisational dancer, is a wizard at this.

A painter is constantly making contextual color decisions: a yellow area surrounded by purple will appear more yellow than that patch surrounded by orange. Complimentary or opposite colors create maximum vividness. Shullenberger ups the ante with her art, as she must also constantly consider the inherent patterns and textures of the fabric and how they relate to each other.

"Yellow Peony" relies on the ability of our eye to blend the varying textures, patterns, and colors of Shullenberger's fabric. The merging of these often disparate visual elements creates a scintillating effect. In "Yellow Peony," as in much of Shullenberger's work, there is a sense of flickering sunlight and the whisper of wind in the leaves. — Adelaide Tyrol

Dianne Shullenberger is represented by Furchgott-Sourdiffe Gallery in Shelburne, Vermont, where she will have a solo show September 21–October 23, 2012. Her work has been exhibited at the Muskegon Art Museum in Michigan and is part of the permanent collection of the Chicago Art Institute. She may be reached through her website, www.dianneshullenberger.com, or through her gallery, www.fsgallery.com.

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

A PLACE in mind

Mary Cuffe Perez

On a gently raining day in mid-May, I start out with my cocker spaniel, Paco, for a walk in the Sandpit Woods, just up the road from my house in the rural town of Galway, New York. Like Paco, I am a searcher, and it's perfect weather for our purposes. Scent molecules are more easily detected in rain, all the better for Paco's quest, and after five days of on and off precipitation, I have a good chance of finding the object of my search – the yellow morel (*Morchella esculenta*), one of the earliest fruiting edible mushrooms.

You won't find the Sandpit Woods on anybody's list of favorite nature excursions. They have been made and remade like a flophouse bed – excavated, mined, lumbered, farmed, eroded by machinery, and littered with trash. They are a hangout for partiers and dirt bikers and the source of local lore. Town legend tells of lost children swallowed up by the sandpit, of fugitives hiding out in its deepest recesses, and, of course, of ghosts of the lost who still haunt the woods, looking for a way out. Add the cast-off car parts and occasional couches, and you have the makings of a horror movie set.

I passed the entrance to the woods for two years before the spring peepers finally called me in to have a look. Since then, it's been one of my favorite haunts.

Named for an abandoned two-acre sand excavation site at the entrance, the woods stretch well beyond the sandpit. More than 600 acres of mixed hardwoods and conifers cover glacial till descending into Ludlow Swamp, another 300 acres of wetland. The woodland is a unique environment of deep sand beds, black kettle ponds, and an outwash of boulders and stones, all belonging to the Adirondack Highlands before it was vandalized by the Wisconsonian Glacier some 15,000 years ago or so. All the recent surface revisions are nothing compared to the work of an ice age.

With its proximity to a large wetland, its diverse topography and soil composition, this derelict woodland supports a rich variety of plants, birds, mammals, amphibians, and other creatures between the piles of dumped tires, refrigerators, and a colorful assortment of cast-off clothing. Most of its features are courtesy of the glacier, but one of the most productive regions is a manmade pit that fills with snowmelt each April and functions as a vernal pool, frothing with the egg masses of frogs, toads, and salamanders. The pool is at its highest in mid-May, and is a magnet for kingfishers, warblers, and cedar waxwings. Dirt bikers, spinning out countless times, have carved out little islands that jut above the water level and provide nesting sites for Canada geese and mallard ducks until the pond dries up in mid-August.

The pool, which should be rollicking with the chorus of amphibians, is mute on this rainy day and the warblers are only murmurs in the understory. I pass the pond and a heap of tires, which will soon be lost in a snarl of raspberry bushes, and climb the deeply eroded hillside to the next tier: a different story entirely. Here, the path pitches along a slope forested with mature white pine. A northern goshawk nests in one of these pines each spring, and those who walk this path risk being dive-bombed by the ferociously territorial accipiter. But today rain imposes a new order. Petals fold, songbirds hush, and even the goshawk forgives trespasses.

Paco and I hurry through the hawk's territory and follow the path into another excavated area of the woods. It's a minefield of metamorphic and igneous rock, rounded and smoothed by the forces of the retreating glacier. They're just rocks any other day, but rain brings out the colors of their mineral compositions – ochre, blue, green, ebony, and red. The path curves back around a kettle pond, where I have often found painted turtles sunning themselves on logs, great blue herons on the hunt for frogs, and ducklings cruising the shoreline. But today nothing disturbs the surface but the dimpling of rain.

Just past the pond is where I expect to find morels. I study the root zone of the ash carefully, searching through last year's leaf litter. But today is not the day. I imagine them tucked into their mycelium, like warblers snug in their nests, waiting for the rains to end. Looking so intently and vainly for morels, I discover what I would have walked right by any other day: a round-leaved yellow violet, beaming up at me through the rain-slicked vegetation from behind a bead curtain of miterwort. Today is its day to shine. A miniature sun in its own universe.

It's raining harder now. Paco and I take a shortcut out of the woods to the road. As I clip on Paco's leash, I hear a rhythmic tapping nearby. I'm hoping to catch sight of the magnificent pileated woodpecker, but the tapping calls me to the roadside, not the tree tops. It's rain falling on a beer can. Music found.

Mary Cuffe Perez is a writer and woods roamer who lives in Galway, New York. Her latest book, *Nothing by Name*, inspired by a local farm woman, is available at www.marycuffeperez.com.

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