The Place You Call Home

A Guide to Caring for Your Land in Connecticut

A Northern Woodlands Publication

Northern Woodlands

The Place You Call Home:
A Guide to Caring for Your Land
in Massachusetts
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Welcome

There was a time, centuries ago, when caring for your land meant clearing it of trees. Those were the days when human industry was both a means of survival and a moral calling. Picture an early pioneer hacking away at the precolonial forest in an attempt to bathe the land in light.

Today, thanks in large part to the hard-won lessons of the past, we're a lot more knowledgeable, and careful, when it comes to forest stewardship. Today, ecologists understand the interplay between soil fungi and tree roots and the carbon dioxide in the atmosphere. Wildlife biologists are well versed in what different animal species need on any given parcel of land – from the spotted newts on the forest floor to the raptors in the sky above. Foresters have a keen understanding of how to grow high-value sawlogs and, just as importantly, how to manage forest disturbances with an eye on ecosystem health.

Collectively, we're more enlightened than we've ever been. The irony, of course, is that as our world becomes more disconnected from nature, owning forestland has become a more passive and disengaged endeavor. Many of the fields and forests in southern New England suffer from a kind of benign neglect. The environmental movement has done a great job of raising awareness of the damage humans can do to the natural world; there's less awareness of the good people can do by being thoughtful caretakers.

We hope this publication is a small step toward changing that. It is intended to be both a celebration of our region's forestland and a forestland owner's manual. If you're new to active management you'll learn all the basics, like what a forester does (and where to find one), what a good logging job looks like, and how to improve the wildlife habitat on your land. If you're already actively managing your land, we've provided information that can help take your management to the next level. Can you prune hardwoods for profit? How do you bring back old apple trees? How do you go about selling or donating a conservation easement that will ensure your woods stay woods after you're gone? We hope you'll find this guide useful as you develop, or refine, your forest management strategies.

The poet Delmore Schwartz famously pointed out that "in dreams begin responsibilities." It's nowhere near as lyrical to say that in forestland ownership begins responsibilities, but it's equally true. — Dave Mance III

KARI POST

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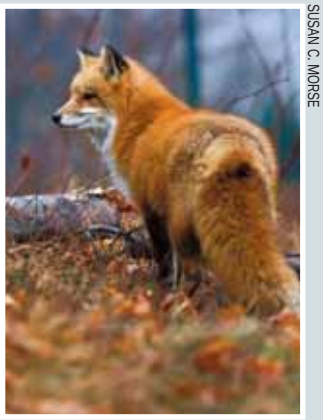

SUSAN C. MORSE

KARI POST

JOHN BURK

This Place We Call Home

By Robert Perschel

As the leader of a nonprofit group that conserves and promotes the sustainable management of forests, I sometimes get the opportunity to visit woods in other parts of the country or the world. I cherish the chance to experience different forests and meet the people who rely on them, but around the second or third day, I start missing the place I call home – the rolling hills, rivers, streams, wetlands, woods, and stone walls of New England.

Something slides into the back of my mind – a memory, a feeling, a comfortable connection with a place I know well. I recall the hot, summer afternoon sun on my face filtered through oak leaves, or the cold air of a winter morning slipping off the maple-covered hillsides. I can hear the cross-country skiers schussing through the woods or the foresters calling out to each other through the pine. I see eagles drifting over a hidden cove on the river, or a beaver drawing his ripple across the mirrored lake.

Like you, this is the place where I live, work, and own land. I put my roots down here and now this place is a part of who I am, wherever I might travel. It's a good place to live and I would like to keep it that way for our children, grandchildren, and future generations.

Individual and family woodland owners play a critical role in the future of this place we love. In Massachusetts, where 61 percent of the state is forested, approximately 27,000 family landowners own more than 997,000 wooded acres, according to 2011-2013 data from the National Woodland Owner Survey conducted by the U.S. Forest Service. And in Connecticut, where 59 percent of the state is forested, approximately 18,000 family landowners own an estimated 589,000 wooded acres.

The health, beauty, and productivity of the landscape is in the hands of many private citizens like you, and the decisions you and other landowners make over the next several decades will determine whether this region maintains the character and qualities we all cherish. We can't take this future for granted because we are steadily losing our forest base. MassAudubon's "Losing Ground" study found that Massachusetts lost 30,000 acres of forestland to housing development between 1995 and 2005. Meanwhile, UConn's Center for Land Use Education and Research (CLEAR) found that Connecticut lost about 118,000 acres of forest to development during the study period 1985 to 2006. Declining forest cover reduces habitat for wildlife and means fewer places to hike, ski, or otherwise enjoy the outdoors. It may adversely affect drinking water or air quality, and thereby affect people's health. And it will have major effects on the character of the region and the way of life we now enjoy.

A recent report by the New England Forestry Foundation – *New England Forests: The Path to Sustainability* – catalogs and quantifies 12 potential forest benefits, including clean water and air, wildlife habitat, fuel for home heating, home-grown sustainable wood for affordable housing, and rural jobs and economic opportunity. The quantifiable benefits are astounding. For example, if 26 percent of the homes now heated with oil or propane converted to modern wood heat, the region would save $1.85 billion a year. If we replaced steel and concrete in building construction with an additional 400 million board feet of wood, we'd keep 3.5 million metric tons of carbon out of the atmosphere every year.

Given the importance of our region's forests, it's critical that landowners make informed choices about how to manage their woods. Unfortunately, there's evidence of a gap between woodland owners and the resources available to them. A recent survey in southern Massachusetts and northern Connecticut showed that 46 percent of forest landowners had sold timber, but only 22 percent could correctly or approximately name a private consulting forester. Only 6.7 percent of respondents could name a state service forester who is available to provide advice to private landowners. This indicates that timber in this region is often harvested without the help of a professional.

The guide you are reading is designed to be a go-to source of information for landowners. It is part of a pilot project in which the New England Forestry Foundation is working with local land trusts, foresters, and other partners in 10 communities on the border between central Massachusetts and northeastern Connecticut. This state border area is situated within a larger conservation region of 38 towns (from Belchertown, Massachusetts, south to Hampton, Connecticut) known as the MassConn Sustainable Forest Partnership area. Some notable landowners and institutions in the area include Norcross Wildlife Sanctuary, Old Sturbridge Village, Yale-Myers Forest, and James L. Goodwin State Forest and Conservation Education Center, as well as numerous other state forests and parks.

Though divided among thousands of private landowners, this border region's forests are still relatively intact (77 percent forested) and possess many ecological values, although they face threats from encroaching development. It is revealing to see this area on a satellite photo of the Northeast at night. Much of the coastal seaboard is awash with lights, except for a narrow, dark corridor that stretches north from Long Island Sound. These images provide a tangible sense of how fragile this landscape is and how close we are to losing it forever. We can still maintain these woods, but we have to act now.

If we are successful in helping the region's landowners to protect and manage their land, we can bring the same tools and lessons to other pockets of relatively undeveloped landscapes in New England. Our long-term goal is to work with many conservation and forestry partners throughout New England to keep our region as beautiful and bountiful as it is today.

We know that many landowners are particularly interested in how they and their families can continue to enjoy their land. They value the tranquility and privacy of their woods and the chance to see native wildlife in a natural setting. Because woods are continually changing as they age, and are affected by insects, disease, weather events, and the changing climate, professional advice can help you to maintain the aspects of your land that are most important to you and your family. If timber income is important, professional forestry techniques can help you grow and determine when to harvest the most valuable crop of trees.

We consume a lot of wood in New England – 11.5 million cords, to be exact – and it is ironic that in one of the most forested regions of the country, only 3 percent of our consumption is met by wood harvested locally. With the help of professional foresters, you could play an important role in supplying local and sustainably produced wood to our region's manufacturers. Increased demand for local and environmentally sound wood could support local landowners, foresters, and loggers, with enough wood left over to export sustainably grown products elsewhere in the country.

We know that forestland often changes hands, and that the majority of landowners do not have specific long-term plans for their woods. This turnover is a challenge and an opportunity when, as a community, we are working together to keep a region's landscape well-managed and intact. The New England Forestry Foundation is a resource for you as you determine an approach that fits your needs. If you would like to ensure that your woodlands always stay in a natural condition, there are ways that we can help you accomplish your goals. Estate planning and land protection tools like conservation easements or restrictions can help you protect your land from development while you and your family continue to own it, enjoy it, and manage it as a part of New England's natural heritage. There are state and federal tax incentives and land protection funding programs that may be a perfect fit for your financial goals. Please also refer to the Guide on page 78, listing the variety of public and private resources available to landowners in our region.

In the larger scope of things, you are one of many landowners supporting and managing a treasured landscape that delivers value to all New England residents. You deserve our thanks and recognition! We hope you will continue to own your land, ensuring that your woods are an important producer of clean water, clean air, and wildlife habitat. A special thanks to those who keep their land open to the public for recreation purposes.

As fellow landowners, you own an important part of this place we call home, and we hope that you will continue your role as the stewards of this special region.

Robert Perschel, Executive Director
New England Forestry Foundation

A Look at Spring's Main Events

By Virginia Barlow

	MARCH	APRIL	MAY
First week	Look for early robins, bluebirds, and song sparrows / Stone flies are hatching. Look for them resting on rocks near streams / Short-tailed weasels are losing their white winter coats / Earliest migrating ducks, if the weather is reasonable: black, mallard, greater scaup, lesser scaup, ring necked, and common merganser / Chickadees prefer birdhouses that are in or near woods. On their own, they use rotten stubs, tree cavities, and abandoned woodpecker holes	The male winter wrens returning now are extremely vocal. The winter wren nests soon to come will be hidden among the roots of overturned trees / Female spotted salamanders hold their fertilized eggs for several days before depositing them in large spherical masses / As soon as snow melts from the bases of trees, hepatica will flower. The delicate pink or lavender flowers look too fragile to withstand harsh April weather / Look for ospreys along big rivers	The dark-colored eggs now being laid by American toads contain melanin, which helps protect them from over-exposure to ultraviolet light / Bank swallows are digging two- to three-foot-long burrows in steep sand or gravel banks. They are colonial nesters: usually there are 10 to 100 burrows in close proximity / Don't be discouraged by your lawn: dandelion flowers can be dipped in flour, fried, and eaten / Queen bumblebees are laying their first clutch of eggs
Second week	The tiny new leaves of big toothed aspen give a distinctive gray-green tint to wooded hillsides / Muskrats may be mating. Up to eight little muskrats, each weighing less than an ounce, will be born in about a month / Crows may be seen carrying nesting material / Whitetail bucks begin growing antlers, nourished by a system of veins and arteries within the dense marrow. Developing antlers are so well supplied with blood that they would feel warm to the touch	While the weather may still be conducive to sap flow, by now the sugar content of maple sap is usually below 1 percent. At 1 percent, it takes 86 gallons of sap to produce a gallon of syrup. Time to quit boiling / Barn swallows may be returning, somewhat earlier than was normal 20 years ago / Bears have left their dens but will continue to lose weight until succulent vegetation becomes available. Wetlands are an important food source because they green up early	Very young plantain leaves are good in salads; soon they will become stringy / Tree bats are returning; migration may be synchronized with the first moth hatches of spring / The veery nests being built now incorporate a base of dead leaves and are large compared to the size of the bird / Baby opossums will be weaned soon. Their first 60 days were spent in the mother's pouch / Starflower, a low plant that is found in the north all around the globe, is blooming
Third week	Wood frogs are arriving at ponds to breed. Egg laying is synchronized and adults will return to the woods within a week or two / Grouse drumming begins. It will continue for many weeks / Meadow voles breed almost year-round. The first of their four to ten litters has probably been born. At four to five babies per litter, it's no wonder that they are such abundant mammals / Hooded mergansers stay in rivers until ice disappears from their breeding ponds	Moose hair is in raggedy patches as they are molting their thick winter coats / Porcupines are successful animals, even though each female gives birth to only one offspring per year. They are born from April to June, usually in tree cavities or fissures in rock outcrops / Listen for the first evening songs of the hermit thrush / Balsam shoot-boring sawflies, a bit larger than blackflies, may be abundant in Christmas tree plantations at midday if it is warm	White-spotted sawyers are beginning to fly. They will be out through the summer and are often mistaken for Asian longhorned beetles. They have a white spot at the top of the wing covers, where the covers meet in the center of the body, which the Asian beetles lack / The season's first spotted fawns are born. Mature does that entered winter healthy and well-fed will produce twins / White ash leaves are finally opening, well after most other trees
Fourth week	There may still be some snow on the ground when mourning cloak butterflies begin flying. If it is cold, they will bask on dark surfaces to warm their flight muscles / Spring peepers begin peeping in earnest. Isolated peepers will peep from now until November, but only now is there a deafening chorus / Turkey vultures are arriving from parts south. They ride storm fronts, sometimes gliding four miles high / Mourning doves are cooing away at the crack of dawn	Alder flea beetles, .25 inches long and metallic blue-green, are evident on swelling alder buds and will soon begin laying eggs / Male whitetails are quickly regaining the fat they lost over the winter and during last autumn's rut / Warbler arrivals may include ovenbird, magnolia, parula, Blackburnian, and northern water thrush / Several invasive species leaf out early. The pale green leaves of nonnative honeysuckles are visible before those of most other shrubs	Luna moths, the largest of the giant silk moths, are searching for mates / The gray fox will climb trees and jump from branch to branch like a cat. Look for a ridge of black guard hair (which also has a black tip) on the tail / Broad-wing hawk chicks are hatching; often their nest is high in a tree / By now, spotted salamander eggs have hatched and the larvae are developing. About 70-100 days after hatching, miniature adults, three inches long, will crawl ashore

Events may occur earlier or later, depending on your latitude, elevation – and the weather.

NED THERRIEN

Forgotten Fruit: Apple Trees in the Wild

By Michael Snyder

Far from forbidden – but often forsaken – wild apple trees are an unmistakable sight on many woods walks in southern New England.

This wild apple tree is truly prolific.

NORTHERN WOODLANDS

Regardless of whether the old apple grove is an abandoned farm orchard or a collection of seed-grown mavericks, the look is similar: a few scraggly and struggling survivors just barely hanging on under the stifling shade of red maples, white pines, or any of the other species that outpace the naturally rotund apple tree.

You know the type. They have multiple stems of twisted, mostly rotten wood covered by loose, sapsucker-riddled bark. Their branches are mottled with moss and lichens, and they appear thorny for all the broken wood and dead spur shoots. What used to be a glorious spreading crown is now a pathetic collection of disproportionately long shoots desperately seeking a break in the canopy. And there atop those slender whips are a few sad leaves, eking out a living from whatever light the foliage of other species grudgingly lets through.

These are the apple trees that Thoreau described as the kind "you expect nothing but lichens to fall from." To stumble upon a collection of them in the woods is an arresting experience. There is a certain tension about the scene. They are obviously not orchard trees, but they're not quite forest trees either. They're in suspension, somewhere between cultured and wild.

When apple trees are in such limbo, it is easy to see them as decrepit has-beens, to focus on the decay and death. Throw in their usual associates – the remains of the collapsed barn, the cellar hole, the rock heap, and the bottle dump, all growing up to brush – and it can be downright depressing. What would Johnny Appleseed think?

Of course, many wild apple trees are in far better shape. Still, even in the best cases, it is easy to see wild apple trees as suppressed, to focus on the lack of leaves, the knobby stems and spur shoots of deadwood.

But look more closely at that scene. And consider it more broadly. See the vigor and vitality, the vibrance. This much is certain: things happen around apple trees. You don't need a wildlife degree to know how popular apple trees are with animals of all kinds.

The active apple

A friend of mine is fond of describing forests more as verbs than as nouns. He likes to emphasize the activity of the forest – the living, breathing, dying, and rotting – and not just the stuff. It's an intriguing concept, and when applied at a slightly smaller scale, it is particularly apropos of apple trees in the wild. Sure, it's a tree or a group of trees, but to see them as active players in the life of the forest is to fully appreciate their value. Wild apple trees don't just exist; they grow and give, fight and feed. They emerge, they succumb, they sprout, they break. They engender life. And through it all, wild apple trees are remarkably productive. It may not be board feet or bushels, but they put out nonetheless – and they do so in countless ways.

It is often said that apple trees are "good for wildlife." That's a little like saying water is good for fish; it's the height of understatement. You'd be hard-pressed to find a tree species that is more variously giving of itself than an apple tree.

Foremost among an apple tree's many gifts to wildlife are its fruits, the apples themselves. Their importance as a food source to game species like white-tailed deer, black bear, foxes, coyotes, and ruffed grouse is well documented. But there's more to wildlife than those high-profile species, and there's far more to the value of apple trees than their fleshy fruits.

First, the fruits are eaten by many more species than just the so-called "charismatic megafauna." Look carefully at a fallen apple in the woods and you might see evidence of tampering by all manner of critters – from squirrels and jays to worms and snails.

Then there are the other kinds of food and cover the apple trees provide. Buds and twigs are browsed by deer, ruffed grouse, cottontail rabbits, and numerous others. Voles, rabbits, and mice seem to savor the inner bark of the trunk, especially in winter.

And even though some of the wood on those apple trees may be dead, it's not without life. It provides excellent cavities for nesting and roosting sites for a variety of birds. Flycatchers, for example, use such trees if they're growing in the woods, and bluebirds will nest in them if they grow near openings.

Mammals and birds not your thing? Don't despair; the apple tree provides plenty for insects too. Yellow jackets swarm windfallen apples in the autumn, and apple blossoms are abuzz with honeybees in the spring. Throughout the year a great variety of

Some apple trees hold onto their fruits well into winter, a boon for wildlife when food is scarce.

ROGER IRWIN

Ten Slow Steps to Apple Tree Restoration

The longevity, vigor, and yield of your wild or abandoned apple trees can be enhanced greatly by using some simple but pleasing cultural techniques. There is as much art as there is science to the improvement of apple trees, and no two situations are exactly alike, so there is no standardized prescription to follow. However, there are a few basic principles that you can adapt to your particular circumstances and style.

Apple tree improvement involves two phases: release and restoration. Release work focuses on removing competing vegetation from around your apples, and restoration involves pruning and caring for the apple trees themselves. Both phases can be outlined in 10 simple and purposefully slow steps.

Step 1: Carefully examine your tree(s). If you have several in various stages of vigor or decline, identify the ones with the best hope for rejuvenation and focus your attention on them. Mark these trees. Identify their competitors – all the other shrubs and trees from the apple stem out at least to the drip line of the crown – and mark them too.

Step 2: Slow down. Eat an apple.

Step 3: Remove the competitors. Cut out all those trees that you identified as shading or interfering with the growth of your target apple trees. At a minimum, remove the overtopping trees on at least three sides, especially those on the south side of the apple tree.

Step 4: Slow down. Go have some cider.

Step 5: Look more closely at your target trees with an eye toward improving them through pruning. On each tree, look for the presence of multiple stems. Choose the largest and most vigorous one and save it. Cut out the others – including basal sprouts – as close to the ground as possible. Remember, it's quality that counts. If the largest stem on a tree is not the best, remove it and work with the next biggest but healthiest stem.

Step 6: Slow down. Make an apple pie.

Step 7: Look for broken, diseased, or dead wood and remove all of it.

Step 8: Slow down. Eat your pie.

Step 9: Inspect the remaining live crown. Don't be too eager to hack away. Try to leave healthy branches growing in a horizontal plane. Don't remove the spur shoots that grow on the sides of main branches – that's where the fruits grow. Focus your cutting efforts on crisscrossing branches that rub together and on water sprouts – those zillions of rapidly growing vertical shoots that sprout from the tree top. Try to reduce the spread of the upper limbs to allow more sunlight to reach the interior and lower limbs. This will encourage their fruitfulness.

Step 10: Step back and admire your work. Wait till next year, reevaluating the condition of your trees. Watch the wildlife move in from your neighbors' neglected trees.

A few cautions and comments. Did I mention going slowly? It's important. Don't try to remake the whole tree in one outing. The first annual pruning in particular should always be light. There is also a distinct possibility of shocking the tree with too severe a release. This is especially true of trees that have been under heavy shade for a long time. Releasing them too much and too fast can bring strange and unwanted responses from the tree – like death.

One way to ease into the release is to leave standing any other soft or hard mast-producing trees. If you've got, say, serviceberry or oaks around your apples, consider leaving them. Another way is to kill – but not fell – the competitors by girdling them. Cut a ring through the bark completely around the stem of the unwanted tree, and it will die and open the canopy a bit more gradually. This is especially useful when removing large trees that might otherwise trash your apple trees upon felling.

When it comes to removing dead apple wood, you can hardly go wrong. But, you may want to leave some of those large, hollow, and often horizontal branch segments. These make excellent nest sites for a variety of birds.

Always use good technique. Make clean cuts with sharp tools. Leave no stubs, nicks, tears, or splits.

Timing counts. Pruning apple trees is best done only when the tree is dormant – when there are no leaves. Late winter and early spring are best, from February to mid-April. You can cut out competitors at any time, but for best results, try to cut the hardwood competition just after they've broken bud or when they are stressed – during a drought or insect attack, for example.

What to do with all that brush and slash that you've cut? One idea is to pile it for wildlife cover. Cottontail rabbits are particularly fond of brush piles. The most effective piles are those that are made over rocks or stumps or the like.

A few helpful tools are all you need: short- and long-handled pruning saws and loppers, nursery shears, and maybe a sturdy ladder and a lightweight chainsaw.

Go to it. Slowly.

other, less-obvious insects makes a good living on apple trees, too. There are aphids and ants, maggots and mites, borers and beetles, scales and skeletonizers.

Microbes, you ask? Sure. The bacteria that cause fire blight disease have quite a time for themselves moving from blossoms to leaves to stems. Not to be outdone, the fungi are also well represented: frog-eye leaf spot, cedar-apple rust, and apple scab are all common apple diseases caused by fungi.

When it comes to illustrating the finer points of biotic diversity and species interactions, the Discovery Channel has nothing on forest-dwelling apple trees.

Where did they come from?

As valuable and important as apple trees are for wildlife, they have had a similarly long history with people. Indeed, the apple overcame a decidedly inauspicious start in the Garden of Eden to enjoy a long and storied relationship with human civilization. The apple, if not the apple tree, has become a powerful icon of Americana.

And so it has been in New England. Curiously, though, the apple is not native here – this despite its long history and widespread presence. There are a couple of species of wild crabs thought to be native to North America, but domesticated apple trees originated in Eurasia.

When European immigrants settled in North America, they brought with them seeds from their favorite apple trees. Many written histories state that planting apple orchards was among the first tasks the early settlers undertook.

Here in the Northeast, those first orchards were planted with imported seeds and were used to produce cider. Owing to the peculiarities of apple biology, these first seed-grown apple trees hybridized with each other and with crabs that had become naturalized. The result was an explosion of new varieties.

VIRGINIA BARLOW

This wild apple tree has been released from competition.

Initially, apple growing in New England – and throughout much of the U.S., as land was settled – was limited to seedling trees of uncultivated varieties. Since apple trees do not reproduce true to seed, growers intent on cultivating any particular variety had to learn and develop sophisticated methods of grafting and propagation.

Eventually, three varieties emerged as the early favorites: Baldwin, Northern Spy, and Rhode Island Greening. Of course, there were others, including Summer Rambo, Cox Orange Pippin, Nonesuch, Honeygold, Wolf River, Wealthy, Fameuse, and Winter Banana.

By 1900, commercial orchards of cultivated trees had become the source of New England's apples. Slowly, but inexorably, New England's open landscape reverted to forests, and the remaining small, hill-farm cider orchards gradually slipped into the woods.

Abandoned but not forgotten

Considering their importance to both wildlife and people, it is no surprise that abandoned and decrepit apple trees have become the focus of some intensive restoration and management programs.

Because forest-grown apple trees provide so much for wildlife and because they are often lacking in vigor, managers try to "release" them from the competition of surrounding trees. This entails cutting all surrounding trees and shrubs back to the drip line of the apple tree and removing large overtopping trees from at least three sides, especially toward the south side of the tree. (See sidebar on opposite page for more detailed instructions.)

"We try to release apple trees wherever we have the opportunity," said Chuck Vile, a state lands wildlife forester with the Department of Forests, Parks and Recreation in Essex Junction, Vermont. "If we're doing a timber sale on state land and we find some apple trees, we release them. It's an excellent way to diversify the habitat for a variety of wildlife. It's not like a bird feeder; you don't have to tend it every day."

As if saving the apple trees and increasing their production of fruits were not benefit enough, releasing apple trees also yields indirect benefits. Removing competing trees stimulates growth of new and different species – herbs, shrubs, and tree seedlings – in the understory, which provide added food and cover to a variety of critters.

And as Vile explains, apple trees are not the only target of such release projects. "We'll do it for any soft mast- (food) producing trees and shrubs – cherries, serviceberry, dogwoods – and we don't cut hard mast producers like oaks and beech to release an apple tree."

Maybe it's excitement and anticipation – not tension – that I feel among the apple trees living on the edge between cultured and wild. After all, there's always the promise of fruit. Right after Thoreau described those decrepit trees he went on to point out the apples on the ground beneath them. "Surely apples are the noblest of fruits," he wrote.

Something tells me he did not mean noble in the patrician, aristocratic sense. I'd rather believe that he saw apples as noble because of their dignity, generosity, and magnanimity. He rightly pointed out that we, too, can partake of the apple tree's offerings.

In imploring us to get out and walk among the wild apples, he wrote, "The outdoor air and exercise which the walker gets give a different tone to his palate, and he craves a fruit which the sedentary would call harsh and crabbed. What is sour in the house a bracing walk makes sweet."

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

What do Animals Need?
And do Your Woods Provide It?

COURTESY OF USDA FOREST SERVICE

By Stephen Long

What makes one piece of ground a haven for seemingly every species that Noah saved while another is comparatively void of animals? And how does a forestland owner know whether her woods is an ark or a wasteland?

At the heart of what has to be a complex answer is one simple statement: every animal species needs food, water, and cover in a physical arrangement that meets its specific needs. Some animals are generalists – white-tailed deer are a prime example – that can thrive under a multitude of situations, from the industrial forest, to agricultural land, to suburbia. But there are less-adaptable species whose habitat requirements are so specific that the loss of a particular habitat can put the species' local population in a tailspin. The woodcock, for instance, feeds in dense young stands, nests in slightly more mature woods (15 to 30 years old), and performs its courtship ritual out in the open. If these three elements don't exist in close proximity to one another – and the combination is becoming scarcer in the Northeast, where forests are aging and former agricultural land is turning into subdivisions – woodcock will not be there.

It's not by accident that both examples I've cited – deer and woodcock – are game animals. For many years, wildlife management meant game management. State fish and game departments saw their job as managing game animals for the people (hunters) who, through license fees and excise taxes on sporting goods, paid their salaries. That mission has shifted in the past few decades, a change signaled by the renaming of many departments from "Fish and Game" to "Fish and Wildlife." In Connecticut, it's the Department of Energy and Environmental Protection's Wildlife Division; in Massachusetts, the Division of Fisheries and Wildlife. This shift has come about through recognition that wildlife belongs to all the people, not just hunters and anglers, and that watching wildlife is a pastime enjoyed by thousands.

Because of wildlife managers' historic focus on game animals, it is the game animals' habitat needs that have been studied most thoroughly. Volumes and volumes have been written about managing habitats for turkeys, ruffed grouse, woodcock, whitetails, snowshoe hare, quail, cottontails, migratory water-

At left: This food web in a northern hardwood forest shows some of the interconnections among species.

fowl, and game fish such as trout and bass. Hunting and conservation groups like the National Wild Turkey Federation, Ruffed Grouse Society, Ducks Unlimited, and Trout Unlimited have spent considerable time and money planting oak, patch-cutting aspen stands, building wood duck boxes, and restoring streambanks, all in the name of providing for the needs of their favorite species. Fortunately, though, by concentrating on the needs of game animals, managers have also been providing good habitat for many other species, as well. For instance, the ruffed grouse requires thick sapling stands of hardwoods with dead logs on the ground for its breeding habitat. This same habitat serves the needs of a number of small mammals, amphibians, and songbirds, including veeries, redstarts, and rose-breasted grosbeaks.

Today, instead of featured species, wildlife managers and forestland owners are thinking in terms of biological diversity, or biodiversity. They are paying attention to food webs and biotic communities. These refer to the collections of plants, animals, and other organisms that occupy an area, coexisting in a way that is mutually sustaining to the species, if not necessarily to the individuals.

As in a human community, not all of the residents are present all the time. In a thicket, for instance, migratory birds may use the habitat for much of their northern stay. Ruffed grouse hens, on the other hand, use it for breeding, then move to more open woods for nesting. Others, like the fisher, pass through while hunting for a meal, so the thicket is a very small part of the five square miles it might roam in a month. At the other extreme, an animal with a small home range (the red-backed vole, for instance) can find all the seeds, nuts, and insects it needs in a quarter-acre thicket. The presence of all of these animals, along with the plants and insects, has an effect on all the other parts of the community.

The fields and forests in New England are home to dozens of different mammals and reptiles and hundreds of different vertebrates and birds. Most of these animals have small home ranges, with the vast majority of them living on 50 acres or less. (Note that for migratory birds that cover thousands of miles, the range we're referring to is their range while in residence here.) Because of these small home ranges, it's quite possible for most landowners to play a significant role in the presence or absence of a large number of wildlife species.

A mix of managed and unmanaged forest ensures a tremendous variety of tree sizes and species composition, and that is supplemented by intact complexes of small, ephemeral pools and larger, more permanent wetlands. All this helps support a rich array of biodiversity.

If you want to encourage the presence of a particular species, there is information available through state fish and wildlife agencies to help you get started. Keep in mind that the task will be different if, rather than a songbird, it's a large mammal you're interested in, because you probably do not own enough land to serve all the needs of the large mammals, whose ranges are measured in square miles rather than acres. In this case, it's a collection of many adjacent landowners that holds the key to habitat.

If we're serious about our interest in the large-landscape creatures, we need to be serious about the large landscapes. It's important for people to think about the larger picture and where they fit into it. For bobcats and bears, for instance, it's essential to have large stretches of continuous forest cover. When new houses are built on hitherto unpopulated ridges and hilltops, they are serious interruptions in what had been continuous forest cover.

Mariko Yamasaki, a wildlife biologist who works with the USDA Forest Service, is the co-author of two books (*New England Wildlife: Habitat, Natural History, and Distribution*, 2000, written with Richard DeGraaf; and *Technical Guide to Forest Wildlife Habitat Management in New England*, 2007, written with DeGraaf, William B. Leak, and Anna M. Lester) that have served as the bibles for wildlife managers in the Northeast, helping them provide for the habitat needs of our mammals, birds, reptiles, and amphibians. She said, "Traveled roads are barriers. That's why the national forest gates logging roads when the work is done – so there's no traffic. But a woods road is not fragmenting if people are not driving on it. Animals will walk across it, no problem. The problem comes when there's a change in usage and people are driving on it every day."

Evaluating habitat

If the key to good wildlife habitat were to be summed up most succinctly, it would be in one word: variety. Beyond being the spice of life, variety is the single most important factor in determining whether wildlife will find your patch of woods hospitable. And that variety has to be considered on a number of different scales, ranging from a patch of less than an acre up to the entire landscape.

The first step in evaluating your land is to get the big picture, both figuratively and literally. Yamasaki said, "The larger landscape is the first thing to consider. Is it forested? Is it mixed farms and forest? Is it suburban?" The wider look at the landscape allows you to determine whether your land is typical of what surrounds it, or whether it may provide some unique features.

"Look for things that have inherent diversity," Yamasaki said. "What is there besides woods: are there aquatic or wetland situations, are there any strikingly different elevations? That's the stuff you either have or you don't have; you're not going to make any more of it. The more interesting the mixture of those things, the more interesting the piece of land is going to be for critters."

How large a landscape do you need to be thinking about? As a rule of thumb, Yamasaki recommends that you know what an area ten times your own acreage looks like. If you are the typical Connecticut or Massachusetts forest landowner and own around 10 acres, then you should take a look at topographical maps and aerial photos that cover at least 100 acres. If you own more land, expand your overview proportionally.

It used to be that you had to go to the Natural Resource Conservation Service office to get an aerial photo of your property. NRCS offers photos that are updated every 10 years or

so. Now, with the online availability of satellite imagery, orthophotography, and maps combined with aerial photos, it is easy and fun to get a feel for some of the ways in which a particular property fits into the larger landscape. These bird's-eye views provide an immediate sense of whether your land is a continuation of a large trend or whether it holds some anomalies.

If a forester has developed a management plan for your property, the map that accompanies it will be invaluable. Photocopy it and add details to it as you discover more about your land. As you look at these maps or photos, it's variety that you are seeking: variety in elevation, in land cover, in forest type. If, for instance, your reverting pastureland is the only open land in the area, it can have tremendous significance for any number of grassland birds, including the bobolink and eastern meadowlark. If, on the other hand, your land is part of an unbroken stretch of sidehill hardwoods, then your challenge will be to introduce some variety through your management choices.

More information can come from soil maps and bedrock maps, which can help you recognize an anomaly on your land. It may be that your land serves as a deer wintering area or that it holds endangered plant or animal species. These, too, are mapped and available from the state fish and wildlife departments.

Yamasaki said that the different style of landowners' use of their land over the years has precluded uniformity of habitat. "In the Northeast, the intensity of management has not been uniform. Because of different outlooks and different types of landowners, the likelihood of managing stands all alike is really low."

She notes that other parts of the country don't have the built-in mix that is so important in the Northeast's landscape. "The terrain is extraordinarily heterogeneous, sites are extraordinarily heterogeneous, the landscape is changing dramatically every five to 10 acres, and so it's harder to be absolutely uniform. However, having said that, the tendency of a new kind of landowner to want it all to look like untouched woods does have an effect over time, and that's what we're seeing."

It is particularly apparent in the areas where forestland is owned increasingly by people with urban or suburban attitudes toward logging and forest management. There, the forest can be markedly lacking in an understory, which provides food and cover for so many species.

"People are talking about unbroken forest canopy being the epitome of what folks want to see," said Yamasaki, "but frankly, from a wildlife habitat perspective, this is Boresville. It's horrible! There are reasons to do that, but there are a whole lot of reasons not to make it the only tool in your bag."

The party in Boresville – the break in an otherwise unbroken canopy – comes either from natural disturbances such as ice storms or windstorms that blow down sections of forest, or forest management that imitates nature by removing patches of trees.

Variety. Diversity. Heterogeneity. Once you've gotten acquainted with the bird's-eye view and you can see whether your land provides any variety on the landscape scale, it's time to take a

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Land managed for game animals, like the ruffed grouse, often also serves the needs of other mammals, amphibians, and songbirds.

walk so you can see what it all looks like on the ground. And the good news is that one walk won't be enough for you to get the complete picture.

A Walk in the Woods

Many people who take walks in their woods have developed a routine. Maybe there are logging roads, trails, or other kinds of woods roads that serve as the regular route. Or there are particular stops along the way that just have to be made – the hilltop opening with a great view, or a favorite huge old tree. Contrast that with the way a forester conducts a timber cruise, which is to lay out a grid over a map of the land, identify the sample plot points, and then head out with a compass to examine the woods from that series of predetermined points. It's a thorough and scientifically sound method for getting detailed information about the woods.

This is not to suggest that you set up a grid of plot points for the exploration of your woods, but you should adopt the *spirit* of the forester's timber cruise, if not its rigor. Cover the ground systematically. Above all, get off the trail. Explore areas you habitually bypass. If you do, it's guaranteed that you will see your land with new perspective.

What are you looking for?

On your first pass through, get the general impressions. Observe on the ground what you will have already seen on your topographical map and your aerial photos. See how the nonforest areas that showed up in the photos make the transition to the adjacent forest. Try to develop an eye for the stands, that is, groups of trees that are about the same size and the same dominant

Water, Food, and Cover

Water, food, and cover are the essentials of life for any species. Water comes in many forms, whether standing in ponds and lakes, running in streams, brooks, and rivers, or pouring forth from the ground in a spring. Its more ephemeral forms – rain-soaked shrubs or dewy grass – can meet the water requirements of many small species.

The forest is full of food. From beneath the ground to the forest canopy, there is a tremendous variety of food. Animals eat parts of plants that range in size from grasses to trees: they eat the leaves, stems, buds, flowers, and seeds of trees, shrubs, forbs, and grasses. They eat fungi, mosses, lichens. And they eat each other.

The relationship between predator and prey is at the heart of habitat, which makes it nearly impossible to talk separately of animals' needs for food and cover. It's true that animals require cover from the elements – they need shelter from heat, wind, cold, and precipitation. But more important – literally, of life and death importance – is the need for cover from predation.

The predator-prey relationship determines the habitat choices that nearly all animals make. Predators are seeking prey. Prey animals are seeking food and always aware of cover that will make them less vulnerable to predators. At specific times, they are looking for different kinds of cover: travel and escape cover is different from roosting or sleeping cover. Depending on who is the prey and who is the predator, cover can take many forms. Tunnels provide voles with cover from most of the mammals and all of the birds that prey on them. Thick stands of hardwood saplings provide grouse with shelter from their chief avian predator, the goshawk. Thick stands of softwoods and brush keep rabbits and hares safe from fox, coyote, bobcat, and lynx. A lone spruce in an otherwise deciduous forest is a magnet for nesting songbirds. For their nest sites, hen turkeys look for low shrubby cover next to a tree or stump.

When you think of predators, the region's larger ones – coyotes and bobcats – come to mind. But think smaller, too: fox; fisher, mink, and other weasels. Think beyond mammals: owls and hawks. And if you're willing to recognize invertebrates as prey, then it becomes wide open: turkeys eat grasshoppers, woodcocks eat worms. Insects are a staple for many songbirds, if not throughout the summer, at least for their broods. The strict herbivores in the crowd are few: a dozen or so mammals and fewer birds. Not a single reptile or amphibian in northern New England relies solely on plants.

Why is this so important?

"Prey has to be available," explains wildlife biologist Mariko Yamasaki. "Predators have to have something to eat, and there has to be some predictability in the likelihood that they'll find something to eat if they wander through [a particular area]."

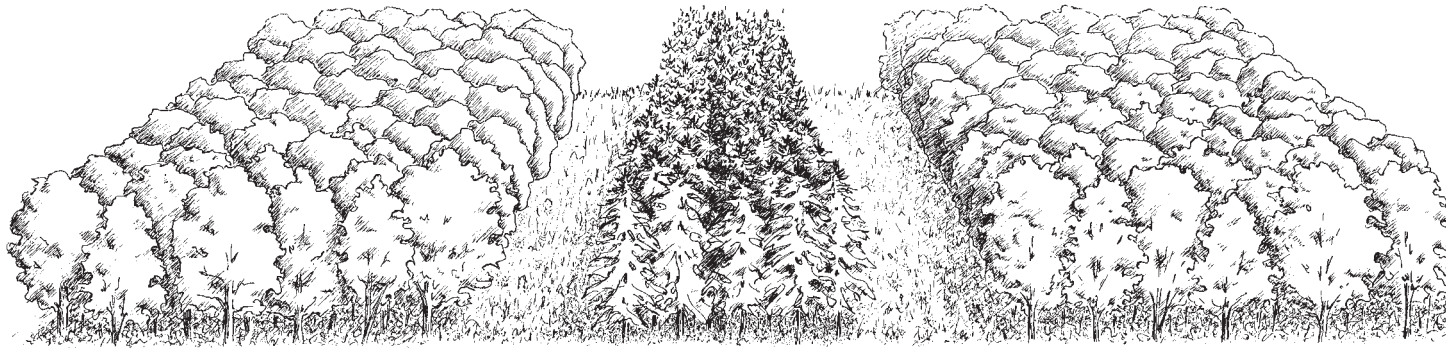
Some of her research at the Bartlett Experimental Forest in the White Mountains of New Hampshire has been on the small mammal prey base that serves the needs of the small- to medium-sized predators. She said that six species of small mammals supply 95 percent of the biomass that's available to be eaten: short-tail shrew, red-backed vole, masked shrew, woodland jumping mouse, deer mouse, and white-footed mouse.

What about the lynx, which some organizations are trying to have listed as an endangered species? What about large carnivores like the mountain lion and the wolf that many people would like to see back in these woods? Said Yamasaki, "These are big area wanderers, hundreds of thousands of acres for some of these things. Again, prey has to be available."

And while society's concerns for safety and possible economic loss will have a lot to say about whether wolves and mountain lions are welcome in the Northeast, their presence and that of bobcat and lynx is tied to the existence of a viable prey base. The lynx relies particularly on snowshoe hare, but hare populations are down, largely due to loss of habitat. "People in New England are not doing a whole lot to make the prey bases attractive enough to hold the larger carnivores. There's less regenerating forests and consequently there's not as many bunnies. The New England cottontail is close to being listed [as an endangered species]. They love abandoned farmland, they love real brushy dense hardwood regeneration. The more you make the cuts smaller, the less regeneration, and the less opportunity for snowshoes and others to get by in and flourish. And it's not just the large carnivores; there's a whole slug of species – owls, for instance – that are tied into what rabbit and hare are doing."

CLOCKWISE FROM TOP: SUSAN C. MORSE / HARVEY HENKELMANN/WIKIMEDIA COMMONS / BRIAN GRATWICKE/WIKIMEDIA COMMONS

Clockwise from top: Bobcat. Cottontail rabbit. Woodland seeps or springs are particularly important for salamanders like this redback salamander.



Here's the football field after we've put in the stands of trees, providing horizontal diversity, which is crucial for wide-ranging animals. Traveling from (or over) one end of the field to the other, an animal would encounter hardwoods, then pasture, softwoods, pasture, then hardwoods again.

species. Notice the size of the trees and their density. See if you can note when the forest changes in appearance. It can change in type or it can change in the size and relative density of the trees. Thus, you could find yourself going from a mature sawtimber stand of northern hardwoods into a pole-sized stand of aspen and paper birch and then into a mature stand of white pine. Take along a field guide if you need help identifying tree species.

If you don't have a management plan prepared by a forester, sketch out a map as you make the rounds. Photocopy and enlarge the topographical map of your land, draw the boundaries and, using the openings, streams, or other features that show on the topo map, sketch in your stands.

Besides doing the mapping, take an inventory of the species that are present. In winter, migratory birds will be gone and reptiles and amphibians will be hibernating, but you'll be able to see tracks of mammals and birds like the grouse and turkey. For the breeding bird survey, June is the best month. Contact your local Audubon chapter and see if a volunteer can come along and help you with bird identification. Carry a notebook and make note of confirmed species.

Don't be scared off by the word "inventory." It won't take days and days and days. If your land is all more or less the same – say sidehill northern hardwoods – the wildlife will not differ much from one place to another. It's the anomalies on your land that might show some interesting things. If you have identified them beforehand on your map – maybe you have a vernal pool or a swamp in the midst of an otherwise continuous stand of mature hardwoods – then you can concentrate your effort there.

Horizontal and Vertical Diversity

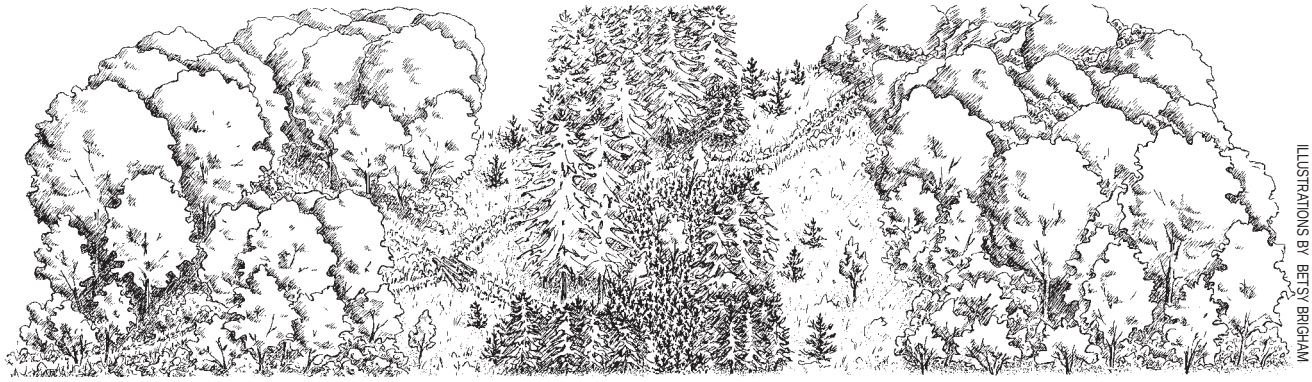
Among the more subtle features that you'll be looking for on your walks are horizontal and vertical diversity. One way of understanding these concepts is to think first of a football field, because it has neither. It's flat, is made up of two dimensions, not three, and growing on it is an unbroken monoculture of Kentucky bluegrass. One other good reason to think of a football field is that it is approximately an acre in size.

While it isn't utterly void of wildlife – robins are finding worms, and moles are tunneling beneath it unless the groundskeeper has found a way to control them – a football field has grave limitations. But with that flat grassy area as a starting point, there are a number of improvements that could be made to enhance its wildlife habitat potential. First, you can't consider it on its own, outside of its context. If the field is bordered by woods, chances are there are bats roosting adjacent to it who will fly out at dusk and pick off insects. Swallows, too. Deer may even come out of the woods and graze if the groundskeeper lets the grass get long between games. Place it in a city, surround it with stands and lights for night games and suddenly you have a lot of birds. Naturalist Ted Levin has documented 16 species of birds while watching a game at Yankee Stadium. Had he gone to Fenway, he probably would have seen at least 17.

So even a flat, grassy surface has some merit for wildlife. For the moment, let's forget about the surrounding context and let's make improvements in the diversity of the field itself. The first thing we'll do is add a stand of hardwoods between the goal lines and the 30-yard lines. Between the 30- and the 40-yard lines, make it a pasture that hasn't been grazed for 10 years. And between the two 40-yard lines, add a stand of softwoods covering the middle of the field. By changing from hardwood to pasture to softwoods to pasture and back to hardwoods as you go from one end of the field to the other, you have created horizontal diversity.

However, there is no vertical diversity, unless the stands we placed there have it within them. Since we're playing God, let's go ahead and do it. In the hardwood stands, let's have about 60 percent canopy cover. The trees are 12-16 inches in diameter and the tallest stretch 60 feet in the air. In the openings among them, there are hardwood saplings growing among thick patches of shrubs. Shadbush and dogwoods get a chance at the edges. In other places, there are trees that regenerated 30 years ago; they're not quite half as tall as the sawtimber, and only four or five inches in diameter. In the softwoods, let's interrupt the dominance of the mature spruce with some patches of regenerating spruce and fir. They're three or four feet high and so thick they're difficult to walk through. Paper birch and pin cherry are interspersed in the softwoods. And there are brambles and other sun-loving shrubs. Suddenly, at all the levels – from the forest floor to the canopy – there is food and cover.

Then, along the transitional edges between the mature softwoods and the pasture, let's put some pole-size trees, and since



ILLUSTRATIONS BY BETSY BRIGHAM

Much greater complexity comes from adding vertical diversity within the stands. The more complex the structure of the forest, the greater diversity of animals whose needs will be filled there.

there is a good adjacent seed source, we'll scatter some softwood seedlings in the pasture among the knee-high grass, juniper, mullein, and thistle.

Let's jack up one corner of the field so it's 30 feet higher than its diagonally opposite corner. And let's have a small stream find its way from the top corner to the lowest corner. Winding its way to the stream from one of the other corners, let's have a woods road that naturally reseeded itself in a combination of wildflowers, grasses, and other herbaceous plants.

Of course, this is an utterly unrealistic preponderance of diversity for a single acre of ground. It's much more likely that these different habitats would require a scale of at least 30 or 40 acres.

But the forest we've assembled is now full of diversity, both horizontal and vertical. For wide-ranging mammals and birds, it's the horizontal diversity that's so important. They need a variety of cover, and thus food sources, to travel through or above. Just as it would be hard for a red fox to eat, drink, and sleep on a football field (even if we extended it to the fox's home range of 400 acres), it would be equally difficult for the fox in a 400-acre stand of mature hardwoods with little or no understory.

For forest birds, it's vertical diversity that is crucial. The wood thrush, for example, sings from the canopy, nests in the mid-story, and feeds on the ground. Almost all – if not all – songbirds use more than one layer for feeding, roosting, breeding, nesting, and raising broods.

Complex three-dimensionality is at the heart of habitat. And the more complex the structure of the forest, the greater diversity of animals whose needs will be filled there.

Stephen Long is a founding editor of *Northern Woodlands* magazine.

A checklist

As you walk through your woods, use this checklist and make note of special features, ranging from landscape scale to individual trees, which are a boon to many species of wildlife. Indicate these features on your map.

WETLANDS, SWAMPS, MARSHES, BOGS. Wetlands are home to a tremendous variety of plants and animals; these special biotic communities are found nowhere else. Animals are drawn to water, thick cover, and food including invertebrates and plants unique to wetlands.

VERNAL POOLS. These are specialized wetlands – depressions in the forest floor that hold water only in spring. Void of living vegetation but perhaps containing some fallen woody debris, they are very important habitat for a number of species of salamanders, frogs, and invertebrates such as fairy shrimp.

RIVERS OR STREAMS. Not only the watercourse is important, but also the riparian zone along rivers and streams, which serves as a travel corridor for many species.

LAKES, PONDS. Shorelines have some of the same qualities as riparian zones. They also provide nesting sites for waterfowl. If the lake is large enough, it might have loons.

BEAVER PONDS. True magnets for wildlife ranging from moose to muskrat. Waterfowl, songbirds, reptiles and amphibians, herons, otter, mink – all are drawn to the cover, food, and water the beavers create.

WOODLAND SEEPS OR SPRINGS. Particularly important for salamanders, they are also sought out by turkeys, bears, and migrating birds in the spring. Seep vegetation is the first to green up, and the surrounding ground is the first to thaw.

DEAD AND DOWN WOOD. Decomposing trunks, limbs, and stumps are used by many species of reptiles, amphibians, birds, and mammals. They provide cover, moisture, nest and den sites, and food in the form of insects, mosses, and lichens. This is a very important and easily overlooked habitat feature.

STONE WALLS OR CELLAR HOLES. Besides being remnants of our past, these can provide safe openings for ground-dwelling animals like snakes and burrowing mammals, and hiding places for chipmunks and mice.

SOFT MAST. Many trees and shrubs provide fruits and berries, and hundreds of species rely on them. Particularly important are cherries (from the black cherry to the pin cherry), blackberries, raspberries, and wild apples, either as single trees or old orchards. Wild apples are a particularly important late-season food.

GROVES OF BEECH OR OAK. The seeds of all trees provide food, but beechnuts and acorns are a critical source of protein for animals preparing for winter. Before entering hibernation, bears load up on beechnuts if they are available. Their claw marks will still show many years later in the beech's smooth bark if they have climbed it in search of nuts. They also gorge on acorns, as do deer, who need the added fat to get them through winter. Beechnuts and acorns, known as hard mast, are also eaten by turkeys.

OVERSTORY INCLUSIONS. A few softwoods within a predominately hardwood stand provide cover and nesting sites for birds. Hardwoods within softwood stands provide food. Either one provides structural diversity.

LARGE CAVITY TREES. Woodpeckers are the excavators, but the cavities they make are then used as nest sites for many birds and den sites for mammals. Songbirds, squirrels, bats, weasels, owls, and raccoons are among the many species that use cavity trees. As the crown dies back, cavity trees are used as perches and roosts. When looking for cavity trees, think also of those in the future. Prime candidates are injured trees and those with a limb broken off. Think also of leaving large trees in your woodlot, those that are too poorly formed to be a sawlog and too big to be handled as firewood.

RAPTOR NESTS. Hawks and owls nest high in the canopy, making their own nests or reusing other species' nests of twigs and sticks. Many of the nests are used repeatedly year after year, especially if there is a minimum of human activity near the nests during breeding season.

CLIFFS AND LEDGES. Important niches for bobcats, which have had much of their habitat usurped by coyotes.

RARE PLANT OR ANIMAL SITES OR COMMUNITIES. This is the one feature that will probably require outside help to identify, but your legwork can get the process started. If an area looks substantially different from its surroundings, take note of the species of plants.

By Michael Snyder

Can Your Woods be Too Tidy?

A landowner once phoned to ask me to visit to see all the good work he'd done extending his landscaping efforts from his yard into the surrounding woods. He was pleased with his work and eager for a forester to see how well he had "cleaned up the woods" and "improved the health" of those woods by removing and chipping or burning all that "ugly dead and rotting stuff." He thought maybe we could use it as a demonstration site for his neighbors. So I went.

CARRIE SANDIN

And, sure enough, that landowner had indeed made some dramatic changes to a few acres of woods bordering his well-manicured yard. But I was considerably less enthusiastic than he was, and I was at a loss for a gentle way to explain to him that his "tidying" had done nothing to improve the health of his woods – that, in fact, he may have done some real damage to its health. As he showed me around from stump to branch scar, noting with pride how easy it was to walk and see through these woods now, I didn't know how to say, "Well sure, but now there's so much less to see." All I could muster was a head nod here and an "I see" there. Then he gave me my big opening.

He told me that before doing all this work he used to see woodpeckers and warblers in the woods, but not anymore. This man truly valued the woods, and he enjoyed working in them – with the best of intentions – but somehow had failed to recognize the full value of all that so-called mess. He had missed the connection between dead trees and woodpecker food, between a dense shrub layer and nest sites for black-throated blues. The conversation that followed wasn't necessarily easy, but now it at least had a new context; he could see his woods in a new light. And by the end of our walk, he had a different work plan for the bit of woods he'd yet to tend on the other side of his house.

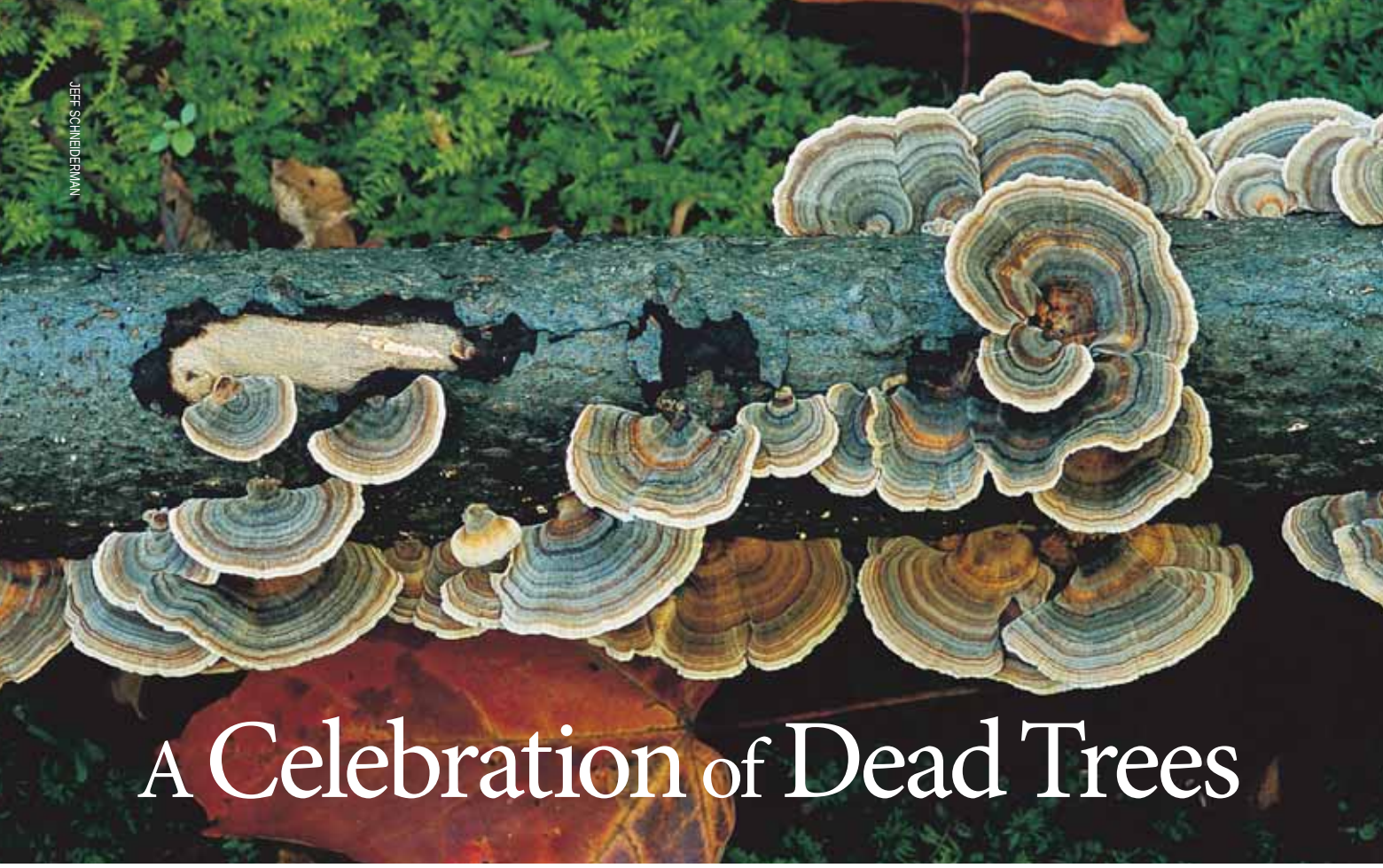
If your only interest is in the neat and tidy, and you just can't abide a natural mess, there's really no argument. You certainly are free to "clean up" your woods. But if you're interested in the health of the land, too, and if your aesthetic sensibility has room for a bit of death, decay, and disarray, then you'll be glad to know there is a way to have it both ways.

It's a matter of blending forestry with traditional landscaping. This sort of management is sometimes called woodscaping. It incorporates an understanding of forest ecology – a sense of how the forest functions fully – into landscaping activities. It stresses values like species diversity, the importance of retaining some dead and dying trees, and the need to keep vegetation in several vertical layers instead of just one canopy level. It is particularly effective when applied in those transition zones between a traditionally landscaped yard and the woods beyond. Yes, of course it's nice to see into the woods from the yard, and there's nothing wrong with cutting some understory vegetation or pruning some dead branches or even removing a particularly messy tangle of downed woody debris – all of which may be obstructing your view or your walk from your yard into your woods. You just try to leave some of these things, recognizing that they are all part of a healthy forest.

This hybrid approach can involve all kinds of management activities; the possibilities are nearly endless. It might include thinning to remove diseased or unsightly trees, which will enhance the growth of remaining specimen trees. Or perhaps pruning some branches to improve sight lines and tree stem quality. Removed vegetation might then be lopped and scattered neatly on the forest floor. This is important for moisture retention, nutrient cycling, and habitat enhancement for many insects, amphibians, and mammals and is far healthier than burning and chipping. Woodscaping might also include planting trees and shrubs to add diversity or visual appeal. It might mean not weed-whacking a patch of ferns or not brush-hogging an area of whips and brambles.

This modified landscaping approach can involve any or all such activities, but it does so with an attitude. It is an attitude of understanding – or at least a desire to understand – that your woods, even at the yard's edge, are more than something you look at. They are living communities of creatures each playing important – if sometimes unknown – roles with far-reaching implications for land health in your yard and beyond. These places don't have to be neat and tidy to be healthy.

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



JEFF SCHNIEDERMAN

A Celebration of Dead Trees

By Gale Lawrence

In the last stage of death, fallen trees are broken down by fungi and other organisms until they return to earth and nourish the next generation.

I manage for dead trees.

Don't get me wrong. I don't actually go out and kill them, but when I see an aging giant showing signs of decline, or notice a top blown off, or look up to my ridge and locate the stark silhouette of the long-dead pine that marks my northwest corner, I perceive value.

The loggers and foresters among you might be getting nervous at this point, assuming that I'm some sort of fuzzy-headed tree-hugger who wouldn't know a board foot from a bird song. But I assure you that my woodland is under the supervision of a sane and reliable forester. Sawtimber production is the long-range objective of the management plan she has written for me, and I promise I will contribute a reasonable number of board feet to the wood supply. But because my own stated objective – right there on the first page of my management plan – is wildlife habitat, I could not do better than to prioritize my dead trees.

There's no danger of my becoming a necrophiliac, however. On the contrary, I am endlessly fascinated, amazed, and surprised by life, especially by watching the way life works in the wild. And, ironically, it is my dead trees that offer me the most life to look at.

First there is the life of the tree itself. If the dead tree achieved any size, it probably led a long and interesting life marked by the seasonal and annual rhythms characteristic of its species, including enough seed production to assure the perpetuation of its genes.

But trees, like human beings, reach a point in their lives when their vigor diminishes. At that point, their ability to resist diseases and insect attacks decreases, and they begin to decline. The difference between the way trees and human beings die is that trees take much longer. A big one might spend a century dying and in the process serve wildlife in innumerable ways. I like to think of this extended dying as the tree's "death cycle," and to me it's every bit as interesting as the life cycle.

A tree's death cycle can begin with old age or it can begin earlier as the result of an injury or insect attack. As the tree begins to die, leaves or needles fall off the dead branches, creating exposed perches for birds. Predatory birds such as eagles, hawks, and falcons use these perches as lookouts. Flycatchers also use them. They feed by "hawking" insects – that is, by flying out from an exposed perch like a small hawk, catching a passing insect, and returning to the perch to eat it.

KATHRYN LUND JOHNSON

Dead branch stubs and rotted heartwood make it easier for woodpeckers to excavate a home.

In the next stage of the tree's

death cycle, the bark loosens, creating nesting opportunities for the intriguing little bark gleaners called brown creepers, who wedge their nests between the tree trunk and a shingle of loose bark. Bats also use loose bark to roost under during the day.

When the central column of the trunk begins to decay, the tree is ready for woodpeckers. They drill through the hard exterior wood and then excavate a nesting cavity in the soft interior. These cavities, which woodpeckers excavate anew every year, serve as winter roosts and future nesting cavities for the many species of birds that don't have the equipment to excavate cavities for themselves.

If the tree still stands tall after it has lost its bark and most of its branches, it is called a "snag." These snags can persist for years, providing perches and nesting and roosting cavities for generations of birds. If a snag breaks off or decomposes to a height of less than 20 feet, it is called a "stub." Stubs are often riddled with insects, which provide food for insect-eating birds, and when they become punky enough, they offer nesting opportunities to black-capped chickadees. Chickadees can't excavate hard wood, but they can chip away at and carry off bits of punk to create themselves perfect little nesting cavities.

Even after the stub falls or crumbles to the forest floor, the death cycle is not complete. Carpenter ants and other insects invade the decomposing wood, providing food for pileated woodpeckers and other forest dwellers. Amphibians, reptiles, and small mammals seek both food and refuge inside and under the rotting wood.

NED THERRIEN

Below: By the time fungi fruit into puffballs like these, there is extensive interior decay in the host tree. Lower left: This pileated woodpecker is starting an excavation in a sugar maple.

GERRY LEMMO

At this advanced stage of the death cycle, new plants often begin to grow from what's left of the old tree, transforming it into what's called a "nurse log." Finally, the nurse log is reduced to humus, contributing the last of its nutrients to the forest soil, where they can be recycled into future trees.

The stage of the tree's death cycle that interests me most is what I call the woodpecker stage. This stage can begin long before the tree dies. All it takes is an injury. A portion of the trunk or an upright branch might be injured by wind, ice, fire, insects, or logging activities, admitting fungi that attack and begin decomposing the wood.

A healthy tree responds to the invading fungi by self-protecting. It compartmentalizes the decay so that whatever decomposition is going to occur can't move beyond a fixed boundary. New, healthy wood forms outside this boundary, and the tree continues to grow upward and outward with the rot contained in a central column that grows no bigger than the diameter of the tree at the time it was injured. This interior rot progresses only downward from the injury, creating a tree that looks and acts very much alive but has a lower, central portion that is decaying.

Woodpeckers are experts at detecting these trees. That's because these injured survivors are just as good at providing nesting cavities as dead trees are. The outside sapwood is still strong and healthy, providing good protection and insulation, while the inside heartwood is decaying, making a cavity easy to excavate.

Different-sized woodpeckers prefer different-sized cavities, so they look for different-sized trees. In Massachusetts and Connecticut, six species of woodpeckers breed commonly – downy Woodpecker, hairy woodpecker, northern flicker, pileated woodpecker, yellow-bellied sapsucker, and red-bellied woodpecker. A seventh species, the red-headed woodpecker, is also present, but rare.

The downy woodpecker, for instance, looks for trees that are about 8 inches in diameter at breast height. For those of you who, like me, don't own Biltmore sticks or specially designed

ROGER IRWIN

GERRY LEMMO

Above: Ruffed grouse use downed logs for drumming, their mating display.
Right: This flying squirrel uses a hole made by a woodpecker.

measuring tapes that can convert circumference to diameter, there is a relatively easy way to come up with a personal reference system that will help you ballpark the diameters of prospective woodpecker trees – and it's only a little bit embarrassing.

I said earlier that I am not a tree hugger. However, to estimate a quick diameter at breast height (DBH), I'm willing to do it. By hugging and measuring the circumferences of numerous trees and then dividing by pi (3.1416), I have learned that my own personal hugs range from 6 to 18 inches DBH. A skinny little 6-incher, I can hug all the way around and touch both shoulders. An 18-incher stretches my hug to its limits: the tips of my longest fingers can just barely touch on the far side.

I have come up with three intermediate-sized hugs that help me measure intermediate-sized trees: 8-inch DBH for downy woodpeckers; 12-inch DBH for hairy woodpeckers; and 15-inch DBH for the northern flickers. The pileated woodpecker's need for big trees, ones that are in the 22-inch DBH range, is humbling. Stretch as hard as I can, I can't reach around them – which pleases me. They make me feel small. Not diminished, just small, which, strangely enough, enlarges me, or at least rearranges my sense of scale.

If all this hugging and measuring is too much for you, you can simplify the program by focusing on only the biggest of your injured, dying, or dead trees. The smaller woodpeckers can readily excavate their nesting cavities in bigger trees, but pileated woodpeckers can't use smaller ones. So if you manage for big dead trees, you'll have the present taken care of, and all you'll need to do is retain enough smaller dying trees to provide replacements.

According to *Silviculture with Birds in Mind*, a guide for integrated timber management in northern Massachusetts hardwood stands, standing trees that are dead and/or contain cavities should be present in all diameter classes, with at least six snags per acre. The State of Connecticut's Department of Energy and Environmental Protection recommends that three snags of at least 12 inches in diameter be available per acre. Since cavity-nesting birds such as woodpeckers usually have large territories, snags should be well distributed. They also advise maintaining at least one 15-inch diameter or greater den tree per acre.

These guidelines make me feel downright virtuous as I patrol my woods for what I have come to call woodpecker trees.

If I had said at the outset that I manage for woodpeckers, I wouldn't have had much to explain. After all, woodpeckers – and most other cavity nesting birds, for that matter – are insect eaters, so they are good guys. They contribute to the health of the forest and therefore to marketable sawtimber. But woodpeckers are so mobile and hard for me to count that I would have difficulty monitoring the progress or success of my personal management program. Because trees stand still and can be measured, observed, and evaluated over time, I feel more comfortable counting them. The truth is that I have perfect confidence in the woodpeckers' ability to manage themselves, if I can just assure them a healthy number of dead trees.

Gale Lawrence is a freelance natural history writer and the author of *The Beginning Naturalist*.

GERRY LEMMO

This flat bark beetle eats insects and fungi beneath loose bark.

By Michael Snyder

How Small a Woodland is Too Small for Forestry?

It's not so much the size as it is the nature of the woodland – and the woodland owner – that determines where forestry ends and where suburbia begins.

With more and more people living on smaller parcels, and with advances in small-scale equipment, it might be time to rethink our view of small woodlands. As parcel size gets smaller, other factors grow in importance and can even break or make a woodland operation.

For years most foresters hereabouts seem to have quietly agreed that 25 acres is on the small end of serious forest management. Similarly, 10 acres has long been a nice round number for families wanting a sustained yield of firewood. But those minimums are always more about wood management. If we're talking about forestry as the more inclusive art and science of applying a stewardship ethic to manage for a more exciting range of values – including timber – then those rules of thumb terribly underestimate the skill and creativity of everybody involved: foresters, loggers, and landowners alike.

Of course, there are limits to what you can get out of any system, and woodlands are no exception. If they are to be sustainable, woodland operations cannot remove more than what the forest produces. Striking that balance is no less important on small lots, but it might be more difficult, especially if your primary interest is in producing commercial timber and you care less about other management ideas.

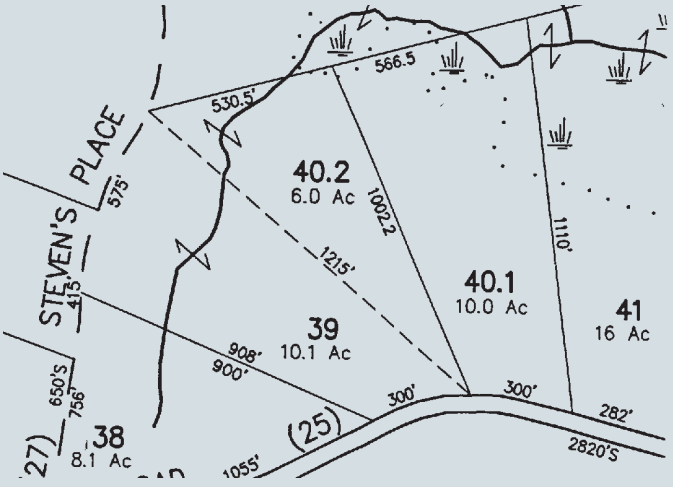
If all you really want to do is harvest and sell timber on a periodic basis – say, every 10 to 25 years – then there are just a few critical factors that will determine how small a woodlot will suffice. Tree size and log value are usually the most important factors that determine whether (and how much) a logger will bid on a small-area timber sale. Site factors that affect the physical difficulty of actually doing the job – terrain, skid distance, access, and landing size – are also important considerations. As on large jobs, it comes down to profitability. Does the value in the wood to be removed exceed the costs of removing it? If the logger can pay you for the wood and do the job as you both desire – with skill and care – and still make a reasonable profit over his expenses, then you've got a viable timber sale. The trick is that some of those logging expenses – like equipment moving costs – are fixed. That is, they are the same for small jobs as for big jobs. Such fixed costs further increase the importance of wood value per acre on small jobs.

Even in this light, it's not unreasonable to think that lots smaller than 10 acres can be managed for timber in a traditional way – if the wood value is there. Actually, even if the wood value is not there today, you might be able to change that. Wood value per acre is a significant factor on all sizes of jobs, but its exaggerated importance on small parcels certainly bolsters the argument for doing precommercial improvement work in promising but as yet unfeasible stands on smallish properties. Some judicious crop tree release and pruning today just might increase the wood value per acre enough to make a commercial harvest feasible in 20 years.

But that's just timber management, and by the traditional timber sale at that. It can and has worked well for many. You can follow that course and still do right by the land, and even manage for other values like habitat and aesthetics to varying degrees. Minimum size, though, would still be shackled to the cold economic realities of the conventional timber sale. As parcel size decreases, there comes a point where there's not enough value present to entice a logger to find a way under the telephone wires, around your septic system, and over your lawn and still pay you for the wood he removes.

Don't despair. There's plenty more to forestry than timber management. And much of it can be practiced on exceedingly small lots as well as on large lots. You can prune trees, cut firewood, tap a few maples, plant and tend some Christmas trees, grow nuts, cultivate mushrooms, and truly enhance wildlife habitat, too. Even with less than an acre of forest you might manage to harvest some trees and saw out lumber for your own use and possibly for sale. These are all good and viable pursuits. Some of them are relatively straightforward; some might require additional savvy. Some might cost money. All will pay dividends. If you really want to practice forestry on your land, then only the limits of imagination – yours and your forester's – will determine how small is too small.

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



Consulting Foresters

What They Do and Why You Need One

By Patrick White

Successful forest stewardship has been likened to a three-legged stool, with each leg – forester, logger, and landowner – playing a crucial role.

In newspaper, radio, and television coverage of forestry, the word *forester* can be used to refer to any one of these three. The forester, however, has a very specific role to play.

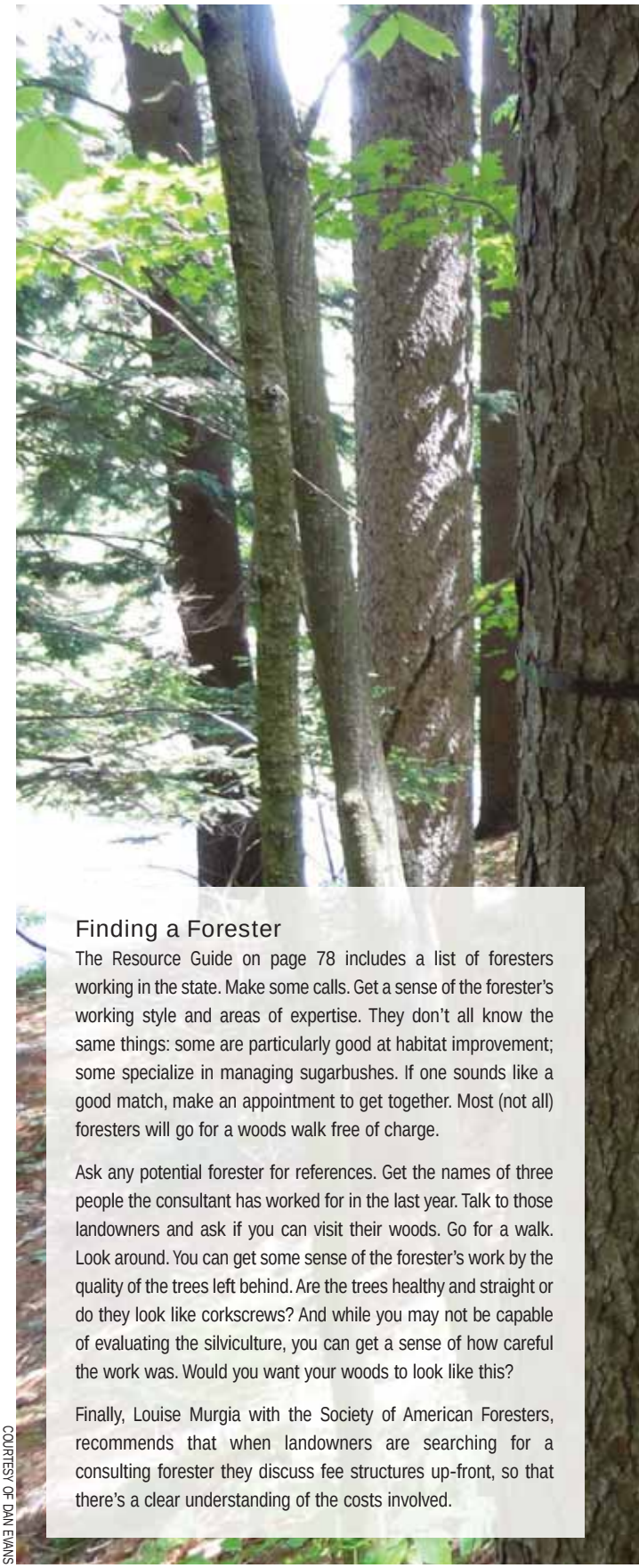
"A forester's job is to listen to a landowner and to give them advice, so the landowner has different sets of options to choose from in order to meet their management goals," said Louise Murgia, a forester and director of field services with the Society of American Foresters, a national organization that directs professional education and certification programs for foresters.

If a landowner wants to conduct a timber sale, the forester will mark the timber and oversee the logger's work. But there's much more to management than harvesting timber.

"If you want to increase the wildlife on your land, or improve the recreational use of the land, a forester can help you with that," Murgia explained. "A forester can also help manage invasives and help prevent or manage insects and diseases."

Landowners vary widely in their knowledge about what a consulting forester does, said Dan Evans, a consulting forester working out of Andover, Connecticut. Some landowners have had past experience working with public (county or state) foresters; others aren't entirely sure what a forester does, or how their role differs from that of a logger.

"For decades, discussions about the importance of having a forester have focused on our understanding of forest products markets and loggers. The historic argument was that we could



While timber is important, consulting forester Dan Evans (seen here taking a common tree measurement called, "Diameter at Breast Height,") says it's not the primary focus for many southern New England landowners: "Folks here don't tend to prioritize the harvesting of forest products as an objective for their forestland. They're mostly interested in aesthetics and recreation and wildlife."

COURTESY OF DAN EVANS

Finding a Forester

The Resource Guide on page 78 includes a list of foresters working in the state. Make some calls. Get a sense of the forester's working style and areas of expertise. They don't all know the same things: some are particularly good at habitat improvement; some specialize in managing sugarbushes. If one sounds like a good match, make an appointment to get together. Most (not all) foresters will go for a woods walk free of charge.

Ask any potential forester for references. Get the names of three people the consultant has worked for in the last year. Talk to those landowners and ask if you can visit their woods. Go for a walk. Look around. You can get some sense of the forester's work by the quality of the trees left behind. Are the trees healthy and straight or do they look like corkscrews? And while you may not be capable of evaluating the silviculture, you can get a sense of how careful the work was. Would you want your woods to look like this?

Finally, Louise Murgia with the Society of American Foresters, recommends that when landowners are searching for a consulting forester they discuss fee structures up-front, so that there's a clear understanding of the costs involved.

get you more revenue for your wood and a better result for the land as a result of [a forester's] oversight," said Evans. While this remains true, Evans says he sees foresters playing a much bigger role these days. "We have a lot of relatively nontraditional landowners in southern New England. Unlike my experience in northern New England, folks here don't tend to prioritize the harvesting of forest products as an objective for their forestland. They're mostly interested in aesthetics and recreation and wildlife. Increasingly, I think it's the role of the forester to facilitate a landowner's engagement with their forest."

Management plan

The keystone of the relationship between forest owner and forest consultant is a detailed management plan. This is the document that helps turn the landowner's objectives into a detailed plan of action.

At the start of the relationship, a forester needs to hear from prospective clients about why they own the property to begin with – not always an easy question to ask, or answer. The forester's second question is often: what do you want to do with your land?

"One thing I always hope to be able to do is go out in the woods and take a walk with the landowner," said Scott Gerrish, a consulting forester in Brimfield, Massachusetts. "That way we can have a back-and-forth discussion that helps me understand what they're looking for, and I can better explain to them what I'm trying to accomplish: the trees I want to remove; the trees I want to protect; openings I want to make for regeneration into wildlife habitat."

It's often easier to have these discussions in the woods than when sitting around the kitchen table, he added.

These woods walks can be an eye-opening experience, even for people who think they know their property pretty well. Owners are often surprised, for example, to find that their trees may be more (or less) valuable than they had thought or that their land sustains an unusual population of a certain amphibian or nesting bird. The forester's professional strength is making owners aware of what they have in terms of natural resources, from wildlife habitat to marketable timber, and how to plan for the future of their land.

Once the initial field work is done, a forester will start work on a more detailed management plan, which starts with a statistical inventory of forest resources, covering the entire property. Information for the inventory comes from the forester's

COURTESY OF SCOTT GERRISH

Consulting forester Scott Gerrish leads a woods walk in Sturbridge, Massachusetts. He says actually getting out in the woods with landowners helps him better explain his forest management strategies.

work on the ground and maps of soils and bedrock geology, which influence a property's capacity to grow trees. The forester will then create a map of the property, including special features such as wildlife habitat, invasive plants, significant geological features, wetlands, and vernal pools. The result should provide a clear picture of the layout and current condition of the forest.

Another key component of the management plan is working out long-range ownership goals and how to achieve them. Most foresters today use software programs and sophisticated mapping tools to find the precise locations of boundaries and other forest features (a deer yard, stream, etc.), inventories of trees by species and size, and other information that will help in the creation of a comprehensive management plan.

Timber sale

When timber harvests or other management work is undertaken in the woods, Dan Evans said it is important for a forester to help a landowner understand the various steps that will take place. "I try to help them set the expectations they will have; it's important that they establish realistic parameters, because harvesting is a disturbance. A forester should also help the landowner understand what the land will look like afterwards. I've even brought people out to past harvests that might resemble what has been prescribed for their land, and that does a lot as far as helping with the education."

Logging practices have improved greatly over time, with loggers taking better care to protect what the forester and owner have decided to leave in the woods. Still, there's no way around some of the effects of the heavy equipment that logging crews use. But a good forest consultant can do much to limit the damage, both physically to the woods and psychologically to a property owner. Owners need to know beforehand exactly what they're getting into when they authorize a timber sale.

When putting a timber sale up for bid, many foresters opt for an invitation-only process, which allows them (in consultation with owners) a good deal of control over the quality of the bidders. Also, foresters and loggers typically know a lot about each other, and a forester can advise his client fairly specifically about a contractor, sometimes even down to the quality of the specific crew working on the land.

Before the logging is even underway, a forester will make sure that trees to be cut are marked clearly and that roads will make the least impact on surrounding land, especially sensitive land features such as wetlands. "I think the most important time to have a forester involved is during the planning and implementation of a harvest," said Evans. "Writing management plans is incredibly important, but it's in the marking of trees and in the administration of a harvest where management really happens on the ground, and the long-term and short-term effects are determined. I would suggest that a good forester not only puts the interests of the client first, but also puts the interests of the forestland first."

When landowners choose to work directly with a logger on a harvest, they give up the oversight role that a forester provides. "I've walked a lot of properties with forest owners who have gotten into harvest scenarios without a forester involved, or without a contract," said Evans. "Some of these people, especially those who are less engaged with their land and don't spend a lot of time out in their forest, are really in a tough position sometimes after these harvests. The effects and the aesthetics can be really shocking."

Once work has begun, the forester monitors its progress and maintains regular contact with the logging crew. Above all, most foresters will retain the right within the terms of the sale contract to stop work if it is not up to agreed-upon standards. Some forestry consulting firms will require that a performance bond be built into a timber contract, so that if there's a problem that the buyer or logging contractor isn't willing to fix (over-rutting of the forest floor by logging equipment, for example) the forester and his client have the bond money to fall back on.

The big picture

Another role of the forester is to educate landowners about the big picture of land ownership. This includes providing information on various programs – current use tax programs (described fully elsewhere in this publication) or federal cost-share programs for habitat improvement, for instance – that might make it more affordable for landowners to hold on to their land and achieve their management objectives. "Foresters can help landowners take part in Natural Resources Conservation Service cost-share programs for activities like controlling invasive species or maybe doing some timber stand improvement work," said Gerrish. "I also help a lot of my clients get into the American Tree Farm System program; give them information about different green wood certification programs; and a huge part of my job is helping landowners with the current use tax program."

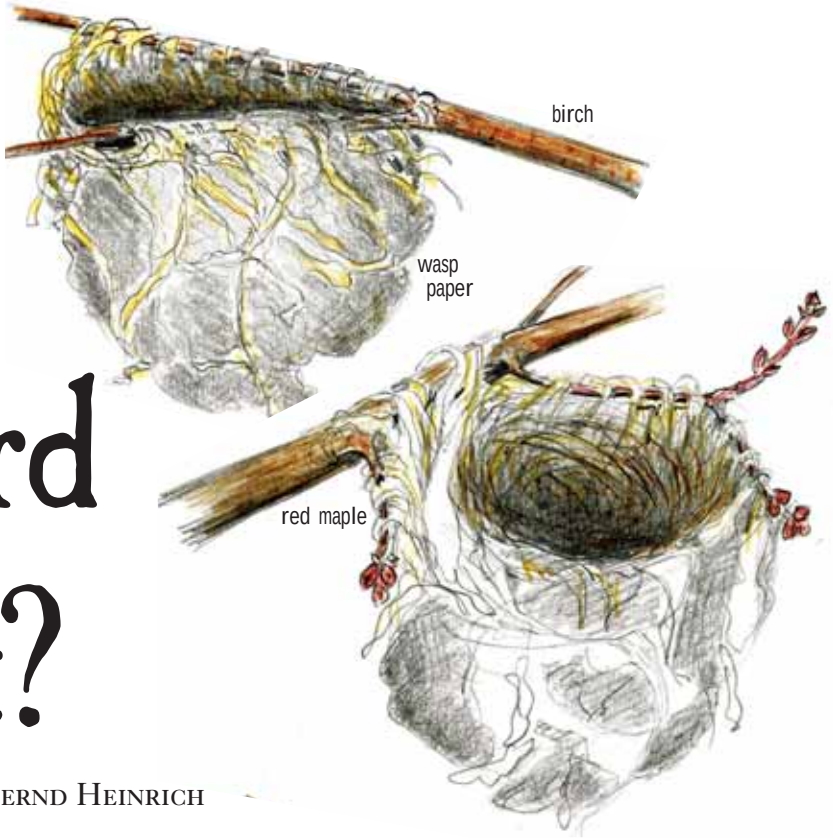
A good forester will help landowners not only manage the forest to meet their immediate objectives, but also plan for the long term. Gerrish said that he sometimes has to explain to landowners that forest management is a long-term proposition – not something you undertake for just five or six years. In other cases, it's the client who emphasizes to him the importance of long-term planning. "Some of the properties that I manage have been passed down from generations already, and the owner's objective is to continue that tradition and pass the land on to their children and grandchildren," he said.

Forest property is cherished by all who own it, whether they own it for recreation, for aesthetic contemplation, for the use of its timber, for wildlife habitat, or for a combination of these. For people who are new to forest ownership, it can also seem like a daunting responsibility – even a burden. Yet it needn't be so.

Hiring a consulting forester to help guide you in your decision-making can take some of the anxiety away.

"The personal relationship involved is very important – many of my clients become good friends," said Gerrish. A landowner has to be able to trust their forester, just as they trust their doctor or lawyer, he added.

Patrick White is assistant editor of *Northern Woodlands*.



which bird made that nest?

Story, Photos, and Illustrations by Bernd Heinrich

The diversity of behavior among bird species

is nowhere so dramatic as in their nest construction. Each species builds a specifically precise nest that differs in functional ways from those of almost all others. The variations are as endlessly diverse as the color patterns on a feather. Chimney swifts use their saliva to glue dry twigs onto vertical walls in a chimney cavity or hollow tree. A masked weaver bird's nest is a finely woven bag with a long, vertical entrance tunnel that is hung from the tip of a thin branch, whereas a sociable weaver builds a communal structure that may weigh a ton. An eagle's massive structure of branches can support a large man, while a plover merely scratches a few pebbles together on a sandbar. Owls never build anything at all but use others' nests or nest holes. A murre lays its single egg on a sea ledge, and a fairy tern "nest" is a bare fork on a tree limb.

While some northern woodland birds build their nests on the ground, many nest in trees. One of the pleasures to be had in the winter months is seeing these nests that had been hidden by summer foliage. When leaves drop, nests are revealed; full of snow, they seem to glow against stark tree limbs. The nest owners are no longer around, making positive identification difficult, but many of these nests can be identified if you match them to geographical area, habitat, and other aspects of nest location.

Above: red-eyed vireo nests; at right, conifer twig indicates blue-headed vireo

Below are descriptions of some of the more common nests likely to be found and identified in the winter woods. You may not find them all in one winter, but this "field guide" should provide you with the basis for a continuing adventure.

Robin

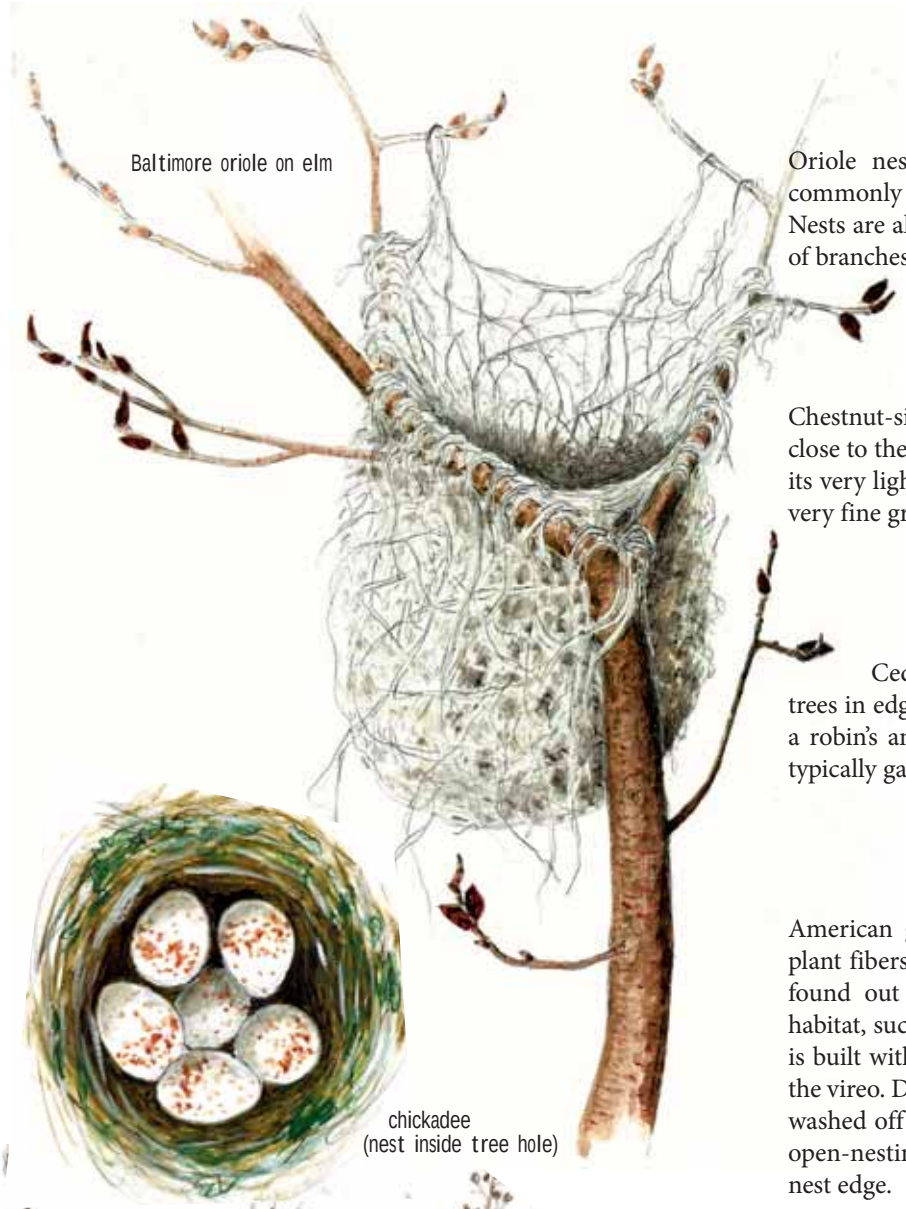
Turdus migratorius

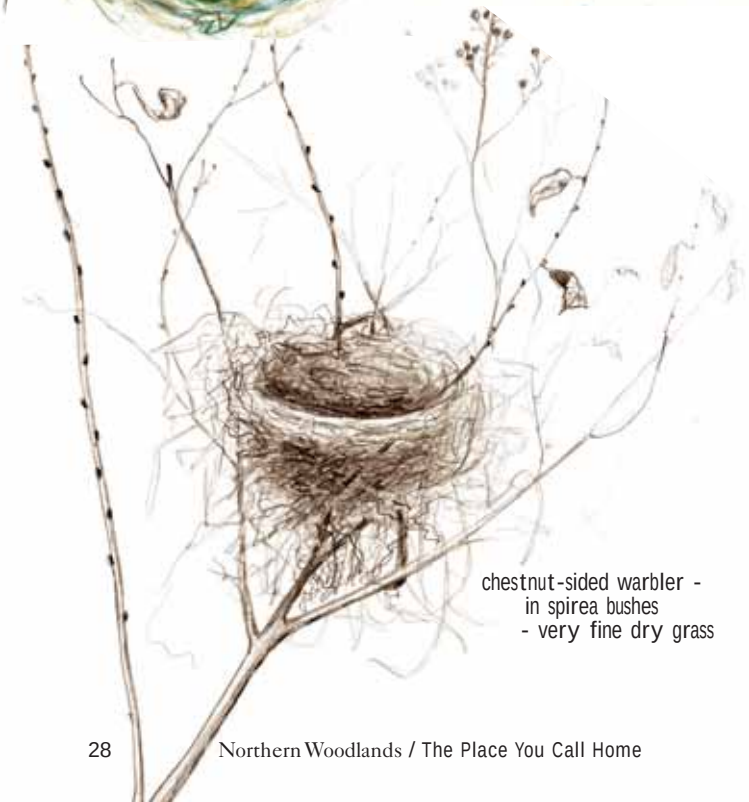
A robin's nest is both universally familiar and frequently misidentified. Nests are built at any height but generally in a protected place, such as inside a barn or where a thick limb forks. The giveaway clue is a mud cup about 3 inches across that in the summer is lined with a thin layer of fine grass. The exterior of the nest is a rough jumble of twigs, leaves, and pieces of bark. Nests exposed to the weather will usually dissolve and collapse by spring; nests under cover can persist for years.

Red-eyed vireo

Vireo olivaceus

Red-eyed vireos build their nests at any height, but always in a deciduous tree. Their nests can be found in both forest and edge habitat. The nest is always a hanging cup suspended along its edges from a thin, horizontal, forked branch. It is a neat, tidy, compact structure that will have bits of birch bark, and usually also wasp paper, decorating the outside. The inside cup diameter of a vireo nest is 2 inches.





Baltimore oriole

Icterus galbula

Oriole nests are baglike nests woven out of fibers, most commonly those stripped from old, decaying milkweed plants. Nests are almost always high in deciduous trees and at the tips of branches, not in deep forest.

Chestnut-sided warbler

Setophaga pensylvanica

Chestnut-sided warblers nest in open edge habitat and also close to the ground, in small shrubs and bushes. This nest, with its very light and flimsy appearance, is made almost entirely of very fine grasses.

Cedar waxwing

Bombycilla cedrorum

Cedar waxwings nest in small evergreens or deciduous trees in edge habitat. The nest cup is untidy on the outside like a robin's and of similar size, but it lacks the mud cup and is typically garnished on the outside with lichens and/or moss.

American goldfinch

Spinus tristis

American goldfinches make solid and tidy cup nests out of plant fibers and line them with thistle down. Nests are usually found out on a branch of a deciduous tree in fairly open habitat, such as a bog, edge of field, or suburban area. The nest is built with its base on the branch, not suspended like that of the vireo. Droppings are a dead giveaway (although they may be washed off by late winter), since goldfinches are the only local open-nesting songbird that allows feces to accumulate on the nest edge.

Least flycatcher

Empidonax minimus

A narrow (1.5 inches across) but deep nest cup placed into a thick, vertical fork so as to be almost hidden by it. Nests are found in deep edge habitat.

Red-winged blackbird

Agelaius phoeniceus

Red-winged blackbird nests could be confused with catbird nests, except that they're found in relatively open marshland. Nests are often built into a tuft of grass, or in a bush, or in cattails within a foot of the ground or water. Common grackles may nest in the same sites (but also in many others). Grackle nests can be distinguished from those of red-winged blackbirds by their larger (inside diameter about 3.5 inches), more compacted nest cup.

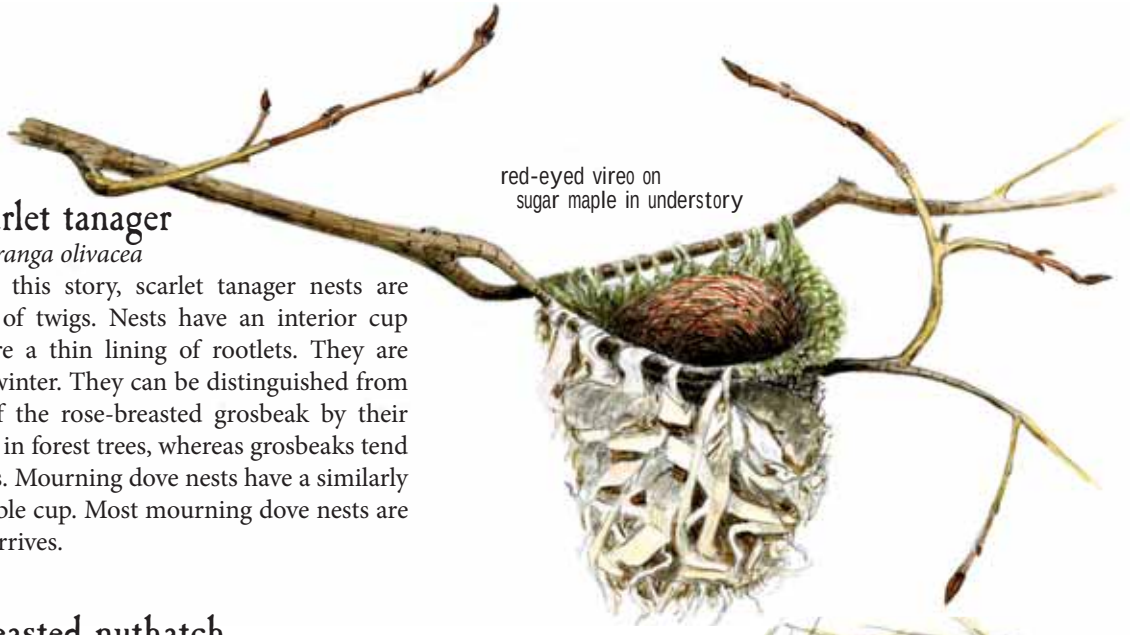
Clockwise from top left: Cedar waxwing, American goldfinch, Red-winged blackbird, Robin, Least flycatcher

Clockwise from top left: Baltimore oriole, Marsh wren, Red-eyed vireo, Scarlet tanager, Red-breasted nuthatch

Scarlet tanager

Piranga olivacea

Unlike the other nests in this story, scarlet tanager nests are composed almost entirely of twigs. Nests have an interior cup 3 inches across and feature a thin lining of rootlets. They are almost see-through in the winter. They can be distinguished from the similar-looking nest of the rose-breasted grosbeak by their location: tanagers nest high in forest trees, whereas grosbeaks tend to nest in young bushy trees. Mourning dove nests have a similarly flimsy structure but no visible cup. Most mourning dove nests are blown away before winter arrives.



red-eyed vireo on sugar maple in understory

Red-breasted nuthatch

Sitta canadensis

Chickadees, nuthatches, and woodpeckers nest in holes in trees, and the nests of these species can be differentiated, to some extent, by the size of the hole. A pileated woodpecker nest hole is 4 inches in diameter, a hairy woodpecker's is 2 inches, a sapsucker's is 1.5 inches, a chickadee's is 1 inch (in those cases where it makes its own nest hole), and a red-breasted nuthatch's, like the one pictured on the opposite page, is also 1 inch. The holes are almost perfectly round.

Red-breasted nuthatches build substantial nests of moss, down, and fibers in their nest cavities, whereas woodpeckers never put in any nest material. When abandoned, tree-hole nests can be recycled by any of a variety of birds or by other tenants. Note the diagnostic globs of pitch brought to the nest to plaster at and below the entrance to the hole; this pitch probably functions to restrict predator access. The tree in this photograph is a dead red maple.

marsh wren (nest inside dome)

Winter wren

Troglodytes hiemalis

All wren nests are domed, with a small entrance hole at the side. Those of the winter wren are most commonly garnished on the outside with green moss and small spruce or fir twigs. Although the wrens may place their nest under a stream bank, in hanging moss close to the ground, or in a small, densely branched tree, they are most commonly found in root tip-ups of wind-blown trees.

Ruby-throated hummingbird

Archilochus colubris

Ruby-throated hummingbirds garnish their walnut-sized nests with lichens to "mimic" bumps on limbs. Nests are lined with soft white plant down. The only nest that is similar in habitat, placement, and appearance, though it is substantially larger, is that of the wood peewee.

American goldfinch on red maple sapling

Bernd Heinrich is professor emeritus of biology at the University of Vermont and author of *The Nesting Season*.

NORTHERN WOODLANDS

Fields Among the Forests

Keeping Open Land Open

NORTHERN WOODLANDS

By Chuck Wooster

Did you know that the area comprising south-central Massachusetts and northeastern Connecticut is approximately 76 percent forested?

That means that if your piece of land happens to include an old field or meadow, you have something of a rare treasure on your hands. Open fields can add greatly to a property's value, thanks to the views they afford. Open fields are also great places to take a walk, watch the sunset, or fly a kite. On top of all this, open fields provide critical habitat for many of our most beloved species of wildlife. So there are a lot of good reasons for keeping them open.

Doing so, however, can be something of a vexation. Leave the field alone for too long and you'll wake up one morning with a young forest on your hands. But try to tackle your field with the lawn mower, and you'll be out there for the rest of your life.

So what to do?

You have three general options for keeping such spaces open, depending on how you decide to look at your old field.

First, you can view your field as an agricultural resource. It's thanks to animals, after all, that we have open fields in the first place. If your field is reasonably flat and fertile, a local farmer may be interested in cutting the hay once or twice per year. This works out well from the farmer's perspective – free hay for the cutting – and from your perspective as well, since you're keeping your field open without so much as lifting a finger. Don't expect to be paid for the hay: the financial benefit for you comes from having the farmer keep your field open for free. Ask for a buck or two a bale, and you'll soon discover the farmer mowing your neighbor's field instead.

Alternatively, you can run a few animals on the field yourself. Sheep, the original livestock inhabitant of the region's fields, thrive here, as do horses, goats, and beef cattle. (Dairy cows do too, of course, but that's likely to be beyond the scope of what you're after.) In a way, running animals on your own field helps keep someone else's field open, too, as the animals eat your grass all summer and someone else's grass (in the form of hay) all winter. You'll want to speak with your county extension agent for more details on what it entails before deciding to get into the grazing business.

If your avocations don't run toward the agricultural, a second way to view your old field is, well, as an old field. All you need to do is cut the grass once per year, and the field will remain a field forever. Hire your neighbor with a tractor to come and cut it, which typically costs about $50 per acre. Some people balk at the idea of spending money to keep their field open – shouldn't the land be able to pay its own way? Sure, but if you've already skipped over the part about owning a flock of sheep, this have-the-neighbor-do-it solution could be for you. It's a small price to pay for maintaining your "million-dollar" view.

But a more fun way to go might be to buy a tractor of your own, outfitted with a rotary mower (often referred to as a bush hog or brush hog). Previously owned, two-wheel-drive agricultural tractors that are perfect for flat field mowing can be had for a song (okay, a few thousand dollars) these days, and, in addition to delighting all the boys in the neighborhood, can be outfitted with a snow plow for winter driveways. Simply cutting the grass without removing it for hay has the additional advantage of returning fertility to the soil and improving the land instead of carting the fertility away to feed someone else's animals.

Whether you mow with your tractor or someone else's, you'd do well to wait as late in the season as possible. Though some landowners like to keep the grass short all summer for the "neatly trimmed" look, doing so comes at a great price for local birds and animals. Before mid-July, your field is likely to be

Opposite page, top: when trees get too large for a rotary mower (brush hog), the next step up is a forestry mower (bottom). This one is mulching a six-inch-diameter pine. This page, left to right: grazing sheep is an effective method of keeping your land in fields. Bobolinks, which make a series of mechanical twitters, frequent fields with tall grasses.

KINDRA CLINEFF/KINDRACLINEFF.COM

STEVEN D. FACCIO

PHOTOS BY STEPHEN LONG

From top: this field is mowed every year; saplings in this field will soon be too large for brush-hogging; this field has grown up too much to be brush-hogged and is on its way to becoming a forest.

home to red-winged blackbird chicks, young bobolinks in their nests, a host of sparrows, and maybe even a fawn or two, not to mention native insects (one of which, the firefly, is so beloved that people often forget it's an insect). Waiting until sometime between August and November will still accomplish the task of keeping the field open while sparing the local wildlife.

The third way to view your open field is as a wildlife nursery. If you only knock the grass down every third year or so, you will still be maintaining the view while also allowing coarser grasses and tree seedlings to take hold in the field. This type of habitat, called "early successional," is preferred by all of the above species, plus woodcock, snipe, a host of warblers, and hawks on the hunt. Deer will love the winter browse, and don't be surprised to see fox and coyote hunting rodents year-round.

This type of habitat is so rare and ephemeral (remember, more than three-quarters of the land in this area is forested, and most of the rest is covered by water or development) that federal cost-share money is often available for landowners who agree to adopt this every-third-year mowing strategy. For many years, a federal program called the Wildlife Habitat Incentive Program, or WHIP, provided cost-share assistance for landowners to establish and improve wildlife habitat, though the program was not reauthorized for 2014. Congress has authorized funding for a Landowner Incentive Program (LIP), to be administered by state fish and wildlife agencies. The goal of the program is to support activities that enhance habitat for at-risk species. Check with your local extension agent to see what similar opportunities may be available.

Though the field-as-wildlife-nursery approach has two great advantages (the abundant wildlife and the federal money), there is one disadvantage to keep in mind: your field won't be suitable for haying anymore because the grass and seedlings will be too coarse for animal feed. Reclaiming such a field for agriculture in the future will require some combination of animal grazing and tractor work, combined with re-seeding. If you never intend to return your field to the agricultural economy, that's not a problem. But if you're waffling on running that flock of sheep, it's worth mowing every year until you make up your mind.

A final variation on the wildlife-nursery approach would be to let the field grow in until it starts to have tree saplings that are about as thick in diameter as your wrist. Then mow it. If the tractor can bend it over, a heavy-duty brush hog can shred the stem. You might be able to go six or eight years between mowings if you go this route, which is even better for wildlife and even lighter on your wallet. Once the saplings grow fatter than your wrist or so, however, a tractor with mower will be unable to bend them over. At that point, you'll either be committed to a young forest or facing a very hefty bill to have specialized land-clearing equipment come in to reclaim the field.

Regardless of which of the three approaches you choose for maintaining your field – agricultural resource, old field, or wildlife nursery – you're doing a great service by keeping it open. The mix of forest and field is precisely what gives pastoral New England its unique character and distinguishes it from areas with steeper terrain, where far more dramatic mountain ranges end up being hidden from view behind thick forest canopies.

That the pastoral aesthetic is an essential part of the New England landscape is clear after even a quick browse through the "regional" section of your local bookstore: there are sure to be a half-dozen or more luscious picture books that feature rolling pastures, pocket fields tucked in among protective forests, or river-bottom holdings windrowed with hay, with each photograph crying out that this is how home is supposed to look. Come to think of it, they're right!

Chuck Wooster keeps sheep, grows vegetables, and manages a family woodlot.

A Look at Summer's Main Events

By Virginia Barlow

	JUNE	JULY	AUGUST
First week	Peas in the garden are in flower / Some emerald ash borer adults appear in May, but peak emergence is in June. Keep an eye out from here on through the summer / European skipper adults emerge. Introduced to Ontario in 1910, they are abundant in much of the U.S. The caterpillars eat grasses and they overwinter as eggs / Does hide their fawns, visiting and nursing them only two or three times a day when they are very young. Later, visits will be more frequent	Garter snakes are giving birth to live young. They are less common in coniferous forests, because earthworms, their favorite prey, are scarce in these more acid soils / The sky blue flowers of chicory are blooming at the edges of highways / Brown snakes have adapted to city life and often live in parks, yards, and vacant lots. They are rarely seen because of their nocturnal lifestyle / Bees are collecting nectar from staghorn sumac, an important honey plant	The eggs of eastern tent caterpillars that are now being laid in a glob on cherry twigs will survive the winter in an anti-freeze solution of glycerol / Muskrats eat freshwater clams, fish, and crustaceans, as well as cattail stalks and roots / Second batch of flying squirrels is born / Eastern newts can coexist with fish in permanent ponds, protected from predation by toxic secretions in their skin / Katydids are in full chorus; cicada calls are increasing /
Second week	Though the woodchuck can be a major nuisance in the garden, other animals, such as weasels and red foxes, use its burrows / Vireos, warblers, and tanagers are all likely to be using birch bark in their nests / The wood thrush's diet features small snails, millipedes, and centipedes, which is why these birds are often seen scratching around in the leaf litter / One good thing about black flies is that they go to bed early; not true of mosquitos or no-see-ums	The deer mouse population is rising. It may grow to a high of 15 mice per acre in autumn / Beginning of milkweed blooming; its nectar is popular with bumblebees, honeybees, and many other insects / Bullfrog tadpoles are transforming into adults. They spend two years as mostly vegetarians, then, as adults, they eat any kind of animal they can catch / Canada geese adults are molting and their young cannot fly yet, so the families hunker down in seclusion	Grasshoppers are sizing up enough to attract the interest of kestrels / Though we mostly see wood turtles in uplands, they spend a lot more time in thick vegetation near water / Hermit thrushes have an extended breeding season and will continue to sing their lovely song long after most other birds have fallen silent / Purple loosestrife is blooming. This beautiful, aggressive, nonnative plant now grows in nearly every state in the U.S., plus most of Canada
Third week	Mother common mergansers are teaching their downy chicks to fish / Sometimes young great horned owls tumble from the nest before they can fly and are fed on the ground by both parents / White admirals, the dark butterflies with white bands across their wings, are out. The larvae feed on yellow birch, aspens, and basswood, among other trees / Gray treefrog tadpoles are eating attached algae and minute floating organisms during their two months in the water	Spring salamanders transform into adults after spending three or four years as tadpoles / Tall meadow rue is blooming, its feathery flower heads well above other roadside and marshy plants / Beginning of ripe raspberries / American kestrels subsist mainly on large insects and only occasionally feast on small birds or mammals. They tend to return to the same section of telephone wire day after day / Bank swallow migration is underway. It will peak in August	Drone bumblebees are spending their nights sleeping on goldenrods and other flowers / Bobolinks and meadowlarks are migrating / Stink bugs are often found in the garden hiding beneath growing pumpkins. While their noxious secretion is thought to be a defense mechanism, at least one omnivorous mammal eats them anyway. You guessed it: the skunk / Robins are grouping into flocks. These gregarious birds will still be in flocks when they return next spring
Fourth week	Hummingbirds get protein from eating insects trapped in sap or nectar and have been known to pilfer them from spider webs / Sapsucker nestlings are noisy. Listen in hard-woods and you may find their nest cavity / From now through August, leopard frogs will live away from ponds in meadows or damp woods / A 47-foot maple tree has around 177,000 leaves, and 675 square meters of surface area, and 220 liters of water moves through the tree every hour on a sunny day	Yellow-bellied sapsuckers, unlike many other woodpeckers, don't excavate insect larvae. Their major summer foods are fruit, ants, sap, and the inner bark of trees / Bitterns, herons, and shorebirds are moving south. The young will follow later, in September and October / If eastern chipmunks produce two litters, the second batch is usually born in late July / If it is hot and dry, toads spend the day beneath loose soil, emerging at night to search for food	Many wasps and flies now reproducing in the leaf litter and soil are wingless. Wings are inconvenient in the tiny spaces to be negotiated as these animals search for food or places to lay eggs / Just a taste of the milky white poison that toads secrete from their parotid glands sends most would-be predators off to look for a more palatable meal / Northern water snakes like both water and low sunlit vegetation for basking. Their live young are born now

Events may occur earlier or later, depending on your latitude, elevation – and the weather.

KEN THOMAS

Tale of the Tick

The Natural History of Lyme Disease

By Dave Mance III

In November 1975, several cases of arthritis in children living near Lyme, Connecticut, were reported to the Connecticut State Department of Health. Researchers looked into things and found that in some rural parts of the state as many as 1 in 10 children were affected. There's a cryptic, type-written note on file, where the public health commissioner first warns his superiors about the new virus: "The seasonal and geographic distribution of cases and the association with a skin lesion suggest that a virus carried by a biting insect may be responsible for this disease . . .."

Today we have a name for this malady – Lyme disease – and we know that it's spread to humans by ticks. Most of us probably know someone who's had the disease, if we haven't had it ourselves. And we know it can be really nasty – from flu-like symptoms to Bell's palsy, and in extreme cases, psychosis.

Paralleling the medical saga is a nature story, one that's only tenuously connected to human suffering. It's a story that involves ticks, deer, and rodents, primarily, but also migratory birds, invasive exotic plants, killer mold spores, and warm winters. And this story starts each June, as the sun dapples the forest floor and tick larvae rise from the detritus to feed.

Know your ticks

There are more than 15 tick species living in southern New England, but many never or rarely bite humans, and only one, *Ixodes scapularis*, the black-legged tick (also known as the deer tick), transmits Lyme disease to humans.

A black-legged tick begins its life in a honey-colored egg. Each egg is part of a larger egg mass that can contain several thousand individual eggs. These egg masses are hard to see,

The adult female black-legged tick dwarfs the male. Ticks pictured are enlarged to show detail; actual sizes range from 1/8- to 1/2-inch.

but you can imagine them as tiny globs, maybe the size of the fingernail on your pinkie finger.

During late spring or summer, a tick larva that is about the size of the period at the end of this sentence will emerge from each egg. The larvae then disperse and travel a short distance in search of blood. Ticks have no eyes; instead, they have photoreceptors at the ends of their legs that detect shade and shape. They also sense and seek out sources of carbon dioxide. In fact, because ticks are attracted to CO_2, scientists sometimes use dry ice to lure them into collection units.

And so the tick larva waits or shuffles slowly in almost pathetic simplicity, blind, deaf, legs outstretched, as it searches for a passing host. Any warm-blooded animal will do: could be a raccoon, a chipmunk, a grouse. If a host presents itself, the tick larva will latch on, seek a blood vessel, and feed.

This first meal is very important to both the tick and the Lyme disease story, because black-legged ticks are born Lyme-free. They must catch the disease from an infected host.

The infection comes from a spirochete, a microscopic bacterial organism with a worm-like, spiral-shaped form. Many large animals do not carry the Lyme spirochete; and so, if the tick larva feeds on a deer, a raccoon, a skunk, the tick's life may progress without any connection to the disease.

If, however, the tick feeds on a small animal, such as a mouse, a chipmunk, or a shrew, it stands a very good chance of ingesting the Lyme spirochete. These small animals have spent millions of years evolving with both the ticks and the spirochete, which allows them to effectively harbor the disease without catching it themselves. The conventional wisdom has long been that white-footed mice are the primary reservoirs of Lyme disease, but this has been largely disproved in the past five years. Shrews, for instance, are particularly effective hosts. And ticks don't even require the blood of a mammal – certain ground-foraging birds serve the purpose just as well.

The tick larva spends the first summer and autumn looking for a host. When it finds one, it feeds for two or three days, then drops back to earth and seeks a sheltered spot on the forest floor where it will overwinter. During this period of dormancy, the larva molts into a nymph.

During the nymphal stage, the tick has eight legs and a black shield on its back. It is during this stage that the tick is most dangerous to humans, because it could be Lyme-positive and is very difficult to see. Tick nymphs begin to emerge from the leaf litter in early May, and most find a meal in June or July. Afterwards, they again retreat to the forest floor, where they molt and re-emerge as adults in the fall. Adult ticks look essentially like bigger versions of nymphs.

As an adult, a tick's main concern is breeding. To accomplish this, both male and female ticks will climb shrubs or tall grass and wait for a large animal to walk by. This is where deer enter the equation. White-tailed deer are the adult black-legged tick's preferred source of nourishment, and they also serve as a staging area for tick breeding activity.

Once attached to a deer, a female will suck blood for a few days. While she's fully engorged, a male tick that also happens to be hitchhiking on the deer can find and breed her. Once bred, the female will drop to earth, deposit her eggs in the detritus, and then die. Males also die shortly after copulation.

This whole life cycle can take as little as three months in a laboratory setting, but in nature it usually takes at least two years.

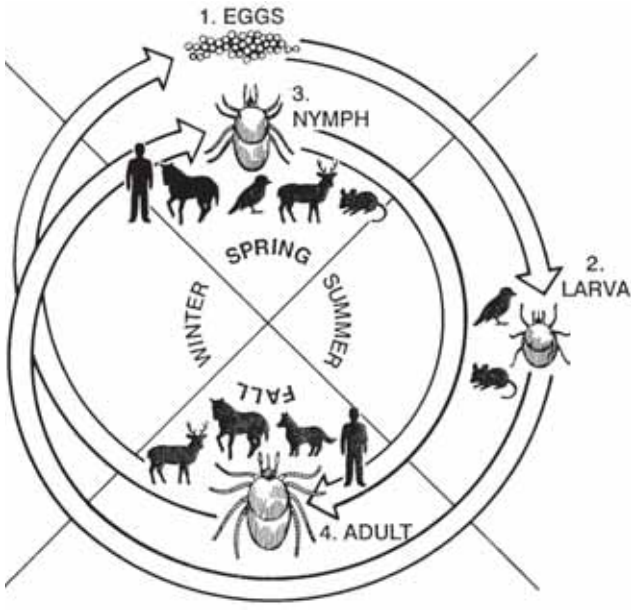
Feeding by stealth

If you happen to be walking by a black-legged tick in either its nymphal or adult phase, that tick will try to latch on to you and bite you. All of this sounds pretty simple but is really quite complicated. The catch is that ticks need to feed on the sly. If you detect them, you'll brush them off before they've had a chance for a meal. And so they must employ a stealth strategy.

When a tick first breaches your skin, it is not drinking so much as spitting into you. Tick saliva is a veritable cocktail of chemicals – analgesics, anti-inflammatory agents, anti-coagulants – designed to make the bite imperceptible to the victim. Only after the tick has regurgitated enough saliva to numb your senses will it begin to draw your blood and eat it.

While all this is going on, the Lyme spirochete is swimming around harmlessly in the tick's gut. However, once the first drops of your blood trickle into the gut, the spirochete springs into action. On cue, it migrates through the gut wall and into the tick's salivary glands and can slide right on into your body.

In most scenarios, a tick must feed for 24 to 48 hours before it can pass Lyme disease on to a human, though it can take even



INTEGRATED PEST MANAGEMENT FOR THE DEER TICK. 1993. CAROLYN KLASS.

LIFE CYCLE OF THE BLACK-LEGGED TICK: The deer tick's life cycle usually requires at least two years to complete. Sometime during late spring and summer, tick eggs hatch into larvae. The larvae feed throughout summer and early autumn, then molt into nymphs. The nymphs lie dormant during the winter, then re-emerge the following spring. After finding a blood meal, the nymphs molt into adults that fall. The adult ticks feed and mate on larger animals, particularly deer, then lay their eggs and die. If an adult tick is unable to find a deer in the fall, it will overwinter and resume its quest in the spring.

GERRY LEMMO

From left: White-footed mice carry the Lyme spirochete but don't get Lyme disease. To keep black-legged ticks at bay when you head out into the woods, take precautionary measures, such as pulling your socks up over your pant cuffs. Ticks pepper the ear of this white-tailed deer. A bullseye rash is often (but not always) seen following a bite from an infected tick.

longer. The first symptom of Lyme disease in humans is usually a rash around the tick bite that often, but not always, is in the shape of a bullseye. Along with the rash, many people develop flu-like symptoms.

According to the Infectious Disease Society of America, when Lyme disease is treated quickly with antibiotics, 95 percent of people are cured within a few weeks. If the disease is left untreated, however, the person can be in real trouble. Unlike the flu, which is a relatively predictable, transparent virus, *Borrelia burgdorferi* is a guerilla warrior. If not eradicated right away, it can hide in the body for months, even years, and its next attack can take many forms. Advanced Lyme symptoms include rashes, sore joints, headaches, fatigue, loss of memory, heart palpitations, vision trouble, mood swings, psychosis, lockjaw, and meningitis, to name a few. In other words, Lyme disease can masquerade as pretty much any malady out there.

Advanced Lyme disease is so contradictory and confusing that not even the medical community is in complete agreement on the different manifestations of the disease. There are even two sets of guidelines for diagnosis and treatment, one developed by the Infectious Diseases Society of America and one by the International Lyme and Associated Disease Society. If you or someone you know thinks you may have the disease, both you and your doctor should be aware of both sets of guidelines.

Attempts at control

In the human version of the Lyme story, the next question is how to defeat this thing. But while it's our way to roll up our sleeves and do battle, the unfortunate fact is that, like so many natural conundrums, Lyme disease is nearly impossible to pin down.

Some communities have tried treating deer with a topical pesticide (they put acaricide-soaked paint rollers around a troth of corn in such a way that the deer would have to brush up against the rollers); others have tried treating mice by putting cardboard tubes full of acaricide-soaked cotton balls in the forest, hoping the mice would use the cotton for nesting material. Both experiments had mixed results, and neither are being replicated on a large scale.

There are several strains of soil fungus known to be pathogenic to ticks, and a commercial treatment is currently being developed for tick control. Researchers from the Connecticut Agricultural Experiment Station were able to dramatically reduce tick populations using a fungal strain called *Metarhizium anisopliae*, which has recently become commercially available.

A change in habitat

From an ecological perspective, the nagging question about Lyme disease remains: why now? Ticks and their hosts have been around the Northeast for thousands of years. And yet, Lyme disease was only officially "discovered" 40 years ago.

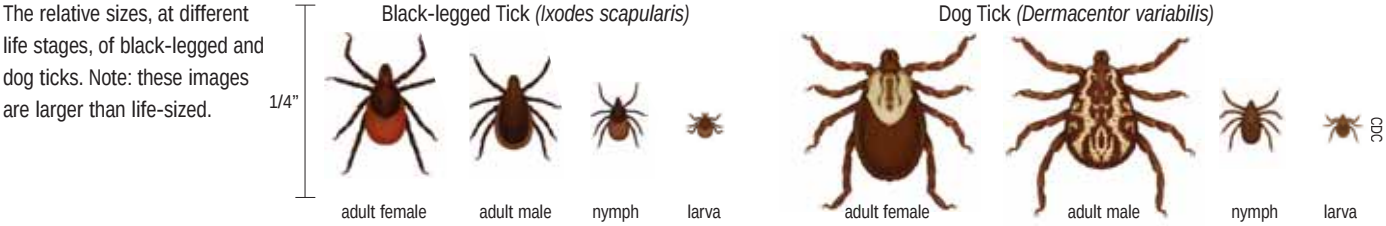
The historical record suggests that the Lyme spirochete has probably been present in the northeastern landscape for 10,000 years. While it's impossible to prove this definitively, scientists from Yale University have found *B. burgdorferi* DNA in alcohol-preserved tick specimens dating back to 1894. Nineteenth century medical records from Long Island, New York, allude to "Montauk knee," and "Montauk spider bite," which many feel was, in reality, Lyme disease.

But the dramatic expansion of Lyme disease and black-legged ticks in the last 30 years can be attributed largely to the surge in white-tailed deer populations over the past century. Historians estimate that before European colonization, there were between 24 and 33 million white-tailed deer in what is now the USA, but by the late 1800s, deer were virtually extinct throughout much of the Northeast.

In the last hundred years, the deer herd has rebounded dramatically. There were, perhaps, a dozen deer left in Connecticut in 1896; today, the population is estimated at over 75,000. In Massachusetts there are probably more than 85,000.

Mice and rodents have benefited from a similar dilution in both their natural enemies and competition. This idea is the

CDC/JAMES GATHANY / SUSAN C. MORSE



The relative sizes, at different life stages, of black-legged and dog ticks. Note: these images are larger than life-sized.

CDC

basis of ecologist David Blockstein's intriguing suggestion that the extinction of the passenger pigeon may be influencing present day Lyme rates. Blockstein pointed out that 100 years ago, passenger pigeons descended on oaks by the thousands and siphoned off a major part of the mast supply. Today, acorns pretty much fall straight down to waiting mice on the forest floor.

The effects of species diversity on Lyme rates can be seen by comparing the incidence of the disease in the northern U.S. to the southern states. The black-legged tick is equally prevalent in the north and the south, and yet south of the Carolinas, no more than seven percent of the ticks test positive for Lyme disease, whereas in northern forests, 20-80 percent of ticks are infected. These numbers can be attributed, in part, to the fact that in the south, lizards are the predominant hosts for tick nymphs and certain species are immune to Lyme infection.

The fragmentation of forests in southern New England has also helped spread the disease. The suburbanization of the landscape means more people are living in closer proximity to deer, mice, and ticks. It also means more deciduous forest and shrubs, which ticks prefer to denser, coniferous forests.

Invasive exotic plants, another byproduct of suburbanization, seem to promote Lyme disease. Researchers Jeff Ward, Scott Williams, and Tom Worthley have studied tick/barberry interactions in southern New England and found that ticks get infected with Lyme at much higher rates in places where the invasive plant is prevalent. In one study, 166 ticks per acre were infected with Lyme in untreated barberry infestations, compared with 50 infected ticks per acre where barberry was controlled and only 20 infected ticks per acre in adjacent forests where there was no barberry.

Warmer winters have also played a role in northern tick propagation. While the milder winters haven't affected tick larval emergence one way or the other, the weather has helped populations of mice, deer, and songbirds, which in turn helps the ticks. The warm weather also leads to longer seasonal exposure times for humans, thus increasing our risk of contracting the disease.

Heightened awareness

And so the two Lyme stories – the scary statistical one and the interesting biological one – are intertwined. And though we're used to dominating nature in its myriad forms, we're pretty powerless when it comes to this disease. There may someday be a vaccine, but for now, the best cure is to not get Lyme in the first place.

Medical professionals suggest wearing light-colored clothing in the woods (makes ticks easier to spot), applying tick repellent (those containing DEET are the most effective), and performing scrupulous tick checks at the end of each day (use mirrors for those hard-to-see places). As you shower, use your hands as well as your eyes – once a tick has been engorged for a day or so, you'll often find a sore spot around where it's feeding.

If you find a tick engorged in your body, grasp it with tweezers and pull straight back. Don't panic – remember that it generally takes at least 24 hours (and often much longer) before Lyme disease is transmitted – but monitor the bite site for a bullseye rash.

If you experience flu-like symptoms following the bite, see a doctor. There are several antibiotics that can effectively treat the disease, including doxycycline, amoxicillin, and cefuroxime axetil.

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

Silk Purse or Sow's Ear?

How to Recognize Value in Your Trees

By Stephen Long and Dave Mance III

Ask a woodworker about nice wood they've seen in firewood piles, and chances are you'll hear woeful tales about figured maple or ray-flecked oak going up in smoke. Foresters, too, wince when they hear landowners talk about the beautiful, straight logs they bucked up for the stove, wood that was "a dream to split." While this landowner certainly saved money by burning his own wood instead of oil, he could have sold the right tree as a veneer log and used the money from it to buy an entire winter's worth of firewood.

These examples work in reverse, too. Most professional foresters have had uncomfortable walks with clients where they've had to explain that there was very little, if any, timber value on a woodlot. These walks can be especially tough if the landowner had been under the impression that a logging job was going to help fund a retirement, or pay a medical bill.

This all begs the question: what makes a tree valuable? The answer is a lot more complicated than it might first seem.

BILL SARGENT

The ratio of low-grade wood to sawlogs can be as high as 5 to 1 on some woodlots. Huge piles of twisted logs like those in the top photo will be used for pulp or firewood…while this select group of straight and round maple logs (inset) will be sold for top dollar as veneer.

Size and shape matter

All trees are not created equal, and the price paid for an 8-foot log can range from pennies to hundreds of dollars, depending on the tree's form and species. In this article, any reference to a tree's or a log's value refers to the mill price (what a mill will pay for a delivered log) and not the stumpage price (what a logger will pay a landowner for a standing tree). The reason for this will become clear when the discussion turns to the cost of logging.

A tree's economic value comes from its usefulness as the raw material for a product. The more valuable the product that can come from it, the more valuable the tree. In today's market, the most valuable product that comes from a tree is veneer, the thin sheet of wood used as the outside skin on furniture, paneling, and other laminated surfaces. It shows its pretty face while hiding the composite board or other inexpensive material that is glued beneath. A veneer log's form needs to be as close to a pure cylinder as possible, and veneer mills purchase only large-diameter hardwoods (for top prices, they require at least 16-inch diameters). Too much taper (shaped like a cone, rather than a cylinder) is unacceptable, as is any curve, which in the trade is referred to as sweep. Veneer is peeled in a continuous sheet from the outside of a rotating log, so any knots, wounds, or seams show up repeatedly as the log turns. These defects are the visual analog of a skip in a record album, for those of you who remember that phenomenon. Even though we're currently in a down log market, veneer buyers are still paying between $1,000 and $4,000 per thousand board feet (MBF) for the best grade of sugar maple. (A 16-inch tree might yield three 16-foot logs; this would equal 241 board feet according to the International ¼-inch scale.)

If the log is less than perfect but is still clear and true, it's called a sawlog. The best sawlogs are converted into clear lumber that's used to make furniture. Branch stubs or knots (the remnants of branches overgrown by the tree's trunk) are the main limiting factors, along with wounds, seams, and – in light-colored hardwoods like sugar maple where the value is in the white sapwood – too much heartwood. The larger the clear board that can be sawn from it, the more the sawmill will pay for the tree. The next tier of value is in shorter, narrower clear boards – used to make flooring, for instance – and they can come either from the smaller cuttings from the large logs or from smaller logs.

So, the prime sawlogs are large – at least 16 inches in diameter – and as free of defects as possible. Highest prices (currently $650 to $800/MBF for sugar maple and red oak) are paid for logs that have four clear sides, a term that reflects the sawmill's process of squaring off cylindrical logs. Prices drop for smaller diameters and for logs with only three clear sides; a log with two clear sides brings even less because the sawyer will get fewer valuable boards from a log with this many defects.

It's not that these defective logs are useless. They are purchased every day as pallet logs, and they are made into wooden spools, crates, ties, and, yes, pallets. But a single 16-inch-diameter, 8-foot-long veneer log can bring $250 in the right market, while the same size pallet log might bring $5, and if the tree is so poorly formed that its best use is pulpwood or fuelwood then it is worth only pennies, if there are any buyers at all.

JOSEPH ADAMS; ALL OTHERS VIRGINIA BARLOW

There are a variety of defects that can limit trees' lumber value. Clockwise from upper left: This open-grown tree didn't shed its lower branches until they were large. Trees are often unable to wall off (compartmentalize) fungal cankers, which then grow larger and larger. As trees with narrow forks grow, there's bark (not wood) between the forks, and they often split apart. Note the seam at the stem. Scar from a sugar maple borer.

All species are not equal

The next major factor in determining value is species. No matter how perfectly cylindrical your hophornbeam might be, it's not going to make a log buyer reach for his wallet.

Sugar maple, black cherry, and red oak are usually in high demand – they're known as the "big three" among northern hardwood species. White ash and yellow birch, while typically not as valuable, are still sought-after and can generate solid returns. Your softer hardwoods, like red maple, white birch, and poplar, are typically worth little as sawlogs. White pine is the one softwood that holds its own with hardwoods.

The key to all of these species is that for each of them there are a number of different grades and thus prices, based on the log's form and size. In addition to the value increase associated with sheer volume, hardwoods graduate into higher classes of products as they grow, and the jumps in value – based almost entirely on diameter growth – can be dramatic. There are as many as seven grades that a hardwood can go through. So while a relatively small sugar maple removed in a thinning operation might bring only $200-$300/MBF, the trees left to grow have the potential to reach the prices noted above for veneer and large sawlogs. On good growing sites, the right tree can double in value in 10 years simply by growing fatter.

Contrast that with a spruce log. The yield per tree and per acre for spruce is going to exceed the hardwoods, both because it is usable down to a 4-inch diameter (at the small end) and because it can grow successfully at greater density per acre. But no matter how good that spruce is, it's a commodity, not a treasure. The current price for spruce in southern New England is around $200/MBF; even in the spruce/fir belt in northern New England, the only buyers paying more than $300/MBF are specialized clapboard mills.

Softwoods, especially spruce, fir, and hemlock, are often destined for the structural timber market, so slight defects typically don't matter much. A two by four is a two by four. For that reason, there isn't as much of a range of log grades with these species – it's either a sawlog or it's pulp.

Measuring volume

Along with form and species, the other factor in timber value is volume, which can be estimated in a standing tree through careful measurement of the tree's diameter and merchantable height. There are a number of tools for measuring the tree's diameter at breast height, including the Biltmore stick and diameter tape, both of which make adjustments that help translate the tree's roundness into a reliable diameter measurement in inches.

The Biltmore stick includes a log scale and a tree scale with the corresponding volumes printed in line with the diameters, so you can find the diameter and instantly read how many board feet are in a log or a tree of that diameter; you can also use it to estimate the number of 16-foot logs in a tree. If this level of minutia is a bit too geeky for you, you can simply hire a forester instead of buying a Biltmore stick.

Logging chance

The final variable affecting your wood value is what foresters call "logging chance." Steep land, or wet land, or landlocked land with poor access will all increase the time a logger has into the harvest, and thus affect the bottom line.

A number of additional factors influence the cost of logging. Of particular significance is the volume per acre to be removed. The lighter the cut and the more dispersed the timber, the more it costs the logger to do the job relative to the value of the wood being cut, and there is a threshold below which it's not worth it to a logger to have his equipment delivered to the site. A long skidding distance – a half-mile or more – can also make a job costly. If, on the other hand, the log truck can drive into a centrally located landing, leaving short runs for the skidder, the operation will be much more efficient – and less costly.

Distance to market also affects cost. The farther a trucker has to truck the logs to a mill, the higher the deduction from your bottom line.

The underlying principles are fairly simple. The more difficult the job of removal, the less you'll be paid for your timber. The bigger the wood, the more attractive the job is to a logger. These principles hold true regardless of the way the arrangement with the logger is structured. Industrial jobs usually will be contracted at a flat rate per MBF to cut and skid the wood. Most loggers who work for small landowners, on the other hand, prefer the more entrepreneurial approach of buying stumpage and then selling logs. Often, the logger and landowner will divide the checks from the mill, usually on a sliding scale that gives the landowner a higher percentage on the more valuable logs and the logger a higher percentage on the lower-priced logs. Keep in mind that one tenet of good forest management is that poor quality wood is removed so that well-formed trees can grow. On a woodlot that has been managed poorly or not at all, the ratio of low-grade wood to sawlogs can be as high as 5 to 1. Because the logger's work is essentially the same whether it's low-grade or veneer that he's harvesting, adjusting the percentages stabilizes the rate per MBF at a reasonable price for the entire job. On jobs with a lot of low-grade, the logger will need to get a higher percentage on the sawlogs to compensate him for losing money on the low-grade.

Because of their experience, a logger and a forester will be able to negotiate and quickly come to an agreement on the cost of logging a particular lot. Landowners who do their own negotiating need to understand as much as a logger or forester does about logging chance in order to be successful.

There are many reasons to own woodland beyond harvesting timber. And yet most of us need money. And we all need to heat our homes. So there's an economic ecosystem in every rural community that depends on local wood to survive. By managing a parcel of forestland in a professional and sustainable manner, a landowner can contribute to the local economy, improve wildlife habitat, help the environmental health of the planet, and hopefully put a few dollars into the bank. Being a tree farmer, even if it's just passively, makes a lot of sense for a lot of reasons.

Invasive Plant Management

Mike Freeman

Standing in a 10-acre shock of green, unmown grass surrounded by yellow-leaved aspen and tulip trees, bronzed oaks, and verdant white pine, Leslie Duthie pointed to a stand of bamboo-like canes, the only plant visible where it grew.

"These give me fits above all others," she said. "This is Japanese knotweed. Very hard to eradicate and spreads easily. Just one piece of one root in a pile of loam [and it will spread] wherever that loam is sold."

We were in the Flynt Quarry in Monson, Massachusetts, a place where a century-old granite mine and a former town dump have been converted to an open-access recreational site. Duthie, a horticulturist with Norcross Wildlife Sanctuary, vice president of the Opacum Land Trust, and board member of the Monson Conservation Commission, has dedicated much of her life to invasive plant control in south-central Massachusetts and northeastern Connecticut. Recently, that work has led her to the quarry, where the landscape history has left the sort of friable soils and ample sunlight in which most invasives prosper.

"This land is obviously quite disturbed," she said. "We have the road right there, with road shoulders being prolific seed-source invasive sites all over New England, and along the field here we have the usual array."

She pointed first to bright red berries – orange-yellow where the husks had yet to shed – garnishing Asian bittersweet tresses that choked hard and softwoods. She then stepped to a willow-like shrub, bending a leaf back to show the silvery underside.

"These are autumn olives; and you can see winged euonymus (burning bush), too, with those bright red leaves, which seem to be required planting for every post office building and McDonald's in the Northeast. We have a lot of tours here, both for kids and property owners. We tell the kids the fruits of invasives are like Twinkies for birds – high in color and sugar, but low in nutritional value, unlike the native plants which bear high-energy fruits. If birds fuel up on bittersweet and buckthorn during migration, they'll tire long before they should. Invasives are quite prevalent on this site, but we are controlling their spread to the interior forest, which is still fairly clean – a lot of oak and white pine on the granite sheets along with juniper in the understory. The more people walk here and on other [demonstration] sites, the more they see what's possible. Invasives are tough to beat back, but it can be done."

LESLIE DUTHIE

"Invasives are tough to beat back, but it can be done," says horticulturist Leslie Duthie. Here, workers attack multiflora rose and bittersweet at Norcross Wildlife Sanctuary in Wales, Massachusetts.

A Foothold in the Forest

While global commerce has generated great wealth over the centuries, it's also resulted in great loss for local ecosystems, New England's forests not excepted. While few would claim that honeybees and apples haven't benefited the North Woods, they likewise wouldn't describe Dutch elm disease or chestnut blight as anything but catastrophic, and the more recent influx of insects aboard Asian packing ships hold similar potential. Beyond invertebrates and pathogens, introduced plants have been the longer-running scourge, in some cases dating back to pre-Independence. In many parts of southern New England, they've colonized much of the forest understory. Certain species in certain areas are so well established – Japanese barberry and multiflora rose to name

USING HERBICIDES

Due to ecological concerns, some people are understandably reluctant to use herbicides. In the case of invasives, however, many experts feel that their judicious application is better than letting the plants thrive.

Ted Elliman of the New England Wild Flower Society uses herbicides in his work. "We certainly don't discourage people from using them on their own land," he said. "We just advise them to use the best chemicals and techniques for the application, and in the right concentrations."

The herbicide most widely used in invasives control is glyphosate. Originally sold under the trade name Roundup, glyphosate is no longer under patent and is available in various formulations. It works by inhibiting an enzyme reaction crucial to plant survival. Although it is a full-spectrum herbicide, killing most plants, it is considered significantly less toxic than many other herbicides, including chemicals from the organochlorine family, such as DDT.

Appropriate concentrations of herbicide vary depending on the application. More diluted solutions are used for spraying leaves, while higher concentrations are used for direct application to cut stumps. Cut-stump application is particularly effective in the fall, when nutrients are being moved downward into the plant's root system for winter storage. Directly applying the herbicide to the stump also minimizes the risk of inadvertently spraying other plants and animals. (Alternatively, cut stumps of woody species can be covered with a patch of heavy-duty black plastic tied around the stump to suppress resprouting.)

Cut-stump applications can be impractical, especially with vines that have extensive root systems. In the case of Oriental bittersweet, for example, a spray treatment of triclopyr is often recommended. This herbicide kills broadleaf weeds and woody plants without affecting grasses or sedges.

JOHN DOUGLAS / FLYING SQUIRREL

For further guidelines on herbicide use, landowners can consult conservation organizations experienced in invasive species control. If wetlands are nearby, your state environmental agency must be consulted. Local regulations may also apply.

two – that many amateur forest lovers simply assume they're part of the original matrix, not threats to native flora and fauna. So pervasive are many of these that land managers have uniformly resigned themselves to an invasive plant permanency.

Fragmented forestland further complicates matters. As is commonly known, the overwhelming majority of New England's forests are privately owned. Traditionally, this has hampered control efforts, as many owners are either unaware of or indifferent to these plants' existence.

"It can absolutely be frustrating," said Amanda Weise, ecological program director for the New England Wildflower Society, "but we work within it despite the setbacks. Landowners can be as conservation-minded as anyone, but this focus stays steady on our public trusts while private land is subject to the will of its tenant."

Though landowner awareness is rising, the magnitude of invasive management can prove too much, something noted by Barbara Keene, a horticulturist and landscape designer in Holliston, Massachusetts.

"While it's unlikely we'll eradicate these species, we can reduce their spread, something we address on all our sites. In our experience, though, management depends on landowners' commitments, and since invasive management involves owner labor or hired help, this isn't always possible, as finances and physical ability are often limiting factors."

Even when landowners are able to combat invasives, the plants' tenacity can be an inhibitor. Though visibility and a stationary nature make plants the easiest invasive suite to target, their unrelenting fecundity can be daunting, particularly in places where nonnative flora compromise most of the understory, such as in southwestern Connecticut, where Patricia Sesto is Wilton's town forester.

"In the last 30 years, our upland forests have become largely devoid of native understory species. When invasives take over

they do it completely. An understory of varying native shrubs becomes a nonnative monoculture, which in our area usually means Japanese barberry or winged euonymus. The fewer the plant species, the fewer types of insects, birds, and animals an area can support." Sesto added that along with inflated deer herds and their subsequent browsing, native tree seedlings – particularly deer-favored oak – simply can't regenerate where nonnative shrubs dominate.

As depressing as accounts such as Sesto's can be, cautious optimism should prevail. For one thing, even in overrun areas such as Wilton, aggressive management can still make a difference; and secondly, most of even southern New England isn't as severely plagued. (Being a bedroom community to New York City, Sesto's Fairfield County has seen intensive ornamental gardening, leading to that region's substantial invasive troubles.) There, as elsewhere, if invasives can't be eradicated, they can be significantly checked using proper practices. In addition, federal, state, and nonprofit agencies – such as Duthie's efforts at Norcross – have been aiding landowners now for some time. As in any endeavor, the key is simply getting started. In this case, it's important for landowners to know that they're not alone, and that there are resources available to help.

The Goal is Control

"The first thing to do is develop a management plan," said Donna Ellis, senior educator for the Connecticut Invasive Plant Working Group. "Work with a private forestry firm or state agency like the University of Connecticut's Coverts Program to develop short-, mid-, and long-term strategies for addressing invasive species. These aren't one-and-done prescriptions. Most plants are hardy organisms, particularly the most common invasives, and after initial treatment, annual monitoring is vital. Of course, the more you do in year one and two, the better. Management plans map this out, and professionals can help with plant ID."

Cooperation is vital, and there's much willing owners can do themselves. As Ellis notes, though Connecticut alone lists 97 invasive plant species, there's a particularly noisome cadre posing most of the threats. [See sidebar.] Learning to identify these (with the help of either field manuals or professionals) is paramount, followed by learning how to approach their removal, which can rely as much on the when as the how.

Awareness of which invasive plants are growing on your woodland is a prerequisite for any forest management activities. For instance, if a landowner would like to implement a timber harvest, the surrounding landscape needs surveying. If an adjoining property has Japanese stiltgrass or barberry, disturbing the ground will invite expansion, making cutting without preventive measures unwise.

"How timber cuts or salvage operations are performed effects a great deal," said Duthie. "Simple things like spreading out the slash, especially the tops, can make all the difference." She noted that following a 2011 tornado, Monson did just this in the ensuing salvages, whereas neighboring Brimfield cleared damaged areas entirely on several town and state properties. "They looked like parks," she said, "and the results are plain. We

Japanese Barberry
Berberis vulgaris (pictured)

Common Barberry
B. thunbergii

Oriental Bittersweet
Celastrus orbiculatus

Common Buckthorn
Rhamnus cathartica (pictured)

Glossy Buckthorn
Frangula alnus

Burning bush
Euonymus alatus

Garlic mustard
Alliaria petiolata

Bush Honeysuckles
Lonicera maackii,
L. morrowii,
L. tatarica,
L. x bella

Japanese Honeysuckle
Lonicera japonica

Autumn Olive
Elaeagnus umbellata

Norway maple
Acer platanoides

DESCRIPTION AND HABITAT	THREATS	CONTROL AND REMOVAL
Deciduous shrub. Compact and twiggy, usually growing two to three feet, sometimes six feet tall. The small leaves are either untoothed (Japanese) or sharply toothed (common). Beneath each cluster of Japanese barberry leaves is a single spine; common barberry has two or three spines. One of the first plants to leaf out in spring. Clusters of ½-inch yellow flowers produce scarlet berries; foliage turns orange or red in autumn. Grows along roadsides and open fields and in open woods. The Japanese variety, being more shade tolerant, is more often found in forest.	Where barberry establishes a dense, shady ground cover, little else is able to sprout or grow. Deer and other browsers avoid it in favor of native plants. Raises soil pH and reduces depth of leaf litter on the forest floor.	The entire plant and roots can be pulled with hand tools or by other mechanical means. Alternatively, the stem can be cut and herbicide applied to the stump.
Deciduous woody vine. Climbs in a twining pattern to 60 feet high. Vine base can reach two to five inches in diameter. Alternate leaves are highly variable in shape and size; small, greenish-yellow flowers. Best identified in fall, when yellow fruits split, displaying the scarlet seed covering. Grows in forests, fields, wetlands, and beaches. (Note: American bittersweet, *C. scandens*, looks similar but produces flowers and fruits only at the end of the branch. Oriental bittersweet has flower and fruit clusters between leaf and stem. While *C. scandens* is native and noninvasive, this has been complicated by hybridization in the wild.)	Twining vines girdle the trees and shrubs they climb. Vine mass can pull trees down and make them more vulnerable to wind, snow, and ice damage. Once an infestation is well-established, a nearly impenetrable mat blankets the area, shading and choking out other vegetation. Unfortunately, it remains popular as an ornamental.	A combination of mechanical removal and herbicide (often triclopyr) is typical. Large infestations are difficult to control, as roots sucker and seeds persist in the soil for several years. In fields, weekly mowing is effective. Infrequent mowing merely stimulates root-sprouting.
Deciduous shrub or dense, small tree. Dark bark with lenticels. Leaves of glossy buckthorn have parallel veins. Common buckthorn has smooth, rounded, finely-toothed, subopposite leaves; black, glossy fruit; twigs often tipped with sharp thorns. Glossy buckthorn has glossy, oval, toothless, alternate leaves; red fruit turns nearly black. Larger specimens can resemble old apple trees and grow to 20 feet. Shade-tolerant. Occurs in a wide variety of habitats – including fields and forests – with common tending toward drier, alkaline sites and glossy preferring wet, acidic soil.	Dense stands shade out all other shrubs and tree seedlings, as well as wildflowers and other herbaceous plants, reducing habitat for small mammals and birds. Seedlings can wait decades for the canopy to be opened. Laxative properties of fruits can harm wildlife or rob them of energy. Elevates nitrogen content of forest soils, altering insect communities.	In small numbers, seedlings can be pulled by hand and hung in nearby trees to desiccate. In thicker stands, pulling can stimulate growth, as can mowing or burning. Foliar herbicide is sometimes required. Larger trees can be girdled, or cut with herbicide then applied to the stump.
Deciduous shrub. Leaves are opposite, elliptic, one to three inches long and finely serrated; dark green in summer, they turn an unmistakable bright red in autumn. The bush is also known as "winged euonymus" for the cork-like wings that often grow from the sides of smaller branches. Flowers are small and yellow-green. Smooth, purple-red, ½-inch-long fruits appear in fall. Grows in full sun to full shade and in a wide variety of soils. Still widely used in landscape and highway plantings.	In a well-established stand, the thick foliage casts heavy shade, which – combined with a shallow, dense root system – prohibits all other undergrowth species. The numerous seeds are widely spread by birds.	Smaller plants should be pulled by hand or dug out with hand tools. Larger shrubs can be cut and herbicide applied to the stump. For extremely large infestations, herbicide can be sprayed in early summer.
Biennial. First-year plants show basal rosettes of kidney-shaped leaves with scalloped teeth. In spring, second-year plants generate stalks two to three feet tall with alternate, heart-shaped, sharply toothed leaves and clusters of white, cross-shaped flowers. When crushed, new leaves and stems emit a strong garlic odor. Taproot is slender and white with a distinct S-curve. Highly adaptable; grows in sun to heavy shade, favoring forest and forest-edge habitats.	Shade tolerance, dense growth, and prolific seed production (to 6,000 per plant) make it an aggressive competitor, especially against other spring-blooming species. Kills mycorrhizal fungi, thus threatening hardwood regeneration. Certain native butterfly larvae often die when hatched from eggs laid on garlic mustard.	Infestations are best pulled by hand (with care taken to remove the taproot) or repeatedly cut at ground level before seeds form. Second-year plants are best removed when in full bloom. Fire or herbicides are sometimes used for larger areas. Seeds persist in soil for up to five years.
Deciduous shrubs. Growth is multi-stemmed with opposing branches. Mature plants usually reach 6-10 feet tall. Leaves are opposite and one to three inches long. Sweet-smelling white, yellow, or pink flowers are tubular and paired. Berries are red or, rarely, yellow. Preferring sun to shade, they aggressively invade abandoned fields and forest edges but are also found in intact forests. (Note: less common is the Northeast's native and beneficial fly-honeysuckle, *L. canadensis*. It can be distinguished from exotics by the pith in the center of each stem. Cut a stem crosswise and the pith of *L. canadensis* will be white and solid. Nonnative piths are brown and often become hollow.)	Spreading quickly in disturbed soils, honeysuckles can severely affect forest regeneration after logging. Mature bushes cast heavy shade and suppress growth of native species, resulting in a reduction of plant diversity. Because invasive honeysuckle is rarely eaten by deer, its presence increases browsing pressure on the relatively fewer, nearby native species.	Small plants can be pulled by hand. With mechanical removal techniques, any portion of the root left behind may resprout. Cutting and applying herbicide to the stump can be effective, especially in autumn.
Trailing or climbing, woody, semi-evergreen vine. Usually 6-10 feet long, but can reach 30 feet. Opposite one- to two-inch-long leaves. Flowers are similar to bush honeysuckles', but berries are small and black, rather than red. Habitat is similar to bush varieties. (Note: native honeysuckle vines are distinguished by their red berries and connate, or fused, upper leaves. The upper leaves of *L. japonica* are separate.)	Competes ferociously for both light and soil resources, spreading by seeds, runners, and underground rhizomes. Can, like bittersweet, topple trees and shrubs.	Very difficult to control, due to its several propagation strategies. Pulling often leaves roots and rhizomes behind. Herbicide (sometimes in tandem with fire) is often applied in fall or winter.
Deciduous shrub or small tree. Grows to 20 or 30 feet. Autumn olive's alternate gray-green leaves are oval, smooth-edged, and – when mature – silvery underneath. Small, tubular, white or yellow flowers grow in clusters. Fruits are a pale, pinkish red. Olives can tolerate a wide variety of conditions, from wetlands to forests, and have a special advantage on infertile sites: they are capable of nitrogen-fixing.	Outcompeting native species, olives can form dense thickets that alter natural succession patterns and reduce plant, bird, and other wildlife diversity. Can interfere with the nitrogen cycle of native species dependent on poor soils. Prolific seeds are easily spread by birds. Can flower and set fruit at three to five years old.	Small plants can be hand-pulled. Herbicide is often required, applied to cut stumps or as a foliar spray. Cutting (without herbicide follow-up) and burning merely stimulate sprouting and more vigorous growth.
Deciduous tree. Grows to 60 feet. Popular as an ornamental and street-side tree, it resembles sugar maple. Norway maple's bark is more regularly grooved than that of sugar maple and its autumn color is more yellow. Norway maple is most easily distinguished by the milky sap emitted from broken stems or torn leaves. Shade-tolerant, fast-growing, and stress-resistant, it succeeds in a variety of conditions and locations.	Outcompetes sugar maple by spreading rapidly to disturbed forest sites. Seedlings sprout vigorously. Mature trees form a denser canopy than sugar maple, shading out wildflowers and other tree seedlings.	Control methods include pulling seedlings, cutting trees, and – when necessary – applying herbicide to prevent resprouting.

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have far less invasive encroachment here than there."

In places where invasives are already established, removal strategies can be based on either manual or chemical control.

"Invasives can be treated both ways," said Ellis. "For sound reasons, lots of owners are hesitant to use chemicals and many firms operate without them. Nonchemical, as in other fields like organic farming, is more labor intensive, as cutting needs to be done over a number of years, but done right it is effective."

On the other hand, for land managers who have hacked away at knotweed, honeysuckle, and bittersweet in perpetuity with spotty results, a chemical conversion is equally understandable.

"For years I was anti-chemical," Duthie said. "But after a while, I surrendered. Now we use the 'rubber-cement' treatment. Crew members cut vines and shrubs, and I follow with a chemical bucket and brush. Some people like Roundup [glyphosate], but we prefer Garlon [Triclopyr]."

When using chemicals, both Ellis and Duthie recommend doing so toward the fall, when plants put their energy toward root extension, pulling herbicides down. Conversely, hand-pulling might be best in spring and summer, before plants fruit. Chris Polatin, of Polatin Ecological Services, is particularly fond of nonchemical treatments.

"It takes time," he said. "Three years gets you 99 percent control (not eradication), and then you're on the hook for perpetual stewardship. Ninety percent is relatively easy through brute force, while the next 9 percent requires tenacity. The last 1 percent gets fun – people on hands and knees pulling seedlings. Wildlife and wind constantly reintroduce seeds, so the lesson of invasives is simple: if you love land, be aware of it. Walk it. Not just the trails and vistas, but the uninteresting areas. Put your awareness there so you can prevent the next invasive wave from gaining a competitive advantage."

Will and Vision

Any landowner wavering over whether to undertake such an effort due to the labor and costs involved should explore National Resources Conservation Services (NRCS) grants designed to support invasives control on private lands by greatly defraying costs. The work can be done by landowners or by contractors who specialize in this work.

As awareness of the issue grows, more owners are stepping into the invasives battle. And success stories are serving as inspiration. Having driven across Monson from the Flynt Quarry to the 8,000-acre Norcross Sanctuary, Duthie ended the day on one such oft-toured stretch of woods, a block of sugar maple, oak, and hemlock bisected by a dirt road.

"You see reintroduced dogwoods and viburnum here now," she said, sweeping a hand, "along with other native understory species, but this used to be pure buckthorn, and that stand in the field we just passed was overrun with bittersweet and burning bush."

Robins flocked through the conifers and hardwoods, flurrying native shrubs, and a late-migrating Swainson's thrush stilted along a hemlock branch.

"It's taken years," she said, veiling hard-earned pride, "but we more than have a handle on it now."

Mike Freeman lives in Rhode Island and is the author of the outdoor memoir *Neither Mountain Nor River: Fathers, Sons, and an Unsettled Faith*.


1

THE LIST GOES ON

This article and accompanying chart only cover a handful of the major invasive plant threats to the forests of New England. Others include:

1 Common reed *(Phragmites australis)* – This wetland invasive, taking advantage of ditches alongside timber access roads, is one of the few invasives moving into Maine's North Woods. Limited efforts are underway to keep it from becoming more widespread in remote areas.


2

2 Himalayan jewelweed *(Impatiens glandulifera)* – This fast-growing herbaceous annual can reach six feet in height, outcompeting native jewelweeds and other vegetation along streams and in moist, lowland forest soils.


3

3 Japanese knotweed *(Fallopia japonica)* – This large perennial resembles bamboo, though the two are not related. Primarily a problem along rivers, where it destabilizes bank soils, knotweed is also a problem for many of the Northeast's floodplain forests.


4

4 Japanese stilt grass *(Microstegium vimineum)* – Highly adaptive, stilt grass can spread in all but the deepest shade. It has been found in New York and has been moving north through the Connecticut River valley for over 20 years.


5

5 Pale and black swallow-wort *(Vincetoxicum rossicum, V. nigrum)* – These herbaceous perennial vines don't tolerate shade but are infiltrating the oak savannahs of New York's Onondaga limestone escarpment and have become entrenched in parts of New England.

Invasive species are a problem for all habitats, not just woodlands. Many plants, including purple loosestrife and wild chervil, threaten wetlands, roadsides, and grasslands. Others, such as Eurasian water milfoil and water chestnut, pose serious aquatic dangers. More broadly, invasive species include not only plants but also many animals (particularly insects and fish) and diseases.

PHOTO CREDITS FROM TOP: DAVE MANCE III; RUTH KINZIE; NAJA KRAUS, NYSDEC FOREST HEALTH & PROTECTION; TED BODNER, SOUTHERN WEED SCIENCE SOCIETY; BUGWOOD.ORG; ELINOR OSBORN

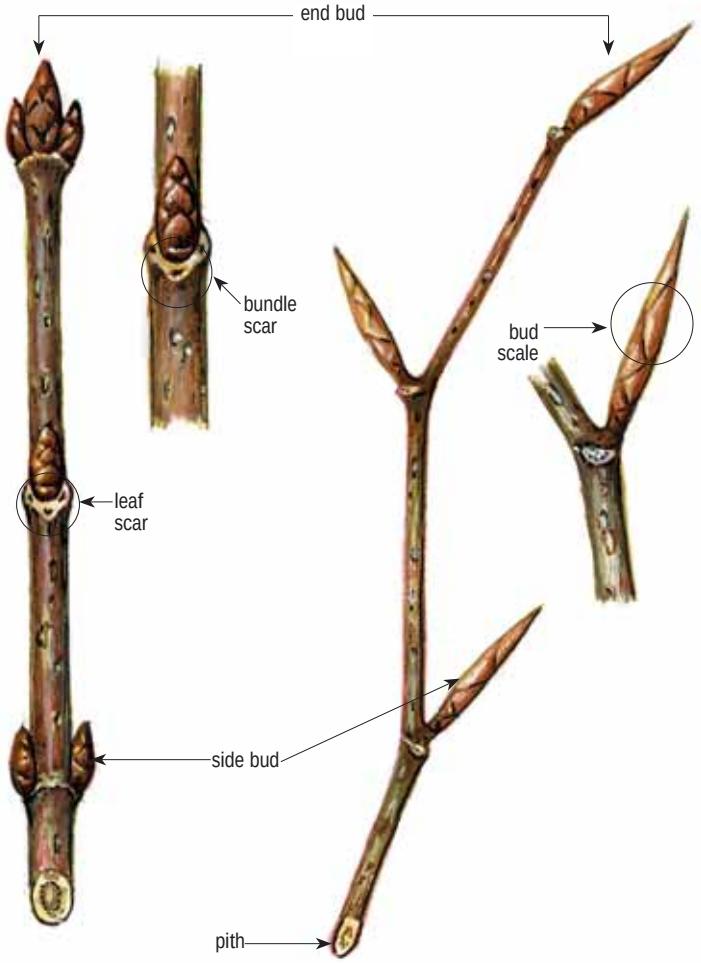
Sorting the Saplings

A Quick Guide to Winter Tree and Shrub Identification

By Ana Ruesink with Illustrations By Rebecca Merrilees

When winter's winds remove the multicolored cloak of leaves from northern hills, most of us return our tree guides to the bookshelves. Without leaves, woody residents of the northern forest seem to lose much of their distinctiveness – especially the young ones. Where once we may have seen a forest understory of red maple, gray birch, and eastern hophornbeam, now suddenly we see nothing but "brush."

Yet woody plants in winter are anything but featureless. A moment's scrutiny with a 10X magnifying lens or sometimes just the naked eye reveals details, distinctions, and marvelous diversity. Identifying deciduous trees in winter – without their showy clothes on – can be one of the great joys of a cold, gray season and an antidote to the first impression of dull uniformity that so often attends our visits to the winter woods.



Take along your magnifying lens and be sure to retrieve your field guide before venturing out to learn to identify the trees in your wintry forest. Sure, the jargon-rich entries can be a bit forbidding at first, like this excerpt from *The Illustrated Book of Trees* by William Carey Grimm, in which he describes eastern hophornbeam:

"The twigs are slender, more or less zig-zag, tough, dull yellowish-brown to reddish-brown in color, and either smooth or slightly hairy. There is no terminal bud, the lateral ones diverging at an angle of about 45 degrees from the twigs. They are ovoid, sharp-pointed and about one-quarter-inch long; with from 8 to 12 greenish-brown to reddish-brown, and longitudinally striate scales. Fruits may occasionally persist into the winter, and small catkins, usually in groups of three, are often present."

But don't despair. The language and concepts are well within reach.

In deciduous forests of the Northeast, you could encounter roughly 70 species of trees. Considering woody shrubs, as well, adds another 80 species to the list. Daunting? Just be glad you don't live in the tropics, where woody plant species number in the thousands (and you're stuck with 12 months of bad skiing).

In some plant groups, such as maples and poplars, all the species can be easily identified in winter. In others, like oaks and roses, you can make a reasonable guess. In still others – willows, hawthorns, shadbushes – even a guess is difficult. In those cases, there's nothing to do but hunker down and wait for spring.

First, learn the toxic plants – poison sumac and poison ivy – and avoid them (the poison oil is found in the stems and roots of these plants, as well as the leaves, so they pose a threat in winter as well as summer). Then start with plants that you already know. Be systematic in your examination, noting twig arrangement, buds,

leaf scars, tree architecture, and other features. Examine your twigs in good light, and use a magnifying lens if possible. The details will astound you! Raid your bookshelves and haul a few good guides out into the field. Or better yet, harvest a few twigs on your winter rambles and bring them home, where you can inspect them in good light and by the comfortable warmth of a blazing woodstove. In winter, there's no risk that your specimens will wilt.

Features to focus on

Numerous plant parts and features hold clues to tree identity in winter. Stripping trees down to the bare branches beneath eliminates the distracting leaves and frees us to look for nuance and subtlety, to invest all our senses in close examination, and to marvel at the deep blend of form, function, and beauty that is a tree.

Many trees in the northern forest have one or two striking features that permit easy identification in winter – consider the sticky, aromatic buds of balsam poplar; the lance-shaped, sharp-tipped buds of American beech; or the monkey-faced leaf scars of butternut. For the rest, you'll need to examine a suite of characteristics before making your final diagnosis.

Resist the temptation to immediately look at bark for guidance once a woody plant's leaves are gone. Sure, you can see bark without a magnifying lens or a ladder, but that's the only easy thing about it. Distinctive lines, ridges, flakes, stripes, textures, and colors often aren't expressed until a tree reaches maturity and the bark has had a few decades to twist and split with age. In a stand of saplings, bark won't help you distinguish hophornbeam from birch, cherry, or hazelnut. Here are some more helpful features to focus on in winter:

TWIG ARRANGEMENT When first faced with an unknown tree in winter, check out the twigs. On most trees, twigs are attached in an alternating pattern along each branch. A few notable exceptions occur, in accordance with the so-called MAD Honey Principle. Woody plants in these groups – maple, ash, dogwood, and members of the honeysuckle family – arrange their twigs opposite to each other in pairs. There are spoilers in every kingdom, of course, and a small handful of woody plants have discarded the simple elegance of opposite vs. alternate in favor of a twig arrangement best described as "subopposite." Look at common buckthorn for an example.

BUD ARRANGEMENT Bud characteristics can help narrow the list of possible species to one or several (see sketches). Find a representative twig and look at how the buds are arranged along its length. Like twigs and leaves, buds may be opposite each other in pairs, subopposite, or alternate. Note that these three elements function together – on any woody plant, the twigs, leaves, and buds are all either opposite, subopposite, or alternate. Alternately arranged buds usually spiral around the twig in two, three, or five planes. Bud size may be constant or it may vary from the base of a twig to its tip. Buds may hug the twig tightly or lean away at a 45-degree angle. Terminal buds may be solitary or clustered, while side buds may be crowded or sparse along the length of the twig.

BUD SIZE AND SHAPE Fat ones, skinny ones, shiny ones, hairy ones: buds exhibit a remarkable variety of shapes and forms. Each bud is, in fact, a short branch, and it may contain leaves or flowers or both. It may be a terminal bud, which contains the true growing tip of the branch, or a side bud, which does not. The buds of most woody plants are protected by scales, but in a few, such as witch hazel and hobblebush, the buds are naked.

BUD OR TWIG COLOR Even in winter the plant world has its share of flashy dressers. Look for the distinctive sulfur-yellow buds of bitternut hickory or the characteristic blotchy green twigs of boxelder. Most trees dress their buds and twigs in more subtle colors, but even browns, purples, and grays can be diagnostic against a white background of snow.

LEAF SCARS Although leaves fall away in winter, leaf scars remain on the twigs to mark the corky place where a leaf was once attached. Leaf scars may be round, triangular, or elliptical; they may be enormous or hardly visible at all; they may encircle the bud like a cup, or the bud may perch daintily on top. In general, the largest leaf scars belong to woody plants with big compound leaves, such as butternut, hickories, and ashes.

BUNDLE SCARS On the leaf scar's surface, one to many small dots or lines present a variety of patterns. These are the bundle scars, where nutrients and water once passed between leaf and stem. Each tree species has a characteristic bundle scar design, and for a winter botanist equipped with a simple magnifying lens, bundle scars are a great aid in identification.

OVERALL TREE ARCHITECTURE (for those who prefer the big picture). Just as an expert birder can often identify a bird by its silhouette alone, a savvy student of winter trees can learn to recognize distinctive shapes and growth forms. Look for the graceful, vase-shaped form of American elm; the contorted branches of pignut hickory; or the irregular, zigzag branching pattern of black cherry. White ash generally sports chunky twigs and branches, while gray birch grows clumps of slender twigs sometimes described as "twiggles." Of course, tree shapes are mainly useful for older, open-grown trees and shrubs. A young tree might look entirely unlike a grizzled veteran of the same species. But within limits, tree architecture can be a satisfying and successful way to learn your trees – especially larger trees that hold their twigs and buds beyond the reach of most magnifying lenses.

UNUSUAL FEATURES Several woody plants can be easily identified with a quick scratch-and-sniff. Two birches – black and yellow – smell sweet like wintergreen when their twigs are bruised, while cherries have an aroma best described as rancid peanut butter. Other unusual features to look for include thorns (hawthorn, for example), spines (prickly ash), catkins (beaked hazelnut), persistent leaves (American beech), and persistent fruit (high-bush cranberry).

Go for it!

Once you're comfortable examining winter features such as buds and twigs, you may find that these new skills come in handy during other seasons, as well. Most winter buds are formed by July or early August, so bud and twig characteristics are useful except for a three-month period in early summer at the height of the growing season. And, of course, features like pith, thorns, spines, aromatic twigs, and tree silhouettes are always present for identification purposes.

So when the gray days of winter threaten to bring you down, head for the hills and enjoy the beauty in the "brush."

Ana Ruesink is an ecologist and conservation planner who lives in Burlington, Vermont.

Recommended Field Guides

Campbell, Christopher S., Fay Hyland, and Mary L.F. Campbell. 1975. *Winter Keys to Woody Plants of Maine* (revised edition). University of Maine Press, Orono, Maine.

Cope, Edward A., and Walter C. Muenscher. 2001. *Muenscher's Keys to Woody Plants*. Cornell University Press, Ithaca, New York.

Harlow, William M. 1946. *Fruit Key and Twig Key to Trees and Shrubs.* Dover Publications, Inc., New York.

Trelease, William, 1979. *Winter Botany: An Identification Guide to Native and Cultivated Trees and Shrubs.* Dover Publications, Inc., New York.

Buds in opposite pairs: sugar maple (also typical of ashes, dogwoods, and other maples)

Spiral, three-ranked buds that hug the twig: quaking aspen (typical of other poplars as well)

Buds in subopposite pairs: common buckthorn

Spiral, five-ranked, equal-sized buds that hug the twig: black willow (typical of other willows as well)

Two-ranked* buds, with the largest buds at the tip of the twig: hophornbeam (also typical of hackberry and elms)

Spiral buds, with the largest buds clustered at the tip of the twig: red oak (typical of cherries and other oaks)

Two-ranked, equal-sized buds that diverge from the twig: American beech (also typical of birches)

Large end buds and few side buds: American basswood (also typical of shadbushes and apples)

*In two-ranked species, buds form at two sides of the twig; in three-ranked species, it's three sides, and so on.

Healthy Rivers

are Made in the Shade

By Stephen Long

The health of America's rivers has come a long way since Cleveland's Cuyahoga River caught fire, and many other rivers – whether combustible or not – could not be deemed suitable places to fish or swim.

Think back 40 years when the cities and factories that lined the nation's waterways spewed waste directly into them. The gravity of the problem was so apparent and so appalling that, along with air that was increasingly unfit to breathe, it gave birth to a national concern about the environment.

Today, water quality problems are much more subtle. Instead of coming from individual pipes, pollution is carried in runoff from adjacent land. Sedimentation, under the perhaps more dignified name of "nonpoint source pollution," has become the major threat to our rivers and streams.

As a devoted trout fisherman, I don't need much of a shove to step into the water, and I can't say with a straight face that I was doing research about water quality when I had my revelation about sedimentation. I was fishing.

It was a few years ago, during the course of a dry summer, when I began to notice a pattern of shifting conditions on my local river that affected my ability to entice a trout to rise to a fly. Between rains, the water would be low, clear, and – especially during the afternoon – bathtub warm. In the heat of August, the only time I could catch a wild trout was at first light when the water was at its coolest.

Brook trout like this are sensitive to the health of their aquatic habitats.

Eventually it would rain, and it didn't take much of a downpour to raise the water level of this lowland river and turn its color to chocolate brown. For two days, the water would be stained, the trout couldn't see to feed, and it was pointless to cast even the flashiest streamers.

On the third day, I'd catch trout. The water was still cool from its infusion of rainwater, and the clarity was off just enough to hide my line and leader and make a mayfly imitation look exactly like dinner. That summer, I learned to wait for the third day, and I caught lots of hungry trout that way.

I accepted that cycle as a fact of river life until I realized that the same downpour on the same river five miles upstream did not discolor the water. It brought the river up enough to make wading difficult, but the water still ran clear. In that day on a headwater stream, I learned the basic truth of water quality, that the condition of the land determines the condition of the water.

The muddy color follows the release of billions of silt particles from the streambank into the water, enough of them to turn the river opaque.

When these fine particles settle into the river bottom's gravel, they function like caulk, sealing the gravel and rendering it incapable of incubating fish eggs. The silt also takes away the major food source for adult trout by making the streambed inhospitable for many mayflies, caddisflies, and stoneflies.

In his book *Natural Acts*, David Quammen wrote that "a good trout stream must first be an excellent insect stream, a superior haven for algae and fungi and bacteria, a prime dumping ground for dead leaves, a surpassing reservoir of oxygen and calcium. It will then also, and thereby, be a good osprey stream, a favorite among otters, a salvation to dippers and kingfishers and bank swallows and heron, mergansers and Canada geese and water shrews, mink and muskrat and beaver."

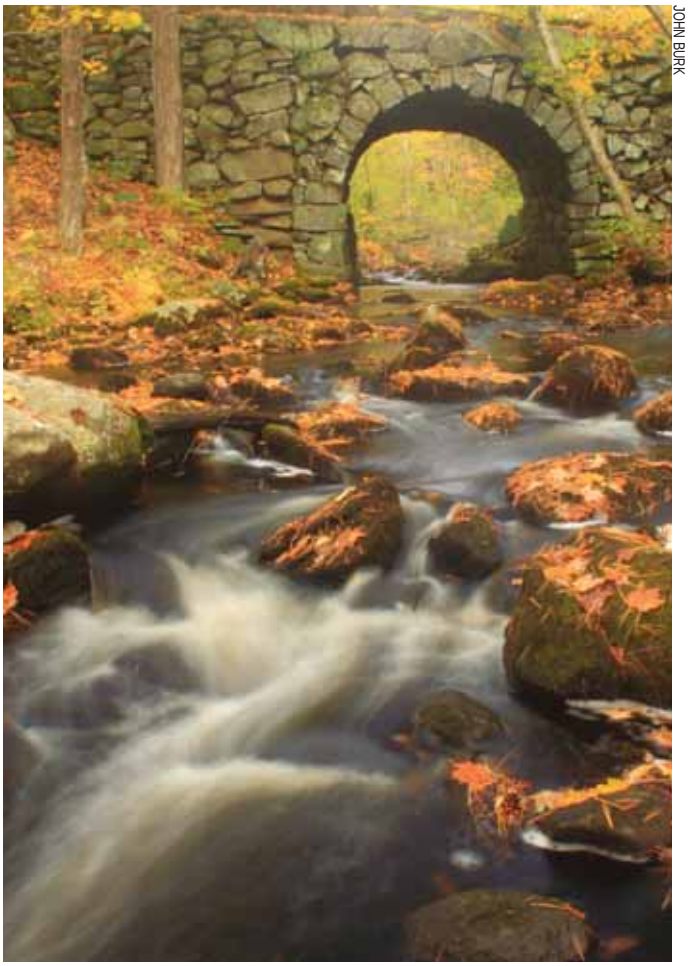
Having spent many mornings and evenings between the banks of a trout stream, I can corroborate Quammen's catalog of the riverine ecosystem. While fishing rivers in the Northeast, I have waded within casting distance of wood ducks, mallards, and

black ducks; I have seen predators at work – the osprey, mink, otters, heron, and the ubiquitous kingfisher; and I have watched a black bear swim across a swift current, climb up on the bank, shake like a dog, and then walk casually away into the brush.

Water, clear and cold, is the source of life. Unfortunately, a lot of the water in Massachusetts and Connecticut rivers is neither clear nor cold. But it's not all bad news. Clearly, our rivers are in a state of recovery. There have been dramatic differences in land use. Farmers are doing a better job at protecting water quality. Road crews are not mining streams for gravel. Factories are not dumping solvents and other chemicals into the rivers.

Just as the main sources of water pollution have changed, so have the means of monitoring it. Forty years ago, water quality was measured in terms of its chemistry. Today, while chemistry is not ignored, scientists are looking at streams and rivers in physical and biological terms as well. There's more to river health than dissolved oxygen and *E. coli*.

I suppose, too, that there's more to river health than the presence of a reproducing population of wild trout, but biologists assure me that my use of trout as a gauge of river health isn't as parochial as it might seem. Trout are a good indicator species. They have a set of habitat requirements that make them the proverbial canary in the coal mine.



JOHN BURK

Wide vegetated buffers help trap sediment and foster healthy fisheries.

COUNTING TROUT

I once had the opportunity to spend a day in the river with fisheries biologists who were conducting a fish census. Their method was electroshocking; immersing a wand with a DC current causes an involuntary impulse called galvanotaxis that impels close-by fish to swim toward it. They are then netted, measured, and released unharmed.

In one 600-foot stretch of the river with a nice combination of riffles and pools that should have been loaded with trout, there were only two spots that held trout. The first was the confluence with a tiny brook 12 inches wide that pumped a steady stream of cold water into the head of a bend pool. Lined up tight to the bank like children at a drinking fountain was a pod of wild brookies, 10 of them in all – not surprising since the water temperature elsewhere in this stretch was 73 degrees, not quite lethal to trout but approaching the danger zone. More than a day or two at water temperatures above 77 degrees and brookies will go belly up. Rainbow trout and brown trout can handle slightly warmer temperatures, but the preferred temperature for all of them is within a few degrees of 60.

In the next pool upstream, there was a similar number of brookies along with an eight-inch brown and some hatchery rainbows camped out in a three-foot-deep pool in the shade and shelter of a blowdown spruce. The trout had found the only relief they could, the shade of a blowdown and the cold water of a feeder brook.

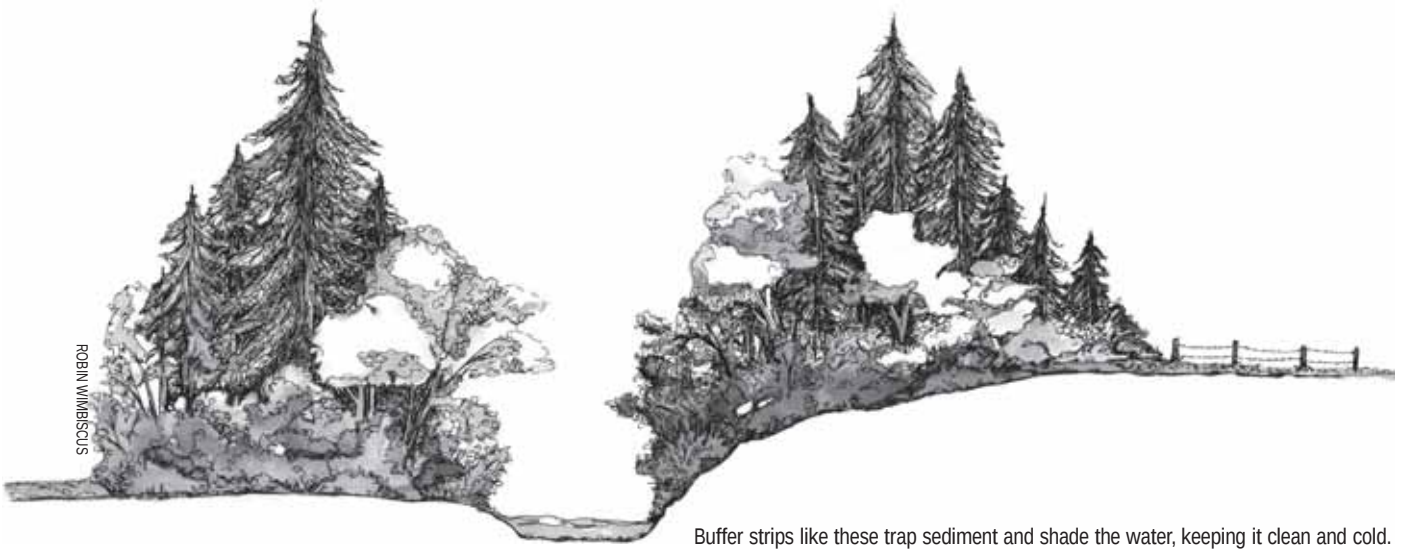
If it weren't for the canopy over the brook and the mature tree that had fallen into the river, there might not have been a single trout in this stretch of the river.

The take-home message from the biologists is this: Leaving a buffer strip is the single most important thing landowners can do to improve or maintain trout habitat. If you have a canopy over your brook, leave it there. If it's gone, let it grow back. We're talking about even tiny brooks not big enough to hold trout. The shade keeps the water cool, not just in the brook but in the river that it flows into. The river depends on it. Once the water warms up, no amount of shade is going to cool it down. It takes cold water entering the stream to bring the temperature down.

Cold water is not the only benefit provided by riparian buffer strips. Brush and trees also help to stabilize the stream bank by binding the soil with their roots. Without streambank vegetation, each shift in water level dislodges silt from the banks, which gets deposited on the river bottom somewhere downstream, the exact destination determined by the speed and volume of water and the steepness of the grade it flows through.

Another critical part of a buffer strip – the leaf litter – filters and traps sediments being carried toward the bank in runoff. Sediments can contain phosphorus, nitrogen, silt, petrochemicals, heavy metals, and other toxins from sources such as residential and commercial development, agricultural land including both cropland and pasture, logging, and roads and ditches.

River managers today are at an odd disadvantage, because the threat to river health is not as readily apparent as it was 40 years ago. Back then, the spewing pipe was a stark image that brought clarity to the issue, if not to the water. Everyone could



Buffer strips like these trap sediment and shade the water, keeping it clean and cold.

embrace the cleaning up of industrial and municipal waste. Today, the problem can seem as clear as mud, because almost any 10-acre parcel has at least some water standing or flowing through it. Today's challenge is one facing almost every single landowner. The buffering of our streams will take – if not a grass roots effort – a tree roots effort.

What does a buffer strip look like?

Recommended best management practices (BMPs) vary by state and specific site (check with your local extension office), but there are some general guidelines that can help you understand buffer strips. Stand on the streambank, turn your back to the stream and walk away from it. Take three long paces (a left and a right), which will carry you 15 feet from the bank. This is what is commonly called Riparian Zone 1. The ground between you and the stream should be covered with brush and trees. There shouldn't be any roads or trails, temporary or permanent, within that 15-foot strip. Equipment should be excluded from operating in this zone. When cutting trees, they should be felled in the direction away from the bank and winched out without entering the zone with a skidder.

Riparian Zone 2 starts where Zone 1 ends and extends farther away from the stream. The steeper the slope, the wider Zone 2 will be. At a minimum, it is 50 feet; where the terrain draining to the stream is pitched steeply, the strip needs to be wider. The goal for Zone 2 is to maintain a continuous forest cover made up of different age classes. Equipment can operate in this part of the buffer, but the goal should be to minimize it, so that natural processes are disrupted as little as possible.

If a lawn or a hayfield encroaches into the space, it's time to cut the engine and let this section of lawn go wild. If necessary, flag the edge of the buffer strip to remind overzealous mowers about the no-cut zone. We have inherited from our European ancestors a love of the park; with its neatly trimmed grass and the occasional round-crowned shade tree, the park brings comfort to those who need to know that the wilderness has been tamed. It fails, however, to do anything for the stream or the wildlife that depend on it.

Livestock also help to tame the land, and they, too, serve to remove the vegetation that is so vital to rivers. If you have been pasturing livestock within the riparian zone, it's going to take a sacrifice and some fencing to keep them out. The Natural Resources Conservation Service is in the business of helping landowners in this situation. They generally have funds available and can help to design an area where livestock can get water without having free access to the regeneration within the buffer strip.

It doesn't take long. If you do nothing more than simply allow nature to take its course, early successional poplars, dogwoods, willows, or other quick starters will be as tall as the grass by the end of the summer. If the laissez-faire approach doesn't appeal to you, plant some quick-growing shrubs or trees. Willows and dogwoods can be transplanted at anytime and they'll do a nice job of holding the bank while larger trees get established.

Beneath them, the longer-lived river-loving species hemlock will seed in.

If your buffer strip is already forested, then you are more than halfway there. The task then is to make sure that it provides continuous cover now and continual cover for generations. Manage your buffer strip as an uneven-aged stand, with a goal of maintaining three age classes of trees: saplings, pole-size, and mature. If the stand is crowded and has sparse regeneration, thin lightly. If, when removing trees, the leaf litter is scraped down to mineral soil, seed it with an annual grass and mulch it with hay.

THE FUTURE OF OUR RIVERS

It was a major shift in thinking, a national awakening to environmental reality, that brought about the changes to our water quality in the last 40 years. Bringing about the full recovery of our rivers will require a similar shift in understanding, and an equally widespread commitment by those who own the land. Incrementally, tributary by tributary, brook by brook, the water can run clearer and the river system can be full of life.

Stephen Long is a founder of *Northern Woodlands* magazine.

Making Plans For Your Land

Protecting and conserving it into the future takes work now.

Dave Mance III and Patrick White

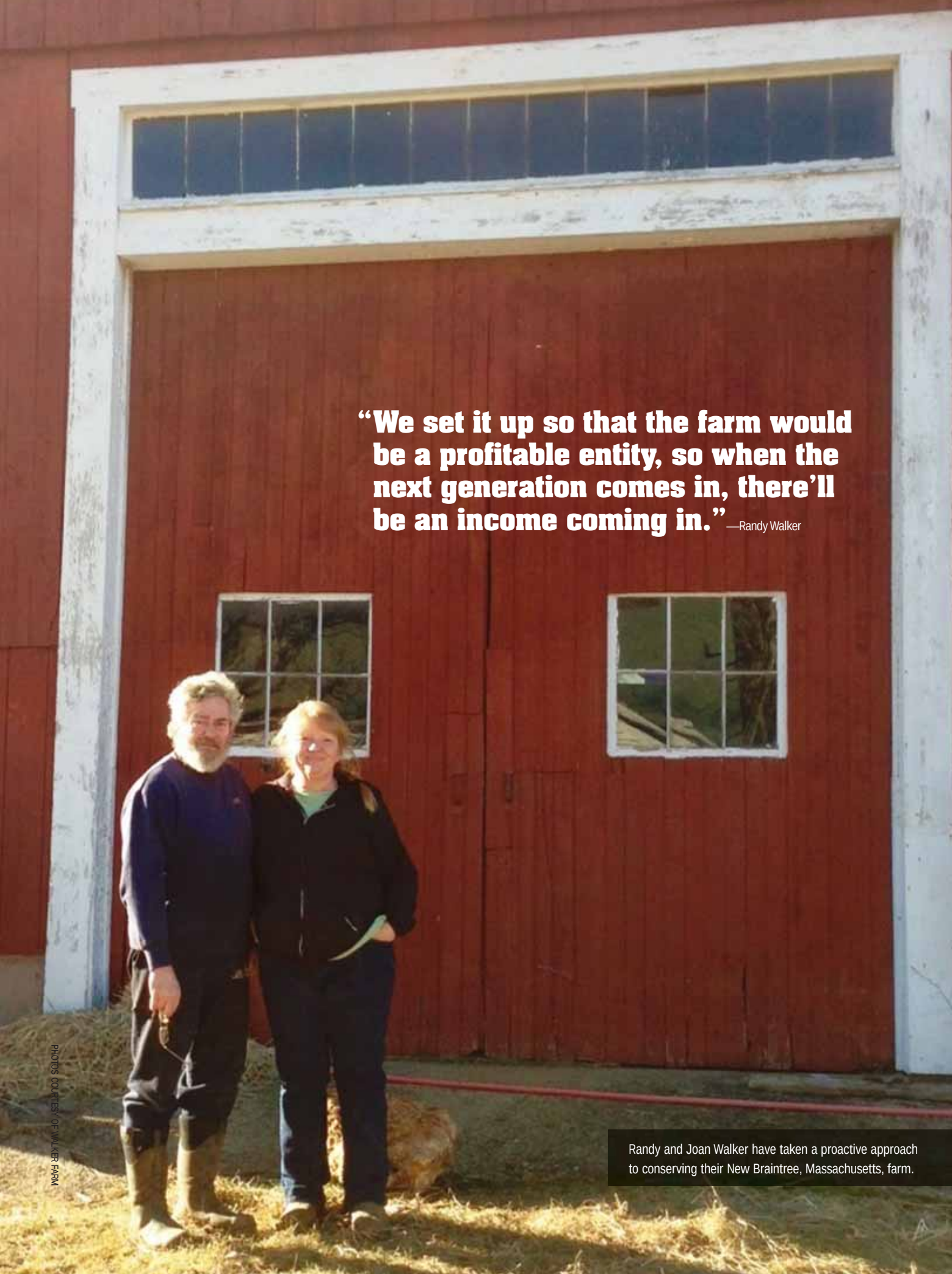
Paul Walker purchased a 400-acre farm in 1957 and worked it for more than four decades. But he waited until the day he died to tell his heirs what he wanted to happen with the land after he was gone.

"I asked him that day what he wanted to do with the farm," recalled daughter-in-law Joan Walker. "He said, 'I want it to stay as a farm.'" A doctor had to be summoned to witness the declaration. In the end, Paul's wishes were fulfilled and today the land remains intact, undeveloped, and working. But Randy (Paul's son) and Joan know that was a fortunate outcome; as the current owners of the parcel, they've been much more proactive in taking steps to ensure that the property will be protected even after they're gone.

If you're interested in permanently protecting your woodland or farmland, a conservation easement is your means to this end. (In Massachusetts they call them conservation restrictions.) The first step would be a family meeting, so everyone can get on the same page.

"A lot of New England families don't sit down and have a real conversation about these things," said Randy. "It's hard. You don't want to focus on the fact that you're going to be gone, but you need to have these talks."

In the Walkers' case, Randy had to partner with his brother to buy the farm out of the estate at fair market value. "And the only reason we could afford it was that Randy's sisters didn't push for the land to be appraised [at its highest value] as house lots," explains Joan. "We were very lucky; had his sisters decided they wanted top dollar, we would not have been able to keep the farm." Family dynamics can be fickle and subject to evolution. So Randy and Joan decided to formally ensure that the farm would be protected, even if future generations were more interested in growing houses than beef.



"We set it up so that the farm would be a profitable entity, so when the next generation comes in, there'll be an income coming in." —Randy Walker

Randy and Joan Walker have taken a proactive approach to conserving their New Braintree, Massachusetts, farm.

PHOTOS COURTESY OF WALKER FARM

"There's a lot of development pressure in this area, and we want the land to stay in a natural state when we're gone." —Bob Dubos

Not Just for Large Landowners

The Walkers' 400-acre farm is something of an outlier in Massachusetts and Connecticut, where average-sized parcels are 8 and 14 acres, respectively. But conservation easements aren't just for large landowners.

Bob and Pat Dubos moved to Chaplin, Connecticut, in the late 1960s. They bought a small house on 13.5 acres and started a sugaring operation that has grown, over the years, to 1,500 taps (some taps are leased off site). Their two kids moved away when they became adults, and neither expressed an interest in taking over the land. So the couple donated an easement to the Joshua's Land Trust, a nonprofit that holds easements on some 4,000 acres in the region.

"We've always loved this land and used it," said Bob. "There's a lot of development pressure in this area, and we want the land to stay in a natural state when we're gone."

The Duboses found the process very painless, and while they weren't directly compensated for their development rights by Joshua's Trust, they made out in other ways. They got an audit that determined the value of the property without the easement versus the value of the land with it, and they were able to write that value off as a tax deduction. Their overall property tax bill also went down as a result of the easement.

Money, however, wasn't the motivation, said Bob. "Southern New England is under intense development pressure because a lot of farms are dying out and there's just a lot of people. We were interested in keeping this land from becoming a subdivision full of upscale homes."

Pat Dubos said that she was glad they did it when they were young.

"This should be done when you're healthy and relatively young," said Pat, "before some event forces your hand."

DAVE MANCE III

Bob and Pat Dubos donated a conservation easement on their 13.5-acre property (which includes a sugaring operation) in Chaplin, Connecticut. "We were interested in keeping this land from becoming a subdivision full of upscale homes," said Bob Dubos.

Step two involves coming up with a plan for what you want to do with the land. "Our goal is that it will always be a farm; we're going to set it up and lock it up," said Randy. To accomplish this, he and his brother set the farm up as an LLC. "To me, that's the best way to go if you're going to protect anything," said Randy, citing both tax benefits (heirs buy in as shareholders, rather than inheriting property and having to pay an inheritance tax), as well as protection of the property in the event that an individual family member is sued or incurs some other personal legal liability.

The third step is to establish a conservation restriction with the help of an outside party – typically a land trust. Land trusts range from large organizations that work in more than one state to small outfits formed with specific projects in mind. If your property is large and/or particularly valuable, the land trust may buy your development rights, but in most cases you'll donate the rights to them. (You can deduct the value of this gift on your income tax return.)

The Walkers sold the development rights to a portion of the farm's acreage through the State of Massachusetts' Agricultural Preservation Restriction program, a two-year process that began in 2009. Essentially a state-operated land trust, the program specializes in prime open farmland and won't accept more woodland than open fields, so it was interested in just 87 of the farm's 400 acres. East Quabbin Land Trust stepped in to help assist the state in purchasing the development rights to that portion of the farm, and the Walkers have been in talks with that group regarding conservation easements on the rest of the farm's acreage, with the stipulation that it remain a working farm.

Currently, the farm is focused on raising grass-fed beef (including some silvo-pasturing), as well as an actively managed woodlot. About 280 acres of the farm is wooded, and Walker Farm was the 2010 Massachusetts Tree Farm of the Year. The management plan for that forestland has played an important role (along with the more recent addition of the beef cows) in helping the Walker's continue their pursuit to conserve the property. "We set it up so that the farm would be a profitable entity, so when the next generation comes in, there'll be an income coming in," said Randy.

Specifically, he worked with a consulting forester to divide the woodlot up into 10 blocks of about 30 acres. Each of those sections was placed on a light 10-year cutting plan, so theoretically there's a harvest taking place every year. (The forest management plan is also structured to promote wildlife habitat and control invasives.) "Doing it that way, we're not paying a hefty income tax, but it's enough to take care of the farm and pay the bills," he explained. "We wanted a nice, slow system." With a drop in stumpage prices in the area, no cutting has been done for a couple of years, but the plan is to resume next year. Firewood sales will also be added as a farm business, furthering the goal of making the farm a profitable entity that will allow the land to continue to be worked. The Walkers say that there are many approaches to conserving land, and landowners need to come up with strategies to best meet their goals. "Our priority has been to look at what's best for the land," said Randy. "We're just caretakers here."

Current Use

Property Tax Program Helps Keep Working Land Well-Managed

By Joseph Adams

The season's first snow. Sap buckets on a row of roadside maples. The first firefly in June. The little envelope from the Massachusetts Department of Revenue.

The arrival of the property tax bill is one of the few unpleasant ways to track the passing seasons. Fortunately for owners of forestland in Massachusetts, the state's Chapter 61 Current Use Tax Programs offer some relief, bringing the tax bill's growth rate into line with that of the trees.

All real estate in Massachusetts – except those properties enrolled in Chapter 61, 61A, and 61B – is assessed at its fair market (development) value, also known as its *ad valorem* or "highest and best use" value. The fair market value is determined by the market and is measured by recent sales of comparable property. The current use tax program allows land to be assessed as productive forest land, agricultural land, or open space, which generally results in a reduction of at least 75 percent of the resulting property tax bill. You can look at this as a tax break that incentivizes rural livelihoods, ecosystem services, and pastoral aesthetics, or you can see it as a matter of fairness: since undeveloped land doesn't require municipal services, emergency services, or schools, why should it be taxed at the same rate as a housing development or shopping mall?

For forestland to be eligible in Massachusetts, at least 10 contiguous acres must be enrolled. The landowner must exclude their residence, other structures, and any land used in connection with those buildings. (This land will continue to be taxed at full assessment.) The enrolled land must be managed according to a 10-year management plan approved by a state service forester. In general, this means hiring a private consulting forester to develop a management plan; following the plan, including cutting trees

Current use programs help reduce property taxes for landowners, thereby lowering pressure to develop forestland, farmland, and other open spaces.

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when appropriate; and allowing the state to inspect the property. Some forestland that is not managed for forest products may be enrolled – for example forested wetlands or open/shrub land used for wildlife habitat – but it can't constitute more than 25 percent of the total enrolled parcel.

Hiring a forester and developing a management plan will cost money, but in most cases the tax savings will more than offset this. Farmland can be enrolled in Chapter 61A, and open land can be enrolled in Chapter 61B, though the acreage and management requirements may differ.

Once land is accepted into the program, the landowner can expect to enjoy fairly substantial tax savings. For a hypothetical 50-acre woodlot in central Massachusetts, valued at $2,000 per acre with a $15 tax rate, a landowner would pay $1,500 per year in property taxes. If the same 50-acre woodlot was enrolled in the Chapter 61 program, this year (2015) the land would be valued at just $43 per acre, and the total tax bill would be just $32.25, a savings of more than $1,400 per year. Tax values for land under Chapter 61 are not fixed – they're adjusted every year based on the average price paid for timber over the previous five years, with separate values for woodlands east and west of the Connecticut River.

If the enrolled land is ever developed, subdivided, or harvested contrary to the management plan or standards, the landholder must repay five years' worth of deferred tax, with five percent interest, or pay a conveyance tax on the sale price, whichever is greater. When a parcel of forestland is put into current use, the town puts a lien on the property that is released once the rollback or conveyance taxes are paid. There are exemptions that allow for the land to be sold or converted to a residence for an immediate family member. This is an oversimplification of a very nuanced system; it's best to talk to your local assessor if you're uncertain about penalties.

A further condition of current use is the town's first refusal option. By enrolling in the program, landowners agree to give the town the right to purchase the property if they decide to sell or develop it in the future. If they keep the land in the current use program, the town has no right to purchase it – that right is triggered only when the owner seeks to change its use. Moreover, the town has no first refusal option on land that's sold to someone who resolves to keep it in the program, verified by an affidavit.

Perhaps because of various attempts to change the program over the years, there are several key points that are often misunderstood and worth noting:

- Enrolled land is not required to be open to the public. Posting is not prohibited.
- A landowner can harvest timber on land in 61B, but the harvest must be guided by a state-approved cutting plan (required for all harvests over 50 cords or 25,000 board feet).
- Land encumbered with a conservation easement is eligible for the program and is assessed at its use value, just as other enrolled land is.
- There is no specified minimum amount of wood that needs to be harvested; however, there is the obligation to engage in active management.

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- Chapter 61 forest management plans must be submitted to the appropriate Department of Conservation and Recreation regional office by the end of the business day on June 30. Approved Chapter 61 management plans and certificates must be filed with the assessors in the town(s) in which the land is located by October 1.

For more information about enrolling in Chapter 61, contact your state service forester. A list of service foresters is included in the resource guide beginning on page 78.

Joseph Adams is a frequent contributor to *Northern Woodlands* magazine.

Wildlife in a Changing Climate

The past offers a glimpse of the region's future.

By Madeline Bodin

In 1986, you could consider yourself lucky if you saw a Zabulon skipper in Massachusetts or Connecticut. It wasn't just that this tiny orange and brown butterfly is hard to spot; it was also considered a southern species, common in North Carolina but reported in Massachusetts fewer than four times between 1986 and 1990.

On the other hand, back then it just wasn't summer without the dance of bright orange Aphrodite and Atlantis fritillaries across the region's forest glades. These two boldly patterned species were historically among the most common butterflies in the area.

Today, these butterfly species offer a stark illustration of how animal abundance can change over time. According to Greg Breed, a Harvard University scientist who analyzed the records of the Massachusetts Butterfly Club's annual count, the number of Zabulon skippers in our area has increased about 1,800 percent since 1986. Connecticut and Massachusetts are now considered part of this butterfly's range, while decades ago they were not.

Conversely, the number of Aphrodite and Atlantis fritillaries in the area has plummeted by 90 percent.

While many factors influence species distribution, Breed crunched the numbers on 100 Massachusetts butterfly species and found a clear pattern: most of the traditionally northern species had declined in number, while every southern species found in the state had increased. No other factor, he concluded, had as big a role as range and climate in determining whether the population of a butterfly species went up or down during the study period.

It didn't matter if the butterflies lived in grasslands or wetlands, which part of the state they lived in, or whether the host plants they rely on are common or rare. Butterfly species that favored warmer climates thrived, while those preferring colder climates suffered.

According to U.S. Forest Service scientists, the northeastern United States has become warmer and wetter over the past 100 years. Specifically, the researchers found that summers have gotten a little warmer – 0.2 degrees Fahrenheit per decade over the last three decades – and winters have gotten warmer still – an average of 1.3 degrees Fahrenheit per decade during the same time period. Those are not changes you can necessarily feel, but cumulatively they represent a long-term trend of shorter, milder winters.

The amount of rain and snow falling on New England has increased by 12 percent over the last 100 years, says Lindsey Rustad, team leader for the U.S. Forest Service's Center for Research on

MATT PALMER / WIKIMEDIA COMMONS / D. GORDON E. ROBERTSON/WIKIMEDIA COMMONS / MEGAN MCCARTY/WIKIPEDIA COMMONS

Clockwise from left: Shorter winters are boosting tick counts, which in turn are reducing moose numbers. The populations of many bird species have increased with warmer weather in New England, but others, like the black-capped chickadee, are dropping. Atlantis fritillary butterfly populations have plummeted more than 90 percent in parts of southern New England…while the number of Zabulon Skipper butterflies has increased 1,800 percent since 1986.

Ecosystem Change, and the lead author of the report. It's also noteworthy that the increased precipitation is falling more often in big storms, with longer dry periods between them.

It's impossible to tell whether any single summer or winter will be warmer or colder than average, or whether it will be wetter or drier than average, says Rustad, but the general trend has held for the past century. And it will continue into the future, she adds. "We have a good idea of the direction of change, where we are coming from, and where we are going."

It's not just butterflies whose numbers and ranges have been altered by the change in the Northeast's climate. Other groups of animals in Massachusetts and Connecticut have also been affected. By examining what has happened in the past, scientists have been able to tease out patterns that allow them to predict with greater confidence what will happen to our region's wildlife in the future.

On the wing

Having lots of data is the key to finding out which wildlife population trends are related to climate and which are caused by other factors, such as habitat loss, disease, and natural succession. There's a wealth of data available on birds. The Audubon Christmas Bird Count has been going on for over 100 years. The annual national Breeding Bird Survey has been collecting information for nearly 50 years. The eBird online database from Audubon and the Cornell University Laboratory of Ornithology contains millions of records, including historical ones.

Like butterfly populations, bird populations are responding to many factors, from habitat loss to forest fragmentation and introduced predators. Nicholas Rodenhouse, a professor at Wellesley College, sat down with all that raw data to tease out which trends in the Northeast's bird population could be pinned to climate change.

One of the patterns he found was similar to the butterfly finding: in general, species at the northern end of their ranges in the Northeast were faring better than species at the southern edges of their ranges. There were exceptions like the pine siskin, a northern species that extended its range south. But of the 38 Northeastern bird species that shifted their range, 27 moved north. (Four species expanded in every direction, indicating growing populations.)

Rodenhouse also found that resident bird species, the ones that stay around through the winter, showed a strong pattern of population increases. He found that 15 of the Northeast's 25 resident birds species increased in abundance, likely because the harsher winter weather of the past was the main factor limiting those species' survival, he says.

Still, the five resident bird species expected to buck that trend – by decreasing in number – are among the Northeast's most iconic birds, including the black-capped chickadee and the ruffed grouse.

Snow makes a difference

The decline in snow cover plays a starring role in the fates of two of New England's largest and most beloved animals, the moose and the white-tailed deer.

"Everybody cares about moose," says Rodenhouse, whose expertise on the impact of climate change on the Northeast's wildlife is not limited to birds. Moose have celebrity status on the border between Massachusetts and Connecticut, where it is at the very southern edge of its range.

Moose arrived in the area as their populations increased in northern New England, but the population trend has made a quick U-turn, Rodenhouse says. Warmer winters with less snow mean that moose numbers are being reduced from the stress of winter ticks. (Long, cold winters keep winter ticks in check. When winters are short, tick numbers surge, reaching levels that can kill a moose.)

Sharing a habitat with white-tailed deer puts another dent in the moose population, says Scott Williams, a biologist with the Connecticut Agricultural Experiment Station, part of the state's Department of Forestry and Horticulture. White-tailed deer carry brainworm, a parasite that

doesn't harm deer but kills moose.

Deep snow gives white-tailed deer predators an advantage, Williams says, but without deep winter snow, deer have fewer limits and can be found even at higher elevations where, in northern New England at least, moose once ruled. A New England with a warmer climate likely will be one with even more of the already-plentiful white-tailed deer.

Some like it hot…

These creatures have either increased in number or expanded their range in the Northeast recently. Their success has been linked to climate change.

- white-tailed deer
- green heron
- great egret
- cattle egret
- brown-headed nuthatch
- Chuck-Will's-widow
- loggerhead shrike
- Persius duskywing (butterfly)
- gray comma (butterfly)
- Zabulon skipper (butterfly)
- common checkered skipper (butterfly)
- frosted elfin (butterfly)
- sachem (butterfly)
- bronze copper (butterfly)

…But many do not.

These creatures' recent decline in numbers or shift in range has been linked to climate change. The birds listed represent just a sampling of the species that have either declined or are expected to decline in the Northeast.

- moose
- ruffed grouse
- black-capped chickadee
- Baltimore oriole
- hermit thrush
- Blackburnian warbler
- rose-breasted grosbeak
- wood thrush
- veery
- American bittern
- Bicknell's thrush
- Aphrodite fritillary (butterfly)
- Arcadian hairstreak (butterfly)
- Atlantis fritillary (butterfly)
- Leonard's skipper (butterfly)
- northern cloudywing (butterfly)
- oak hairstreak (butterfly)

It's the little things

Moose and deer are among New England's largest animals, but it is New England's smallest animals that need more attention from scientists studying climate change, Wellesley College's Nicholas Rodenhouse says. While we find them easy to overlook, insects are among the most important animals in New England, as well as in the rest of the world. It's the abundance of insects during the New England summer that brings migrating songbirds here to raise their young. Insects feed many other larger animals, as well, including frogs, turtles, moles, and shrews.

But insects have eluded scientists when it comes to studying the impacts of climate change in the Northeast. That is mostly because, outside of butterflies, there is very little existing information about the region's insects, Rodenhouse says.

Paradoxically, warmer winters with less snow mean colder conditions for insects when they overwinter in the soil or among the fallen leaves on the forest floor, according to Peter Groffman, an ecologist with the Cary Institute of Ecosystem Studies in Millbrook, New York. In a study done in a New Hampshire forest, Groffman found that a lack of snow cover means soils are not insulated from cold winter air, making the soils colder. This exposes insects and other invertebrates to freezing temperatures that they may not survive.

What the future may hold

Scientists can speculate on which species are likely to win or lose under different climate change predictions, but generalizations aren't easy, Rustad and Rodenhouse say. Uncoordinated gains and losses can disrupt ecosystems in hard-to-predict ways. Caterpillars might hatch based on one set of climate cues, while the baby birds that eat them might be on a different schedule related to a different set of climate cues.

Rodenhouse says that a striking example of this lack of synchronization happened seven years ago on New Hampshire's Lake Winnipesaukee. Ice cover typically drives common loons off the northern lakes; they fly south and winter on the ocean, where the loons molt their feathers, becoming flightless.

That warm winter, a group of loons stayed on the lake until they molted. When the ice came, they couldn't fly away. Worse still, they apparently served as decoys for a group of migrating loons that landed on the ice beside them. Loons need open water to launch into flight, so the frozen lake was a death trap for the new group, too.

Seventeen adult loons died, representing three percent of all the loons in New Hampshire. Five loons were saved and released on the ocean. New Hampshire's Loon Preservation Committee calculated at the time that even if similar die-offs happened only occasionally, it could still tip New Hampshire's loon population from holding steady into decline.

While scientists have been able to pick up the thread of climate change among the wildlife population patterns in New England, climate change is still just a single threat in a host of causes, factors, and influences. Rustad and Rodenhouse say that reducing the other threats, which include habitat loss and fragmentation, pollution, and invasive species, will help wildlife cope with a changing climate.

Rodenhouse adds that even more pronounced changes in the make-up of our wildlife will come when the average global temperature increases by three degrees Celsius (about five degrees Fahrenheit), which is expected at mid-century under current climate models.

Healthy New England forests will be critical to buffer those changes, the U.S. Forest Service's climate change report concluded. Whether Aphrodite fritillaries continue to flit in local forest glades and how likely we are to see black-capped chickadees at our birdfeeders on a February morning in 2050 depends not only on a global carbon footprint, these scientists say, but the care we take today with the forests and other ecosystems in our own backyards.

Madeline Bodin has written about wildlife, conservation, and science for many publications, including *The Boston Globe, The Hartford Courant*, *Nature Conservancy Magazine*, and *Northern Woodlands*.

A Look at Autumn's Main Events

By Virginia Barlow

	SEPTEMBER	OCTOBER	NOVEMBER
First week	Snapping turtle eggs begin to hatch. At just over an inch long, the hatchlings may head for water after digging to the surface, or they might stay put till next spring / Silverrod, the only goldenrod that isn't yellow, is blooming / The meadow jumping mouse lives in tall grasses or near patches of jewelweed. It eats jewelweed and other seeds, along with subterranean fungi / Nighthawks are migrating in large, loose flocks, best found near rivers at dusk	The dark red conks of hemlock varnish shelf (*Ganoderma tsugae*) now look as though they've had several coats of high-gloss varnish / Northern fall field crickets are silenced by the first hard frost, unless they get into the house. At that point, the once-lovely song may become annoying / Crows are collecting and stashing acorns / Warbler migration has peaked, but late warblers and lots of other birds – flickers, phoebes, and indigo buntings – are on the move	Burdock is a biennial and after its first year the long taproot is edible. Plus, no burrs on the dog next summer if you harvest it now / If a killing frost has taken place and there are three days during which the temperature does not fall below 40 degrees, it's called Indian Summer / Whitetail bucks are making scrapes – bare oval depressions, two or three feet long – by pawing at the ground / Tamaracks may still be holding on to their golden needles
Second week	Green frogs leave ponds with low dissolved oxygen to winter in streams and seepage areas. They will survive as long as they don't freeze / Most yearling white-tailed bucks leave their home territories, settling many miles from where they were born / Bluebirds at this time of year are in small flocks, often seen in the yard feeding, bathing, and checking out next year's nesting possibilities / A good week to see warblers, often in mixed flocks, on the move	Yellow-rumped warblers are quite cold-tolerant and may still be feeding on the white berries of gray dogwood / Fall color for red maples peaks about now, but many late-turning trees are still bright green, providing intense contrast / Carotene, a pigment in the leaves of some trees, is responsible for the yellows and oranges of an October hillside / Witch hazel is in flower, and at the same time the seed capsules from last year's flowers are popping open	Red-backed salamanders are headed downward. Sometimes they use the burrows of other animals to get below the frost line / Shagbark hickory nuts are falling from their thick husks. Wood ducks and wild turkeys eat them, as do many mammals, from mice to bears / White ash and boxelder hold on to their winged seeds – food for winter birds / Mice collect milkweed seeds over an extended period, sometimes leaving the fluff and sometimes using it in their nests
Third week	Fall dandelions are blooming. The flowers are similar to the dandelions that bloom in the spring, but are smaller / Halloween lady beetles, a thriving non-native species, are seeking out overwintering sites in attics or window casings / Trying to squeeze more produce from tender plants? Then it's time to dig out the old bedspreads and have them ready to protect against the first frost / Hairy woodpeckers are adding more fruit to their diet, including poison ivy berries	Empty bird nests might be taken over by mice and used as nests or storage bins for their winter food supply / Anthocyanin, a pigment made from decomposed chlorophyll and the waste products of leaves, is responsible for the reds and purples of October hillsides / Beavers are working long hours, not just at night, to gather enough branches to feed themselves through the winter / It's mating season for northern red-backed salamanders. Eggs will be laid in spring	Leaves have fallen off apple trees, but often the fruits remain / Late migrants: snow geese, red-throated loons, ring billed gulls, pine siskins, evening grosbeaks, and common redpolls / Reports of warblers at this point are likely to be rare. Sparrows are still seen regularly / Mourning doves are forming winter flocks, organized in the hierarchical manner typical of most gregarious birds / If mice move indoors, weasels may follow. They are remarkably slender
Fourth week	Porcupines are growing the insulating underfur that they molted at the beginning of summer / The air outside is crisp, but it's July-hot in the kitchen as the canning pot works overtime / Catbirds are fattening up on almost any fruit or berry you can think of. They will soon leave to winter from the Gulf Coast south to Costa Rica / Indian pipes, colorless saprophytic plants of deep shade, are turning their wax-like flowers upward and the seeds are ripening	The trees are full of migrating warblers, just as in May / Look for sparrows now that leaves are down and they can search for seeds. You might see chipping, fox, song, white-crowned, or white-throated sparrows / Gliding from thermal to thermal, broad-winged hawks are off to their winter range, perhaps in Mexico or even Peru / Grouse are growing their "snowshoes." These horny scales double the surface area of a grouse's toes and will be shed next spring	It's a good time to find bird nests, now that leaves are off the trees / The berries of wild roses that persist into winter provide food for mammals and birds / Downy and hairy woodpeckers are excavating one or more roosting cavities / Many of the earliest arrivals in spring are among the last to leave in the fall. Buffleheads, goldeneyes, common and hooded mergansers, mallards, black ducks, and great blue herons may still be found on lakes and rivers

Events may occur earlier or later, depending on your latitude, elevation – and the weather.

The Look of Logging

Keys to Getting a Good Job Done

A good logger can get large trees on the ground with little or no damage to the smaller trees in the understory.

By Stephen Long

Homeowners embarking on a construction project take great pains to do their research. They talk to different contractors, get bids, check references, and look at examples of each contractor's recent work. When entering into an agreement, they make sure the contract spells out their expectations. Nobody would consider this amount of attention excessive – after all, the homeowners are going to have to live with the result.

If landowners paid the same amount of attention to planning the logging work in their woods, there would be a lot more satisfied landowners out there. There would be fewer complaints about logging jobs, and in the long run, fewer people would be reluctant to manage their forestland.

Most successful logging jobs are a partnership between the landowner, a forester, and a logger. If you're a landowner looking to conduct a timber sale, your first step is to find a forester. Yes, you can cut the forester out and work directly with the logger, in the same way that you can go to court without a lawyer. But if you're not an expert in silviculture, and ecology, and log markets, it's wise to have a knowledgeable person representing you and your woods.

If you don't have a forester, you might start by consulting with a service forester (see Resource Guide on page 78). Service foresters are employed by either your state forestry department or your state's extension service, and it's part of their job to offer private landowners management advice. Few research projects are more pleasant than taking a walk in the woods with someone who makes his living out there. Make an appointment to visit some logging jobs with your service forester. Ask questions, take notes, and keep your eyes open. While these public foresters can't steer you to a particular private consulting forester and/or logger, they can provide a list of reputable professionals working in the area. If you are favorably impressed with a particular job, find out who did it.

Once you're set up with a consulting forester, the forester will mark the timber sale with an eye on both your wishes and the overall health of the forest. He'll know local loggers in the area and will match the right logger with the conditions on the ground. For instance, a mechanized crew with a feller buncher may be appropriate for a series of patch cuts on 200 acres. On the other hand, a horse logger may be the right man for the job on a 10-acre veneer job. As with the example of home-building, if you want the job done right, it's ultimately up to you as the landowner to devote the time and research to selecting the right contractors and making your wishes and priorities known.

It's outside the scope of this article to discuss all the variables involved in determining the type, quantity, and value of the timber that is removed and the timber that remains. Those questions are at the heart of the art and science of forestry, and that's why it's best to work with an experienced forester. However, most forestry professionals would concur with the following set of standards for a well-done logging job:

- There should be very little damage to the trees left behind to continue growing. The felling and the skidding should not result in trees with skinned-up bark. There should be no trees leaning on others.
- A skid trail means soil compaction, so there should be a minimal

BEN HUDSON

NORTHERN WOODLANDS

Top: Deer often feed on buds in the tops of trees cut during a winter harvest. Middle: Trees along skid trails that are damaged by skidded logs are called bumper trees. Even though they are skinned up they serve a purpose and should be left in place because they will keep other trees from being damaged in the next harvest. Bottom: Log landing. Note pile of topsoil at far end. This was pushed off to limit mud and soil compaction; when the logging is finished, it will be re-spread and the clearing reseeded.

NORTHERN WOODLANDS

Top: Skidding logs on frozen ground minimizes damage to soils. Bottom: A good logger will take measures to avoid and protect wet areas when skidding logs.

PHOTOS BY BEN HUDSON

number of them. The trails should provide straight and direct access across a gentle slope to the landing. The trails shouldn't cross watercourses or stone walls unless absolutely necessary. When they do cross streams, it should be at a right angle to the stream, and the logger needs to make provisions not to cause siltation downstream.

- Disturbed ground, particularly on slopes, can erode. Culverts or waterbars should be used to divert water across, rather than down, the trails and roads.
- The landing should be just large enough for the efficient operation of the equipment required by the job. Too small a landing makes for difficult work; unless you want a large opening for another purpose, too large can be, well, too large.
- The trucking road that leads from the landing should be either flat or on a gentle slope, over well-drained soils. It too should be only as large as it has to be for safe passage of the trucks.

Those are the ideals. Can they be achieved? Under perfect conditions, yes. Unfortunately, much of the terrain in the Northeast – while undeniably beautiful – is rarely perfect. Hilly country, wet soils, and a preponderance of springs and streams complicate the work of the loggers.

In addition, small parcels are often difficult to log effectively, because boundary lines often have nothing to do with natural features. Laying out a system of roads, trails, and a landing on a 10-acre lot can require the skill of a magician. Still, these challenges can be met successfully.

One of the big questions is what to do with the slash: the unmarketable upper limbs and branches of a harvested tree that are normally left on the forest floor. The wood then rots back into the soil, providing nutrients. A generation ago, standard practice was to leave them untouched. Today, it's more common to require loggers to cut the larger limbs so the top collapses and doesn't stick up any higher than two or three feet above the ground.

Some landowners find even these piles visually objectionable and ask their foresters: "Why can't the slash be run through a chipper and left in neat piles?" The answer is that it can, but it will cost you. That kind of work is very labor intensive and could quickly eat into the revenue you'll receive from selling the stumpage. Furthermore, many loggers will not want to do it. But if that's what you want, you can find someone to accommodate you. In fact, there are more and more loggers who specialize in that kind of low-visual-impact logging. And some logging firms that deal in biomass may remove the woody material for this purpose.

It should be noted that landowners who are interested in providing good wildlife habitat have a different attitude toward slash. The tangle of those tops is great cover for amphibians, small mammals, and songbirds, whether it's assembled into piles or left just as it is.

There's something else to consider. In areas of high deer density, tree seedlings are constantly being "nipped in the bud." Tree tops that are not lopped can provide a browse barrier for a few years, giving the seedlings a chance to grow.

There's no question that harvesting trees and operating machinery in the woods creates a temporary disturbance. But if the right trees are taken and the right ones left behind, and if the logging contractor works conscientiously, there will soon be few traces that a disturbance ever happened, and the benefits to the forest will unfold over decades.

Stephen Long is a founder of *Northern Woodlands* magazine.

Forestry for the Birds

By Jennifer Fish

As the landscape has changed through the centuries, so too have the region's bird populations. Understanding how the two relate can help a landowner protect bird species that are currently in decline.

That's why the Massachusetts Department of Conservation and Recreation has teamed up with Mass Audubon and the Massachusetts Woodlands Institute to start Foresters for the Birds. This program helps foresters integrate bird habitat into the forest management plans they prepare for landowners. Simple tweaks to standard forest management practices – such as retaining soft-mast trees like black cherry, avoiding fragmentation, and creating tree species diversity – can go a long way toward helping declining bird populations, especially when repeated in multiple woodlots.

About 200 species of birds breed in Massachusetts every year, and identifying all of them by sight and sound is a daunting task, even for expert birders. There is a simpler starting point for those interested in managing with birds in mind – the "Massachusetts Birder's Dozen," 12 forest songbirds that MassAudubon has identified as high priorities for protection in Massachusetts and the Northeast.

This list ranges from the wood thrush, which requires large (at least 70-acre) patches of contiguous forest, to the eastern towhee, which favors young, brushy forest. Many of these birds need older forest with patches of young forest for breeding or just after leaving the nest. While the optimal design of habitat structure varies by bird species, there are some simple things that can be done to benefit many different species of birds:

- Retain, release, and regenerate soft-mast species, such as black cherry, serviceberry, and apple, which produce food sources in late summer that are critical for preparing for successful migration.
- Retain softwood inclusions in hardwood stands.
- Control and monitor invasive plants.
- Maintain closed-canopy buffers along beaver ponds, wetlands, and riparian areas.
- Retain a minimum of six snags per acre
- Create scattered slash piles of fine woody debris to enhance songbird cover and foraging opportunities.

The Massachusetts Foresters for the Birds program began in the spring of 2014 as a pilot in western Franklin County and portions of western Hampshire and northern Berkshire Counties; there are plans to expand that pilot program to include central and southern Massachusetts during 2015. As part of the program, foresters attend two training sessions and then collaborate with a bird biologist until they gain enough bird habitat knowledge to conduct assessments on their own. Once a bird habitat inventory is complete, habitat considerations can then be included in a forest stewardship plan. The Department of Conservation and Recreation is offering some cost-sharing to help offset the extra time needed to do these habitat assessments, and Natural Resource Conservation Service funds may be available for certain management activities.

Jennifer Fish is the Department of Conservation and Recreation service forestry program supervisor. For more information on the program, contact her at jennifer.fish@state.ma.us or Margo Servison, Mass Audubon, at mservison@gmail.com

A Forest in Fragments

Smaller Parcels Can Cause Large Problems

By Joseph Adams

Parcel maps, known more ominously as tax maps, show the boundary lines of every property in town. In many parts of the state, more and more boundary lines are being drawn on those maps, as existing parcels are divided into smaller ones. Why is there a trend toward smaller parcels? The need to subdivide often comes as owners respond to changing personal circumstances: a parent breaks off a parcel for a child to build a house; new landowners recognize they paid too much for their place in the country and sell off a piece to recoup some money; college tuition for children or medical expenses lead owners who are strapped for cash to tap into the largest asset they own.

These situations aren't new, but the historical context surrounding them is. We're on the cusp of the largest intergenerational transfer of forestland in the nation's history. The latest National Woodland Owner Survey (conducted by the U.S. Forest Service) shows that forestland owners are getting older. In 2013, the survey found that 40 percent are 65 or older, up from 35 percent in 2006. The aging of the landowner base means that a significant amount of that land is going to be sold or bequeathed in the next 10–20 years. Each of those transactions is a prime opportunity for land to be subdivided. Current owners could themselves try to divide it equitably among several heirs. Or if bequeathed intact to more than one heir, the new owners may have different interests: some may want to own a quiet place in the country, others may prefer cash, which leads to parcels being sold.

BLAKE GARDNER

Why is this a problem?

To answer that question, let's define two words that go hand in hand – parcelization and fragmentation. One is a cause, the other an effect. Parcelization refers to the division of land into smaller and smaller lots over time. Fragmentation is the effect on the land when parcelization leads to development. As this happens, formerly intact landscapes become broken up by clearings for houses, yards, and roads.

A fragmented landscape is less hospitable to many wildlife species. It tends to exclude those animals – black bear and bobcat among them – that need large intact tracts of land to thrive. What is a barrier to some species is an opportunity to others. In highly fragmented habitats, only those species that are adapted to habitat edges or dependent upon human activity are able to persist. This means that populations of robins and whitetail deer have increased as rural areas have become more suburban in nature.

Degraded habitat is one of the most serious threats to conserving threatened species, and fragmentation is cited repeatedly for contributing to degraded habitat. Fragmentation leads to what biologists call "edge effects," which include increased nest predation by skunks, raccoons, and house cats; increased noise, light pollution, and climate variability.

The loss of habitat and road mortality caused by fragmentation affects all species, but particularly many amphibians and reptiles.

A patch of good news

There's a difference between patchiness and fragmentation. In an intact forest, open patches of different sizes are beneficial because they provide a diversity of conditions. An opening filled with grasses, shrubs, or saplings is especially advantageous if the surrounding forest cover is all of a uniform full canopy. It's still a forest, but some of it is in an early successional stage. This patchiness increases the diversity of habitat and provides suitable conditions for those animals (birds, in particular) that couldn't use the full canopy conditions. Diversity is good.

It's only when you construct a road to that patch and build a house, garage, and lawn that it has a fragmenting effect. The existence of one house can then lead to further subdivision, because the existing infrastructure makes it more cost-effective to build a second. The built environment and the human activities compromise the habitat not only of the footprint of the house and road but also of the land surrounding them.

Rivers and streams, for instance, can suffer from subdivision and development, because impervious roads and rooftops shed rain and snow and can sweep pollution into previously undisturbed waterways, compromising aquatic species. Another environmental concern is that when forestland is converted to nonforest cover – houses, roads, or commercial development – it no longer stores carbon and contributes to global climate change. Forest edges are particularly receptive to nonnative plant species like buckthorn and honeysuckle; once these invasive species get a toehold, they begin to crowd out the indigenous species.

If all that's not bad enough, the parcelization of land also has economic implications, because smaller parcels of woodlands are more difficult to manage for timber, fuel, and other forest products. Working forests provide good jobs in rural areas and contribute important raw materials, including fuel, pulp for paper, and high-quality sawlogs for construction, furniture, and other valuable wood products. Forests help maintain healthy watersheds, which means clean drinking water, crisp and clear swimming holes, and good trout fishing. And, of course,

"A fragmented landscape is less hospitable to many wildlife species."

forests in southern New England offer a vast array of recreational opportunities, including hiking, birding, skiing, hunting, and snowshoeing. Chopping up a rural landscape presents many challenges to maintaining its rural character and economy.

All is not lost

The good news, however, is that there are still many large blocks of relatively intact forestland in Massachusetts and Connecticut. Conservationists, the forestry community, and many large landowners share the common goal of keeping the forest intact. Landowners have the power to minimize fragmentation, and there are a variety of steps that can be taken to maintain the viability of our local forests:

- Talk about the future. It's wise to discuss your goals for your property with your family, including your wishes for the land beyond your ownership: your desires, your heirs' interests, potential estate tax obligations, and the economics of land ownership should all be discussed. Annual family meetings to discuss the property can be very helpful in keeping forestland intact.
- Consider conserving your land in order to keep it intact. The story on conservation easements on page 56 shows how other landowners have used these tools to avoid dividing and developing land.

When that's not possible – when subdivision is the only solution to life's circumstances – there are ways to accommodate new construction while at the same time protecting the values forests provide. The problems of fragmentation are largely a function of the way landowners develop their land.

- If you are thinking of subdividing your land, consider clustering house sites while keeping the majority of the land intact.
- As you explore your land, identify any significant natural or cultural features. Do not encroach on these areas when choosing sites for houses and roads.
- Choose a building site as close to existing roads and utilities as possible, keeping roads and driveways short. Keep clearing to a minimum, as a forested landscape protects land from erosion better than an open landscape.
- If your roads cross streams, bridges are preferable to culverts because they leave the natural streambed relatively intact. If you do install culverts, be sure they are big enough to handle high flows of water. Also be sure to leave vegetated buffers between any construction and streams.

An intact forest performs so many beneficial services. However, as family circumstances change for landowners, subdividing forestland is sometimes unavoidable. By carefully considering your options, you can minimize or avoid the problems associated with forest fragmentation.

Joseph Adams is a frequent contributor to *Northern Woodlands* magazine.

The parcelization and fragmentation of our region's landscape present challenges to maintaining the character and economic vitality of rural areas. Inset: Black bears, for example, need large tracts of unfragmented forest.

NORTHERN WOODLANDS

GERRY LEMMO

Early Detection Can Save Thousands of Trees

MASSACHUSETTS IS HOST TO POPULATIONS OF THREE DEVASTATING INSECTS:

Emerald ash borer was first detected in Massachusetts in August 2012. That infestation in the western part of the state was followed by a second detection, this time in the northeastern corner of the state. In both cases, a quarantine area was established to restrict the flow of wood in these areas, and steps were taken to treat and dispose of infected trees. This deadly insect kills ash trees within a few short years of infecting them. Emerald ash borer has now been detected in more than 20 states and has killed millions of ash trees in the Midwest. To help prevent a similar fate in Massachusetts, "It is important for the public to remain vigilant and to report any ash trees with signs of emerald ash borer damage," said Department of Agricultural Resources Commissioner Greg Watson. "Early detection of new infestations will help slow the spread of this pest." To report suspicious tree damage or insect sightings, or to learn more about this pest, visit www.massnrc.org/pests/eabreport.htm or call the USDA's EAB hotline at (866) 322-4512.

Asian longhorned beetle attacks many species of hardwoods, and Massachusetts has been home to the worst infestations of this pest in the United States. Asian longhorned beetle was discovered in Worcester by an alert homeowner in 2008; since that time, more than four million trees in the area have been surveyed and 23,500 infested trees and 10,250 high-risk host trees have been removed. A quarantine remains in effect and the program of containment and eradication will continue indefinitely in Worcester. Better news comes out of Boston, where the beetle was discovered in 2010 but has since been eradicated. "While the eradication of this infestation is a victory for all of us, we ask that residents of Massachusetts stay vigilant in inspecting their trees regularly for signs of the beetle," said Osama El-Lissy, APHIS Plant Protection and Quarantine deputy administrator. For more information, visit www.AsianLonghornedBeetle.com or contact the Massachusetts ALB Eradication Program, (508) 852-8090.

Hemlock woolly adelgid was introduced into the state in 1988, spreading from an infestation in neighboring Connecticut. There is no comprehensive management strategy possible at present for managing infestations in forest settings, but treatment is possible for individual hemlocks in nursery and landscape settings. A 2012 report from researchers at Harvard Forest explores the distribution and impact of the hemlock woolly adelgid in central Massachusetts; it can be accessed at http://harvardforest.fas.harvard.edu.

Alert citizens can make a difference. It's often interested and educated landowners who discover outbreaks. And since firewood is a primary means by which these insects spread, it's important not to move firewood more than 50 miles from its source. To learn more, visit www.dontmovefirewood.org.

PHOTOS FROM TOP: KENNETH R. LAW, USDA APHIS PPQ; INSET: HOWARD RUSSELL, MICHIGAN STATE UNIV.; PA DCNR FORESTRY ARCHIVE; INSET: LARRY R. BARBER, USDA FOREST SERVICE; CT AG EXPERIMENT STATION ARCHIVE. ALL COURTESY OF BUGWOOD.ORG.

Pruning for Profit

By Virginia Barlow

Many people appreciate the park-like appearance of a stand of trees in which the lower branches have been removed. Trails lined by pruned trees invite us to take a walk, and for some of us, sawing off dead branches seems to satisfy a primordial impulse.

Pruning for profit is a different matter. People have been pruning fruit trees and rose bushes for centuries, but few take the time to prune crop trees in order to produce clear, knot-free wood. It will take years to realize a profit, but in some cases clear boards are so much more valuable than knotty ones that the cost of pruning is repaid with interest when the trees are harvested and sold.

A study by researchers at the Yale School of Forestry confirmed that the cost of pruning white pine could yield a compound interest return of as much as 13 percent, even when the trees were not harvested until 30 years after pruning.

Making money on your pruning investment depends on starting with reasonably good trees. You will also need to have a *loooong* time horizon (for some of us, it might fall into the category of estate planning), for it takes at least a couple of decades for a tree to cover the cut branch stubs with enough wood to yield clear lumber.

It is no use pruning unless you are willing to free the pruned trees from competition, so thinning the stand enough to promote consistent, good diameter growth goes hand in hand with pruning. Otherwise, your grandchildren will be in rocking chairs by the time your pruned trees reach maturity.

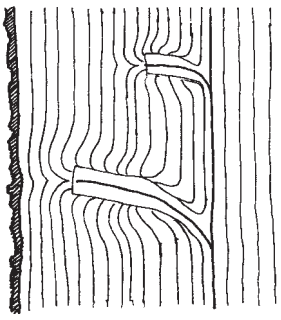
It has often been said that the wood from rapidly grown trees is inferior to more slowly grown wood, but the Yale study found no evidence for this belief. The wood from pruned trees that they grew as fast as they could, including one that had an average diameter increase of over 0.6 inches per year, was fine.

The trees to be pruned must be chosen carefully and pruned properly, because pruning the wrong tree will not repay your investment, and pruning the right tree improperly can do more harm than good.

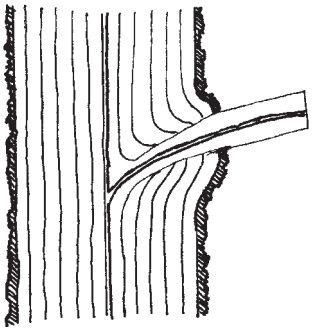
What species to prune

Good white pine, if you have it, is the best place to invest your pruning hours. White pine lumber ranges from magnificent clear cabinetmaking wood to ratty boards with loose knots. Pine is quite rot-resistant, and the dead branches (it is these that make loose knots) stay on the tree for a long time. Pruning can't cure all a pine's ills, but it can turn good into wonderful.

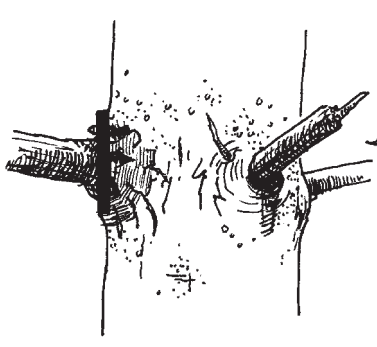
You won't get the rapid stem-diameter growth needed to maximize the pruning investment, however, unless the crowns of your pruned pines have room to expand in diameter at the rate of about one foot per year. Most other softwoods don't



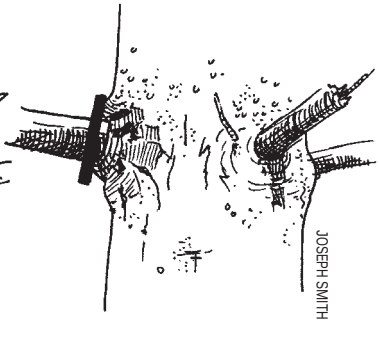
1. Pruning dead branches yields more clear wood. Shown above is a pruned stub and underneath, an unpruned branch.



2. In the barrier zone that forms just inside the collar, the tree deposits chemicals that stop the advance of decay-producing microorganisms.



3. WRONG: This pruning cut is too close to the stem and cuts through the branch collar.



4. RIGHT: Cut as close to the stem as possible without injuring the branch collar.

Try to prune to a height of 17 feet.

respond to thinning as well as white pine, and the difference in price between knotty and clear for other softwood lumber is not as dramatic.

Choosing your tree

Prune only crop trees. These are the healthiest, most vigorous, and straightest trees of species that make good sawtimber. You'll want to prune between 35 and 60 beautiful trees per acre. This corresponds to a spacing of 27 to 35 feet between pruned trees.

A good time to prune pine is after the first thinning, when the trees are about six inches in diameter. This way there will be no logging damage to newly pruned trees, and they will grow quickly. You can start earlier. An initial pruning when the trees are about three inches in diameter, provided you leave plenty of greenery, gives the tree plenty of time to acquire a good, thick shell of knot-free wood. It may be prudent to delay pruning white pines until they are at least 16 feet tall. If the white pine weevil injures the leader after that, you at least will have one good, full-sized sawlog.

How to prune

Trees may be pruned any time of year, but late in the dormant season is the best. They have a good spurt of growth in the spring, and part of this effort will be directed toward growing over any injury.

When a branch dies it is highly vulnerable to decay organisms. Since dead branches are routine for almost all trees, they have evolved ways of dealing with this. In the process of shedding a branch, the tree summons defensive chemicals to the base of the branch that limit the spread of decay. The living branch-bark ridge or collar is part of the process of walling off decay. Cutting into this collar when you prune disrupts the process. Furthermore, you are inflicting a new wound, which is a new opening for infection.

It used to be thought that injuring the branch-bark collar stimulated "healing." U.S. Forest Service research, though, has shown that plants don't have the ability to "heal;" they can only wall off or compartmentalize, limiting decay to tissues formed prior to the injury.

Cutting small, live branches outside of the branch-bark collar is acceptable. The branch-shedding system will work to wall out rot-causing fungi, but you are courting infection and decay if you cut off live branches more than two inches in diameter, even in a healthy, fast-growing tree. Besides, pruning large branches is time-consuming.

Chances are you will mostly be cutting off dead branches. Cut as close as you can to the collar without injuring it. Long branch-stubs take many extra years to cover with clear wood. Applying a wound dressing rarely, if ever, does any good, because bacteria and the spores of disease-causing fungi are very small, and no wound dressing can tightly seal a wound over a period of years. Spores are released by the millions, and the cut tree surface you cover with dressing may already be covered with spores.

How much to prune?

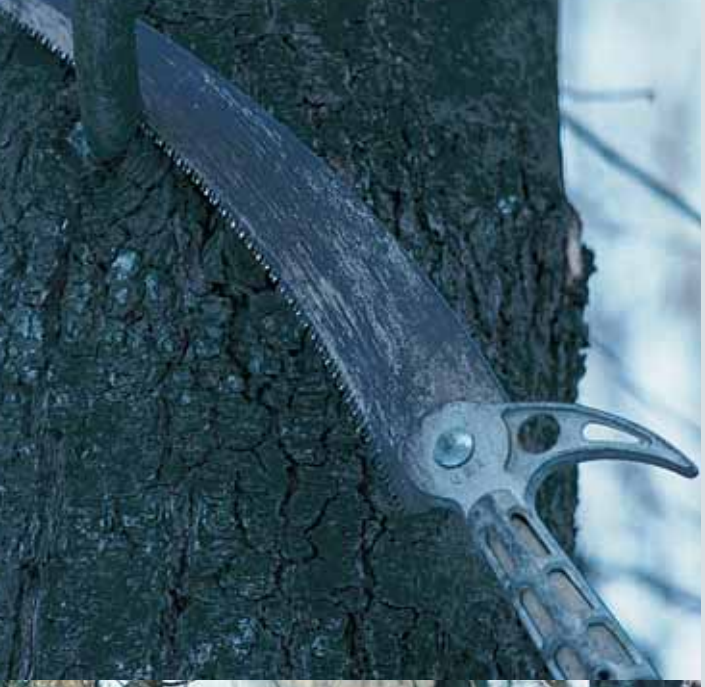
If possible, prune as high as 17 feet above ground level in order to have a standard, 16-foot log on a one-foot stump. However, pruning to any height over nine feet will result in a knot-free merchantable log since eight feet is the minimum length for sawlogs. Twelve feet is another common log length in New England, and pruning to 13 feet will allow for a one-foot squirrel platform. Pruning can be done in stages, perhaps first with a hand saw and later with a pole saw.

Remove all dead branches that you can reach safely. When pruning live branches, don't remove more than one-third of them. And always leave one-third to one-half of the tree's height in live branches when you are done. Remember, live branches hold the tree's green leaves. If too many are cut, diameter growth will slow down. You need to balance tree growth against tree quality. One other caution: If your forest ends at a field or road, don't prune the outside trees. The lower branches keep the sun and hot drying winds from penetrating into the stand.

From top: Close-up of a pole saw used for pruning limbs; small bow saws are handy in a tangle of branches; a pole saw is used to prune difficult-to-reach white pine limbs.

Even though you will have to wait from 25 to 50 years to recoup your 10- or 15-minute-per-tree investment, this effort can produce some of the highest long-term returns available in timber production. And sometimes having an excuse to snowshoe into the woods on a sunny February or March day with your pruning saw can yield a pretty good return immediately.

Virginia Barlow is the co-founder of *Northern Woodlands* magazine.



PHOTOS BY NED THERRIEN

Tips for Pruning Hardwoods

By Michael Snyder

Pruning hardwoods can make good sense. And dollars too. Pruning is done to produce high-quality, clear lumber. The clear wood that results from pruning – be it on softwood or hardwood – has more dollar value than does knotty wood from unpruned trees. The difference is that pruning hardwoods takes a heck of a lot less work than pruning softwoods.

With pine, for example, you might be pruning 20 to 40 branches per tree. What's more, foresters generally recommend that pine pruning be done in conjunction with a thinning, because trees that have just lost all those branches may lose a bit of their competitiveness and need to be freed from surrounding competition. Though it's fine to peck away at it, thinning and pruning through an entire pine stand can take some serious time.

Hardwoods are so much simpler and the payoff can be even better. Most likely you'd only need to prune three to five 1-inch branches per tree. A few easy strokes with a pruning saw and you're on to the next tree. That's not to say that neatness doesn't count. It's particularly important to make good, clean cuts that don't wound the tree's bole or branch collar. Still, it is quick work and, because you're not removing a large proportion of each tree's leaf area, you don't necessarily have to thin in association with your pruning on hardwoods.

Because standard hardwood log grades are based on log size and the presence or absence of visible defects such as branch scars, proper pruning really can make a big difference. When you remove small branches from vigorous trees, the trees can quickly grow over the resulting small scars and then produce clear wood.

With hardwoods, pruning can boost the value not only of crop trees, but also those trees that will be removed when releasing the crop trees.

Pruning off a few one-inch branches when trees are younger can boost the grade of even non-crop trees by increasing the number of clear faces on the logs. Consider a scenario where you prune, say, 320 yellow birch trees spread over 12 acres (about 27 trees per acre). If your pruning raises the quality of each log by one grade and that grade jump results in a value jump of $200 per thousand board feet, then at a conservative 50 board feet per tree, your four hours of work might eventually produce a gain of $3,240 over what you would have received in a thinning of unpruned wood.

Pruning can also add to your fun, your exercise, and the aesthetic quality of your stand. Many landowners are eager to get out and work in their woodlots but lack the equipment and experience to tackle many forest improvement operations. Pruning is one valuable operation that is easily done with a minimum of equipment and training.

If this makes sense to you, consider a few general hardwood pruning guidelines:

- Prune with a human-powered pruning saw. Chainsaws are too likely to wound the tree or worse.
- Prune as close to the branch collar swelling as possible without cutting into it.
- Prune anytime from late summer through just before maple tapping time. Daytime is best.
- Prune branches no bigger than your thumb. Okay, two thumbs max.
- Prune up to 12 or 18 feet, but don't overdo it.
- Prune yellow and paper birch, red and white oak, black cherry, and white ash.
- Prune maple with extra care. Stick to small branches and prune only a couple in any one year.
- Don't prune if doing so will create more tree damage than benefit. When in doubt, don't.

Resource Guide: Connecticut

New England Forestry Foundation

The New England Forestry Foundation is dedicated to helping landowners find the resources they need to help them care for their woods both now and for future generations. For more information, please visit their website at www.NewEnglandForestry.org or contact Lisa Hayden at (978) 952-6856 or lhayden@newenglandforestry.org.

Certified Foresters

Landowners can access the services of a variety of foresters. Service foresters work for the state and are available to walk your woods, counsel you about options and improvements to your woodlot, and help you access government cost-share programs. Procurement or mill foresters are employed by forest products companies and purchase timber on their behalf. Consulting foresters are independent professionals who you can contract with to help you plan and manage your woodlot. These foresters provide a broader suite of services than other foresters and have a fiduciary responsibility to you during planning and negotiations. It is often best to hire a consulting forester to help you with the ongoing management of your woods. A full list of all certified foresters in Connecticut can be found at www.ct.gov/deep/forestry by clicking on Directory of Certified Forest Practitioners. A sampling from this list can be found below.

Mike Bartlett	Pomfret Center, CT	(860) 974-0127
David Beers	Norfolk, CT	(860) 384-1214
Joel Bronson	Falls Village, CT	(860) 542-5422
Chris Casadei	Pomfret Center, CT	(860) 974-0127
Gregg Cassidy	Foster, RI	(401) 965-7086
Star Childs	Norfolk, CT	(860) 307-1977
Dan Evans	Andover, CT	(413) 374-1406
Eric Hansen	West Simsbury, CT	(860) 349-7007
Robert Hart	Branford, CT	(203) 481-4371
Shane Hetzler	New Haven, CT	(203) 402-8847
Anthony Irving	Lyme, CT	(860) 434-2390
Nancy Marek	Chaplin, CT	(860) 345-5231
Julius Pasay	Guilford, CT	(203) 430-6960
Dan Peracchio	Middlefield, CT	(860) 349-7007
James Provonost	Litchfield, CT	(860) 283-4383
Curtis Rand	Salisbury, CT	(860) 287-9987
Tom Strumolo	Norfolk, CT	(860) 542-5882
Marc Tremblay	Pascoag, RI	(401) 568-3410

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Service Foresters

Doug Emmerthal	Program Office, Hartford, CT	(860) 424-3630	douglas.emmerthal@ct.gov
Sherwood Raymond	Eastern Connecticut, Hampton, CT	(860) 455-0699	sherwood.raymond@ct.gov
Larry Rousseau	Western Connecticut, Harwinton, CT	(860) 485-0226	lawrence.rousseau@ct.gov

Land Trusts & Conservation Organizations

To locate a local land trust, visit www.ctconservation.org and go to Find a Land Trust. There you can search by map or by town, with links to additional regional and multi-town organizations that you can contact. The following groups work with individuals, organizations, and communities to conserve land and educate landowners about their conservation and management options.

American Forest Foundation	Washington, D.C.	(202) 765-3660	www.forestfoundation.org
American Tree Farm System	Washington, D.C.	(202) 765-3660	www.treefarmsystem.org
Audubon Connecticut	Greenwich, CT	(203) 869-5272	www.ct.audubon.org
Audubon Center at Pomfret	Pomfret, CT	(860) 928-4948	www.ctaudubon.org/center-at-pomfret
Connecticut Audubon Society	Fairfield, CT	(203) 259-0416	www.ctaudubon.org
Connecticut Forest and Park Association	Rockfall, CT	(860) 346-2372	www.ctwoodlands.org
Connecticut Farmland Trust	Hartford, CT	(860) 247-2002	www.ctfarmland.org
Housatonic Valley Association	Cornwall Bridge, CT	(860) 672-6678	www.hvatoday.org
Joshua's Trust	Mansfield, CT	(860) 429-9023	www.joshuastrust.org
MassConn Sustainable Forest Partnership	Monson, MA	(508) 347-9144	www.opacumlt.org/massconn
New England Forestry Foundation	Littleton, MA	(978) 952-6856	www.newenglandforestry.org
The Last Green Valley	Danielson, CT	(860) 774-3300	www.thelastgreenvalley.org
The Nature Conservancy	New Haven, CT	(203) 568-6270	www.nature.org/connecticut
The Trust for Public Land	New Haven, CT	(203) 777-7367	www.tpl.org

Landowner Organizations & Resources

Eastern Connecticut Landowners Association	Brooklyn, CT	www.ecfla.org
My Land Plan – A Woodland Owner's Resource (American Forest Foundation)		www.mylandplan.org

University Resources

University of Connecticut Extension (Tom Worthley, thomas.worthley@uconn.edu)	(860) 345-4511	www.ctforestry.uconn.edu
Coverts Program (Tom Worthley, thomas.worthley@uconn.edu)	(888) 30WOODS	www.ctforestry.uconn.edu/volunteer.html
Yale University Quiet Corner Initiative	(203) 432-5134	www.environment.yale.edu/forests/outreach
For landowners in Union, Ashford, Eastford, or Woodstock		

State Government

Department of Energy and Environmental Protection	Hartford, CT	(860) 424-3000	www.ct.gov/deep
Division of Forestry	Hartford, CT	(860) 424-3630	www.ct.gov/deep/forestry
Division of Wildlife	Hartford, CT	(860) 424-3011	www.ct.gov/deep/wildlife
Landowner Incentive Program		(860) 295-9523	judy.wilson@ct.gov

Federal Government

USFWS – Northeast Regional Office	Hadley, MA	(413) 253-8200	www.fws.gov/northeast/ma.htm

Natural Resources Conservation Service (NRCS)

Tolland State Office			(860) 871-4011
Danielson Field Office	Raymond Covino	raymond.covino@ct.usda.gov	(860) 779-0557
Hamden Field Office	Diane Blais	diane.blais@ct.usda.gov	(203) 287-8038
Norwich Field Office	Javier Cruz	javier.cruz@ct.usda.gov	(860) 887-3604
Torrington Field Office	Kathleen Johnson	kathleen.johnson@ct.usda.gov	(860) 887-3604
Windsor Field Office	Vivian Felten	vivian.felten@ct.usda.gov	(860) 688-7725

KARI POST

A Look at Winter's Main Events

By Virginia Barlow

	DECEMBER	JANUARY	FEBRUARY
1 First week	Most birds shell acorns before eating them, but wild turkeys eat the whole shebang / Spring peepers are hibernating in the woods beneath several inches of soil / The red berries of winterberry holly, held tight to the twigs, are brightening wetlands / Each snowfall brings more birds to the feeder / Short days have triggered the change from brown coats to white for weasels. They stand out like beacons if there is no snow	January 6 is Twelfth Night when, according to European folklore, domestic and wild animals can speak / Whitetail bucks are beginning to shed their antlers. It will be hard to tell does from bucks until new antlers begin to grow in spring / Fish are an even more important part of the otter's diet in winter, for now insects and amphibians are less available / Pileated woodpeckers and many songbirds will eat the fruits of Virginia creeper, a high-climbing vine	In Europe, badgers were believed to forecast the weather. Early settlers, finding no badgers here, resorted to the groundhog / Hawthorn fruits are nobody's favorite, but they stay on the tree all winter and are valuable emergency food / Keep your eye out for snowshoe tracks in sugarbushes, especially if there is an early thaw / Grouse place one foot almost in line with the other, leaving a fairly narrow groove in the snow that shows the three front toes
2 Second week	Dec. 9: Beginning of meteorological winter; the coldest 90 days of the year will follow / Red-spotted newts form groups and remain somewhat active beneath the ice in ponds and streams. Those in the terrestrial red eft stage are hibernating under logs or forest debris / Nibbled birch polypore fungal conks could be the work of either red squirrels or white-tailed deer / Pregnant female bears are the first to hibernate. They will turn in for the winter soon	Redbacked salamanders are deep underground where they won't freeze. Deep snow increases their chance of surviving / Beavers feed beneath the ice all winter on twigs and branches stashed during the autumn / Mourning doves are gobbling up almost every kind of seed from birdfeeders, but on their own they mostly eat tiny grass seeds / Muskrats don't usually cache food for the winter. Now they are eating the rootstalks of cattails and the leaves of aquatic plants	Coyotes are sexually active. Five to nine pups will be born from mid-April to May / Blue jays cache large numbers of acorns and beechnuts, sometimes as much as a mile from the parent tree, and those that are not retrieved often germinate / Most mammals sit tight during a snowstorm, tucked in their dens, warm and dry. Wait two days and the woods will be full of their tracks / The snowshoe hare is well named. Its furry feet are very large for its weight
3 Third week	Foxes are pairing up. They will mate in January and February / Old man's beard looks much the same, summer or winter. This lichen festoons trees wherever cool fog visits and the air is not polluted / Nearly constant, loud chee-chip or chee-chip-chip calls may be coming from a flock of pine grosbeaks, tame birds often seen picking salt from roads / Like humans, some migratory birds procrastinate, and are still hanging around for the Christmas bird count	The ventilation shafts that voles dig to the snow's upper surface may be used by foxes to zero in on a tasty meal / Flying squirrels are spending their days in nests lined with moss, lichen, grass and/or birch or cedar bark / Goshawks have been known to attack grosbeaks and mourning doves at birdfeeders / White-footed mice move indoors after a snowstorm / The juicy red fruits of highbush cranberry stay on the shrub – until a flock of cedar waxwings finds them	Meadow voles breed almost all year round. Fortunately, they are eaten year-round, too, and are the major food now of hawks and owls / Winters are hard on opossums. They don't store enough fat to get through the winter and when they go foraging they sometimes get frostbitten ears and tails / Evening grosbeaks may be feeding in boxelders, the only maple to hold its seeds through winter / Mated pairs of pileated woodpeckers remain together all year
4 Fourth week	Hemlock seeds don't attract a wide variety of birds but are eaten by chickadees, siskins, and crossbills / Porcupines are now eating a lot of bark but it is low in nitrogen and they typically lose around 17 percent of their weight over the winter / As cold weather settles in, grouse may form coveys and roost in the lower branches of conifers, somewhat protected from the wind / Star-nosed moles are tunneling below the frost line in search of worms and slugs	Look for raccoons or skunks if there's a thaw / The stiff tail feathers of downy and hairy woodpeckers support the birds as they pound at trees / Dead deer are an important part of the winter diets of fishers and coyotes / Bad weather sends American tree sparrows to birdfeeders. In normal times they prefer self-reliance and feed on weed seeds / Mother bears will clean and nurse their newborn cubs, but will then do some napping for the next month or so	The opening buds of pussy willows are a sign that winter is losing its grip / If you see one brown creeper spiraling up a tree, look for another following it, perhaps part of their prebreeding behavior / Male red-winged blackbirds are returning. They make quite a racket as they choose nesting territories / Chickadees begin the "feebee" songs that break up the winter flock and help them establish their breeding territories. Spring is in the air

Events may occur earlier or later, depending on your latitude, elevation – and the weather.

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A Guide to Caring for Your Land in Massachusetts

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The content of this guide is intended for anyone who owns forestland in Massachusetts, and anyone who believes that, with careful stewardship, the landscape that makes our region so special can support and sustain us for many generations to come.

For more information, or to request additional copies of this guide, visit www.newenglandforestry.org, call 978-952-6856, or email LHayden@newenglandforestry.org. For more information about *Northern Woodlands* magazine, visit: www.northernwoodlands.org