The Place You Call Home

A Guide to Caring for Your Land in the Upper Valley



A Northern Woodlands Publication

Northern Woodlands

The Place You Call Home:
A Guide to Caring for
Your Land in the Upper Valley

© Spring 2006

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POSTMASTER: Send address corrections to *Northern Woodlands* Magazine, P.O. Box 471, Corinth, VT 05039-0471 or to mail@ northernwoodlands.org.

For *Northern Woodlands* subscription information call (800) 290-5232

Printed on paper with 10 percent post-consumer recycled content.

Welcome

My wife's family has roots in this area, Topsham to be specific, that go back to the late 1700s. My own roots here hardly go back at all: in 1988, she and I bought a piece of land in Corinth, and we moved here and built our house the following year. So even under our roof, we mirror a dichotomy that exists all over the Upper Valley – some people have ties to the land measured in generations. Others have fallen in love with it just recently.

As one of the latter, I became so fascinated with the land and all its systems – the ecosystem as well as its place in the local economy – that it literally became a full-time job for me. In 1994, in partnership with my friend and neighbor, Virginia Barlow, I started a magazine, *Vermont Woodlands*, that covered many of the subjects I wished I knew more about when I first walked my land: the plants and animals on it, its history, and its potential for wildlife habitat, recreation, and producing income. Five years later, that magazine expanded its coverage to include New Hampshire and beyond and was renamed *Northern Woodlands*.

For 12 years, we've been publishing information designed to inspire people to learn more about, and take better care of, this forest that sustains us. The publication you are now holding, *The Place You Call Home: A Guide to Caring for Your Land in the Upper Valley*, is a collection of material that we think will give landowners the information they need about their land and role it plays in the ecology, economy, and culture of the Upper Valley. It is, in fact, the owner's manual I wished for nearly 20 years ago.

The purpose of this guide is to help us all – native or newcomer – become better stewards of the land in the beautiful Upper Valley. Even the most committed and effective tenders of the land are not born with a sense of stewardship, which comes with spending time on a piece of ground. By getting to know it in all seasons and in all weather, we develop an appreciation that the land is the only constant: it preceded our ownership and will be here when our tenure is done.

It's very easy to look at land simply as real estate, a certain number of acres, plus or minus, that surround the house. But land is so much more than that – it is a tremendous asset not only to the owner but also to the community. Forestland helps filter and store water so the supply of it is plentiful and clean. It provides habitat for a stunning array of wildlife species, a broad diversity of habitat being the key to rich biodiversity. It serves as the backdrop for our dazzling views. And it provides a supply of wood, the processing of which employs thousands of people in the communities of the Upper Valley.

From Haverhill to Bethel to Springfield (both of them), the history of much of this land has followed a similar pattern. When Europeans arrived, they cleared it for farming. By the early nineteenth century, this was an open landscape, dotted with farms. It supported family farms for years, though gradually it diminished in fertility and productivity, until land to the west that had been opened up began to attract large numbers of New Englanders, who followed New Hampshire native Horace Greeley's advice to "Go West, young man." Forests then grew up on the pastures and tilled land, and over the last century and a half, most of the land in the Upper Valley has reverted to forestland. Forests now cover 90 percent of the Upper Valley landscape.

As more and more people are attracted to the Upper Valley, those forests are at increasing risk of being divided into house lots. Town and state regulations and planning efforts play a role in directing the development to the most appropriate places. But in truth, the future of the forest that surrounds us is in the hands of the thousands of individuals who now call that land home. I hope that this guide helps all of us make good decisions. — Stephen Long

Initial funding for this publication has been provided by a grant from the Wellborn Ecology Fund of the New Hampshire Charitable Foundation – Upper Valley Region. Supporting grants and contributions from other organizations and businesses, all of which are listed on the inside back cover, have been instrumental in making this publication a reality. We thank them all.

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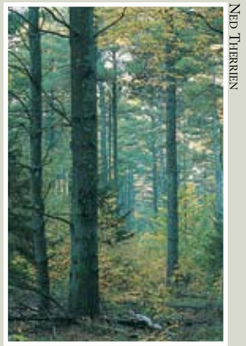
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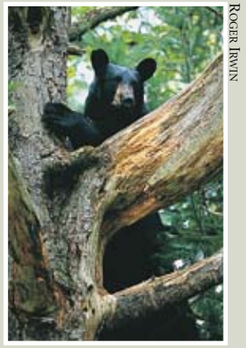
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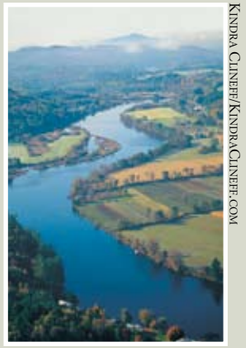
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Our Home in the Upper Valley

By Chuck Wooster

Technically, at least, the Upper Valley is no longer a rural place, meeting neither the demographic definition (most people living in towns with fewer than 2,000 people) nor the economic definition (most people making a living, in some way, from the land). Medicine and education are the chief engines of the local economy, with the Dartmouth-Hitchcock Medical Center (DHMC) and Dartmouth College being the two largest employers and Lebanon and Hanover being the two most populous municipalities.

But this does not mean that the rural economy has disappeared. Far from it. Farming, forestry, and recreation that is directly linked to farming and forestry employed 4,800 people last year in the Upper Valley. Considered in aggregate, farming and forestry are the second largest employer in the region, trailing only DHMC, which had 5,977 employees in 2005. Farming and forestry also generated more than $712 million in economic activity – just ahead of the College's annual budget of $629 million. Agriculture and forestry may not dominate the local economy the way they did a hundred years ago, but news of their death has been greatly exaggerated.

Combine this with a second statistic: although 25 percent of New Hampshire and 14 percent of Vermont is public land, very little of that is in the Upper Valley. The various state parks, wildlife management areas, town forests, and other public ownerships total less than 10 percent of Upper Valley land. This means that the 4,800 jobs and $712 million in economic activity are almost entirely dependent on private land that is owned by landowners who are, in all likelihood, very much like you.

According to the 2002 census, there were 2,040 active farms in the four counties that make up the Upper Valley (Windsor and Orange in Vermont, Sullivan and the southwestern half of Grafton in New Hampshire). Collectively, these added up to 322,162 acres – roughly 16 percent of the Upper Valley land base. These farms produced goods valued at $79.5 million.

Jim Block

Two statistics that might surprise you about agriculture: there are more farmers now in the Upper Valley than there were 20 years ago, and farming is a secondary income for 55 percent of those farmers. Dairy farming continues to struggle in the region, helping to feed the misperception that farming overall is in trouble, but other types of farms – vegetables, hay, and livestock for meat – are springing up to replace them. And these new farmers are a lot like many of their neighbors: they hold down multiple jobs and work in more than one sector of the economy.

None of these statistics, by the way, includes the thousands of Upper Valley residents who keep a few pigs in the summer, run a few sheep out back, or grow so much zucchini in the garden as to be considered a public menace.

There's also a thriving forestry-based economy: sales of Christmas trees, wreaths, and maple syrup totaled $7.5 million in 2000. Wood (both firewood and biomass chips) provided just over six percent of all the energy used in the region – more than twice the national average. Chips fuel the region's two wood-fired power plants, one in Ryegate, Vermont, the other in Springfield, New Hampshire. Firewood sales totaled $6.9 million.

On the higher end of the product range, there are a number of sawmills turning hardwood and white pine sawlogs into lumber that's sold all over the world. Some of that lumber is used locally by the hundreds of furniture makers ranging in size from large employers like Pompanoosuc Mills and Copeland Furniture to one-man shops turning out custom work.

Each 1,000 acres of forestland in the Upper Valley supports roughly three forestry-related jobs: two directly and one through recreation and tourism. Those "directly" jobs include loggers, foresters, truckers, surveyors, sawmill owners and employees, furniture makers, salespeople, and all the managers who keep these businesses going. There are nearly 500 foresters in Vermont and New Hampshire, for example, more than half of whom do business in the Upper Valley.

Many landowners recognize that when logging is done with the long-term health of the forest in mind, it can both provide wood to the economy and have a positive impact on wildlife habitat, recreational opportunities, and the future productivity of the forest. There are approximately 1,000 logging operations conducted in the Upper Valley each year – more than a dozen per town per year. Roughly 70 percent of forestland owners have logging done on their property at some point in time.

But there is a catch: parcel size is important, and there is a trend toward smaller and smaller parcels as a result of subdivision. There are still thousands of parcels in the Upper Valley larger than 100 acres, but the average forested parcel is less than 50 acres. Nevertheless, you needn't be a land baron to participate in the rural economy. More than a few timber harvests are the result of several neighbors working together on smaller pieces, which can make even a 10-acre parcel viable for forest management. The future of the forest-based economy is very much dependent on the availability of that forest. Whether people coordinate with their neighbors or act independently, the decisions landowners make about their land have an enormous impact on life in the Upper Valley.

This is equally true when it comes to quality of life. Take recreation, for example. State laws in both Vermont and New Hampshire provide for public access across private land, unless that land is specifically posted to the contrary. Many of the activities that make Upper Valley life so wonderful – walking, skiing, snowshoeing, birdwatching, hunting, fishing – would simply not be possible without this longstanding tradition of public access to private land.

If you are concerned about a specific activity occurring on your land (hunting, or perhaps ATV driving) you might consider putting up signs to limit just that activity rather than putting up the standard "Posted: No Trespassing" signs that eliminate all access and erode this important aspect of New England life. Unlike most states, both Vermont and New Hampshire offer strong legal protections that limit landowners' liability from mishaps that occur on their property as a result of public access. (The fine print: landowners can't charge a fee for access or deliberately set out to cause harm.)

Wildlife is another example of the crucial role that private land plays in the Upper Valley. Since there's so little public land, nearly every species that we enjoy, from moose to mole and fish to fisher, depends on individual private landowners for survival.

Recognizing the crucial role that private land plays in the life and economy of the two states, the governments in Concord and Montpelier have created a special property tax category to encourage landowners to keep their land in forestry or agriculture. Called "current use" in New Hampshire and "use value appraisal" in Vermont, these programs establish a lower tax rate for undeveloped land that is enrolled in the program. The details vary between the two states, but the tax savings are significant. Ask your service forester (county foresters in Vermont, extension foresters in New Hampshire) for more details – he or she will point you in the right direction.

These programs are proving to be very popular. In Vermont, nearly two-thirds of all eligible parcels are currently enrolled, totaling a third of the state's entire acreage. Although New Hampshire does not keep statewide statistics, the acreage is likely even higher because the requirements for enrollment are less restrictive in the Granite State. Because these programs tax the land at a rate based on its current use (growing trees or crops) instead of its potential for growing housing or other development, they help ensure that private land will be available for the rural economy of the future.

Life in the Upper Valley combines the best of two worlds: a thriving knowledge-based economy centered on medicine and education and a thriving natural resource-based economy centered on forestry and agriculture. Not many places in this country can say the same. Nor can they boast the large number of individuals who care so deeply about the landscape around them.

Map created by Tele Atlas, ©2006, and provided courtesy of Vital Communities, www.vitalcommunities.org.

Chuck Wooster is associate editor of *Northern Woodlands* magazine. He keeps sheep, grows vegetables, and manages woodlands on 100 acres on the Hartford-Hartland line.

ERIC SPLOWITZ

A Rocky Past: Rural History is Written in Stone

By Virginia Barlow

Almost anyone who has walked in the woods of the Northeast has paused more than once to puzzle over the stone walls that run like stitching through much of the region's wooded land. Even in dense forest, a mile from the nearest habitation, the stone walls speak of a tamed landscape: a farmer, his team of oxen, a stone boat, sheep, and cropland.

Though thousands of miles of these walls were built in New England in the eighteenth and nineteenth centuries, very little is known about their origins. Giovanna Peebles, Vermont's state archaeologist, attributes the lack of written materials to the fact that stone walls were such a common part of everyday life. Mention of them in diaries or newspaper stories "was about as likely as writing about the fact that you reheated last night's supper in the microwave."

It is difficult to tell, for instance, when a stone wall was built, because construction styles changed very little over time, though you can sometimes tell the footprint of a particular mason. "I think you can probably identify certain very brilliant stone masons, as to their particular work. It's like looking at a work of art and knowing Picasso did this," said Peebles. Still, we don't know how many masons were responsible for the walls we see today, or how many farmers built their own.

We do know something, however, about what stone walls were designed to accomplish. Little more than 100 years ago, 60 to 80 percent of New England's land had been cleared, either for cropland or pasture. Many of us have heard this figure before, but still find it difficult to absorb. All we see now are trees, but in 1880, wherever you looked, there was open land, being used either for crops or for grazing animals.

Fences were needed to separate the two. As far back as 1642, a court decreed that "every man must secure his corne and meadowe against great cattell," though at that time fences were made of stumps or split rails and were only replaced by stone fences when wood became scarcer.

Jane Dorney, a geographer from Richmond, Vermont, uses stone walls to determine how land was used in the past. She says that the links between the nineteenth-century farming landscape and the twentieth-century forested landscape are so strong that they challenge the philosophical separation of humans and nature. We think of the forest as nature, and the field as human, but in fact we can't make that distinction. Much of the forest is the way it is because of past human activity.

"The process of figuring out how an area was used is like solving a multi-dimensional problem," Dorney said. "People who like to solve puzzles enjoy this kind of work."

Dorney believes, as do most archaeologists, that the tumbling-down walls we now see once kept large and/or nimble animals where they belonged. Old photographs and lithographs show that stubby stone walls were extended with "stakes and riders" or with a thicket of posts stuck into the wall. Many old walls now have a strand or two of barbed wire running along the top, an indication that these walls were functional at some time after the late nineteenth century, when barbed wire came into general use.

Although stone walls were occasionally built as boundaries between one farmer's pasture and another's, Dorney believes that the most important role of a fence was to separate pasture from non-pasture.

Separating the sheep from the oats

One thing Dorney looks for is a row of large, old trees, older than the surrounding forest, growing out of one side of a stone wall. "These trees, most often sugar maple, white ash, or black cherry, are on the side of the fence that once was cropland. On the pasture side, such palatable species would have been eaten by grazing animals, but plows and harrows do not approach a stone wall as closely as an animal does," Dorney said.

The kinds of trees you find on each side of the wall also tell a story. When cropland is abandoned, the bare earth offers an ideal seedbed, and trees, usually hardwoods, will colonize it within a few years. Gray birch is often the pioneer, but sugar maple can be quite aggressive and may form pure stands in which the trees are almost exactly the same age. Other factors, such as the soil type and depth, the depth to the water table, and the amount of slope may influence which tree species become established.

On the other hand, pasture, being grass-covered, presents a problem for many tree seeds and is recaptured only slowly over many years by members of the woody clan. Uneven-aged softwoods are strongly correlated with abandoned pasture. Peter Marchand, author of *North Woods*, believes that the relatively heavy, wind-disseminated seeds of conifers "work down to the soil surface and provide enough stored energy to develop a seedling large enough to compete successfully with grass." If cropland was used as pasture before being abandoned altogether, the forest might look similar on both sides of the stone wall. In these cases, you will need to look for other clues.

Land that has never been plowed is often hummocky, a result of generations of trees toppling over and raising big mounds of soil with their roots. These pits and mounds persist for hundreds of years and are only erased by plowing and harrowing. Along with the bumps, you may well find more rocks on the pasture side of the wall. Some large rocks may have been removed or piled on top of one another when land was used as pasture, but most are likely to have been left right where the last glacier deposited them.

Hawthorn and barberry are two sun-loving plants that grow up in old pastures. Their thorns and prickles protect them from grazing animals, and they may have gotten a head start before a pasture was abandoned. Black locust is valuable for fence posts because of its resistance to decay, and though not native to the Northeast, a patch of the trees was often kept in a convenient, out-of-the-way place on many northeastern farms. Sprouts grow from the roots of older trees, and a supply of fence posts may still be growing on a long-deserted farm.

NED THERRIEN

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STEVEN D. FAGGIO

Clockwise from left: Repairing stone walls is not just an historical activity!

Note the use of granite, a readily available material, in this New Hampshire stone wall.

Stone walls provide havens for all sorts of wildlife, from insects to chipmunks, like this one with nest material.

There's rocks in them there hills

Stone walls that march up steep hillsides indicate that even steep terrain was cleared and used for grazing. This evidence corroborates the view that the earliest settlers were strongly attracted to slopes rather than to valleys for their farm sites. In particular they preferred south-facing slopes; early maps often show roads and houses on the south-facing sides of brooks, separated by an expanse of uninhabited north-facing slope.

Early settlers also showed a preference for the highest elevations at which farming was possible – roughly up to 1,800 feet. At these elevations the soil warms in the spring sun, and cool air drains to the valleys, where malaria was thought to linger. Because early farms were largely self-sufficient, the distance to market was not a significant factor. Some high-elevation farms remained in use for a long time, which would explain why Dorney has found some of the most well-tended stone walls at higher elevations.

On the other hand, there are few stone walls to be found at the region's lowest elevations, such as along the Connecticut River Valley. Here, the stones that were distributed by glaciers over the neighboring hills were buried in a deep, fine sediment at the bottoms of post-glacial lakes.

Harvesting the crop of stones

Some fields produced abundant crops of stone, and it was necessary to get rid of them. Most of the stones in a wall came from one side – the side that was cultivated, where they posed a hazard to farm equipment. Before spring plowing, removing the annual crop of stones that had been heaved up into the plow zone by frost action was an annual ritual.

The size of the stones in a wall may even help identify the crops that were raised, according to some writers. The presence of very small stones suggests that the adjacent field may have been used for growing root crops, for which even small stones are a hindrance. When early farmers dug their potatoes, turnips, and carrots, they threw aside the stones they found, later adding them to a nearby wall.

These appear as part of the rubble or small stone filling inside a double wall. Depending on the soil type, finding a really large number of small stones built into a wall may indicate that the field was cultivated over a long period of time.

On the cultivated side, the surface of the ground will be much smoother than on the pasture side, and perhaps you can find a "dead furrow," the last, usually downhill, ridge that tends to grow in size each time a field is plowed because the smoothing effect of the harrow does not quite reach to the edge of the soil that the plow has turned over. If soil has piled up against the inside of a wall at the lower side of a field, this, too, suggests a period of plowing, which causes more erosion than turf-covered grazing land.

The walls nearest the house and barn, according to Dorney, are often the finest. Perhaps this is because they were the first built and longest tended, but they were also the ones most likely to be seen by the neighbors. There was a time when, as one historian has said, "the quality of enclosures was not uncommonly taken as a measure of a farmer's competence."

The tumbling walls bordering abandoned fields today seem ineffectual and puzzling without a house and barn to give meaning to their shapes and patterns. There was a time, however, when the way these walls divided up the land was crucial to the whole economy and workings of a rural society.

For more information see *Sermons in Stone: The Stone Walls of New England and New York*, by Susan Allport, and two books by Robert M. Thorson: *Exploring Stone Walls: A Field Guide to Stone Walls* and *Stone by Stone: The Magnificent History of New England's Stone Walls.*

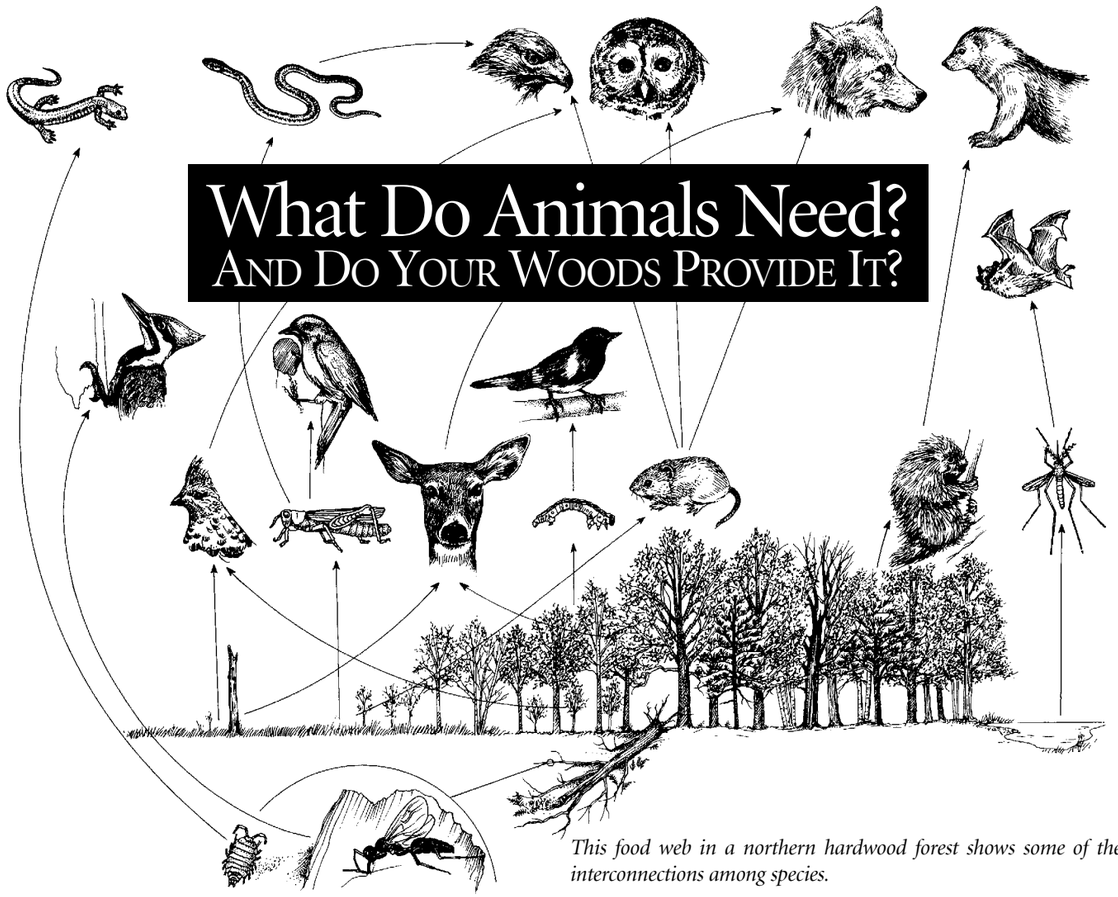
Virginia Barlow is co-editor of *Northern Woodlands* magazine.

A Look at the Season's Main Events

By Virginia Barlow

	MARCH	APRIL	MAY
First week	Pussy willows will soon begin to open. Bring some indoors for an early taste of spring / Brown creepers are among the earliest spring migrants, perhaps because they don't migrate far. Listen for their song, a thin, sibilant *see-see-see* / Skunk cabbage is flowering in swamps. In southern New England it may have been up and blooming since January / White-breasted nuthatches may use birdhouses, starting soon. The entrance hole should be 1¼ inches in diameter	Willow pollen is the first spring food for many species of bees / Spring peepers begin peeping in earnest. Isolated peepers will peep until November, but only now is there a big deafening chorus of them / The spirited song of the vesper sparrow, an early migrant, is often heard at dusk – hence its name / Killdeer return. It's not easy to tell the male and female apart, plus soon they will both incubate the eggs and care for the chicks / Raccoons are up and about and trying to wreck birdfeeders at night	During the breeding season, sapsuckers still consume sap, but their diet shifts primarily to insects. They catch insects in midair and capture them at sap wells / Sparrows are sometimes missed among the more colorful warblers. Here or coming soon are tree, fox, white-throated, song, white-crowned, and field sparrows / Time to bring in the birdfeeder to keep hungry bears from developing bad habits as they come out of hibernation
Second week	"When the wind is from the north and west, that's when sugaring is the best." / Coltsfoot is one of the earliest wildflowers. Brought from Europe because it was used as a cough remedy, it has found a niche here in wet gravel at the edges of roads / Songbirds save the least favorite foods for last; look for pine and evening grosbeaks and robins eating sumac berries / Like all fish-eating ducks, the hooded mergansers now moving north have serrated bills for holding their slippery prey	After a winter in the soil, white pine weevils are ascending to the terminal shoots of their host trees to feed and lay eggs / Female hazelnut flowers have extended their tiny purple tongues, and the male catkins are shedding pollen / Red foxes are giving birth to 3 to 7 pups. Until the pups open their eyes, the male brings food, and the female leaves the den only for water / Mink are giving birth to 3 to 6 young, not far from water, perhaps under roots along a stream or in an old muskrat lodge	Dandelion leaves taste best when picked before the flowers come out / Queen bumblebees are laying their first clutch of eggs / Smelt are running upstream / At this time of year, orioles will eat oranges from the bird feeder. Yellow-bellied sapsuckers sometimes join them / The five-petaled white flowers of shadbush are out along roadside and in deciduous woods / Flickers are laying five to eight white eggs. Both parents will incubate them for about two weeks; the male usually takes the night shift
Third week	March 21: The vernal equinox, or first day of spring, when day and night are of equal length all over the world / When the snow melts, don't blame shrews for those tunnels you see in the lawn. They do live there, but the tunnels were made by moles / Great horned owls are nesting in old redtailed hawk nests / Male woodcocks return as soon as the ground has thawed enough to make earthworms accessible. Listen for the *peent* and whistling wings of the male's courtship flight shortly after sunset	Watch for returning yellow-rumped warblers. They use a variety of techniques for catching insects and will work over decaying logs, bark, or litter, and sometimes they hawk for insects / Nest excavation takes about 20 days for downy woodpeckers and 16 days for hairies / Basswood buds aren't just pretty; in spring they also are good to nibble on / Loons return to inland lakes from coastal wintering areas / Trout lilies are blooming. The pretty yellow flowers follow the sun during the day and close at night	Young plantain leaves are good in salads, but soon they will become stringy / Woodcock eggs hatch. The precocial chicks leave the nest within a day of hatching and at four weeks old are difficult to distinguish from the adults / Ruffed grouse chicks follow their mothers and eat insects and spiders. She will brood them at night until they can fly, about 12 days after hatching / Late warblers arrive when oaks begin to leaf out: bluewinged, goldenwinged, Tennessee, Cape May, prairie, baybreasted, Wilson's, Canada
Fourth week	Fox sparrows are moving through / Redtailed hawks are returning. They are also called chicken hawks, although they normally eat more rodents, woodchucks, and rabbits than chickens / Many hawks add greenery to their nests. Sprigs of green at this time of year indicate an active nest / The severity of apple scab infections in the season ahead can be reduced by raking up and removing last year's fallen leaves	Look for osprey and great blue herons along big rivers / Spring migrants: black and white, palm and pine warblers. Also, solitary vireos, hermit thrushes, and winter wrens / Pear thrips adults are emerging from the soil and flying to sugar maple buds, ready to pierce the buds as soon as they begin to open / Balsam shootboring sawflies, about the size of large blackflies, may be abundant in Christmas tree plantations at midday in the warmth of the sun	*Unck*, the sound of plucking a loose banjo string, can be heard now through August, mostly at night, from ponds with green frogs / Fawns will be born soon. Most newborns are walking and nursing when less than one hour old / Honeybees may swarm, especially on a warm, sunny day following days of rain or cool cloudiness / Look for cedar waxwings in flowering apple trees, eating the petals / Lilacs are in full bloom – what a change since March 1st!

These listings are from observations and reports in our home territory at about 1000 feet in elevation in central Vermont and are approximate. Events may occur earlier or later, depending on your latitude, elevation – and the weather.



Courtesy of USDA Forest Service

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

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. Whether or not a plot of land can serve as home to any particular species depends on its capacity to provide the requisite combination of food, water, and cover. 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 that 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." Many wildlife departments now specifically incorporate a non-game division. 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 waterfowl, and game fish such as trout and bass. Hunting and conservation groups like Wild Turkey Federation, Ruffed Grouse Society, Ducks Unlimited, and Trout Unlimited have spent considerable time and money planting oak, patch-cutting aspen stands, building 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, co-existing 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 number of vertebrates native to the region is surprisingly small. In the New England states, there are 338 species: 62 mammals, 220 birds, and 56 reptiles and amphibians, according to Mariko Yamasaki, a wildlife biologist who works with the USDA Forest Service, in Durham, New Hampshire. Yamasaki is the co-author (with Richard DeGraaf) of *New England Wildlife: Habitat, Natural History, and Distribution*. This book, an update of a U.S. Forest Service publication by the same name, and its companion volume, *New England Wildlife: Management of Forested Habitats*, have been the bibles for New England wildlife managers, helping them provide for the habitat needs of New England's mammals, birds, reptiles, and amphibians.

Most of these animals have small home ranges: two-thirds of them require less than 10 acres, and 85 percent live on 50 acres or less. Since 50 acres is the average holding of a Northeastern landowner, it's quite possible for most landowners to play a significant role in the presence or absence of a large number of wildlife species.

No matter how hospitable your land is, however, it will not be home to all of these species, or even half of them. To put this into perspective, Yamasaki and her colleagues have done much of their research at the Bartlett Experimental Forest, which comprises 2,600 acres of fairly typical northeastern forestland in northern New Hampshire. Here's a place where researchers have been taking an ongoing inventory for decades, which has given them as thorough an accounting of species as can be expected anywhere. In this 4 square miles of forest, they have documented the presence of 35 species of mammals, 90 species of birds, and 15 species of reptiles and amphibians. That's only 40 percent of the possible species.

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 – deer, moose, black bear – whose ranges are measured in square miles rather than acres.

Fifty of the resident vertebrate species have ranges larger than 50 acres, so landowners will be able to provide only part of their required land base. These species include the wide-ranging predators and carrion-eaters – both mammals and birds – along with a range of others including the loon, wild turkey, and pileated woodpecker. In this case, it's a collection of many adjacent landowners who hold the key to habitat.

"More and more, we as a people are very interested in the large landscape creatures. Isn't it time we started thinking about the large landscapes?" said Charles Johnson, former Vermont state naturalist and author of *The Nature of Vermont*. "People really need to be thinking 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."

Johnson cites new houses being built on hitherto unpopulated ridges and hilltops as the most serious impediment to continuous forest cover, an opinion shared by Yamasaki. She said, "Traveled roads are barriers. That's why the White [Mountain 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

"More and more, we as a people are very interested in the large landscape creatures. Isn't it time we started thinking about the large landscape?" —Charles Johnson

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 10 times your own acreage looks like. If you are the typical forest landowner and own approximately 50 acres, then you should take a look at topographical maps and aerial photos that cover at least 500 acres.

Aerial photos and topographical maps are available for the entire region. Your local offices of the extension or county forester or the Natural Resources Conservation Service can help you obtain aerial photos of your land. They are helpful tools in looking at your own land and placing it in the larger context. They're also great fun. 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 or bottomland spruce-fir, then your challenge will be to introduce some variety through your management choices.

Charles Johnson also recommends looking at 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.

Mariko Yamasaki said that the different styles of landowners' use of their land over the years has precluded uniformity of habitat. "In New England, 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 5 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 New England to look like untouched woods does have an effect over time, and that's what we're seeing."

The effect of a societal preference for a mature forest is particularly apparent in the southern part of the region, where land 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. The opposite is true in large sections of the industrial forest in Maine, which is dominated by young, early successional forests. There, the challenge is to find the late-successional stands that dominate southern Vermont, New Hampshire, New York, and Maine.

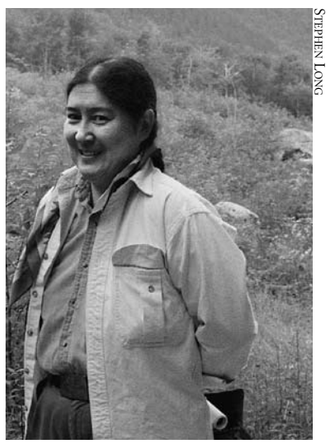
"People are talking about unbroken forest canopy being the epitome of what folks in New England want to see," says Yamasaki, "but frankly, from a wildlife habitat perspective, this is Boresville. It's horrible! There are reasons to do that, but there are a whole lot of reasons not to make it the only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

The party in Boresville – the break in an otherwise unbroken canopy – comes either from natural disturbances such as ice storms (remember January, 1998?) 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 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 pre-determined points. It's a thorough and scientifically sound method for getting detailed information about the woods.



Stephen Long

Mariko Yamasaki

I'm not suggesting 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 non-forest 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 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, Charles Johnson recommends taking an inventory of the species that are present. In winter, migratory birds will be gone and reptiles and amphibians will be

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 hare 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," Mariko Yamasaki said. "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 bobcat, whose numbers are decreasing across the area, and 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."

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.

Said Johnson, "People hear the word Ôinventory' and they're afraid that they're looking at days and days and days. You can make predictions that if it's all sidehill northern hardwoods, it's going to be more or less the same as far as wildlife goes, so you can spend little time there. But the anomalies on your land might show some interesting things. If you have identified them beforehand – 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

One of the more subtle features that you'll be looking for on your walks is 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. I suppose you could call the yardline markers an interruption in the otherwise sameness of the horizontal plane, and you could call the goalposts vertical diversity, but let's not. One other good reason to think of a football field is that it is approximately an acre in size (without the end zones, a football field covers 1.1 acres).

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 ways to improve on it. First, you can't consider it on its own, outside of its context. If it 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 of Thetford, Vermont, has documented 16 species of birds while watching a game at Yankee Stadium. (Yes, the Yankees play baseball, not football, but trust me, that doesn't make a difference.)

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, make it a pasture that hasn't been grazed for 10 years. And between the two 40-yard lines, add a stand of softwoods. 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 to 16 inches in diameter and the tallest are 60 feet tall. 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 hard 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 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.

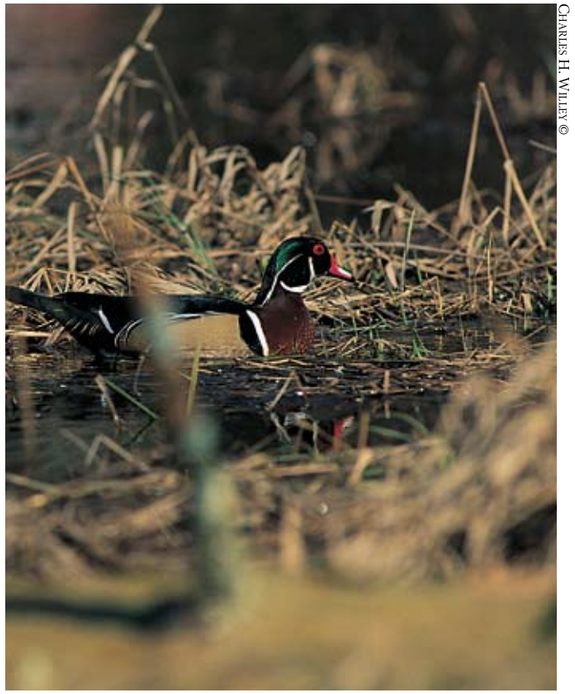
Let's jack up one corner of the field so it's 30 feet higher than its diagonally opposite corner. And let's have a small stream find its way from the top corner to the lowest corner. Winding its way to the stream from one of the other corners, let's have a woods road that naturally reseeded itself in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

Of course, that's an utterly unrealistic preponderance of diversity for a single acre of ground. Also, lines between stands are never this clearly defined, unless one of the stands is a plantation. It's much more likely that the kinds of changes I've described would take place on 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 (predators, along with deer and moose) and birds (raptors and carrion eaters, for example), 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 midstory, 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.



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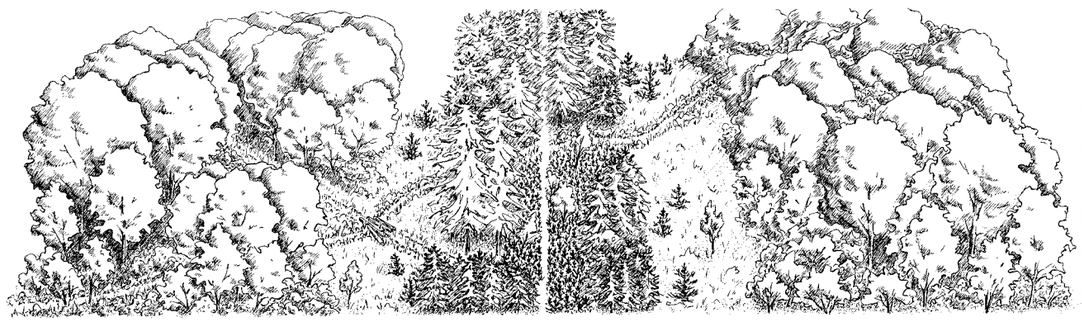
CHARLES H. WILLEY ©

Both moose and wood duck are drawn to beaver ponds.

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.

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.



ILLUSTRATIONS BY BETSY BRIGHAM

A checklist

Finally, as you walk through your woods, use this checklist and make note of special features, ranging from landscape scale to individual trees, that are a boon to many species of wildlife. Add these features to your map.

•**Deer wintering areas.** These are mapped by state fish and wildlife departments. One sign that deer are using an area in winter is overbrowsed hardwood saplings (thick branching makes them look broomy) within primarily softwood stands. Deer are such efficient generalists that they can find food and cover almost anywhere nine months of the year. Winter habitat is the only limiting factor; without it, there can be large winter kills in prolonged periods of deep snow and below-zero temperatures.

•**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 by 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.

•**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 to put on fat to get them through winter. Beechnuts and acorns, known as hard mast, are also eaten by turkeys.

•**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.

•**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 re-using 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. Check with your state natural heritage office (most likely within the fish and wildlife department) or with The Nature Conservancy to see whether there are any rare sites mapped on your land. Depending on the state, these range widely from floodplain forests to white cedar swamps to natural stands of red pine.

Observing, understanding, and mapping the features of your land can be an end in itself, or it can be the first step in developing a management plan. Your forestland's potential can best be realized if you enlist the services of a forester.

Stephen Long is co-editor of *Northern Woodlands* magazine.

Author's note: In researching this article, I have found the following publications to be particularly helpful:

New England Wildlife: Management of Forested Habitats, by Richard DeGraaf, Mariko Yamasaki, William Leak, and John Lanier.

New England Wildlife: Habitat, Natural History, and Distribution, by Richard DeGraaf and Mariko Yamasaki.

Biodiversity in the Forests of Maine, by Gro Flatebo, Carol Foss, and Steven Pelletier; edited by Catherine Elliott.

Good Forestry in the Granite State, by The New Hampshire Forest Sustainability Standards Work Team.

The Elements of Biodiversity, compiled and edited by Brian Stone and Scott Darling of Vermont's Agency of Natural Resources.

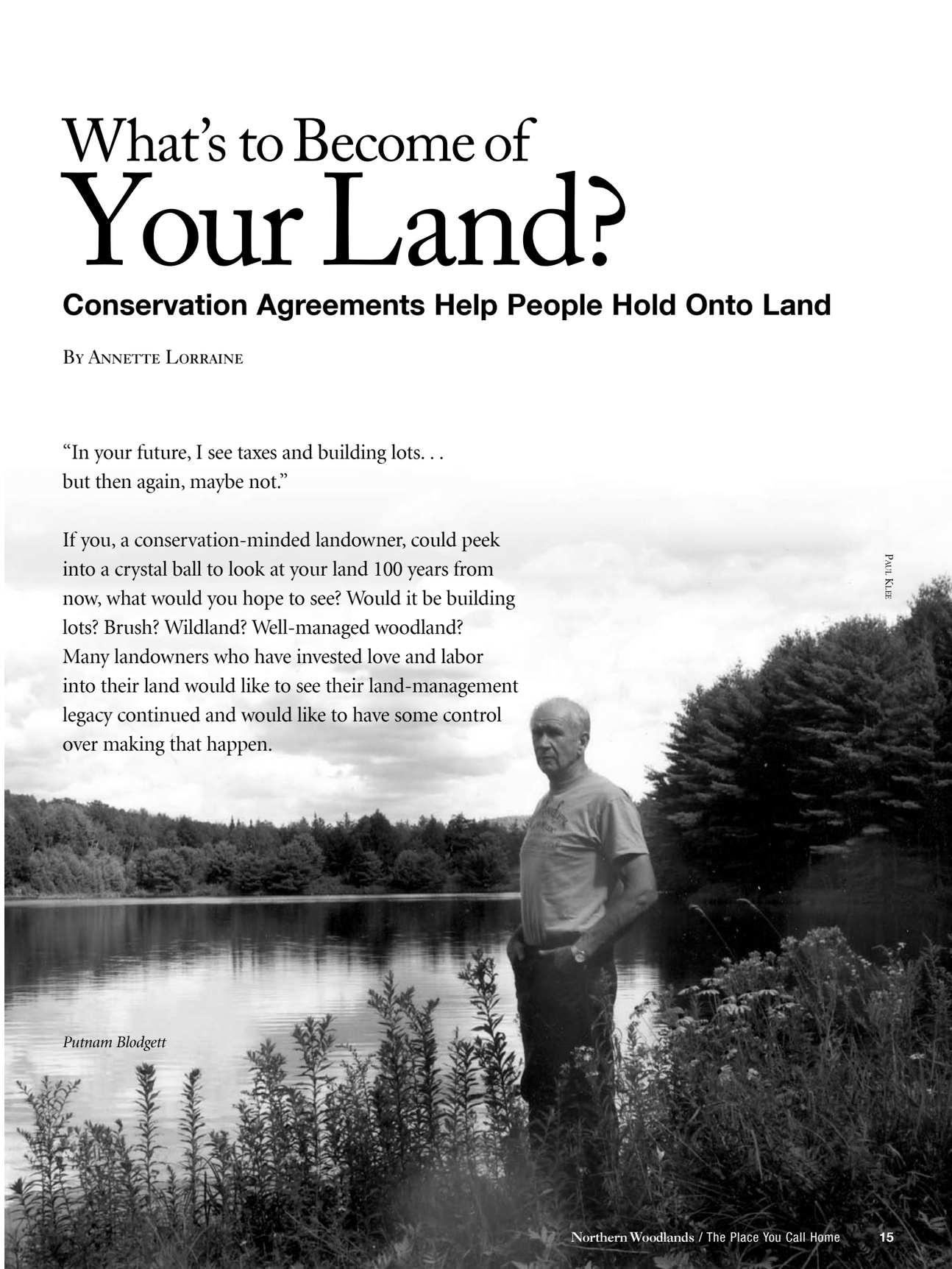
What's to Become of Your Land?

Conservation Agreements Help People Hold Onto Land

By Annette Lorraine

"In your future, I see taxes and building lots. . . but then again, maybe not."

If you, a conservation-minded landowner, could peek into a crystal ball to look at your land 100 years from now, what would you hope to see? Would it be building lots? Brush? Wildland? Well-managed woodland? Many landowners who have invested love and labor into their land would like to see their land-management legacy continued and would like to have some control over making that happen.



Paul Klee

Putnam Blodgett

Putnam (Put) Blodgett, of Lyme, New Hampshire, is just such a landowner. "I hope the forest can be a touchstone for my family to some of their roots," said Blodgett, who remembers his father harvesting timber on his family's Bradford, Vermont, land using a team of oxen and a two-man crosscut saw. Although Blodgett eventually sold the family farm, he held onto 600 acres of the family woodland.

With an investment of a lifetime in his woodland, it is no surprise that Blodgett wonders how to best secure his family's legacy in the land. Understanding that land is at risk every time it passes to a new generation, he has placed a conservation agreement (also known as a conservation easement) on his land with a nonprofit land trust.

Ron and Sylvia Ferry of Montpelier, Vermont, had similar concerns about their 83-acre farm and woodland. After rearing their three children there, the question remained: "What will become of the land?"

"Our biggest asset is this land; we won't have much money when we go," said Sylvia Ferry, describing their all-too-common "land-rich, cash-poor" situation. The Ferrys purchased their land in 1958 at a price that seems absurdly low by today's standards. Nevertheless, when it comes to calculating capital gains taxes on investment property like a woodlot, that purchase price is their basis. If the Ferrys were to sell their investment land, the capital gains tax would be very high because of the dramatic difference between the basis and today's fair market value. It is important, however, to distinguish between investment property and one's personal residence since tax laws treat them differently.

The Ferrys took a unique approach to making their decision: they wrote to each of their three children asking what they wanted in the future for the house and the land. Each one wrote back, separately expressing a desire for the land to be conserved as a whole.

So the couple opted to place a conservation agreement on their land and to leave it to their three heirs. It now appears that the Ferrys, being fortunate enough to have like-minded heirs, do not need to worry about the future of their land. However, prior to the agreement, the threat of estate taxes could have obstructed everyone's best intentions.

By using the conservation agreement, they solved two possible tax problems: capital gains and estate taxes. The problem with estate taxes is that all too often, with a bequest of land and not enough cash to pay the tax, heirs are forced to find a way to raise cash quickly. Some end up cutting timber, often before it has reached its maximum potential. Others choose to sell off enough development parcels to pay the estate taxes.

Indeed, estate taxes are a major concern for many who wish to leave their land to heirs. Because the value of land throughout the Northeast has increased so much in the last 25 years, estate taxes are due from many people who would not have been subject to these taxes before. Often, local folks gasp at the prices newcomers pay for backcountry real estate – only to find out those seemingly outrageous values now apply to their own land. It's no longer only the obviously wealthy who need to worry about estate planning.

A simplified way to estimate estate taxes is to total up one's net worth, which is the fair market value of one's gross assets minus debts. At the date of death, if one's net worth is more than the tax exemption for that year allows, there will be an estate tax. The date of death is important because the 2001 tax law change adjusts the exemption upward each year until 2010, when there is no estate tax at all. Then, on January 1, 2011, the exemptions will revert to the pre-2001 amounts unless, in the meantime, Congress changes the law again.

For people pondering estates and estate taxes, it is crucial to obtain up-to-the-minute professional advice. With that in mind, here is a glimpse at the exemption amounts as they exist in 2005. For a person who dies in 2005, a net worth of up to $1.5 million is exempt from estate taxes. In 2006, that amount will increase to $2 million where it will stay until 2009, when it increases to $3.5 million. Any estate worth more than the exemption has the excess amount taxed, and the largest estates will pay at the maximum rates, which are currently capped at 47 percent in 2005, 46 percent in 2006, and 45 percent 2007-2009. Again, there is no estate tax in 2010, but unless Congress enacts a change, in 2011 the rate will jump to a cap of 55 percent with a $1 million exemption.

In any case, estate planning is a good idea for any person or couple with a net worth of more than $1 million. Landowners who reach this level from their real estate values rather than from liquid assets must ask themselves how their heirs are going to come up with the cash to pay the taxes.

There are several strategies for postponing or reducing estate taxes, such as revocable and irrevocable living trusts and lifetime giving techniques. There are pros and cons to each method; a good accountant or attorney can be consulted for individual advice. But, whether in addition to other tax strategies or by itself, there is currently only one option that reduces taxes and guarantees that land can stay undeveloped: a permanent conservation agreement. Removing the development potential from land lowers its fair market value and thus the capital gain upon transfer, and it lowers the owner's net worth for estate tax purposes.

The most typical way for a landowner to conserve land is by donating a perpetual conservation agreement to a nonprofit land trust. In this scenario, a landowner grants perpetual development restrictions on the property to an organization whose sole purpose is to permanently restrict and monitor any development of the land. At the same time, the landowner retains ownership of the land and is free to sell or leave it to heirs as desired.

Title to the conservation agreement must be granted to a nonprofit organization that the Internal Revenue Service deems qualified to hold and enforce those rights in perpetuity. These are usually called land trusts or land conservancies. Landowners can claim income tax deductions for voluntary donations or bargain sales of conservation agreements (as provided by Section 170(h)(4) of the Internal Revenue Code) when they accomplish certain goals, such as the conservation of scenic open space, working farms or forestland, or wildlife habitat, so long as there are significant public benefits. However, as of 2005, Congress is considering changing these qualifications too, so it is important to be aware of the most recent law and policies. Land trusts will be happy to steer interested parties in the right direction.

It's important to note that conservation agreements also place restrictions on the property that will affect every future owner of that property; for instance, the land can never be subdivided and developed (although sometimes limited exceptions may be negotiated beforehand), nor used for mining nor storing trash. However, most land trusts allow – and often promote – timber harvesting with good forestry practices. This may be appealing to woodland owners who want to see their working forest remain a forest beyond their ownership.

Conservation agreements can be particularly helpful to woodland owners with tax concerns. Without the development potential, the fair market value of the property is reduced significantly. The landowner must document this drop in value by obtaining a special appraisal of development rights that meets certain IRS qualifications. This should be done by an appraiser experienced in this field, and will cost more than a standard appraisal. However, a landowner will want such an appraisal to determine if a conservation agreement will make a significant decrease in a possible capital gains tax.

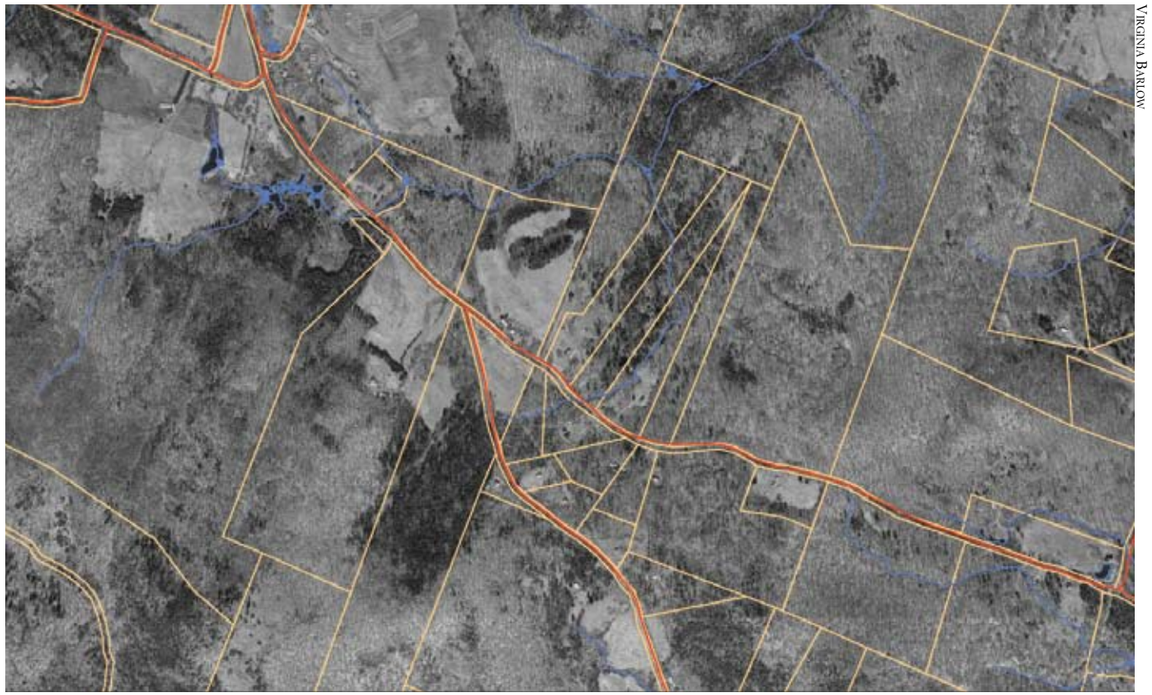
An appraisal will also assist the landowner in estimating how the estate taxes, if any, will become more manageable for the heirs. A further benefit is that a donation of permanent conservation restrictions to a nonprofit land trust is tax-deductible. Depending on a landowner's income and other circumstances, the costs associated with appraisals and the land trust agreement may be deducted from one's adjusted gross income, along with the fair market value of the development rights as determined by the appraisal.

Theoretically, a decrease in property value should also reduce property taxes. However, governmental policies for assessing conservation lands differ from state to state, and in some cases, town to town. There is no guarantee that extinguishing develop rights through a conservation agreement will lower property taxes. In the case of land enrolled in a state's "current use" property tax valuation program, however, conservation land is most likely already being taxed at its lowest possible rate.

So what does this all amount to in the vision of one's land for the future? With careful planning, it is possible to preserve one's financial resources, one's land, and one's land ethic for future generations. It is rare that such a variety of concerns may be addressed by one tool; yet working out a conservation agreement with a land trust has proved a viable option for many. Landowners like Ron Ferry, who have chosen this option, feel satisfaction knowing "the land is more ours than it ever was before, because we know it will be preserved."

Annette Lorraine lives in Hartland, Vermont, and is the stewardship director and legal counsel with the Upper Valley Land Trust.

Conservation easements are one tool to help contain the subdivision of the landscape.



Virginia Barlow

A Look at the Season's Main Events

By Virginia Barlow

	JUNE	JULY	AUGUST
First week	On fine mornings, honeybees may swarm, leaving the hive with the old queen. A new queen will emerge from the old hive and will mate with several drones high in the air / On hot, humid nights listen for the trill of gray tree frogs as they begin to congregate at mating ponds. With a flashlight and some patience, you can follow the calls to their source, often in trees or among shrubbery near ponds and marshes	One of the planet's most successful creations, the mosquito has been around for 50 million years. A female mosquito can suck up two and a half times her empty weight in blood / The fragrance of milkweed in bloom can be almost overwhelming. Bees, moths, wasps, butterflies, and even flies are drawn to its nectar / Look for the eggs of green frogs – floating masses of jelly with black-and-white eggs. Laid late, usually when the water is warm, they hatch within a week	Large dragonflies such as the green darner (*Ajax junius*) may replace flying with some gliding on hot days to prevent overheating their flight muscles / Ruffed grouse chicks are eating more vegetable matter and fewer invertebrates. High-protein insect food is the norm only during their first few weeks of life / On hot days the beautiful blue flowers of chicory will fold up by noon / Eastern newts can coexist with fish in permanent ponds, protected from predation by toxic secretions in their skin
Second week	Listen for the crash of big, chunky June bugs (they are really beetles) on window screens / Though the woodchuck can be a major nuisance in the garden, keep in mind that other animals such as cottontails, weasels, and red foxes use its burrows / Blackflies are among the many insects that are pollinating blueberry flowers / White pine leaders that are infested with the white pine weevil will soon wilt and become evident. Corrective pruning can be done any time / Peak of alpine bloom in the White Mountains	By now milk snakes have laid their 5-24 eggs. They will hatch from late August to October / Deer mouse population is on the rise. It grows from one mouse per 2 acres in spring to a high of 22 mice per 2 acres in autumn / New bumblebee queens are out / Damage by the larvae of alder flea beetles is clearly visible. The black caterpillars usually occur in innocuous numbers, but occasionally there is a population explosion. The cobalt adults overwintered and were feeding in the spring, before laying eggs	Backswimmers patrol the surface of ponds, nabbing mosquito larvae as they come up for air / White-faced hornet nests are getting bigger, as a growing population of workers adds layers of paper – made of chewed up, weathered wood – to the outside / Green frogs stay near water and will jump in with a splash and a yelp if startled / Chokecherries and the first blackberries are ripe, but black cherries are still green / Splashes of red are starting to show here and there on a few scattered red maples
Third week	Look for the yellow robber flies hanging around beehives, sometimes gobbling up pollen-laden bees as they come home from work / Cedar waxwings are choosing nest sites, usually near fruiting trees and shrubs. They may use pieces of string or yarn if you put them out / Sometimes young great horned owls tumble from the nest before they can fly and are fed on the ground by both parents / Shadbush fruits are ripe	Little brown bats may consume half their weight in insects in an evening. Look for them over wetlands or still water, where insects are abundant / Tall meadow rue is blooming, its feathery flower heads well above other roadside and marshy plants / Bullfrog tadpoles are transforming into adults. After spending two years as mostly vegetarian or scavenging tadpoles, as adults they will eat any kind of animal they can catch / Ambush bugs are hiding in flower clusters, waiting for unsuspecting honeybees	Flickers on the ground are picking off ants. Their sticky tongues can extend up to 2 inches beyond the tip of the bill / The fine airborne pollen of ragweed will be with us until the first frost / Chimney swifts will migrate soon / A fringe of stiff hairs on the hind feet of northern water shrews allows them to run across the water's surface / Yellow-bellied sapsucker parents are still with the fledglings. Unlike other woodpeckers, they don't excavate beetle larvae. Their major summer foods are fruit, ants, sap, and the inner bark of trees
Fourth week	When the population of arborvitae leafminers is high, you will see the tiny moths now if you shake the foliage of a cedar tree / Goldfinches begin building nests. They form pairs in May but delay brood rearing to coincide with the ripening of thistle seeds and other composites / Female garter snakes bask to optimize the temperature for their developing offspring. They will give birth from July to early August	Look for chipping sparrows in the cabbage patch. They love cabbageworm / If eastern chipmunks produce two litters, the second batch is usually born in late July / The summer diet of screech owls features large insects: moths, June beetles, katydids, and crickets. Outdoor lights may attract the insects and the owls / Toads are tiny – 0.3 to 0.4 inches long – when they transform into adults and leave their breeding pools / Blueberries are in fruit	Joe Pye weed (pink), boneset (white), and goldenrod (yellow) are flowering in colorful masses at the edges of wetlands / Juniper berries can be crushed as a seasoning for veal or roast lamb / Painted turtle eggs begin to hatch, about 65 days after they were laid, if they have escaped notice by skunks, foxes, and raccoons / Newly transformed northern leopard froglets, just over one inch long, are leaving water for grassy meadows

These listings are from observations and reports in our home territory at about 1000 feet in elevation in central Vermont and are approximate. Events may occur earlier or later, depending on your latitude, elevation – and the weather.

By Michael Snyder

Which trees make the best firewood?

One might be tempted to say that the best firewood is that which grows fast and is cut, split, and stacked in one's yard by someone else at no cost to oneself. But what fun would that be?

Actually, there are many characteristics of good firewood. It's readily available and relatively cheap. It's easy to split and easy to ignite. It produces long-lasting coals and it smells good, too. But sensible northerners would agree that the most important attribute of good firewood is its heat value – the ability to produce heat when burned.

Some woods burn hotter than others. Heat value varies among tree species because it is dependent primarily on a wood's density, moisture content, and concentration of resins and tannins – all of which vary according to species. Typically, heat value is measured by the British thermal unit (Btu). One Btu is defined as the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit. I don't know anybody who was ever interested in raising a pound of water one degree, so perhaps a better way of describing a Btu is that it takes about 100 million of them to heat your basic, reasonably well-insulated Vermont house for a year. And it takes less of some woods than others to produce those same 100 million Btu. So the question becomes, which woods are better, and why?

Pound for pound or ton for ton, softwoods such as pine produce more Btu than do hardwoods like maple. What's that, you say? Well, it's true. A pound of dry hardwood produces only about 8,500 Btu, whereas burning a pound of dry softwood gives off 9,000 Btu, thanks to all that pitch and resin, which burn quite hot. If you were buying firewood by weight, you'd get more heat for your money if you bought a ton of pine than if you bought a ton of maple.

But you probably don't buy firewood by weight. You buy it by the cord, which is a measure of volume. Because hardwoods are so much more dense than softwoods, they pack more wood (weight) into a given space (volume). Accordingly, a cord of dry sugar maple produces 21.3 million Btu compared to only 13.3 million Btu per cord of white pine. So to get those 100 million Btu to heat your house, would you rather cut, split, stack, and handle 4½ cords of maple or 8 cords of pine? I thought so.

Some woodburners – maple sugarmakers come to mind – are quite happy to burn softwood. It's readily available as a by-product of sugarbush management, and they like the quick, hot flame it produces. But most who heat their homes with wood don't use much softwood, primarily because of the low heat value per cord, but also because those resins tend to end up as dangerous creosote deposits on chimney linings. So the quest for the perfect home-heating wood generally occurs among the hardwoods.

If you're buying your firewood commercially, you'll understandably want the most heat for your dollar, and you may not have much choice in what species gets delivered. But if you're cutting your wood on your own woodlot, you probably do have a choice.

Thinking strictly of heat value, the denser the wood, the greater the heat output. Shagbark hickory, black locust, and hophornbeam are among our most dense woods, and they all produce over 24 million Btu per cord. Beech, sugar maple, red oak, and yellow birch are slightly less dense but still have excellent heat values, putting out between 20 and 23 million Btu per cord. Traditionally, woods with heat values below 20 million Btu per cord (red maple, paper birch, black cherry, butternut) have been considered poor firewood species.

Does this mean you should stuff all your best red oak, sugar maple, yellow birch, and white ash into the wood box? Probably not. These species put out more heat, sure, but they also happen to be among the most valuable sawlog species. This potential for increased value is well worth considering. The difference in heat value between red maple and sugar maple is negligible compared to the difference in sawlog value between the two.

But just because it's a sugar maple or a red oak doesn't mean the tree has a sawlog in it. A poorly formed sugar maple isn't worth much more than a poorly formed red maple. To make a sawlog, a tree's stem must be relatively straight, disease-free, and without much in the way of defects such as branch stubs, wounds, and seams.

Remember, the most valuable wood products are those that still look like wood after processing – furniture and flooring, for example. Wood used for things that don't resemble wood (like pulp and paper) are less valuable, and the least-valuable wood products are those that get obliterated in your firebox.

Considering such economic realities – not to mention how long it takes to make a tree – who could argue that the highest and best use of a tree is to burn it? If it can be used as a sawlog and thus as furniture, the tree can be worth a couple hundred dollars to the landowner; if it's firewood grade, it's worth less than $5. I'm not saying we shouldn't burn wood – it's a perfectly good use – but as long as you're paying for that land and cutting trees anyway, why not maximize your returns?

Most woodlots have no shortage of poorly formed trees of low-value species. The trick is in finding and fostering the high-value ones. So, to the extent practical and reasonable for your circumstances, it makes good sense to take your firewood as a by product of your other management efforts – be they toward sugaring, wildlife habitat improvement, or production of quality timber.

Come February, I love a good hot fire, but I sure hate to see the best trees burned. I guess one could say the best firewood comes from the worst trees.

Michael Snyder is the Chittenden (Vermont) County Forester.

Taking the Spring Out of Spring Poles

The best way to manage spring poles is to avoid them. They pack a tremendous amount of force and often respond to release in unpredictable ways. It's often possible to avoid spring poles by:

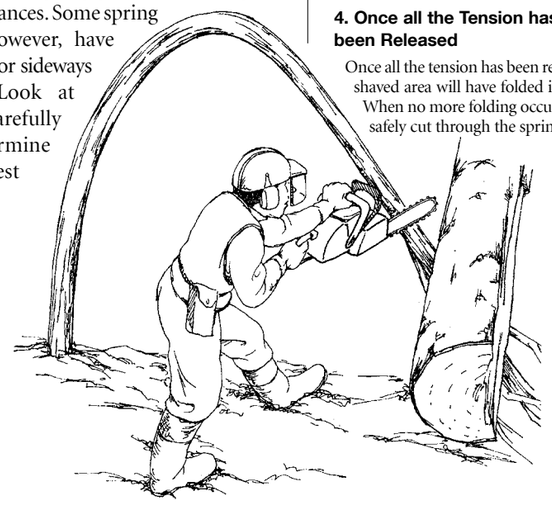
- Using precision felling to avoid saplings
- Clearing out a landing zone when a tree must be felled into saplings
- Skidding trees out of sapling areas before delimbing

When You Must Release a Spring Pole:

Sometimes spring poles are unavoidable. Many people learned to release spring poles by making a series of small cuts from above. However, cutting from above may cause the tree to break apart suddenly if the cuts are too deep.

The safest method is to attack the problem from underneath. Shave wood away from the bottom of the bend, releasing the tension slowly and minimizing the risk of the tree breaking apart suddenly. Don't cut too deep or you'll pinch your saw.

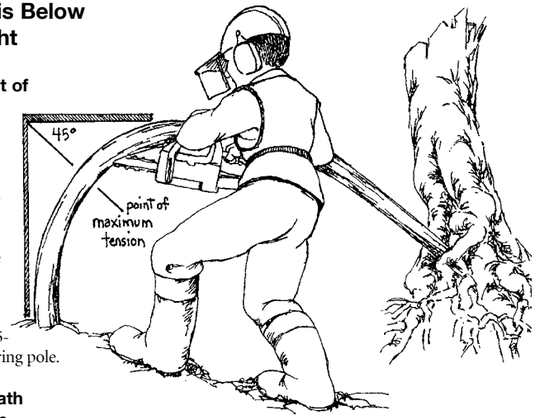
Here are some suggestions on how to deal with spring poles in the simplest circumstances. Some spring poles, however, have multiple or sideways bends. Look at these carefully to determine the safest solution.



If Spring Pole is Below Shoulder Height

1. Locate the Point of Maximum Tension

To locate the point of maximum tension, imagine a vertical line extending up from the base of the tree and a second line running horizontally across the highest point on the spring pole. From the intersection of these two lines, imagine a 45-degree angle to the spring pole.



2. Shave Underneath to Release Tension

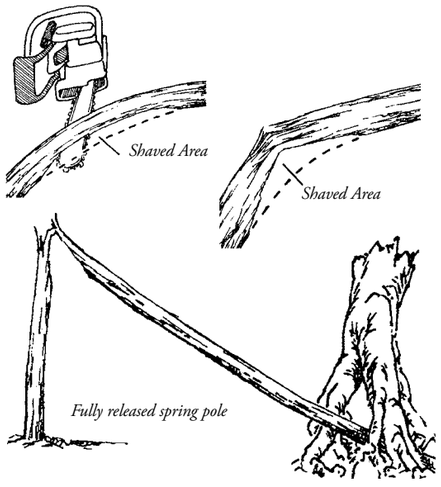
Stand as far back as possible and use your saw to shave wood off the underside of the spring pole around the point of maximum tension. Don't cut into the spring pole, though, since the compression of the wood will pinch the saw.

3. Keep Shaving Until all of the Tension is Released

As wood is shaved, the fibers on the back side may begin to break apart. The top of the spring pole will begin to relax toward the ground as fibers on the inside begin to bend.

4. Once all the Tension has been Released

Once all the tension has been released, the shaved area will have folded in on itself. When no more folding occurs, you can safely cut through the spring pole.



If Spring Pole is Above Shoulder Height

1. Clear any Branches Underneath the Pole

Stand under the spring pole and trim any branches and brush that may be in the way.

2. Release the Top

You can release the spring pole by cutting off the top. If you've been careful to remove all brush or limbs that are in the spring pole's path, it should fly harmlessly above you.

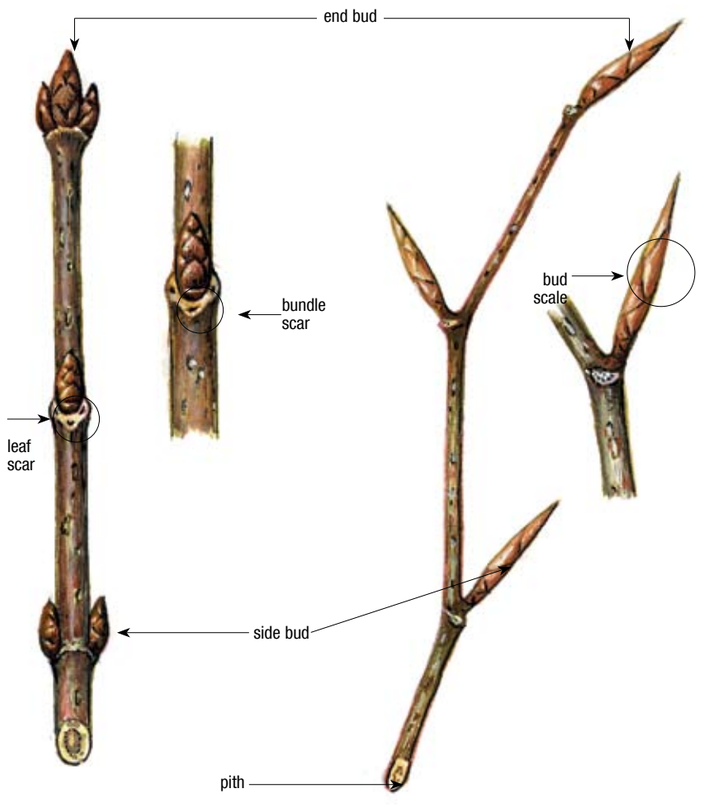
Tricks of the Trade is provided courtesy of Yankee Forest Safety Network, a non-profit logger safety group serving loggers in New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island.

Sorting the Saplings

A Quick Guide to Winter Tree and Shrub Identification

By Ana Ruesink
Illustrations By
Rebecca Merrilees

When winter's winds remove the multi-colored 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 even with 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 winter 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 zigzag, 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 1/4 inch long; with from eight 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. 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. Leaves, in truth, are distractingly obvious. Stripping trees down to the bare branches beneath 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 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. Other aspects are more helpful; here are some of the most useful 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 "sub-opposite." Look at common buckthorn for an example.
- **Bud arrangement:** bud characteristics can help reduce 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, sub-opposite, or alternate. Note that these three elements function together – on any woody plant, the twigs, leaves, and buds are all either opposite, sub-opposite, 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.

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

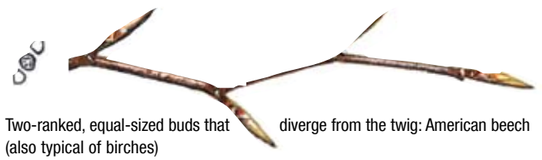
Spiral, three-ranked buds that hug the twig: quaking aspen (typical of other poplars as well)

Buds in sub-opposite 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.*

Birds in the Brush

The Lowdown on Ground-Nesters

By Bryan Pfeiffer / Illustration by Adelaide Tyrol

The ovenbird was agitated. And who could blame her? I had unwittingly walked too close to her nest.

She and her mate had chosen a rich stand of old hardwoods in Vermont's central piedmont. Foamflower, miterwort, and early saxifrage were in bloom up to my ankles. Forest openings were carpets of violets. Maidenhair fern, the most elegant plant in the woods, reached its semicircular fronds toward the sun.

The ovenbird is an unwarbler-like warbler. Olive above and heavily streaked below, this songbird looks more like a miniature thrush than a member of that glittering, lyrical family of birds, the warblers, or Parulidae. The one dashing feature on the ovenbird is its orange racing stripe – edged in black – running from the forehead to the nape. When excited, the ovenbird will sometimes raise the feathers on its head, making its point with a pumpkin-colored Mohawk hairdo.

My approach certainly made these ovenbirds excited. The female prepared to defend her nest. The male flew to a sugar maple at the edge of his territory and began shouting, with a full crescendo, his penetrating *TEA-cher! TEA-cher! TEA-cher! TEA-cher*! – one of the most enduring and revealing sounds of the northern hardwoods.

What isn't so revealing, however, is the ovenbird's nest site; it's hidden on the forest floor. And that is hardly unusual among birds. A good number of our songbirds, even those ordinarily foraging high in trees, nest on the ground or a few feet above in the shrub and sapling layer. Their presence provides convincing evidence that life in healthy woodlands – everything from songbirds to salamanders – does not thrive by tall trees alone.

To be sure, the planet is sprinkled with ground-nesting birds: loons, most duck


ROY W. PILCHER

Black-throated blue warbler eggs

species, geese, sandpipers (the solitary sandpiper, which uses deserted songbird nests in trees, is a notable exception), gulls, terns, and jaegers, just to name a few. Many of these birds nest on the ground because they like to be near the water's edge or simply because they breed in treeless areas of the arctic.

Consider as well some birds that nest *in* the ground. Oceangoing petrels squirm into burrows at the seashore. Alcids – murres, razorbills, and guillemots, the so-called "penguins of the north" – nest on seaside ledges or in rock crevices, although one of the most famous alcids, the Atlantic puffin, prefers burrows. Belted kingfishers excavate horizontal burrows into vertical banks near water.

More surprising, however, are the numerous members of bird families normally associated with lofty trees – vireos, wrens, thrushes, warblers, and certain sparrows – that nest on or near the ground. After all, these birds belong to the great order Passeriformes, or Passerines, the perching birds, so named for their having four toes – three facing forward and one (the inner, corresponding to our big toe) facing backward – designed for perching on branches. (Feet are important in bird taxonomy – consider the finer points of the hawk's foot or webbing on a duck's foot.)


ROY W. PILCHER

Ovenbird

"People really don't think much about the fact that birds nest at different levels in the woods," says David Capen, a professor of wildlife biology at the University of Vermont. "Woodland owners often assume that since a bird can fly, if it doesn't have a place to nest at two feet it will just move up to eight feet."

Recall from high school biology class the lessons on ecological niches. We all know that living things are opportunistic. They'll go where they can find food or nutrients, where they can survive and reproduce. In the woods, few vacancies go unfilled – from canopy to soil. Yet how do songbirds survive down there? It would seem that ground-nesting species are at a certain disadvantage to their more arboreal cousins. Raccoons, skunks, opossums, coyotes, foxes, rats, mice, house cats, and even humans are well-known, ground-dwelling predators of bird eggs and young. But ground-nesters prosper nevertheless. And like any creature, they adjust to life in the leaf litter with some clever adaptations – ranging from camouflage to outright trickery.

Rewind to that pair of ovenbirds. Their backs were the color of fallen leaves. The female, somewhere on the forest floor, blended in like a leaf in a forest. That's a shared strategy for ground-nesters: their uppersides tend to be the color of their habitats – brown, tan, olive, or green.

The hermit thrush, which nests on or near the ground in softwoods or mixed woods, is olive-brown on its back. The mourning warbler, nesting low in the shrub in open deciduous woods and wetland edges, may be bright yellow below, but gray and green uppersides make it more obscure to predators above.

The male black-throated blue warbler, which nests in the shrub layer in hardwoods, is metallic blue above – not exactly the right color for hiding in hobblebush. But the female black-throated blue is downright drab for a warbler – overall gray-green. And if you're a black-throated blue warbler sitting on eggs all day, not being blue helps you and your offspring stay alive. This sexual dimorphism – the more cryptic female plumage in many, not all, songbirds – is a wise adaptation in any nest location, high or low in the forest.

Even though I could hear that male ovenbird shouting at me, I never actually saw him. Ovenbirds have another advantage that enhances their protective coloration. Most birds reveal their location when they move, flitting from leaf to leaf or hopping across the ground. Ovenbirds don't hop; they walk stealthily. Countless times I've heard a calling ovenbird, louder than anything in the woods, sitting somewhere on a branch at eye-level, yet for all intents and purposes invisible.

Even so, this female ovenbird made herself quite visible. She actually walked toward me, not at all concerned that I might notice her near the nest. In fact, as it turned out, this was all part of her plan. She wanted to be seen. So I stepped closer. She then did what any self-respecting ovenbird with eggs would do. She drooped both wings as if they were broken. And with her wing tips dragging the ground, she began to walk away.

It was a smart move on her part. Lots of birds – killdeer and ruffed grouse (also ground nesters) among the most noticeable – do this broken-wing trick. It's called a distraction display. By feigning an injury, the bird believes the intruder will pursue an easy prey with a busted wing. Some birds will feign exhaustion. Others will scoot like a rodent.

In any event, when the actor draws the predator a sufficient distance from the nest, the performance reaches its finale: the bird flies off in full health to return to her nest, which presumably is now out of the predator's sight. Sleight of hand (sleight of wing, rather) has come to the forest.

This drama is played out on the ground or in the shrub layer of our forests every year at nesting time.


ROY W. PILCHER

Black-throated blue warbler and nest

We walk over, alongside, and under it with every ramble in the woods. Some of the best proof of birds nesting at various heights in the forest came in 1961 from the Canadian-born ecologist Robert MacArthur. He demonstrated that the vertical complexity of forest vegetation – the diversity of heights and density of foliage at those heights – is directly proportional to breeding bird diversity. MacArthur called it "foliage height diversity." It's classic reading in college-level ornithology. Grasslands have exceedingly low forest height diversity; shrublands have more; and tropical forests with multiple canopy layers have the highest.

To oversimplify, animals – no matter where they live – need food, water, and shelter. More specifically, birds need nesting sites, perches for resting or singing, and vegetation structure for finding food. A forestland owner needs nothing more than common sense to realize that the higher the vegetative diversity, the higher the species diversity. "As the understory becomes more simple, the bird species complexity becomes more simple," says William McShae, a wildlife biologist with the Smithsonian Institution's Conservation and Research Center in Front Royal, Virginia.

In the woodlands of McShae's Virginia, and in Pennsylvania and other states, wildlife biologists are seeing declines in ground-nesting bird species. The culprit is a native herbivore that harms songbirds indirectly: the white-tailed deer. The loss of larger predators such as wolf and cougar has contributed to a rise in whitetails. And an overabundance of deer can eviscerate understory vegetation. They literally eat songbirds out of house and home.

"There is absolutely no question that regions with high deer populations have depauperate understories," says Capen, "and bird species have been documented to be pretty seriously impacted."

But deer aren't the only understory-clearing culprits. In New England, in places where deer densities aren't as high, sugarbush owners sometimes clear forest understory vegetation, making it easier to get around to trees and buckets. Residential landowners with small woodlots sometimes clear understory plants, creating a comfortable, park-like aesthetic, but depriving a class of songbirds of crucial habitat. It means fewer birds in the woods, at the feeders and, as a result, perhaps an increase in insect pests.

Having lured me into her one-act play (and away from the nest), the female ovenbird felt the tug of her eggs. It was cool and rainy that morning, so she couldn't leave her eggs uncovered for very long. I backed off. And she began a slow, stealthy walk toward her nest.


ROY W. PILCHER

Slate-colored junco

That nest is how the ovenbird gets its name – and it is perhaps the most important example of how songbirds can survive on the ground. The ovenbird walked to the base of a clump of Christmas fern. She had inadvertently revealed the location of the supreme priority in her life at that moment. Her nest was a small dome woven from older fern fronds and leaves. With its front entrance, it looked like a classic domed oven. Inside were five tiny, pale eggs. There can be few better bird hiding places in the woods.


STEVEN D. FACCIO

Ruffed grouse

Nest location and camouflage are critical to ground-nesters. And it seems to work well for them. Consider studies in which researchers place artificial nests with eggs at different locations in the woods – on the ground, in the shrub layer, and higher in the canopy. The results show consistently that the nests placed in the shrub layer and canopy are hit by predators more often than those located on the ground. It seems to be an easier place to hide a nest.

Think of the winter wren. Actually, try finding one. Despite its explosive song, which is an extended series of excited trills and buzzing, this little brown bird regularly eludes birdwatchers. Finding its nest is like finding money in the woods – it's hidden in a tree cavity, under a stump, or in the exposed roots of a tip-up. The black-and-white warbler, much more obvious with its zebra pattern and nuthatch-style foraging habits, conceals its nest at the foot of a log or stump, among a tangle of exposed roots or in some depression. The Nashville warbler may feed in plain view out at the tips of conifer twigs, but its nest is tucked away under a clump of sedge, grass, or other vegetation.


STEVEN D. FACCIO

Hermit thrush

Never would I have found that ovenbird nest had I not been clever enough to hide and watch the female walk to it. Even better was watching her step into the nest and settle on her eggs.

But it was time to leave her alone. I turned and started my walk out of the woods toward breakfast. The male ovenbird began singing again. Scarlet tanagers and rose-breasted grosbeaks, two of the showiest birds in these woods, were singing and glowing in the canopy. But walking that morning through those woods, my thoughts were with the invisible ground nesters – probably only a few steps away.

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Consulting Foresters:

What They Do and Why You Need One

By Stephen Long

Michael Silberman

Consulting forester Lynn Levine and the Silberman family study a moose track in Dummerston, Vermont.

What do you think of when you see a skidder parked in a landing next to a pile of logs?

Does it warm your heart, reminding you that the forest products industry is a significant part of the rural economy? Or does it bring to mind a horror story told by a landowner of his beautiful woods left ruined by a logging job? For too many, the presence of a skidder brings a shudder of dread.

What gives? Is every logger a scoundrel and every landowner a victim?

Hardly. The problem often starts with a landowner who knows just enough about logging to get into serious trouble. For starters, many misunderstand the nature of the relationship between logger and landowner, thinking that the logger is providing a service, much like the fellow who plows the driveway or paints the house. Unschooled landowners get dollar signs in their eyes when they realize that not only will the contractor thin their woods for them but also he'll pay them for what he takes off their land.

That is the true nature of the relationship – buyer and seller. A logger is buying raw material from the landowner and reselling it to a mill. And like anyone who wants to stay in business, the logger needs to buy low and sell high. The difference between those two prices determines how well his family is fed, how nice a truck he drives, and whether or not his skidder payments are made on time.

Caveat emptor doesn't exactly apply here – the buyer is well aware. It is the seller who too often doesn't know the true value of what is being sold or, more importantly, what should be sold. And if the logger is making the choice of which trees he buys, there is no reason for him to cut those that have little value. But removing the poorly formed trees is an essential part of forest management, and removing only the valuable trees leaves behind an impoverished forest. Often, in this case, when the job is done and the woods are utterly changed, seller's remorse sets in. The stumpage payment seems a pittance, the best trees are gone, and another horror story gets told.

Brian Stone, a forester who serves as chief of forest resource management for Vermont's Forestry Division, has heard the tales and knows that all the heartache is unnecessary.

"Most people are not qualified to make their own stock investments, and they know it. They need stock brokers to pay attention to what's happening and to use their expertise to make recommendations," said Stone.

"And when you have a toothache, you don't fill your own teeth. You go to a dentist, a specialist, someone who provides analysis, an assessment, an inventory if you will – someone who can advise you of your choices. It's the same with woodland owners. Very few can do the work on their own. It takes an experienced professional forester to make it happen. That doesn't mean handing over the responsibility. My best days in the field are spent walking with a landowner, explaining to them what they have and giving them options. I'll say ÔYou could do thus and so and this is what you would end up with. Or you could do thus. Which one would you prefer to do?'"

In his present capacity, Stone spends the majority of his workday indoors, and he doesn't do much walking in the woods with landowners. But there are many consulting foresters throughout

Ned Therrien

Charlie Moreno, right, with a client. On a woods walk with a landowner, a forester will gather information for the management plan.

the region who do. These foresters – trained in silviculture, forest health, statistics, surveying, ecology, plant identification, physiology, organizational skills, business management, writing and communication – are the best means of insuring that a landowner knows what he or she is getting into when the skidder and the log trucks start work. As the landowner's agent, the consultant represents the client's interests both in the short term – negotiating a contract with the logger and making sure the contract's conditions are met – and in the long term – marking the trees with an eye on the future forest.

Consulting foresters will do everything from drawing up the initial management plan to helping to plan the conservation of an estate. In between, they will manage timber sales, appraise land and timber, locate boundaries, and provide information about government programs that assist landowners. Probably the two most common tasks a consultant does for a landowner are preparing a forest management plan and administering a timber sale.

Management plans

At its simplest, a management plan describes the present conditions of the forest in terms of species, quality, and volume of the trees. It should include a map of the different stands and note whether any diseases are evident. It includes a plan for the next 10 to 15 years worth of harvesting activities and should be used as a guide for any work that is done in that time. A useful management plan comes about through conversations between the consultant and landowner in which they discuss interests and philosophies and what the landowner wants from his or her land. It is not meant to be altered any time the landowner is strapped for cash, but instead should provide the big picture of how the land will change over time.

The management plan usually assumes there will be periodic timber harvests. When it's time for a timber sale, the consultant will handle all the details: hiring a logging contractor, preparing a timber sale contract, marking the trees to be cut, laying out the woods roads, and assuring that the details of the contract are met. In this capacity, the forester can prevent the misunderstandings

between logger and landowner that can lead to hard feelings and, yes, horror stories.

Many foresters can also serve as tremendous sources for information on much more than timber sales. Lynn Levine, a consulting forester from Dummerston, Vermont, sees her job at least partly as an educator, and she's as comfortable wearing her naturalist hat as her forest management hat. One of the bonus services she provides her clients is keeping a journal of what she sees when she's at work on their land.

"People love to hear what I saw on their land: tracks and wildlife, unusual formations," she said. "Every client thinks that their land is the most special piece of land in the state. Walking around, they've gotten to know their land so well. They know that they saw a deer once down in that gully and so that gully stays special to them. Or there's a tree over there that's been marked by bears. That's what they want to protect. That's why they own the land."


NED THERRIEN

Levine's description of her clients corroborates the results of surveys that have been done in a number of states to find out more about non-industrial private forestland owners. The survey results show that the forests of the Northeast are owned primarily by people for whom the land is a place to take walks, to see wildlife, to have something beautiful they can call their own. Most aren't averse to the occasional timber sale, which they see as something that can help offset the property taxes. But growing sawlogs and making money from timber sales is not their top priority.

Levine has marked trees for three timber sales for John Whitman on his 280 acres in Readsboro. Over the years, she has watched as Whitman has become more and more knowledgeable about his woods. She calls him her "super client" because he has enthusiastically taken on much of the improvement work himself. He releases apple trees and gets all the firewood he needs through crop tree release cuts.

Said Whitman, "When we bought the land, it had been high-graded. It was overstocked, and the mature trees were basically low quality. I look forward with some pride to increasing the quality of the stands." Whitman would like to see some commercial rewards for improving his timber, but he is also very interested in his forest's capacity as habitat for wildlife. He is involved with Vermont Coverts, an organization that helps landowners increase their land's habitat potential.

"We have plenty of deer, and this past winter a moose has been in. I've seen bear scat, and I tracked a fisher across the property. One of the pieces is a younger stand, so it has lots of rabbits, and there's the coyotes chasing the rabbits. So it's not one specific species we're targeting except perhaps the patch cuts that were specifically for grouse," Whitman said.

Levine has an active list of 200 clients; their forestland averages around 100 acres. When she is managing a logging job for them, she will see them regularly for a while, followed by a stretch when their only contact will be the letter Levine writes to every client in the winter. She works with a dozen or so loggers. "We've mutually chosen each other to work with," she said.

Before she handles the first timber sale for a client, she arranges to have a very frank talk. "I tell them: ÔYou hired me to handle this logging operation. I want you to know that I will make sure that the loggers do the least amount of damage that is possible. However, when they're done, you might be horrified by what you see. The stumps are bright, there's slash on the ground, the roads are denuded. There might be some skidder damage. There's always change.' People think of the forest as a place of no change, but there is constant change. I spell it out. And most people tell me after it's done that I prepared them so well that it doesn't look as bad as they expected.

"I make sure that the roads are put to bed, that the best trees are left to grow, that the road design is sensible. I am working with clients who are environmentally very sensitive. They're not sure they want this to be done to their land. It's not pretty. But I've trained myself to look up, to see what's left. And the difference is in the long run. Even the most sensitive people think that it looks fine in the long run."

In her years as a forester, Levine has seen steady improvement in the logging contractors who are doing the work. "The quality of work that loggers are doing today is so much better than when I first started. Now I go out on jobs and don't even have to mark where the waterbars should be. They're already in place. It's definitely been taken to a higher level."


NED THERRIEN

Above: Forester Charlie Moreno uses a diameter tape to determine this tree's diameter. Right: Dennis McKenney, like most consulting foresters, develops long-term relationships with a handful of loggers and works with them regularly.

Separation of powers

Ross Morgan, a consulting forester in Craftsbury Common, Vermont, agrees that loggers have recognized the importance of doing much more careful work, but he is quick to point out that that doesn't mean the forestry decisions should be left up to them.

"People don't like me to say this," he says. "But the fact is, loggers are not out there practicing silviculture. The logger's job is to get the wood out and market it. It's the forester's job to practice good silviculture."

Morgan is a true believer in forestry. He lives it, breathes it, and loves to talk about it. After many years working in the woods and as a college instructor, he is a frequent public speaker. When he stands up in front of a group in a jacket and tie, he proclaims them the only clothes he owns that aren't spattered in blue paint. He says proudly and cheerfully that his highest and best use is out there in the woods with his paint gun marking trees.

"The idea of forestry is a guided and well-thought-out intrusion. Intrusion is a rough word, but in the right context it's a good word, because what we're trying to do is intrude as human beings into a natural system to extract things we want. You start by understanding geology, soils, natural systems in terms of plant communities and the animals that are part of them, and then you ask, 'How do I intrude into the system to remove products for human beings without destroying it?' If it's planned out and thought out honoring that natural system and its processes, then the damage to that system can be minimized."

The damage he wants to minimize is not only the temporary aesthetic changes that can seem so devastating. He is more concerned with the long-term damage that comes from cutting so heavily that the remaining stand is endangered, by compromising the regeneration of desirable species, and by taking only the best wood and leaving behind a forest of culls.

Morgan believes that the future of the forest relies on excellent silviculture practiced by a forester who has a combination of a good academic background along with the practical experience from years of making decisions in the forest. Brian Stone agreed, saying, "Forestry is not just technical know-how, it's not just reading all the books. I look at my forestry degree as my license to practice. Then I went out and learned *how* to practice. A good forester has the background and the experience to provide sound advice, service, and outcome."

Whether it's an even-aged stand that has resulted from field abandonment 70 years ago, or an uneven-aged stand brought about by a forester's work to bring its dynamics more into line with the natural system, the work of manipulating the forest is terrifically complex. It requires an ability to see into the future – as many as 100 years for hardwoods like maples – and to envision the stand's architecture at the various stages along the way.

"That intricacy, that delicacy, is only done by those people who have studied these models, studied the system, marked trees in a hundred different situations, and come to these findings," said Morgan. "That decision can't belong to a logging contractor who has spent his life figuring out how to carefully get this wood out, how to cut this hitch, how to get it to the landing, how to do the marketing. When the logging contractor takes over the skills of the forester, I don't see good forestry being practiced. You can see some aesthetically pleasing jobs but not the details of good silviculture."

This uncompromising stance on the separation of powers between forester and logger could seem like arrogance, but the bearded, rumpled, paint-spattered Morgan can pull it off without offending. He is perfectly comfortable kicking tires and swapping stories on a log landing, and the loggers who have worked with him for years wouldn't have it any other way.

Craftsbury logger George Allen said, "I'd rather have Ross mark the trees. I want to do a good job, and he marks the way they should be marked. When I first go in, I think I might want to take a few more of the bigger ones, but after going back to jobs we did a while back, I see why he left the bigger ones. What we're trying to do is grow three generations of timber. This way, I might be able to go back in 10 years and thin out some more."

For his part, Morgan says that he doesn't have the skills to be a logger. "I'd be a drastic failure trying to get the wood out of the woods because I just don't have the background. I've cut a lot, I run a chainsaw, but I'm not a logging contractor. That's a very demanding and high-skilled job. Good work comes from the logging contractor's realization that I have a body of knowledge in silviculture, and my recognition of their immense skill to extract the wood. Good forestry practices are the linking of the skills of the logging contractor with the skills of the forester. "

STEPHEN LONG IS CO-EDITOR OF *Northern Woodlands* MAGAZINE

Finding a Forester

If you are looking for a consulting forester, look at the Resource Guide on page 74. You can also contact your service forester, who is also listed in the Resource Guide.

When you have some names, 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 interested in 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 the walk. Look around. Taking Brian Stone's analogy of the dentist one step further, you can at least partly judge a dentist's or a forester's work by what they leave 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?

Most consulting foresters charge for their services in one of two ways: either they charge an hourly rate (most often it is between $30 and $60 an hour) plus expenses; or they take a percentage of the proceeds of the timber sale. The percentage will range from 10 to 50 percent; if the logs are bringing high prices, the percentage should be lower than if the logs are of poor quality. Charging a percentage is frowned on by some foresters, including Brian Stone. He said, "The theory is that with a high set of standards, someone won't consciously improve the condition of their wallet by making choices that are against the interests of the landowner. My opinion is that a percentage makes a forester want to cut more."

Some foresters, Ross Morgan included, offer their clients a choice between the two methods. There ultimately won't be much of a difference in the total bill, regardless of which way the services are tallied. Another variation is that some foresters find it convenient to bill for management plans on a per-acre basis.

Roger Irwin

Ned Therrien

From the top:

Skidding logs on frozen ground minimizes damage to soils.

Poorly laid-out skid trails can lead to ruts.

After a harvest, woods roads can be seeded to minimize erosion. And they're a great place to walk the dog.

Ned Therrien

The Look of Logging: Keys to Getting a Good Job Done

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.

Jim White, the Bennington County (Vermont) forester, believes that every logging job is a partnership among the landowner, the forester, and the logger. "I tell landowners that if they get a good job done, then they deserve some of the credit, because they got a good forester and a good logger to do the work. But, if they get a bad job, they also have to take some of the responsibility," White said. "They're all in it together."

In each state in the Northeast, landowners can find help from service foresters, who operate out of either the state forestry department or the extension office. The job of these public foresters is to help landowners learn about good forestry practices.

White said, "When someone comes in who's thinking about having some logging done on their land, I like to take them around and let them see some work being done in a stand that's like the one that they own. That way they're not surprised by what happens on a logging job."

Besides the jobs in progress, White shows the landowners jobs that were completed two or three years ago, to give them an indication of the long-range impact.

Logging inevitably changes the look of the woods. Since many woodlots are adjacent to a homestead, it's particularly important that landowners know what is reasonable to expect. With that understanding, they can confer with the forester and logger to determine what the finished results will look like.

Getting started

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 or logger, they can provide a list of those working in the area. If you are favorably impressed with a particular job, find out who did it.

When you contact a consulting forester or logger, ask them to give you the names of two landowners for whom they have worked in the last year. White said, "A logger should be happy to have you go see his work, and to have you talk to people he's worked for. It's free advertising. Ford and Chevy have to pay people to say good things about them, but a good forester or logger can get that for free."

What to look for

It's outside the scope of this article to discuss 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 there's been a library of books written on the subject. 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 minimum 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.

Jim White said, "There's a saying, ÔIf you do a good job, everybody in town knows about it; but if you do a bad job, everybody in the county knows about it.'"

White said that he is seeing a different kind of landowner in recent years: people who are more particular about what the woods look like when the job is done.

"The loggers have adapted, and it's been for the good," White said. "These landowners demand a better job. They want the logging to be beneficial for the forest. And they ask better questions."

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 this 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.

It should be noted that there is a different school of thought on slash. 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.

When the job is done and the logger and forester have said goodbye, a glance to the heavens may help you accept the short-term disarray on the forest floor. For it's in the crowns of your trees that the future of the forest ultimately rests. The daylight between the crowns of your newly thinned trees means that they have room to grow. And the sunlight that reaches through gives hope to a new generation of seedlings and saplings.

Stephen Long is co-editor of *Northern Woodlands* magazine

Ned Therrien

From the top:
Trees along skid trails that are damaged from 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.

Deer often feed on buds in the tops of trees cut during a winter harvest.

The light thinning of these woods is hardly noticeable two years later.

Charles H. Willey ©

Virginia Barlow

By Virginia Barlow

White pine weevil, *Pissodes strobi*

Beginning in June, white pines whose terminal shoots are wilting and have turned yellowish almost always have the same cause – the white pine weevil. This plump, quarter-inch-long beetle has a tapering head that narrows to a long snout with chewing mouthparts at the end. Two antennae sprout from the snout, first aiming off in the wrong direction, then taking a sharp bend forward. Overall, the beetle looks like a harmless Dr. Seuss character.

But, far from harmless, it is the most economically damaging pest of white pine. The feeding of its larvae kills the terminal shoot and bud cluster, destroying at least two years' growth and leaving several side branches to compete for dominance. This competition at best leaves a bent tree trunk, but just as often the tree forks, which drastically reduces the likelihood that it will ever produce a halfway decent sawlog. Some trees get nailed again and again by weevils, leaving a disordered mess of stems that can be very irritating to look at.

On warm days in April, adult beetles begin emerging from their winter quarters in the litter just as white pine buds begin to swell. Both males and females crawl or fly to the treetops where they feed and mate – for good measure, perhaps, as most of them have mated the autumn before and the females retain viable sperm.

Preferring sunlit, vigorous, fat terminal shoots at heights between 4 and 30 feet, the females chew holes just below the bud cluster and lay a couple of eggs in each hole, covering the opening with a protective wad of excrement. Usually two or three females will lay eggs in the same shoot. If only a few eggs are laid in a shoot, the tree may produce enough pitch to drown the larvae when they hatch. If too many larvae hatch, some will starve. Each female lays a total of about 100 eggs.

The larvae move downward as they feed in the cambium and inner bark, and as they grow, their feeding mines coalesce, girdling and killing the stem. After five or six weeks of feeding and molting, they make cocoons of wood chips and pupate.

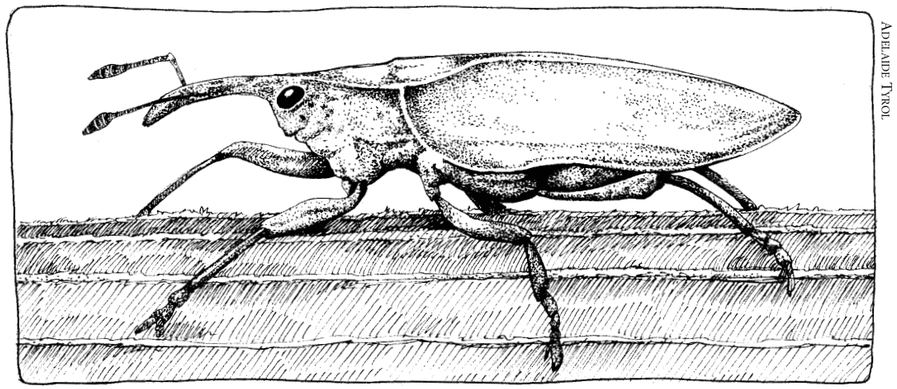
Meanwhile, the wilted terminal shoots have turned from yellow to brown. Left alone, the dead leader persists for many years and may be an entrance point for *Phellinus pini*, the major heart rot fungus disease of older white pines. Before mid-July, when adult weevils begin to emerge, is the best time to prune and burn the infested part, if it is within reach. And while you are there, removing all but the best lateral shoot will make it easier for the tree to get itself straightened out.

From late July to early September, adult weevils emerge through BB-sized holes and begin to feed on buds and bark tissue. By late October, almost all have dug themselves into the litter, most of them within eight inches of a white pine.

Though a native pest, the white pine weevil's natural enemies – including a fly, a couple of wasps, many birds, and small mammals (during the winter) – do not keep it under control. The heavily sodded fields that dense even-aged stands of pine have taken over following the abandonment of agriculture are a weevil's delight. Heavy clay soils also seem to be preferred by the insect.

Tree resistance does seem to vary, and planting white pine at close spacing, preferably with a mix of other species, mitigates the damage somewhat. The weevils like full sun, so partial shade can be helpful, though more than 40 to 50 percent shade will slow a pine's growth significantly.

In short, several precautions will help a little, but none very much.



Adelaide Tyrol

Forgotten Fruit: Apple Trees in the Wild

by Michael Snyder

Far from forbidden – but often forsaken – wild apple trees are an unmistakable sight on almost any woods walk in New England.

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.

© 2005 Tom Kinlan Voss

This wild apple tree is truly prolific.

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 other, less-obvious insects makes a good living on apple trees too.

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

Ned Therrien

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 ten simple and purposefully slow steps.

Step 1: Carefully examine your tree(s). If you've got 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 saw and loppers, nursery shears, and maybe a sturdy ladder and a lightweight chainsaw.

Go to it. Slowly.

ROGER IRWIN

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.

"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 IS THE CHITTENDEN (VERMONT) COUNTY FORESTER.

Fields Among the Forests

Keeping Open Land Open

By Chuck Wooster

Photos by Stephen Long

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.

Can you name the three most heavily forested states in the United States? The answer might surprise you: Maine, New Hampshire, and Vermont, in that order. All three are 80 percent or more 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 of nearby hillsides or distant peaks. 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 fields 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 in this 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 paying someone to mow their field – 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. There's no simpler way to go, and it's a small price to pay for maintaining your "million-dollar" view.

Left: Grazing sheep is an effective method of keeping your land in fields.
Right: Bobolinks, which make a series of mechanical twitters, frequent fields with tall grasses.

Kindra Clineff/kindraclife.com

Steven D. Faccio

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 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 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 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, 80 percent of the land in our area is forested) that federal cost-share money is often available for landowners who agree to adopt this every-third-year mowing strategy. That's right, the government will pay you to keep your field open for wildlife habitat. The current program is called the Wildlife Habitat Improvement Program, or WHIP, and you can find out more information about it from your county extension agent. In general, landowners need to sign multi-year contracts to participate in the program, which ensures that the habitat will remain available to wildlife for years to come.

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, the brush hog can sever 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, 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 is associate editor of *Northern Woodlands* magazine. He keeps sheep, grows vegetables, and manages woodlands on 100 acres on the Hartford-Hartland line.

Ned Therrien

Charles H. Willey ©

Above: Marsh along a New Hampshire river. Left: Bittern in a marsh

Steven D. Faccio

Above: Shadbush in a shrub swamp

Don't Get Bogged Down!

By Rose Paul

Some people call any wet, mucky place a bog, or maybe a swamp. They hardly ever think to call it a fen. Which it may well be, unless, of course, it's a marsh. Or possibly a seep.

How do we sort out this world of wetlands?

The first thing to do is take a look at the water. Is it flowing or stagnant? If it's flowing, you have yourself a **marsh**. Plain and simple. Marshes usually occur adjacent to ponds, lakes, slow-moving rivers, or at river mouths. The constant movement of water increases the oxygen content in the water, brings an inflow of nutrients, and promotes decomposition. Marshes develop a fine, black muck soil that is high in well-decomposed organic matter. A variety of grasses and sedges, including the familiar cattail, thrive in marshes. There are almost never any woody plants growing in a marsh, because they cannot grow in standing water.

There actually is a second type of wetland that has flowing water in it, though compared to a marsh, it's usually very small: a **seep**. The flowing water in a seep comes from underground, where cracks in the bedrock direct flow toward the surface. A seep can persist throughout the year and often forms the headwaters of a perennial stream. One feature of a seep is the constant temperature of the groundwater year round. This allows vegetation such as grasses and sedges to get an early start in the spring, providing food for animals such as bears and deer.

If the water in your wetland is not flowing, then you don't have a marsh or a seep, and you need to ask yourself a second question: are there woody plants growing in it? If there are, then you're talking about a **swamp**. Swamps always occur in low spots in the forest that have wet soils, but not so wet that woody plants can't grow there. They are only intermittently wet, during spring flooding and heavy summer storms. Swamps can be small dips in the landscape, taking up an acre or so, or they can occupy many hundreds of acres. Trees like black ash, green ash, red maple, and swamp white oak are well adapted to the seasonally wet conditions of swamps.

If your stagnant-water wetland has few or no trees growing in it, then you're left with one of three possible choices: a bog, a fen, or a **vernal pool**. The vernal pool is the easiest to identify, because it's small and only seasonally wet. Essentially, it is a swamp without trees. Vernal pools are lined with bedrock or dense gravel called hardpan, which can hold water well into the summer months. They typically lack inlets and outlets, gathering water instead solely from snowmelt and rainfall. In the spring, they teem with amphibian life. Frogs and salamanders depend on them for breeding, egg-laying, and larval development. Because they dry out each year, vernal pools lack predators, such as small fish, that would normally prey on such a bounty of food.

Finally, if your wetland is wet all year, has stagnant water, and has few or no trees growing in it, you're down to two options: a bog or a fen. **Bogs** are the most nutrient-poor of the wetlands. With little to no inflow or outflow, decomposition happens slowly, acids build up, and nutrients are scarce. Most of the water and minerals in a bog come from rainfall and airborne dust. Faced with that scarcity of nourishment, bog plants have developed creative ways to absorb nutrients. For instance, acid-loving dwarf shrubs have partnerships with fungi in their roots that make soil

NED THERRIEN

KATHLEEN LUND JOHNSON

nutrients more available, while carnivorous pitcher plants, sundews, and bladderworts go after their food more directly, trapping and dissolving little insects. The most abundant plants in a bog are sphagnum mosses and acid-loving dwarf shrubs called heaths, including cranberries, leatherleaf, Labrador tea, and bog laurel.

Life in the **fen** is much easier than in a bog. Water does flow, albeit slowly and imperceptibly, flushing out the acidic byproducts of decomposition. Fens are fed by an upwelling of groundwater that is laden with calcium and other minerals. A rich fen looks like a lush, wet grassland and is dominated by sedges. Rich fens have many more species of plants and different mosses than bogs. High spots called hummocks are home to some of our native wetland shrubs like alternate-leaved buckthorn, shrubby cinquefoil, and the white-leaved hoary willow.

New England's most famous fen was in Boston's Back Bay, near the aptly named Fenway Park. But be careful not to identify wetlands solely by their proper names. Eshqua Bog, for example, a much-visited wetland in Hartland, Vermont, that is well known for its showy lady's slipper orchids, is not a bog but a fen. It's just so tempting to call everything a bog!

ROSE PAUL IS THE DIRECTOR OF SCIENCE AND STEWARDSHIP FOR THE VERMONT CHAPTER OF THE NATURE CONSERVANCY.

Top: Floating bog ringed by spruce and tamarack. Inset: Round-leaved sundew, a carnivorous bog plant. Below: Vernal pools dry out in the summer.

STEVEN D. FACCIO

Tracking Tips

STORY AND PHOTOS BY SUSAN C. MORSE

Dog or Cat?

Is the track you found that of a dog or a cat? When you first discover a track, carefully determine which of the following diagnostic features you can identify. By process of elimination, you can often find specific clues that will reveal whether you're examining the track of a wild cat or that of a domestic or wild canid.

Cat

Four smaller, teardrop-shaped toe impressions are asymmetrically arranged (one toe ahead of the others). This leading toe corresponds to our middle finger, the digit one should never use in bad traffic in Los Angeles. Interestingly, cats have a little toe positioned on the outside like our little finger, providing a sure clue to which footprint you are studying.

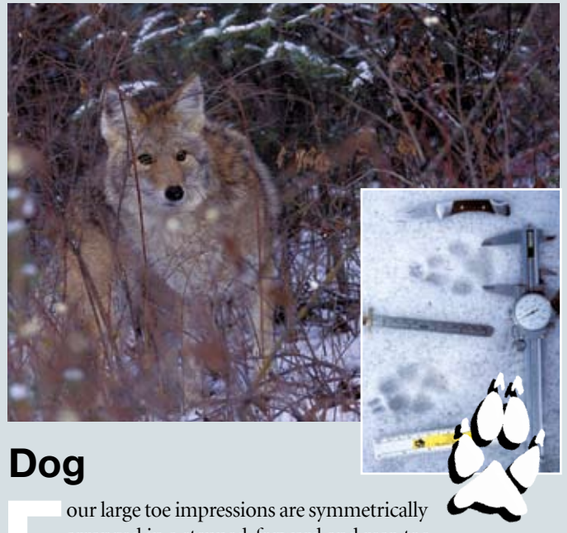
Note that the cat's palm imprint is the dominant feature in the track, which is the opposite of the dog.

The palm pad is blunt and/or bilobed, like an "m." This feature depends on whether the substrate is soft or hard and the resulting depth of the foot's impression.

The bottom edge of the palm is divided into a roughly straight alignment of three lobes, which are even with one another.

The combination of the asymmetrical toe arrangement and the shape of the palm will not permit an "X" to be drawn through the track of any cat, be it Bengal tiger, bobcat, or beloved housecat.

Non-retractable cat claws usually don't appear in tracks. However, when they do, they arch forward in front of the toe impressions – sometimes inserting themselves as tiny sharp holes, sometimes as slits – according to the substrate and the mood of the cat. Mud, ice, and tricky terrain are sure to bring out CLAWS!



Dog

Four large toe impressions are symmetrically arranged in a stepped-forward and rear-toe pattern. Most often, blunt nail impressions will register; however, sometimes they will not. All toes are roughly the same in size and are dominant in the track, appearing collectively larger than the palm impression. Red fox toes and especially the palm pad appear muffled and smallish due to abundant foot fur.

The palm impression is pointed – like the pointed face of a dog (bulldogs and pugs not included!)

The bottom edge of the palm pad appears as an uneven, chevron-shaped arrangement of two thinner, lower, outer lobes encircling a somewhat more robust center lobe, which is situated higher on the track.

"X" marks the spot. You can readily trace an "X" through the ridges in the tracks of fox, dog, coyote, or wolf. This feature will often persist in old tracks even after other clues begin to disappear.

Thicker, blunt nail impressions of dogs usually appear in their tracks, typically extending directly from the toe impressions. Gray fox nails will appear more catlike – delicately inserting themselves forward of the toe prints. Be aware of the fact that dogs, wild and domestic alike, with worn nails and/or thick, callused pads will sometimes leave tracks that show no nail marks – which brings us to our conclusion... When in doubt, follow it out; don't be a nerd, find that turd!

SUSAN C. MORSE IS FOUNDER AND PROGRAM DIRECTOR OF KEEPING TRACK IN HUNTINGTON, VERMONT.

Silk Purse or Sow's Ear?

How to Recognize Value in Your Trees

By Stephen Long

The tree was a corker. It was a sugar maple, with a large, straight bole, and it stood out among its neighbors like a heavyweight boxer at a convention of jockeys.

I was walking a central Vermont woodlot with Jonathan Wood, who was then a forester and log buyer for a hardwood sawmill (he's now the commissioner of Vermont's Department of Forests, Parks, and Recreation). He was evaluating a small parcel of company-owned land, and he had agreed to show me how he estimated the volume and the value of the trees. We had barely gotten started walking the sidehill stand of northern hardwoods when we came upon this beauty.

Wood's eyes lit up as he wrapped his diameter tape around it. "It's a big tree, but it's not shedding its bark yet. That is tight, vigorous, stuck bark. It's being pushed. That tree is putting on some growth."

The tape told us that it measured 23 inches in diameter at breast height (DBH). Then, he walked around the tree, making sure that all sides lived up to the face we'd seen. Finally, he looked up.

"Look at the crown on it: that's a feature crown, that's the boss hog right there. I don't want to get too excited, though. It might be the only one on the lot like it."

Indeed, we only found a couple more trees of that size and quality, but there were plenty of nicely formed, vigorously growing, 16- and 18-inch-DBH sugar maples and white ash. They grew among many that would never make the grade as sawlogs; the best use for these of poorer quality would be firewood or pulp, and many would be removed in the timber sale that Wood was contemplating.

Stephen Long

Virginia Barlow

Left page: Jonathan Wood uses his diameter tape to measure the boss hog. This page: the different forms that sugar maple can take: these photos were taken only a couple of hundred feet from each other. The handsome trees on the top are growing well on deep soil. The ratty specimens on the bottom suffer in part from being on thin, drought-prone soil.

What makes a tree valuable?

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 is 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 very 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. Veneer buyers are paying between $3,000 and $5,000 per thousand board feet* (MBF) for the best grade of sugar maple, and perfect black cherry can bring even more.

The next most valuable product is clear lumber used to make furniture. Branch stubs or knots (the remnants of branches overgrown by the bole) are the main limiting factor, 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 – 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 $1,000 to $2,000/MBF for sugar maple and $850 to $1,150/MBF for 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

* Volume of logs and boards is measured in board feet. A board foot is defined as a one-foot-square piece of wood one inch thick. Estimates for board feet in logs (and trees) are made using a log rule, such as the International 1/4-inch rule, which translates the diameter and length into a quantity of board feet.

JOSEPH ADAMS

VIRGINIA BARLOW

VIRGINIA BARLOW

VIRGINIA BARLOW

A collection of defects in trees

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 below the fork.

Sugar maple borer wounds often are in the most valuable part of the stem.

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 $255 (85 board feet at $3,000/MBF) 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.

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. Bruce Jacobs, president of Fountain Forestry, spoke with me in his office in Pittsford, New Hampshire. Fountain manages forestland for clients throughout the eastern U.S., many of whom seek its foresters' advice in making investments in timberland.

Jacobs said, "The species we want to see ... on the property are sugar maple, black cherry, and red oak. Then there are several secondary ones that we look for: white ash, yellow birch, and possibly white birch, all of them on the second tier of valuable timber. There should not only be a mix of high-value species but also those that grow fast, which is why we would tend to favor cherry over sugar maple. We're looking at species whose wood-quality characteristics are going to have a pretty secure place in markets down the road. There's always going to be a demand for the high-end hardwoods.

"We would tend to throw white pine in with that group, too. It's a species that doesn't reach as much value as cherry or maple, but it does grow very rapidly, it achieves its highest value on a quality basis as opposed to just volume, and it goes to a diverse arrangement of markets. It's a good component to have."

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. Jacobs said that 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.

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 only buyers paying more than $300/MBF are clapboard mills, which buy limited amounts at $500/MBF.

Said Jacobs, "The problem with softwoods other than white pine is that there's very little grade differential – it's either a sawlog or pulp. Our softwoods – spruce, fir, hemlock – go to the structural timber market so there's no grading: a two-by-four is a two-by-four."

Noting that sugar maple in the last decade has overtaken red oak as the most valuable hardwood in the Northeast, I asked Jacobs what's to keep beech, for instance, from being the next trendy wood. The difference, Jacobs said, is in the physical characteristics, the workability, and the quality of the wood itself. "Sugar maple can be made into high-quality products a lot easier than beech can. It can make furniture, veneers, flooring. You have three or four woods that have very high-quality characteristics. Whichever one happens to be performing best is a matter of fashion – how it looks, whether it's a dark wood or light wood."

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 DBH, 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. Jonathan Wood prefers the diameter tape because it is more accurate than the Biltmore stick.

There are, however, a couple of features of the Biltmore stick that experienced foresters might not require but that are very handy to a landowner new to volume measurement. A Biltmore stick includes a log scale and a tree scale with the corresponding volumes printed in line with the diameters, so you can read the diameter and instantly read how many board feet are in a log or a tree of that diameter.

Estimating the number of 16-foot logs in a tree is the Biltmore stick's other use because most of them incorporate a tool called the Merritt hypsometer. The name belies its decidedly low-tech function – it's a glorified yardstick, and in fact a yardstick can be substituted. Here's how it works. Stand exactly one chain (66 feet) from the tree and hold the stick 25 inches from your eye and vertically in line with the tree so the stick's bottom lines up with the top of the stump that would remain if the tree were cut. Then follow the trunk with your eye up to the point where the tree forks, heavy branching occurs, or it otherwise becomes unusable for sawlogs. Keeping that point in mind, look at where on the hypsometer that point lies, and the hypsometer will tell you how many 16-foot logs there are. In substituting a yardstick, do everything the same way. Every 6 inches of stick corresponds to a 16-foot log.

In determining the number of logs, Wood and most other foresters with comparable years of field experience rely on what they call "ocular estimates." I'm never quite sure how firmly a forester's tongue is in his cheek when he uses the term because,

of course, it simply means to eyeball it. Wood said that at the start of each timber cruise, he does use an objective measurement to get his eye calibrated to the heights and tapers in that particular stand, but once he's comfortably calibrated, he goes ocular. A word of caution: if you haven't estimated the height of as many trees as he has, you should stick with the stick.

The lesson to be learned from spending time in your woodlot with a Biltmore stick is how volume gets compounded in larger-diameter trees. Many mills have reduced their utilization standards and will now purchase hardwood logs with as small as an 8-inch top, so more of the stem can now be sold. The boss hog sugar maple in Jonathan Wood's company woodlot rose a full 40 feet before it had tapered down to 8 inches. Its volume (measured on the International 1/4 inch rule) would be approximately 450 board feet. A 12-inch maple that grew nearby would reach the 8-inch limit of marketability at around 24 feet, and its volume would be a relatively puny 70 board feet. Adding inches in diameter puts on geometric growth in volume.

If you own only an acre or so, it would be perfectly reasonable to measure every tree that has reached pole size (4 to 9 inches in diameter) or larger. But that's impossible on larger lots, which is why foresters have developed ways of estimating volume by measuring it on a smaller percentage of the land. Called a timber cruise, it involves setting up a series of plot points, tallying the trees' diameters and merchantable heights at each point, and then using the samples to make assumptions about the volume per acre.

Logging chance

As Jonathan Wood and I walked his woodlot, and he was taking plots and making notes for his volume estimate, he was also silently taking in the variables that would affect what he refers to as "logging chance." How easy or difficult would it be to cut the trees, move them to a landing, and get them trucked out of there?

Said Wood, "There's more to value than just what's in the tree. It's the process of removing it that's the most expensive part. So the more that operation costs, the less you'll get for your trees. [It's crucial to] have a knowledge of the limitations of your woodlot: whether it's wet, whether [the logging] has to be done in the winter, whether it's rocky or ledgy, whether there's an established road system, whether it's too steep. Those aspects are critical to what you can get the job done for."

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, 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 – 1/2 mile or more – can also make a job costly. Uphill makes it worse. 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. If a trucker is delivering to a mill less than 25 miles away, the cost might be as little as $40/MBF. But if the purchaser is on the other side of the state, it will go as high as $100/MBF.

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. 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 pulpwood to sawlogs can be as high as 5 to 1. Because the logger's work is essentially the same whether it's pulp or veneer that he's producing, adjusting the percentages stabilizes the rate per MBF at a reasonable price for the entire job. On jobs with a lot of pulp, the logger will need to get a higher percentage on the sawlogs to compensate him for losing money on the pulp.

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.

Said Wood, "A lot of landowners go into a situation where it's 50 percent for the landowner and 50 percent for the logger. But if they've got enough valuable wood, they might be able to negotiate a deal on a cost per thousand basis that will be simple, straightforward, and fair to both of them."

Landowners should expect that the absolute minimum cost for cutting and skidding wood is $100/MBF. That's if the ground is flat, the skid distance is short, the timber is big and growing close together, and there's a lot of it. If any of these is not the case, the cost per MBF goes up. It can easily be as high as $300/MBF, at which point the timber would have to be high quality to be worth the expense of removing it.

Said Wood, "There's many times where the costs of a lot are so high that the logger deserves 50 percent or more, where that's a reasonable price for the removal process. Knowing the difference is a critical component of what you can get for your timber and what you shouldn't get."

I love it when my forester refers to my woodlot as a goldmine. And there are 30 acres of nice sugar maples that might deserve that designation. But we both know that there are twice as many acres filled with hophornbeam, beech, white birch, red spruce, and hemlock. Maybe someday the white birch will bring a decent price. Maybe not. Like most landowners, my wife and I don't own this forestland as a timber investment. It's part of the home we've made in the woods. It's a place to walk, to hunt, to gather, to learn. But I get great pleasure in thinking that over time those sugar maples will be paying their own way.

Stephen Long is co-editor of *Northern Woodlands* magazine

A Look at the Season's Main Events

By Virginia Barlow

	SEPTEMBER	OCTOBER	NOVEMBER
First week 1	Young red foxes have scattered and may end up as far as 50 miles from their birthplace / The ripening white seeds of poison ivy are an important source of food for fruit-eating birds / This year's turkey vultures have dark heads; the red, naked head comes with maturity / Luna moth caterpillars have dropped from their feeding trees to search for a suitable place to spin a cocoon in which the pupa will hibernate	The berries of common juniper take two or three years to mature. Now grouse, bobwhite, songbirds, and moose are eating them / Canada geese are flying. So are milkweed seeds and their parachutes, for the pods have popped open / Beavers are submerging branches next to their lodge, to be eaten through the winter / Cold weather sends deer mice, Halloween lady beetles, and cluster flies indoors / Time to fertilize trees with high phosphorus/low nitrogen (or no nitrogen), if warranted	Shorter and cooler days in the fall decrease transpiration and water needs of trees, making it an excellent time to plant. Avoid crab apples and oaks and mulch heavily to protect damaged roots / The golden yellow needles of tamaracks are dropping. There is little yellow left in the woods, but many shades of gray and brown / Wood turtles are hibernating at the bottom of streams. Bullfrogs and green frogs have tucked into the mud at the bottom of ponds for the winter
Second week 2	Muskrats are packing their underground burrows with enough grass to last through the winter / The flesh of the giant puffball is delicious if found when it is snowy white. Off-color ones aren't so good / White-tailed deer begin to shed their summer coat and grow a new thick winter coat. The outside hairs are hollow and beneath is a dense undercoat / Asters and goldenrods are among the last flowers visited by honeybees / Tiger beetle larvae spend the winter in vertical burrows dug in loose, sandy soil	Look for the long, toothed evergreen leaves of pipsissewa, a handsome small plant of dry woods / Many birds eat chokecherries and pin cherries. Bears, raccoons, foxes, chipmunks, squirrels, and mice also consume them / Migrating yellow-rumped warblers are feeding on the white berries of gray dogwood. They will winter in the southeastern states / Bears are especially active in the fall, eating everything they can find to store enough fat to last for the next five months. Beehives are especially vulnerable during October	Most great blue herons have left by now and will winter along the coast in the southern states / Ground cedars, most common where there is a mix of hardwoods and softwoods, are releasing clouds of pollen / Grouse numbers are high now. The population will be knocked back over the winter by weather, food shortages, and/or predators / Chipmunks will keep coming out if it is warm / Garter snakes have balled up together underground in caves and crevices, making use of each other's metabolic heat
Third week 3	Flocks of flickers are everywhere and heading south / The larva of a small fly causes goldenrod ball gall. The larva of a moth causes elliptical goldenrod gall. Both are obvious at this time of year / Cooper's hawks are heading south, picking off mourning doves and smaller birds on the way / Praying mantises are depositing their styrofoam-like egg masses around twigs / Sensitive fern leaves are withered by the first frost, but the brown fruiting stalks will stay upright all winter and sometimes even longer	Flocks of juncos arrive from the north / Hawk nests are easier to spot, now that the leaves are down. They may be reused next year, so if you find one, make a note of its location / Most leaves are gone, but lilacs are still green, and blueberry bushes are bright red / The last woodcocks head south, as the ground starts to freeze and worms become unavailable / White pines are dropping half their needles (as they do every fall) / Tree sparrows may still be around, but most other small migrants have headed out	Porcupine eat bark after the leaves have fallen: aspen, basswood, and mountain maple are favorites / Frail, lightly marked tan moths are most often the adults of either the fall cankerworm or Bruce spanworm. Bruce spanworm moths are most abundant in sugar maple stands. The females are wingless and weigh about four times as much as the males, with eggs making up most of the weight
Fourth week 4	Each passage of a cold front sends more flocks of broad-winged hawks south / Crush a few leaves of sweet fern, a shrub of dry or sandy soils, to recapture the fragrance of summer / Turkey vultures will soon begin to move south. They have been caring for their offspring for 11 weeks, a long time compared to most birds / Migrating fox sparrows will eat millet, black oil sunflower seeds, and cracked corn cast on the ground or in a ground-level feeder	Catbirds are fattening up on almost any fruit or berry you can think of. They will soon leave our area to winter from the Gulf Coast south to Costa Rica / Bumblebee queens have mated, and those that survive the winter will each found a new colony in spring / Apple trees may not have colorful leaves, but they certainly have colorful fruit; look for fox, deer, porcupine, grouse, and many other birds eating the bright red and yellow apples	Autumn overturn is completed in lakes as the water temperature reaches a uniform 4˚C (39.4˚F) / The monarch butterflies that left in September will soon arrive at their wintering grounds in northern Mexico. They mostly are gliding, not flying – rising on thermals and then aiming south and west / The absence of all those spring and summer diseases and insects makes this a great time to do that pruning you never quite got around to over the summer

These listings are from observations and reports in our home territory at about 1000 feet in elevation in central Vermont and are approximate. Events may occur earlier or later, depending on your latitude, elevation – and the weather.

ERIC ENGBRETSON

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 the Connecticut River – though it never proved combustible – earned the dubious honor of being "the most beautiful sewer in the world."

Think back 40 years when the cities and factories that lined the nation's waterways had spewed so much waste directly into them that people no longer looked at rivers as places to fish or swim. 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. A river is defined entirely by the land that it flows through.

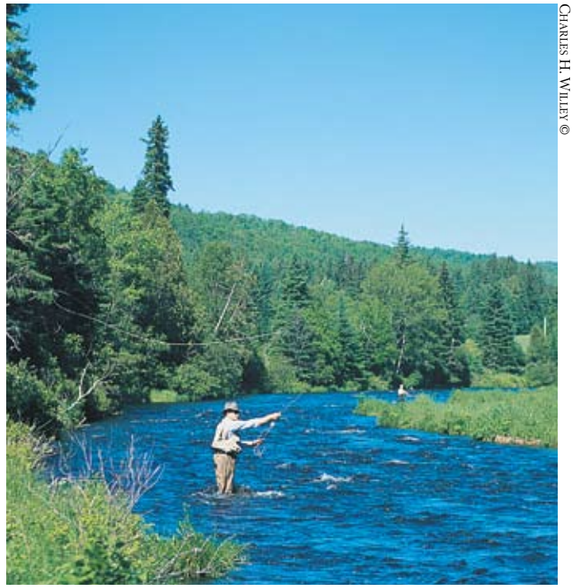
As a devoted trout fisherman, I don't need much of a shove to step into the water, and I can't say with a straight face that I was doing research about water quality when I had my revelation about sedimentation. I was fishing.

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.

CHARLES H. WILLEY ©

Left: These biologists are conducting a stream census by electroshocking. The fish are momentarily stunned, measured and counted, and then released unharmed.

Inset: Rainbow trout like this are sensitive to the health of their aquatic habitats.



CHARLES H. WILLEY ©

Wide vegetated buffers help trap sediment and foster healthy fisheries.

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.

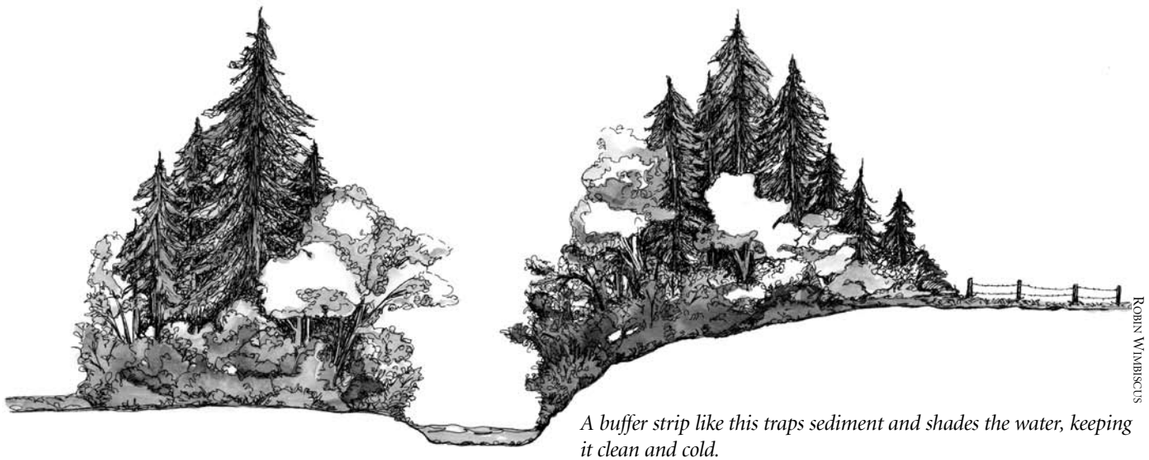
On the third day, I'd catch trout. The water was still cool from its infusion of rainwater, and the clarity was off just enough to hide my line and leader and make a mayfly imitation look exactly like dinner. That summer, I learned to wait for the third day, and I caught lots of hungry trout that way.

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, "On their



ROBIN WIMBISCUS

A buffer strip like this traps sediment and shades the water, keeping it clean and cold.

best days, these [aquatic insects] rule as lords of the stream-bottom jungle; one bad day, one mistake, one loss of footing and they are in the belly of a trout.

"Thousands of bad days for millions of cold-water insects, and the result is what we often call, with some narrowness of vision, a good trout stream. But 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. Not to mention the occasional grizzly bear...."

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 rivers throughout the Northeast is neither clear nor cold. But according to Mike Kline, a river ecologist who works as a planner for Vermont's Water Quality Division, it's not all bad news. "It's important to realize that our rivers are in a state of recovery," he said. "There have been dramatic differences in land use. Farmers are doing a better job at protecting water quality. It used to be anybody with a backhoe could go to the river and take out as much gravel as they wanted. They're not doing that any more because it takes a permit. It used to be every city was dumping raw sewage into the rivers. That doesn't happen any more either."

Just as the main sources of water pollution have changed, so have the means of monitoring it. Said Kline, "Forty years ago, the way we measured water quality was in terms of the chemistry. But that has changed dramatically. Our rivers have recovered tremendously from those days. I look at water quality not just in chemical terms, but in physical and biological terms as well."

Kline has worked with a dozen watershed organizations, most of which were formed from citizens' concerns about water quality. "When I meet with these groups, they're invariably interested in testing. But I tell them, ÔBefore you take one test tube sample, get in a canoe and paddle the river. Walk it, drive along it. See where the banks are eroding, where the trees are gone. How many pools are there, how many rapids or cascades? The allure of the test tube is strong and it's hard to overcome, but 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 Kline assured me that my use of trout as a gauge of river health wasn't as parochial as it might seem. "Trout are a good indicator species," he said. "They have a set of habitat requirements that make them the proverbial canary in the coal mine. They are the top predator, and their absence would be like the woods being without a predator like the catamount or coyote."

Counting trout

Rich Kirn, a fisheries biologist with Vermont Fish & Wildlife, is responsible for managing central Vermont's brook, brown, and rainbow trout. He spends a lot of summer hours wading in rivers, but instead of a flyrod, he fishes with an electroshocking wand, surveying trout populations.

I joined Kim and his colleagues when they conducted their electroshocking census of my local river. The electrode on the wand causes an involuntary impulse called galvanotaxis that impels the fish to swim toward it. The biologists and their assistants net the fish: dace, sculpin, suckers, and trout. If it's a trout, they make note of species, weight, length, age, and whether stream-born or hatchery-reared.

It was a hot August day, the water was low, and the results were... uh... shocking.

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 73ºF, not quite lethal to trout but approaching the danger zone. More than a day or two at water temperatures above 77ºF 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 60ºF.

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.

As Kirn returned the brookies to their pool and the cold water of the feeder brook, he remarked that if it weren't for the canopy over the brook and the mature spruce that had fallen into the river, there might not have been a single trout in this stretch of the river.

"Leaving a buffer strip is the single most important thing landowners can do to improve or maintain trout habitat," said Kirn. "If you have a canopy over your brook, leave it there. If it's gone, let it grow back. I'm 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. This 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 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 grassroots effort – a tree roots effort.

What does a buffer strip look like?

Stand on the streambank, turn your back to the stream, and walk away from it. Take five long paces (a left and a right), which will carry you 25 feet from the bank. 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 25-foot strip. Take another five paces and you have the 50-foot minimum width of protective strip according to specifications for both the Green Mountain National Forest and the "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont," known as the AMPs. Equipment can operate in this outer half of the buffer, but the goal should be to maintain a continuous forest cover. Where the terrain draining to the stream is pitched steeper than 10 percent, the strip needs to be wider.

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 this 50-foot strip, 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 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, longer-lived species like yellow birch and hemlock will come up.

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 conservation mix or 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. It will require a similar shift in understanding, and an equally widespread commitment to effect the full recovery of our rivers. Unlike the West with vast public land holdings, land in the Northeast is owned primarily by individuals, so the responsibility – and the opportunity – is theirs. Incrementally, tributary by tributary, brook by brook, the water can run clearer and the river system can be full of life.

STEPHEN LONG IS CO-EDITOR OF *Northern Woodlands* MAGAZINE

Tim Morton, VT Dept. of Forests, Parks & Recreation

BUILDING BETTER FOREST ROADS

By Madeline Bodin

There is a good road in Bellows Falls, Vermont. Actually, it's a network of roads providing access to Dr. Walter J. Griffiths's woodlot. The woodlot is on a hill above the village and is managed for red oak. The roads are not steep. They were designed to keep the grade to a minimum. They are crowned so rainwater and snowmelt runs off to the sides, not down the middle. They are well drained, with culverts sized correctly for the amount of water that flows through, even in spring. Depending on the season, they are heavily – and politely – used by hikers, bikers, and cross-country skiers from the village below.

Summer finds most of the road network in cool, deep shade. There are a few places where the roads are open to the sky and sun, much like in the surrounding landscape. Bears, moose, and coyotes cross these roads. Raptors keep watch from the trees beside them.

Until recently, a good road meant only that it was good for drivers, cars, and other vehicles. Road engineers have learned a lot about how to design this type of road in the last 50 years. It's only very recently though, that any attention has been paid to making a road good for both vehicular travel and the natural world. A good road, as far as the natural world goes, is one that keeps in place as many of the existing natural systems as possible and has the least impact on the plants and animals that live nearby. Not only does Griffiths's road allow access for vehicles, it also ensures continuity of the natural systems.

Highways and other big roads are usually built by states or cities, but there are several reasons for landowners to build new roads on their own property. Two of the most common are for access to a new house and to allow trucks to get from an existing road to a log landing and back. Skid trails can also be road-ish, so many of the rules of good roads apply to them also.

One of the best sources for advice on how to build a road with minimal impact on the natural world is your state's water quality laws. These laws aim to minimize two of the biggest impacts that small roads have on the landscape: erosion and sedimentation.

When snowmelt or heavy rains meet a poorly designed road, the water can wash away parts of the road, its ditches, and the adjacent banks. The resultant sedimentation pollutes streams and changes the nature of the streambed, filling in gravel beds – where fish such as trout lay their eggs – and the holes where fish keep cool.

All of the northern New England states and New York have laid out "best management practices" for logging jobs. These practices are designed to preserve water quality, and many, if not most of them, address the building of temporary and permanent roads and provide information, such as the size and placement of culverts, helpful to anyone planning a road.

A copy of these best management practices (or acceptable management practices, depending on the state) is available free from your county or district forester. Some states' booklets are more detailed than others, but all provide a reasonable place to start.

Tradition also provides some good advice, particularly about the temporary roads used in logging. For example, logs were traditionally hauled out in winter, when the ground is frozen and the fragile topsoil is protected from the trucks' and skidders' tires by a layer of snow or ice. And even though logging has become a year-round profession, there are some woodlots that simply have to be worked only in winter.

Tradition, however, also celebrates some now-questionable road-building practices. "Sunlight is nature's gravel" is one old saying that suggests the wider the corridor, the drier the road. While bigger may be better for keeping some roads passable, the resident plants and animals would benefit more from a road cut the width of a lane rather than a boulevard.

It's only in the last 10 or 15 years that the science of road ecology has sprung up to provide road engineers and other road builders with scientific information on the impact roads have on natural communities. Road ecologists can give some direction on how to build roads that have the least impact on the natural world while still remaining safe for humans.

While there has long been research on the effect of roads on various animals and natural communities, it is only recently that these scattered studies have been brought together to create a body of knowledge about roads in general. In part because the field of road ecology is so new, this body of knowledge is not systematic.

For example, there have been studies on the relative impact of logging roads in the Pacific Northwest, but not in the Northeast. There have been studies on roads' effects on black bears in New York's Adirondacks and in western North Carolina, but not in New England. Sometimes generalities have been drawn from extensive research, sometimes from just a handful of studies, and sometimes the results from one small study are all we have.

While it's still in relative infancy, the science of road ecology has shown that some of the biggest impacts that narrow, lightly-traveled roads through forested areas have are erosion and sedimentation. Besides minimizing those, the two most important pieces of advice the science of road ecology has for builders of small forest roads are, first, to maintain the tree canopy over the new roads as much as possible, and second, to close no-longer-needed roads to vehicle traffic and return them to their natural state as quickly as possible.

Actually, "Don't build a road if you don't have to" is the first piece of advice from Richard T.T. Forman, a professor of landscape ecology at Harvard University and a leader in bringing together diffuse studies into the coherent science of road ecology. "Minimize road length to save nature and save money," he says.

On those necessary roads then, the narrower the road and the smaller the break in the tree canopy, the better. The more qualities your road shares with the surrounding forest, the less impact it will have on the surrounding natural community. The shade the canopy provides is a key quality.

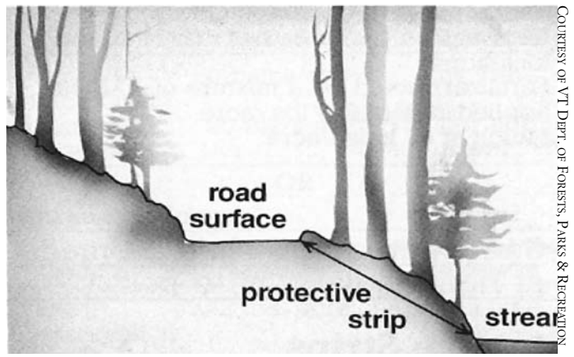
When the forest canopy is broken, a new type of community called a forest edge is created. Edge habitats are by no means bad. They are as important as any other natural habitat and are home to many popular animal species, including many game species. It is just that in most places, even in northern New England, roads are slicing forests into ever edgier pieces. While species that prefer edge habitats thrive when a road breaks the forest canopy, some forest-interior species can suffer.

"Certain species of birds are very vulnerable at the edges of forests," says Scott Jackson, a road ecologist and wildlife biologist with the University of Massachusetts Extension, Amherst. Some of these edge-sensitive species are susceptible to nest predators such as chipmunks, raccoons, and crows – all edge species.

Once upon a time, land managers tried to create as much edge habitat as possible, sometimes by purposely maintaining otherwise temporary roads built for logging. Forman believes a road should be maintained for driving from here to there. Creating edge habitat, he says, should be done thoughtfully, not as an inherent part of road building.

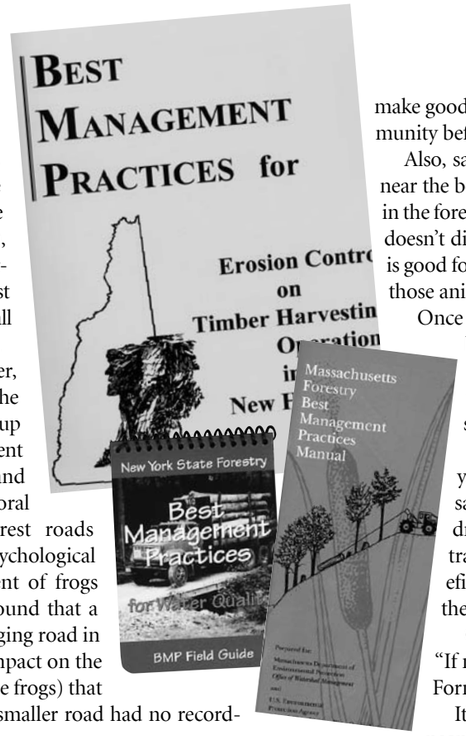
Habitat fragmentation is a problem that is related to the "edge effect." A forest crisscrossed with gaps in the canopy created by roads can discourage some species of birds, such as the hermit thrush, from nesting in the area. "These birds seem to be able to size up the forest patch and decide if it's big enough for them to nest there," says Jackson. When there is a gap in the forest canopy, such as the gap made by a road, they may look elsewhere, and with more roads, there is simply less habitat for these species.

Roads also create barriers to animal movements. Highways give an obvious example of how a road can create a physical barrier to animal travel. We've all seen roadkill. But roads also create a mental barrier which has effects that aren't seen. You don't see the bear that didn't try to cross the road, but it still didn't get to the other side.



Courtesy of VT Dept. of Forests, Parks & Recreation

A "best management practice" keeps an undisturbed area of vegetation between a road and any stream, pond, or wetland.



Big animals don't seem to have any trouble crossing small woods roads (although some may avoid areas where there are many roads), but research done on forest roads in the Northeast suggests that some small animals do have trouble.

Phillip deMaynadier, who now works for the Endangered Species Group of the Maine Department of Inland Fisheries and Wildlife, did his doctoral study on whether forest roads created a physical or psychological barrier to the movement of frogs and salamanders. He found that a larger, well-traveled logging road in his study did have an impact on the salamanders (but not the frogs) that lived near it, while the smaller road had no recordable effect.

First, there were fewer numbers of salamanders (deMaynadier studied redback, blue-spotted, and spotted salamanders and red-spotted newts) near the edges of the wider road, which deMaynadier feels may have been an edge effect. Second, adult salamanders were less likely to cross this road while migrating to their hibernation sites and much less likely to cross during their normal home-range wanderings.

The difference between the roads, says deMaynadier, was canopy cover. The center of the bigger road had only 17 percent canopy closure while the smaller road had a 42 percent canopy closure. In other words, it didn't take much more shade, or even total shade, to make the narrower road "invisible" to salamanders.

While deMaynadier didn't study the annual spring migration that brings so many amphibians onto even busy roads for a honeymoon massacre, he did study the fall migration toward hibernation sites and believes the two are similar. He found that the number of salamanders crossing the larger road during fall migration was 32 percent less than expected from the movements of other salamanders in the study.

To minimize the impact of any forest road, deMaynadier recommends leaving large-crowned hardwood trees next to it, first because they provide more canopy shade than conifers, but also because they provide an annual dose of leaf litter, which further helps the road blend in with the surrounding forest.

DeMaynadier notes that his study points out the importance of not building roads within 500 feet of a vernal pool – the average migration range of vernal-pool-breeding salamanders like the ones in his study.

Why go through the trouble of building a road that salamanders are willing to cross? First, says deMaynadier, salamanders make good sentinel species, exposing problems in a natural community before larger, more glamorous animals are affected.

Also, says Jackson, salamanders and other small animals are near the bottom of a food web that connects all the living things in the forest. Just because they are small, slimy, and largely unseen doesn't diminish their role. A road that is good for salamanders is good for the animals that eat salamanders, the animals that eat those animals, and so on.

Once you've built a lovely road it can be hard to say goodbye, but that is exactly what road ecologists such as Forman and Jackson recommend you do when a temporary road, such as one to a log landing, has served its purpose.

Might you do less harm to the surrounding area if you re-use the same road the next time around? Jackson says maybe. If you've done an excellent job on planning, drainage, and the rest and you are sure you will want to travel the same route the next time around, then the benefits of maintaining the road to use again may outweigh the drawbacks.

One significant drawback is increasing human access. "If not number one, I would put it near the top of the list," Forman says.

It's hard to deny the principle that a road means more people. If you must hike to your favorite pond, you are almost certain to be alone. Build a road to it, and all sorts of people start showing up.

"We *do* want people to get out into nature," says Forman. "Society fundamentally depends on nature. It's a good thing to get people out there." The trick is not to let every temporary road turn into permanent access to an otherwise remote area.

The solution, he says, is effectively closing temporary roads to vehicle traffic when their job is done. Forman acknowledges that, in this country at least, this is a politically sensitive issue. "In Canada they seem to know how to do it. I've seen wonderful examples," he says. "In the U.S. you say, 'close the road,' and there is a public outcry and people hire lawyers."

The other solution is to carefully plan where to build the roads in the first place. Roads built for recreational access should be at the perimeter of what Forman calls "the big, green blob," leaving the interior wild for the few hardy souls willing to travel beyond the road, he says. Similarly, other road networks can be planned with a goal of keeping large areas free of roads.

Forman is not against roads. In fact, he's all for them. He knows that many new roads will be built and believes that is a good thing. He just wants those roads to do the most good for people and the least harm to the environment.

There is a special joy in walking, or even driving, down a forest road and seeing plants and animals that are usually only found deep in the forest. Building a forest road that keeps even the salamanders and the trout happy will probably do a pretty good job of keeping you happy too.

Madeline Bodin lives on a stretch of road in Andover, Vermont, with impressive canopy cover.

It Pays to Be Patient

By Dan Parent


Virginia Barlow

Under good conditions, with thinnings along the way, this sugar maple can average 1/4-inch to 1/3-inch growth in diameter per year. At that rate, its increase in diameter from 7 inches to 18 inches will take 33 to 44 years.

After I finished marking a woodlot, I walked it with the landowner. Looking around at the trees I had designated to be cut, he asked me why I hadn't marked a certain 11-inch sugar maple. With the maple market so hot, I'm sure he was questioning whether or not he was receiving all the value he could from his timber sale. I began a long explanation about how the value of a tree increases dramatically with size, ending by pointing out that if we let that tree grow another 20 years, it could very well quadruple in value. The gentleman said that he understood all that, but continued, "I'm 75 years old now, and I don't think that it will matter much to me how valuable the tree is in 20 years!"

So maybe not all of us can wait 20 or more years for our timber to mature, but those who can will find that a tree's value increases geometrically over time. From a low-valued pulp tree to the "gold-mine-on-the-stump" veneer tree, cutting timber too early can be a very costly mistake. Let's take a look at the different hardwood products typically grown in our forests, and their value relative to size.

Until a tree reaches approximately 7 inches in diameter, it has little or no commercial value. Logging costs exceed the value of the tree. Once a tree crosses this 7-inch threshold, however, it is considered large enough to be used as pulpwood. Pulpwood typically returns about $5 per cord to a landowner. Since it takes about 25 trees of this size to make a cord, a 7-inch tree is valued at about 20 cents.

Once the tree has passed the 11-inch diameter mark, it can be considered sawlog material and really starts to accumulate value. Small sugar maple sawtimber can fetch nearly $500 per thousand board feet (MBF), or roughly $250 per cord. Our 11-inch maple contains 80 board feet of sawtimber, so it would be valued at about $40.

Quality maple sawtimber in the 14-inch and up size class can bring nearly $1,000 per MBF, or $500 per cord. An 18-inch maple has 190 board feet or .38 cords, for a value of $190 for a single tree. Quite a jump in price from our lowly 7-inch pulp tree.

The cream of the crop, of course, is the veneer log. These logs must be of exceptional quality and are usually at least 14 inches in diameter. A sugar maple veneer log can bring $2,000 per MBF, thus our 18-inch maple tree, if of sufficient quality to be graded as veneer, would be worth $380. While not every tree can be grown to such high quality, active long-term management for the best trees can significantly increase the percentage of these high-quality trees in the forest.

While it takes years for trees to accumulate volume, growth rates can be greatly enhanced through careful thinnings, minimizing the wait. Thinning the forest removes many of the low-quality trees that will never have value beyond pulpwood, while opening up the best trees for more rapid growth. As the high-quality trees pass through the different product classes, size increases can mean significantly higher returns when the time comes to harvest them.

Size of Tree	7 inches	9 inches	11 inches	18 inches	18 inches
Product	Pulpwood	Boltwood	Small sawtimber	Quality sawtimber	Veneer log
Volume	0.04 cord	0.09 cord	0.16 cord (80 BF)	0.38 cord (190 BF)	0.38 cord (190 BF)
Value	$5/cord	$15/cord	$250/cord ($500/MBF)	$400/cord ($800/MBF)	$750/cord ($1500/MBF)
Amount to Landowner	$0.20	$1.35	$40.00	$152.00	$285.00

Prices change. The prices listed in this article are accurate as of early 2005 in the northern New England market.

Dan Parent is a consulting forester.

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.

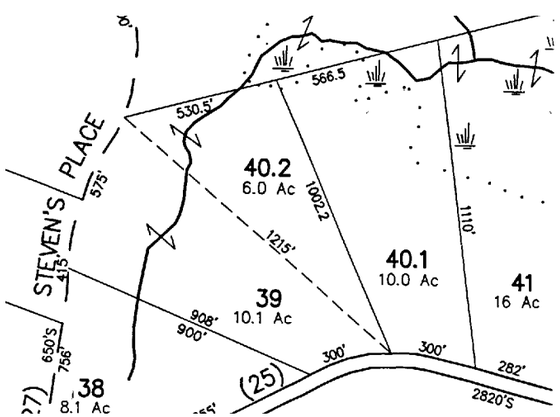
If all you really want to do is harvest and sell timber on a periodic basis – say, every 10 to 25 years – then there are just a few critical factors that will determine how small a woodlot will suffice. Tree size and log value are usually the most important factors that determine whether (and how much) 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.

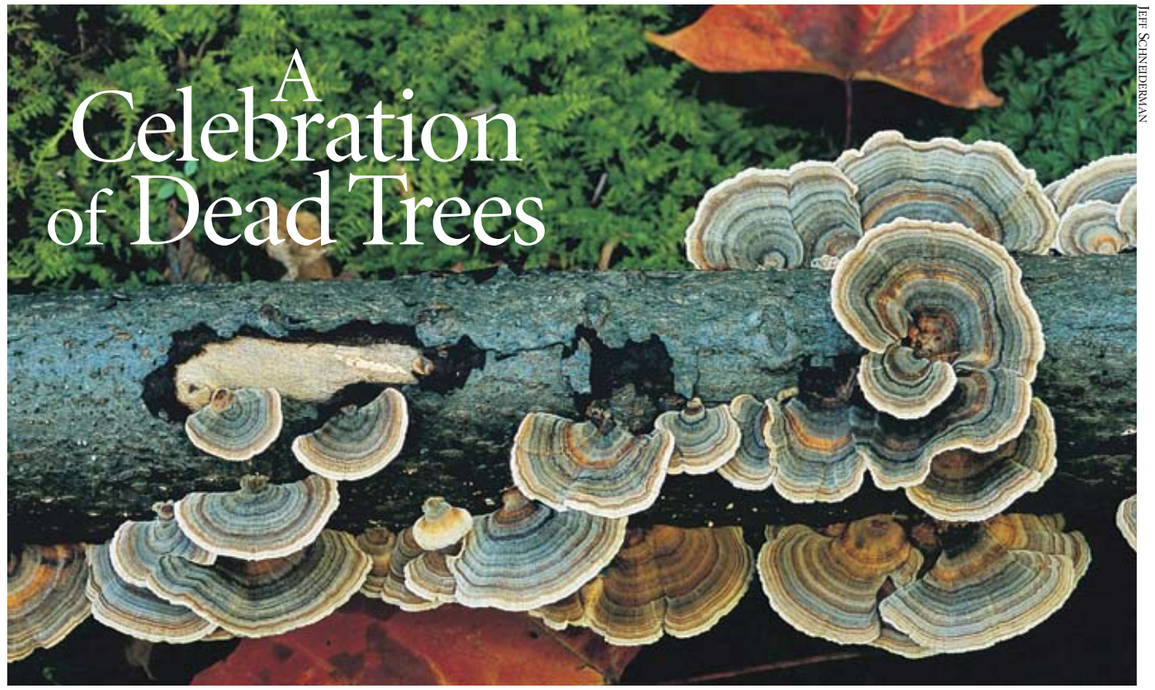
Even in this light, it's not unreasonable to think that lots smaller than 10 acres can be managed for timber in a traditional way – if the wood value is there. Actually, even if the wood value is not there today, you might be able to change that. Wood value per acre is a significant factor on all sizes of jobs, but its exaggerated importance on small parcels certainly bolsters the argument for doing pre-commercial improvement work in promising but as-of-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 is the Chittenden (Vermont) County forester





Jeff Schneiderman

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 100 acres of woodland are 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, 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.

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.

Kathryn Lind Johnson

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

When the central column of the trunk begins to decay, the tree is ready for wood-

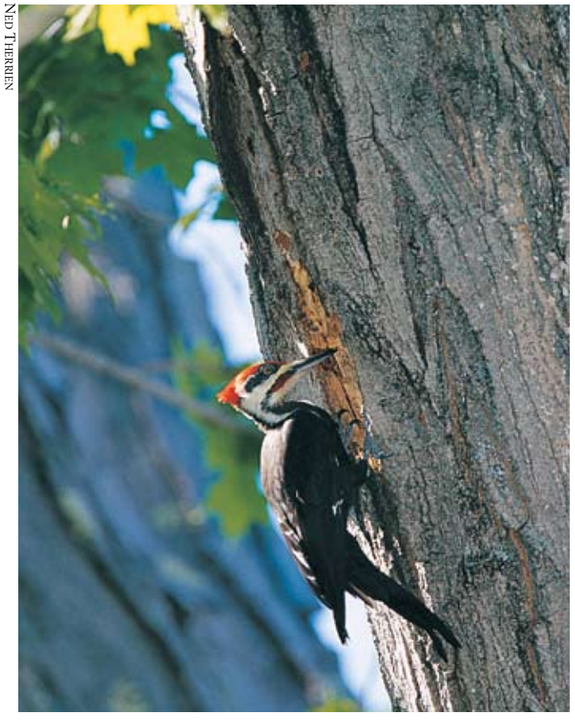
peckers. They drill through the hard exterior wood and then easily excavate a nesting cavity in the soft interior. These cavities, which woodpeckers excavate anew every year, serve as winter roosts and future nesting cavities for the many species of birds that don't have the equipment to excavate cavities 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.

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,

This pileated woodpecker is starting an excavation in a sugar maple.



Ned Therrien

By the time fungi fruit into puffballs like these, there is extensive interior decay in the host tree.

Gerry Lemmo

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. That 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 Vermont, eight species of woodpeckers need cavity trees, but I can ignore three of them – the red-headed, the three-toed, and the black-backed – because they are relatively uncommon or rare. I do pay close attention to the other five and consider them indicators of the different size-class cavity trees that are available in my woods.

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 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

Roger Irwin

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

Gerry Lemmo

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.

Actually, my personal woodpecker-based, dead-tree management program isn't too far removed from what the U.S. Forest Service does. According to Clayton Grove, wildlife biologist for the Green Mountain and Finger Lakes National Forests, most "soft snags" – dead trees with most of their wood in an advanced stage of decay – are left for wildlife. In addition, four trees classified as "hard snags," "den trees," or "replacement trees" – trees just like those I wander around looking for – are left per acre. That means that I can feel perfectly justified in my pursuits until I find upwards of 400 dead, dying, and decaying trees.

Vermont's Fish & Wildlife Department suggests that we should try to leave at least one large-diameter den tree per acre, plus as many snags as possible, while observing human safety concerns, plus some live trees "showing signs of reduced vigor, broken limbs, or scars [because they] may be good candidates as replacement snags." These guidelines, though less numerical than the Green Mountain National Forest's, are liberal enough to make me feel downright virtuous as I patrol my woods for what I have to 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*. She lives in Huntington, Vermont.

Gerry Lemmo

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

How to Grow an Oak from an Acorn

By Patrick Bartlett

Nearly every step of the way from little acorn to mighty oak, the red oak is a prize to someone or something. Being that popular can be hazardous to an oak's survival.

The acorns produced by Northern red oak (*Quercus rubra*) are a favorite food for many species of wildlife. Deer, turkey, bear, raccoon, fox, coyote, rabbit, squirrel, mice, crows, blue jays, and insects all find the acorn's meat irresistible.

When it matures, it is one of our most admired trees, and its valuable wood is sought by lumber buyers and furniture makers who use it as boards or as veneer.

In between, from the time it takes to get from seed to sapling, it is an uphill battle. It's not only the acorns that deer love – they browse the seedlings as well. They eat the leaves in the summer and feed heavily on the tender buds and twigs in the winter months.

Red oak adapts to very different sites throughout its wide range, which includes all of the northeastern U.S., and will flourish on hilltops in very shallow, rocky soils as well as down in the valleys in deep, rich soils. However, adaptable as red oak is, it can be very frustrating getting red oak seedlings to survive; foresters and wildlife managers know this all too well.

Collecting acorns and throwing them around on a hillside is basically a waste of time. These nuts have an aroma that gives them away to the animals that cherish them; most will be eaten in days. But if you wait until April or May to plant a germinating acorn, you will reduce the chance of it being eaten before it becomes a seedling.

The best way I have found for germinating acorns is to collect them in the fall. Forget the ones that have insect holes or cracks, and put the good ones in a sealable plastic bag with a wet paper towel. I store mine in a one-gallon, clear zip-lock bag in the vegetable drawer of the refrigerator. Once or twice during the winter, the paper towel should be moistened again. If you do not see condensation on the inside of the bag, then it's too dry. A cool basement or root cellar that stays around 40 degrees would work just as well. The key is to keep the acorns from freezing or drying out.

When planting time approaches, take the bag out of the refrigerator. Keep it sealed and at room temperature for about a week, and roots will begin to emerge. The acorns should be planted before the root gets to be one inch long. I just poke a hole in the ground one inch down, place the sprout in with the root pointed down, then cover it over. The less you disturb the ground, the better. Squirrels will rob your sprouted acorns if they find them.

Courtesy of Pat Bartlett

Make sure your acorns don't have holes or cracks in them.

Getting these sprouted acorns to grow tall enough to be out of reach of deer is the next challenge. The first step is choosing a good site. Planting germinated acorns in patch cuts in poplar, spruce, or pine has worked well for me. The first spring after the cut has been done is the best time to plant.

I like to plant the acorns in the center of a group of spruce seedlings or under the limbs or tree tops that have been left on the ground after a timber sale. Planting acorns with a group of spruce seedlings that are 6 to 12 inches tall is like having a live, natural barrier from the deer, and spruce tops take years to rot and will protect the oak seedlings. I recommend leaving tops whole to impede the deer movement.

Courtesy of Pat Bartlett

Patrick Bartlett with successfully planted oaks in tree tubes

That's all there is to planting acorns, but if you want to help ensure their survival, you will want to find the 8- to 10-inch seedlings a year or two later, and provide a man-made shelter for the vulnerable seedlings. This is a more expensive approach, but it's worth it – and perhaps essential – if you have a deer-browse problem on your property.

A company named Treessentials makes a biodegradable, brown plastic tube to place over the seedlings. I have planted approximately 250 oak seedlings in these tubes over the past 10 years and have had good results. The 5-foot tube is the best one to use for deer protection. They also come with a net that slides over the top of the tube to prevent birds from becoming trapped in them. The net must be removed the year that you expect the tree to reach the top of the tube. The trees will generally grow 12 to 16 inches a year in the tubes.

In areas where deer use is heavy in the winter, the five-footer will not be high enough once your sapling emerges from the tube. In this case, I slide the tube up the stake as the tree grows. If a leader gets up to 7 feet tall, it should be safe from the deer. The tubes come with two plastic quick-ties for attaching them to a stake. Wooden stakes can be purchased with the tubes; however, I have recently started using half-inch rebar instead. I can use these stakes repeatedly in my forestry business, and it reduces costs for my clients. I cut a 20-foot section into three pieces. This stake won't rot and will be long enough so that you can slide the tube up when the tree emerges above the tube. The tubes normally fall apart after six years. After they're gone, the saplings will generally be weak and should be loosely tied to the stake. Once the sapling is one inch in diameter, it should be able to stand on its own.

The only problem you could have with the tubes is that bears sometimes knock them over, and raccoons might climb them to see what's inside. You'll need to check on the tree tubes each spring for at least six years, so take that into consideration when you are planning where to plant – they need to be accessible.

If you didn't collect acorns last fall, or you want to speed the process along, you can purchase seedlings from a number of nurseries. Ask for 2-year-old seedlings. I recommend putting a tablet of slow-release fertilizer one inch down in the soil above the roots of the seedling. It is very helpful to pull in some leaf mulch and build it up around the seedling to help hold the moisture in the soil. After you do a few, it should take only a few minutes per tree. As with starting the trees from acorns, the 2-year-old seedlings will need protective tubes to help them through the early years of growth. I have had 75 percent survival so far with oaks planted in these tubes.

Another way to protect seedlings is to cage them in with nylon or wire. I make my own cages from hardware cloth – just roll the cut pieces of wire into 8-inch-diameter tubes, and use the same rebar stakes. The trees will grow more slowly with this method (8 to 12 inches a year is common), but the saplings are a bit stronger than the ones grown in plastic tubes.

Whatever method is used, it is important to plant the seedlings where they will get plenty of sunlight. Oaks love the sun. If you are planting in a small patch cut, plant in the center and not under the canopy of edge trees. Patch cuts should be no less than a quarter-acre in size.

If you're lucky enough to already have a mature oak in your woodlot, you may be able to get some natural regeneration. Patch cutting one-half to one acre on the downhill side of an oak tree is the best way to encourage natural regeneration. Leaving the tops of the cut trees whole in the patch cut is important. They will slow the deer traffic through the area while the seedlings are getting established. After six to eight years, the tops of the cut trees will be knocked down by the snow, and with any luck, the terminal buds of the oak saplings will be out of reach of deer by then.

With many of the beech trees declining, we need to promote another nut tree for wildlife. By saving seed trees on woodlots where oaks are scarce and by carefully planting seedlings and acorns, it can be done.

Patrick Bartlett is a private forestry and wildlife consultant in Woodstock, Vermont.

A Look at the Season's Main Events

By Virginia Barlow

	DECEMBER	JANUARY	FEBRUARY
First week 1	The white-crowned sparrows that stop at your feeder may remember it and stop again in spring. These hardy birds breed in the far north / Burdock is a biennial, and after its first year, the long taproot is edible. Plus, no burs next summer if you dig up the root now / Look in wet areas for the bright stems of red osier dogwood / American toads, gray tree frogs, and wood frogs produce glycerol, a compound that keeps them from freezing in their terrestrial hibernating chambers	Shaking the tall, straight stalks of mullein will release a shower of tiny, black seeds on the snow / Orion the Hunter is in the southern sky around 9 P.M. Follow the three stars in his belt to the left and you will come to Sirius, the brightest star in the sky / Ruffed grouse and grosbeaks are feeding on mountain ash berries / Birds don't agree with us on the subject of ragweed: its seeds are a valuable food source for many small birds, until snow covers the stalks	February 2: Groundhog Day / A blue jay's loud calls can be annoying, but these birds are sharp lookouts and will sound the alarm if any danger is sighted / The stalks of chicory have grooves all along the length. You can use them now to remember the flower's beautiful blue summer color / Listen for the loud drumming of single male pileated woodpeckers, advertising for females. Once mated, a pair will remain together throughout the year
Second week 2	Sweet cicely sprouts new leaves in autumn. The small leaves stay green all winter, ready to enlarge quickly in spring before tree leaves intercept the light / Sunflower seeds and peanut hearts are the best sources of protein for birdfeeder birds / December to March is a good time to look for bald eagles fishing in open water below dams. Bald eagles can live for over 30 years in the wild	During bad weather, mink will stay in their dens, usually near water – under tree roots in old muskrat or beaver bank burrows / Meadow voles breed almost all year round. Fortunately, they are eaten year-round, too, and are the major food now of hawks and owls / Brown creepers are searching for insect adults, larvae, and eggs, hopping upward in a spiral from the bottom of a tree. Then they fly down to the base of another tree	Sometimes crows gather in large groups at this time of year / Coyotes are sexually active. Five to nine pups will be born from mid-April to May / Deep snow makes life difficult for fox and deer, but it allows the snowshoe hare to reach a new supply of tender shoots / Cattail flower heads disintegrate throughout the winter, releasing their 125,000 or so seeds / Foxes will cache food caught during good hunting days in pits they dig in the snow. Then it is covered over
Third week 3	Wild cranberries are the same species as the cultivated ones. The berries are still on the plants, in bogs and fens / Red-breasted nuthatches are territorial in winter; a pair will defend about 10 acres / As many as 18,000 common garter snakes occupy some winter dens in Canada / Look for evergreen wood fern and Christmas fern in the woods, and for rock polypody on rocky outcrops when the snow is not too deep. These species stay green through the winter	Mourning doves are gobbling up almost every kind of seed from birdfeeders, but on their own they mostly eat tiny grass seeds / The juicy red fruits of highbush cranberry stay on the shrub – until a flock of cedar waxwings finds them / Downy and hairy woodpecker pairs are executing courtship displays and beginning to establish and defend territories. Home ranges are larger, and may overlap with other pairs	Chickadee flocks are breaking up; listen for the two-note territorial song of the male – *feebee* – the first note higher than the second / Acrobatic aerial courtship displays by ravens are under way. Rolling, tumbling, and soaring are accompanied by the loud territorial call, a resonating *quork* / Maple sugar makers are on the alert. Sap will start flowing in earnest anytime now / Sometimes the fruits of wild grapes turn into raisins and stay well into winter, a plus for wildlife
Fourth week 4	Hemlock seeds don't attract a wide variety of birds but are eaten by chickadees, siskins, and crossbills / Snow usually does not deter moose: their long, skinny legs can plow through 30 inches of it without a problem / When birch or conifer seeds are available, purple finches may winter on their breeding grounds / The flying squirrels that may be coming to the birdfeeder are sociable and commonly sleep together in groups of 10 or more	As the woodpile is dismantled, look for signs of last summer's activities – mouse nests, chipmunk middens, beetles, or snakeskins / The big sticky buds of balsam poplar have a wonderful smell, which is intensified if you crush them / A Cooper's hawk may be keeping an eye on your birdfeeder, looking for small- and medium-sized meals, as big as blue jays and mourning doves / Bear cubs are born. Each of the two or three babies weighs in at 0.4 to 0.7 pounds	Time to clean out your bluebird houses / Wild turkeys seem to get braver as their food supplies dwindle. They may venture into yards and orchards for spilled birdseed and fallen fruits / Skunks come out to look for mates, and sometimes can be heard squabbling in the night. Baby skunks, usually six or seven, are born two months after mating occurs / Moose mothers keep their offspring with them throughout their first winter

These listings are from observations and reports in our home territory at about 1000 feet in elevation in central Vermont and are approximate. Events may occur earlier or later, depending on your latitude, elevation – and the weather.

Notes from the puckerbrush

By Stephen Long

Tending the Woods

Some hunting seasons, I see dozens of deer. Sometimes one of them's a buck, and sometimes I shoot one. And then there are years like last year, when all season long I saw a total of three deer, not one of them with antlers. I hunt almost entirely on my own land because I want to know this one piece of ground inside and out. I want it to be home, just as much as the house we built. Another way of knowing it is through tending my stands of maple, so after the deerless season, I quickly traded in my orange hunting vest for my orange Kevlar chaps and made the transition from the stillness of deer hunting to the 2-cycle roar of felling trees.

I've been doing timber stand improvement on my land for as long as I've known there was such a thing. I tie surveyor's tape around the straightest, best-looking specimens, identifying them as my crop trees, the ones that I'll grow for decades more. I then cut down any poorly formed trees whose crowns are encroaching on those of my prizes. If I don't feel confident that I can fell the cull without damaging its neighbors, I girdle it, cutting two parallel rings around the circumference of the trunk to a depth of at least half an inch, which eventually kills the tree.

I can already notice a difference in the stands that I thinned just seven or eight years ago. The crop trees' crowns have filled the spaces vacated by the trees I cut, and many of their trunks look as if they're trying to grow right out of their skin. The next thinning in that stand will definitely produce some small sawlogs.

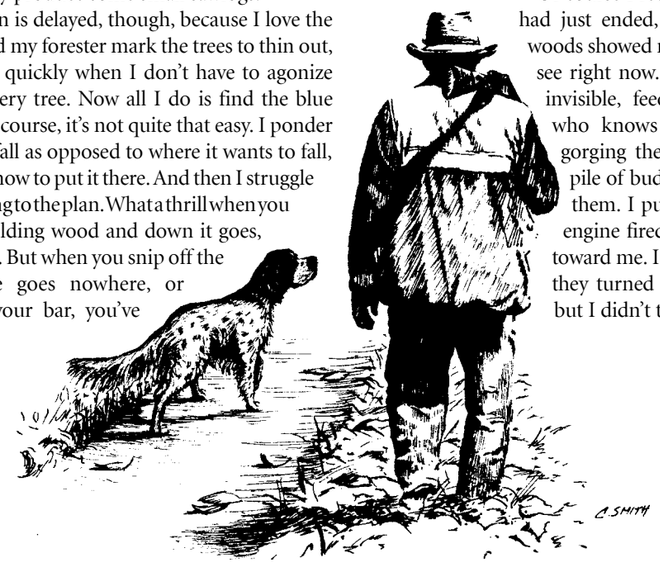
Not all the gratification is delayed, though, because I love the work itself. Lately, I've had my forester mark the trees to thin out, and the work goes more quickly when I don't have to agonize over every decision at every tree. Now all I do is find the blue paint and cut the tree. Of course, it's not quite that easy. I ponder what direction it should fall as opposed to where it wants to fall, and then try to figure out how to put it there. And then I struggle to make it happen according to the plan. What a thrill when you snip off the last bit of holding wood and down it goes, right where you wanted it. But when you snip off the next one and the tree goes nowhere, or worse, settles back on your bar, you've gone from hero to goat in a hurry. The resultant wedging and pounding are done with the added benefit of adrenaline, and all I can say is that so far I have not done myself any bodily harm. Knock on wood.

So in early December, I was doing just that, cutting mostly 5-inch to 8-inch sugar maples that had been marked. Thus far, I had put in four or five afternoons, and for my efforts I could look out on scores of trees showing starkly against the snow on the slope below me, most of them laid out nice and orderly, a couple of them hopelessly hung up. This morning, after an hour or so of steady work, I was pleased to hear the engine scream, telling me I was just about out of fuel.

I shut off the saw, took off my helmet, and poured a cup of coffee from the thermos in my backpack. I was about to sit down for a break when out of the corner of my eye I saw movement. Not far below me stood a deer. It was steadily chowing down on the top of one of the sugar maples I'd felled. As I watched, a second one appeared, and then a third, calmly feeding. They'd been busy biting off buds while I was running a chainsaw no more than 60 yards away.

I watched the show for a full five minutes, finished my coffee, and by then was anxious to get back to work before my muscles stiffened up. I fumbled around with my backpack, put on my helmet, and picked up my chainsaw – and still they didn't notice me.

Of course I recalled the hunting season that had just ended, in which eight days in the woods showed me no more deer than I could see right now. Two weeks ago, they'd been invisible, feeding who knows where on who knows what. But now they were gorging themselves on this huge stockpile of buds I'd so graciously put before them. I pulled the cord on my saw, the engine fired, and finally the deer looked toward me. I waved a greeting. Reluctantly they turned and bounded down the hill, but I didn't think they'd go away for long.



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.

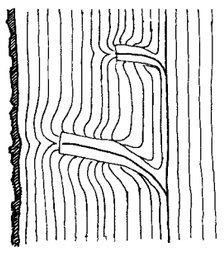
It has often been said that the wood from rapidly grown trees is inferior to more slowly grown wood, but the Yale study found no evidence for this belief. The wood from pruned trees that they grew as fast as they could, including one that had an average diameter increase of over 0.6 inches per year,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

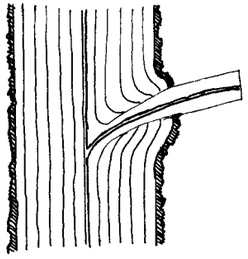
What species to prune

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.

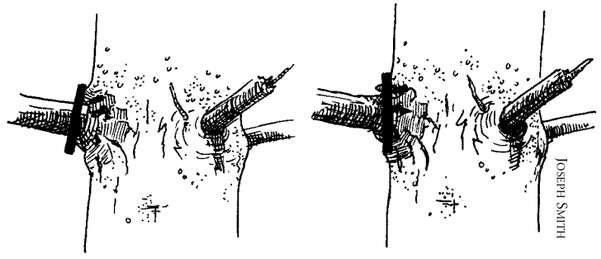
You won't get the rapid stem-diameter growth needed to maximize the pruning investment, however, unless the crowns of your pruned pines have room to expand in diameter at the rate of about one foot per year. Most other softwoods don't respond to thinning as well as white pine, and the difference in price between knotty and clear for other softwood lumber is not as dramatic.



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.



Joseph Smith

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

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

Ned Therrien

Try to prune to a height of 17 feet.

From left: 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.

PHOTOS BY NED THERRIEN

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 6 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 3 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." Thanks to the work of Alex Shigo, formerly chief scientist at the Durham, New Hampshire, office of the U.S. Forest Service, "healing" is out. Plants don't have this ability; 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 2 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 9 feet will result in a knot-free merchantable log since 8 feet is the minimum length for logs. 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 saw on a short handle 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.

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 CO-EDITOR OF *Northern Woodlands* MAGAZINE

What About 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. That's 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 one-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.

Orleans County (Vermont) Forester George Buzzell has made something of a personal study of hardwood pruning on his own woodlot. He makes a good case for pruning not just to improve crop trees but also to improve the value of trees that are to be removed when releasing those crop trees.

He pointed to an 8-inch yellow birch and proclaimed that it was not a crop tree. "It will be cut in the next thinning to release these maples," he explained. "But if pruning off those three, one-inch branches now will make it at least one grade higher when it's cut in the thinning, then I'll prune it." As Buzzell put it, "Jump from two to three clear faces on that little beauty and you've jumped a grade."

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. According to Buzzell, "Price spreads between hardwood log grades have become so great that pruning to improve grade can't be ignored."

To make the point, he described the pruning work he has done in his own woodlot. "In a total of four hours, I pruned 320 yellow birch trees over 12 acres," he said. That's 27 trees per acre. Buzzell conservatively estimates that each pruned tree will have a minimum volume of between 50 and 75 board feet when removed in the subsequent thinning. If his pruning raised the quality of each log by one grade and that grade-jump resulted in a value-jump of $200 per thousand board feet, then, at 50 board feet per tree, his four hours of work might eventually bring him a gain of $3,240 over what he would have received in a thinning of unpruned wood. "You're well advised to consider adding all the grades possible – it's a value-added activity."

It 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. OK, 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.

MICHAEL SNYDER IS THE CHITTENDEN (VERMONT) COUNTY FORESTER.

FieldWork

At work in the woodlot with John O'Brien

By Kathleen Hentcy

Consulting forester John O'Brien stands with head thrown back, cap in hand, looking up at the top of a white pine tree that stands 90 feet tall. He's about 15 minutes into his first outing of the day, and already, a splash of blue paint runs down from his right front jeans pocket. There is paint on his flannel shirt, a dab of paint on his face, spots on his hat. His insulated boots, which don't match, are streaked with paint. O'Brien's dog, Annie, an 11-year-old black Labrador retriever who wanders through the woods around us, has blue spots on her coat. Except for the paint on his face and clothing, which wasn't there when I met him, there's no telling which is fresh paint and which is left from a previous day's work.

O'Brien steps back from the tree and looks toward the skid road, which is obscured by fir seedlings. He's imagining the tree's line of fall and the skidder trail that will be made to the tree if he marks it to be cut. Finally, he steps back from the pine and sprays a splotch of blue on its bark. He walks a few steps toward the skid road, turns and sprays the fir seedlings with blue, sprays a blue stripe on the snow.

"There, now he'll know how to get to it," he says.

Normally, O'Brien works to encourage the regeneration because these seedlings are the future forest. But in this case, the landowner wants this area open, so O'Brien is purposefully knocking back the underbrush in this small pocket of pines on the shore of Upper Baker Pond, in Orford, New Hampshire. And he wants to discourage the fir in favor of any pine seedlings coming up.

He tucks the paint spray gun into his right front jeans pocket. A plastic jug of paint rides on his back in a small rucksack, with a tube leading from the cap to the spray gun.

O'Brien has been to this job several times already, laying out the skidder trails with an eye for the land as well as how the first phalanx of trees will fall with the least amount of damage to other trees. As trees are removed, O'Brien returns to walk the woods again, checking to see if other trees can be cut this time or if they should stay and grow another 5 to 10 years.

"You can't mark too many all at once," he said. "If you do, you lose control over the job." The loggers he works with have come to expect this system from O'Brien and are happy to accommodate him.

"I like a job to look nice," he says. "So I work with loggers who take a lot of pride in what they do. The kind of loggers who, when they're done, step back and say, ÔThat looks nice.'"

For all this talk about looking "nice," however, what is really at stake is the vitality of the woodlot. O'Brien selects diseased trees for cutting. He chooses trees with tops that fork into two stems, making them weak and susceptible to snapping off in a high wind. He marks trees with tops too small to support the tree with any significant growth, since they have so little foliage.

But he will leave a small-topped tree if felling it would break a healthy tree's branches or skin too much bark from the healthy tree. A forester working in a dense woodlot also must consider the need for a continued windbreak for trees left standing, since trees grow to resist the wind they are exposed to. If they have come up in a dense clump, they've resisted much less wind – and therefore are much weaker – than if they've withstood the gales alone. Too many trees taken from a dense woodlot, therefore, puts the remaining trees at risk of losing their tops in a high wind, no matter how big and strong the trees appear.

O'Brien respects the loggers who work for him, but he recognizes that their job is very different from his. While their job is to safely remove trees from the woods, O'Brien's is to safeguard the health of the forest while seeing that the landowner earns enough from the logging job to make long-term management worthwhile.

"Trees grow, and they'll grow fast if you give them a chance to add some foliage to their crowns," he says.

Today, on this walk through a stand of century-old white pines, he recounts the story behind nearly every stump he passes. He walks to a stump near the shore, brushes off sawdust and snow, and points out signs of heart rot; at another stump, he explains that even though the tree was obviously large, it suffered from blister rust or the top was split. He remembers each tree he marked, why he marked it, and where he expected it to fall. He stops to inspect damage on trees where a falling tree scraped the bark. Some he marks for cutting, others he pronounces only superficially damaged and says they will do fine.

"Look at that tree," he says, pointing out the largest white pine we've seen. "It seems to me that tree is 3 feet in diameter," he says. "A logger would say, ÔThat's a nice size, perfect for cutting.' But I say, let Ôer grow."

O'Brien has been a forester his entire professional life. He started in 1972 as an employee with Wagner Woodlands, a Lyme, New Hampshire, forestry consulting company. In 1983, he went out on his own as O'Brien Forestry Services up the road in Orford. Today he manages 30,000 acres for 150 clients within a 50-mile radius of his office. He manages woodlots that range from his friends' 10-acre plots to the Hanover Waterworks' 1,500-acre tract where he oversees logging in the watershed of Hanover's reservoirs.

O'Brien offers his clients a range of services. He will go in and mark for thinning work only, or work with the landowner for wildlife management or strictly for an "active forest," from which the landowner would regularly have a significant number of board feet cut. He will put in a network of trails, in addition to the skid roads, which he always envisions as hiking trails.

Courtesy of John O'Brien

He marks all boundary lines and the trees for cutting, hires the logging crew, contracts for log trucking services, and markets the logs. By keeping so much under his control, he believes he can maximize the landowner's profit while also maximizing the protection of the forest's health.

In addition to his paying clients, O'Brien also volunteers as a forester for the American Tree Farm Service. After 13 years of work with that group, he was chosen from among 10,000 foresters nationwide to receive an award as the "Outstanding Tree Farm Inspector of the Year." O'Brien has brought 53 new tree farms into the program and reinspects those farms and any others in his district at five-year intervals.

On a drive through a section of the Hanover Waterworks tract, his pride in achieving a sustainable, productive forest is clear. The trees are growing so well here that theoretically he could take out a half-million board feet of timber a year without depleting the timber. Since he began managing this land in 1978, loggers have cut 12 million board feet of timber under his direction. He varies the amount of cutting depending on the market – if the price for sawlogs or pulp is down, he just waits another year. Weather is another determining factor – he won't log if the ground isn't frozen or very dry.

At another woodlot, this one owned by Sam Doyle, who once was named New Hampshire Wildlife Steward of the year, O'Brien tours the cutting area, marking a few trees.

"If a tree is unique, I leave it," he said, walking past the few birch trees in this stand. "If there are just a few of one species, I figure Mother Nature put them there, leave 'em."

A group of red oaks draws his attention. These are young, straight-boled trees whose acorns provide important mast for bears and other wildlife. Years from now, they should also produce valuable sawlogs for Doyle.

"Those are the future, right there, as far as revenue for the landowner goes," O'Brien says. And so he has directed the cutting around them with the intent of maximizing their growing conditions.

We emerge from the woods onto the windy hillside log landing. The loggers are bucking logs, and a man running a loader is stacking them on the log truck. After watching awhile, we walk to O'Brien's truck.

"The key to this work is, you have to go slow and careful, plan ahead," he says as we arrive at his truck. "You have to be looking many years down the road, and at the next generation."

His dog, Annie, who accompanied him on his first outing of the day, chose to remain in the truck to sleep through the rest of his stops. When O'Brien opens his door, he hauls Annie toward his side to give me room to get in. Once I'm settled, he releases her and she curls up, half on my lap, half on the seat, for the ride home. As we bump across the field, I finger the dab of blue paint on her back.

Kathleen Hentcy works for the Vermont Department of Public service in the Consumer Affairs and Public Information division. She lives in Walden, Vermont.

Resource Guide

Consulting Foresters

NAME	COMPANY/TOWN/STATE	TELEPHONE
Peter Renzelman*	Alstead, NH	(603) 835-6939
Peter Rhoades*	Alstead, NH	(603) 835-2346
Peter Everts*	Everts Forest Management, Barnet, VT	(802) 592-3088
Bruce Barnum*	Wildwoods Woodland Management, Bath, NH	(603) 747-3416
Dana Blais*	Bath, NH	(603) 788-2770
Harry Burgess*	Bath, NH	(603) 838-5260
Dave Scanlan*	Clark Hill, Inc, Bow, NH	(603) 523-4838
Brooks McCandlish*	Bradford, NH	(603) 938-5354
Steve Hardy*	Green Mountain Forestry, Brattleboro, VT	(802) 257-1644
Ben Campbell	Forest Land Mgmt, Bristol, VT	(802) 453-5591
George Frame*	Feather Ledge Forestry, Bristol, NH	(603) 744-7823
Shaun Lagueux*	New England Forestry Consult., Bristol, NH	(603) 744-6548
Rick Evans*	Clark Hill Inc., Canaan, NH	(603) 523-4838
Paul Barbour*	Charlestown, NH	(603) 863-4909
Tim Buess	Blackhawk Forest Management, Chelsea, VT	(802) 685-3451
Robbo Holleran	Chester, VT	(802) 875-3021
Donald L Huffer	Huffer Forestry Assoc., Chester, VT	(802) 875-3092
Nina M Huffer	Huffer Forestry Assoc., Chester, VT	(802) 875-3092
Irwin Post	Good Wood, Ltd, Chester, VT	(802) 875-4102
Andrew R Sheere	Future Generations Forestry, Chester, VT	(802) 886-1699
Lee Stevens*	Stevens Forestry Corp., Claremont, NH	(603) 542-7617
Robert Bradbury*	Landvest, Inc., Concord, NH	(603) 228-2020
Pete Howland*	Conway, NH	(603) 447-5617
Virginia Barlow	Redstart Forestry, Corinth, VT	(802) 439-5252
Ben Machin	Redstart Forestry, Corinth, VT	(802) 439-5252
James Neil*	Connecticut Valley Timber, Cornish, NH	(603) 542-2912
Leo Maslan*	Cornish Flat, NH	(603) 542-2371
Clayton Platt*	Pennyroyal Hill Surveying & Forestry, Croydon, NH	(603) 863-0981
Kurt Zschau	New England Forestry Consult., Danville, VT	(802) 684-9900
Jeff Smith*	The Ecosystem Management Co., E. Thetford, VT	(802) 785-2615
Michael Batten	Batten's Forest Management, East Orange, VT	(802) 439-5094
Robert Burke*	Vermont Forestry Assoc., Inc., Fairlee, VT	(802) 333-4129
James Burnett*	Vermont Forestry Assoc., Inc., Fairlee, VT	(802) 333-4129
Gregory A Chase	Chase Forestry, Hartland, VT	(802) 436-2661
Andrew S Carlo*	Fountain Forestry Inc., Huntington, VT	(802) 434-5306
David Kent*	New England Forestry Consult., Keene, NH	(603) 357-0442
Jon Martin*	Laconia, NH	(603) 786-9544
Donald Frenette*	Lancaster, NH	(603) 788-2769
Colin Sutherland*	Lancaster, NH	(603) 788-2280
Eric Cole*	Lebanon, NH	(603) 448-2255
Randy Wilcox	Vermont Forest & Field Inc., Leicester, VT	(802) 247-6421
Dave Thompson*	Lincoln, NH	(603) 745-8821
Dick Boulanger*	Boulanger Consulting, Littleton, NH	(603) 444-6085
Steve Boulanger*	Boulanger Consulting, Littleton, NH	(603) 444-6085
Kevin Beattie	Londonderry, VT	(802) 824-4475
Martin Duffany*	Wagner Forest Management, Lyme, NH	(603) 795-2002
Ben Hudson*	Hudson Forestry, Lyme, NH	(603) 795-4535
John Skelly	Lyme, NH	(603) 795-4725
John Meyer	Bardill Land & Lumber Co., Montpelier, VT	(802) 223-6666
Jeremy Turner*	The Ecosystem Mgt. Co., New London, NH	(603) 526-8686
Tim Wallace*	River Edge Forestry, New London, NH	(603) 526-9290
Don Clifford*	North Woodlands Inc., Newport, NH	(603) 863-7947
Andrew Clifford*	North Woodlands Inc., Newport, NH	(603) 863-7947
Anita Blakeman*	Woodland Care Forest Mgt., No. Sutton, NH	(603) 927-4163
Josef Peterson	Timbercraft Forestry, N. Clarendon, VT	(802) 773-0370
Rose Beatty	Northfield, VT	(802) 485-8404
Leonard W Miraldi	Harwood Forestry Services Inc., Norwich, VT	(802) 649-1564
Quentin Mack*	JAQ Assemblies, Orford, NH	(603) 353-9240
John O'Brien*	O'Brien Forestry Services, Orford, NH	(603) 353-9857
Tony Lamberton	New England Forestry Consult., Pawlet, VT	(802) 325-6241
Mark D Riley	Vermont Forest & Field Inc, Pawlet, VT	(802) 645-0189
Terry Sheehan	TW Tree LLC, Perkinsville, VT	(802) 263-5621
Swift Corwin*	Calhoun Forestry, Peterborough, NH	(603) 924-9908
Frank Hudson	Not Just Trees, Pittsford, VT	(802) 483-2397
Nelson Blackburn	Plainfield, VT	(802) 476-6395
Brenda Brown*	All Seasons Forestry Consult., Plymouth, NH	(603) 536-5454
Ken Sutherland, Jr.*	Plymouth, NH	(603) 536-5556
Jim Roberts	Farms & Wilderness, Plymouth, VT	(802) 422-3770
Roy S Burton	Proctorsville, VT	(802) 226-7613
John McClain	New England Forestry Consult., Randolph, VT	(802) 728-3742
Carl Russell	Russell Forestry Service, Randolph, VT	(802) 234-5524
Klint Wigren	Natures Light, Randolph, VT	(802) 728-4251
Norman Arseneault	Rochester, VT	(802) 767-3853
Eben Beever*	Rumney, NH	(603) 744-5268
Bob Berti*	FORECO, Rumney, NH	(603) 786-9544
Tom Hahn*	FORECO, Rumney, NH	(603) 786-9544
Michael Powers*	Wagner Forest Management, Rumney, NH	(603) 786-2574
James (Jock) Harvey	Forestry Services, S. Londonderry, VT	(802) 875-2646
Alan Turner	Turner Forestry, S. Royalton, VT	(802) 763-5270
Charles Stabolepszy*	Forestry Objectives, S. Royalton, VT	(802) 889-3241
Joseph A Hryckiewicz	Vermont Evergreen, Springfield, VT	(802) 885-5511
Stephen D Kraft*	J & S Forest Mgt Services, Springfield, VT	(802) 885-4841
Brian Cutter*	Swift River Forestry, Tamworth, NH	(603) 323-8986
Ehrhard Frost*	Full Circle Forestry, Thetford Center, VT	(802) 785-4749
Paul Harwood*	Harwood Forestry Services Inc., Tunbridge, VT	(802) 356-3079
Markus Bradley	Redstart Forestry, Vershire, VT	(802) 685-4858
Wayne Young*	Wayne L. Young Forest Mgt., W. Swanzey, NH	(603) 357-3693
Tom Sweet	Hunger Mountain Forestry, Waterbury, VT	(802) 244-7344
Andrew Alexander	Wells River, VT	(802) 588-2012
Tracy Burns*	Pioneer Forestry Services, West Lebanon, NH	(603) 298-6564
Kathy Beland	Not Just Trees, West Rutland, VT	(802) 438-2017
David Birdsall	D W Birdsall Forestry, West Rutland, VT	(802) 235-2908
John Wiggin	White River Jct., VT	(802) 295-2336
Charlie Baylies*	Baylies Land & Timber PLLCo, Whitefield, NH	(603) 837-2774
Milan Miller*	Woodland Services, Williamstown, VT	(802) 433-5382
John Morse*	KEAR-WOOD Inc., Wilmot, NH	(603) 526-4047
Patrick Bartlett	Bartlett Forestry & Wildlife Inc., Woodstock, VT	(802) 457-4315
Mark Fogerty*	Chippers Inc, Woodstock, VT	(802) 457-5100
Mike Dannehy*	Woodsville, NH	(603) 747-2457

** Licensed to practice forestry in New Hampshire. Note that Vermont does not have licensing requirements for foresters.*

It is possible that this list does not include every consulting forester practicing in the Upper Valley. When hiring a forester, landowners are well advised to check credentials and references. Some foresters work for sawmills and other wood-buying companies. Ask a prospective forester to disclose if he or she would be representing the employer's interests or your interests in any potential sale of wood.

Loggers

In New Hampshire, loggers are certified. To confirm a logger's certification, call the NH Timberland Owners Association at (603) 224-9699.

In Vermont, there are two organizations involved in training and credentialing loggers: LEAP (802) 235-2908 (info also available at the Sustainable Forestry Initiative (802) 223-3441) and the Vermont Loggers Academy (802) 533-2187.

Conservation Organizations

Appalachian Trail Conference	Lyme, NH	(603) 795-4935
Audubon Society of New Hampshire	Concord, NH	(603) 224-9909
Cross Vermont Trail Association	Montpelier, VT	(802) 498-0079
Keeping Track	Huntington, VT	(802) 434-7000
Montshire Museum of Science	Norwich, VT	(802) 649-2200
New England Forestry Foundation	Orange, MA	(978) 544-1514
Northeast Organic Farmers Association	Richmond, VT	(802) 434-4122
Northern Forest Center	Concord, NH	(603) 229-0679
Northern Woodlands	Corinth, VT	(802) 439-6292
Society for the Protection of NH Forests	Concord, NH	(603) 224-9945
The Nature Conservancy (NH)	Concord, NH	(603) 224-5853
The Nature Conservancy (VT)	Montpelier, VT	(802) 229-4425
The Trust for Public Land	Montpelier, VT	(802) 223-1373
Upper Valley Land Trust	Hanover, NH	(603) 643-6626
Vermont Institute of Natural Science	Woodstock, VT	(802) 457-2779
Vermont Land Trust	Montpelier, VT	(800) 639-1709
Vermont Natural Resources Council	Montpelier, VT	(802) 223-2328
Vermont River Conservancy	Middlebury, VT	(802) 388-9277
Vital Communities	White River Jct., VT	(802) 291-9100
White River Partnership	Rochester, VT	(802) 767-4600

Conservation Commissions

Many towns in the Upper Valley have Conservation Commissions. Check with your town clerk to see if your town has one. For a complete list of towns in Vermont, call the Association of Vermont Conservation Commissions in Middlesex at (802) 223-5527. In New Hampshire, call NH Association of Conservation Commissions in Concord at (603) 224-7867.

Landowner Associations

New Hampshire Coverts	Malin Clyde	(603) 862-2166
NH Timberland Owners Association	Jasen Stock	(603) 224-9699
NH Tree Farm	Committee	(603) 224-9945
Vermont Coverts	Farley Brown	(802) 586-2250
VT Tree Farm	Kathleen Wanner	(802) 287-4284
Vermont Woodlands Association	Kathleen Wanner	(802) 287-4284

Government Offices

NEW HAMPSHIRE		
NH Dept. of Environmental Services	Concord, NH	(603) 271-3503
Wetlands Bureau		(603) 271-2147
NH Fish & Game	Concord, NH	(603) 271-3211
District 3 Conservation Officer	New Hampton, NH	(603) 744-5470
District 4 Conservation Officer	Keene, NH	(603) 352-9669
NH Division of Forests & Lands	Concord, NH	(603) 271-2214
Forest Rangers		(603) 271-2214
NH State Forester	Phil Bryce	(603) 271-2214
NH Dept. of Agriculture	Concord, NH	(603) 271-3551
Grafton County Extension Forester	Northam Parr	(603) 787-6944
Grafton County Agriculture Education		(603) 787-6944
Sullivan County Extension Forester	Chuck Hersey	(603) 863-9200
Sullivan County Agriculture Education		(603) 863-9200
VERMONT		
VT Dept. of Agriculture, Food, & Markets	Montpelier, VT	(802) 828-2500
VT Dept. of Environmental Conservation	Waterbury, VT	(802) 241-3800
VT Dept. of Fish & Wildlife	Waterbury, VT	(802) 241-3700
Fisheries or Wildlife Biologists	Barre, VT	(802) 476-0199
Fisheries or Wildlife Biologists	Springfield, VT	(802) 885-8855
Wildlife Habitat Incentive Program	Dave Adams	(802) 879-2330
Wildlife Habitat Incentive Program	Mary Beth Adler	(802) 885-8836
VT Dept. of Forests, Parks, & Rec.	Waterbury, VT	(802) 241-3670
VT State Forester	Steve Sinclair	(802) 241-3678
Orange County Forester	David Paganelli	(802) 476-0173
Windsor County Forester	Jon Bouton	(802) 296-7630
UVM Extension	Berlin, VT	(802) 223-2389
UVM Extension	White River Jct., VT	(800) 278-5471
U.S. GOVERNMENT		
Green Mountain National Forest	Rutland, VT	(802) 747-6700
Marsh-Billings-Rockefeller Nat. Hist. Park	Woodstock, VT	(802) 457-3405
Natural Resources Conservation Service Field Offices:		
Berlin, VT	Bruce Chapelle	(802) 828-4493
St. Johnsbury, VT	Timothy McKay	(802) 748-2641
Newport, NH	Scott Heckman	(603) 756-2988
Walpole, NH	Scott Heckman	(603) 756-2988
Woodsville, NH	Kathy Judd	(603) 747-2001
White River Junction, VT	Dana Young	(802) 295-7942
U.S. Fish and Wildlife Service	Turners Falls, MA	(413) 863-3070
U.S. Geological Survey	Pembroke, NH	(603) 226-7800
USDA Forest Service	Durham, NH	(603) 868-7600
White Mountain National Forest	Laconia, NH	(603) 528-8721

For information about the current use programs, here are two websites.
Vermont . . . . . www.vtfpr.org/resource/for_forres_useapp.cfm
New Hampshire . . . . . www.nh.gov/revenue/currentuse/currentuse.htm

A Place in
mind

By Mary Hays

When a man I'd never met came to help widen our driveway a few years ago, I was shocked to hear him refer to Kit's Orchard. He was giving his partner a complicated set of driving directions: two miles past this place, four miles past that place, the places being named after people long gone. One of the places had belonged to my family and I said so. He wasn't familiar with the family, he said, but there was a place up in back there where he'd often gone hunting as a boy. Everybody called it Kit's Orchard, he said, though he'd no idea who Kit was. I explained that she was my mother's aunt. "Well, we just called it that," he said, as if it were a coincidence.

As we talked about it, I imagined each of us conjuring up the same images from our childhoods: an unexpected clearing in the woods, twisted apple trees, sunlight, silence. In that moment, I felt a dazzling kind of intimacy with this stranger.

As a piece of property, Kit's Orchard has changed hands since I spent time there. It has probably been 50 years since Aunt Kit walked there, a hundred years since Kit's mother walked there. In our family we always called it the Upper Orchard, differentiating it from the smaller orchard close by the house, a more public spot used for family events, a place where you might go if you wanted to be easily found.

The Upper Orchard, by comparison, was a solitary place where you could hide. It was a refuge, and at 14 I was a refugee, escaping the horrors of family life. I was not only treated like a child, but frequently assaulted with reprimands over my bad manners, impatience, self-indulgence, disrespect, vanity, talking-too-loud, and never-putting-things-away. I was, in short, 14 and altogether humiliated by my circumstances in life.

My favorite time to climb the hill was just before sunset, after the cows had gone home. A neighbor's Holsteins grazed there in the daytime, clumps of them resting under the umbrella-shaped black walnut tree, once in the morning, once in the afternoon. I was afraid of them, and if I was ever in the pasture when they were there, I kept a careful distance. It seemed to me that they watched me with an unreasonable intensity, that they were putting two and two together and they didn't quite like what it added up to.

Over the years the cows had worn a narrow dirt path that zigzagged in long loops up the hill, and I followed this. Then came the steep part of the hill, then the stone wall, the scratchy fir trees, the wellhouse, the shadowy, leaf-strewn path through the maples and birch, and at last, the sudden light of the orchard.

I don't know what ancestor, or what pre-ancestor, planted the 20 or so apple trees, but they were old. They still bore, though many of their limbs drooped to the ground, barren and stiff. The apples were tart, delicious, wormy. You had to nibble warily, the way I imagined the deer nibbled before they bounded away at my approach.

But I didn't go there to eat, and I didn't go there to watch wildlife. I went there to be acknowledged, to be *heard*, though I had only the vaguest notion of what presence I was communing with, and complaining to. God, perhaps, given form by the strangely shaped trees, the soft wind on the hill, the stones that stayed put forever, the small creatures that moved in secret – perhaps even the orchard's ghostly planter.

I was, oddly, not afraid. The orchard was a safe place for me, though I was a timid child. It was a place of transformation; it lent me courage. It gave me grace.

And it was mine alone, or so it seemed. As I grew older I came to realize that other family members spent time there, too. My mother went there on purpose, I discovered, because of its beauty. Even Aunt Kit, who it turned out had not worn thick stockings and lace-up shoes since birth, had played there as a child.

Once, after my parents were gone and I had come back to take care of some repairs, I was stopped in the midst of my chores by the sight of the late-September sun filtering through the yellow leaves of the maple in front of the house. It reminded me suddenly of the light in the orchard, which I hadn't thought about in years. There was just enough time before dusk, and I threw on my jacket and ran up the hill.

As I approached the orchard, I saw a boy get up and move quickly away through the trees. I was surprised; I had never met up with anyone there. At first, I assumed he'd been scouting for deer, and was shy of being challenged. But then I thought, perhaps I had disturbed him in his refuge. He looked to be about 14.

Mary Hays is the author of the novel, *Learning to Drive*. She lives in Corinth, Vermont.

The Place You Call Home: A Guide to Caring for Your Land in the Upper Valley

Was made possible through the generous financial support of the following:

Wellborn Ecology Fund of the New Hampshire Charitable Foundation – Upper Valley Region

French Foundation

Northern Forest Partnership Small Grants Program*

Connecticut River Joint Commissions

New Hampshire Division of Forests and Lands and University of New Hampshire Cooperative Extension

New Hampshire Fish and Game Department

Vermont Department of Forests, Parks and Recreation

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Merchants Bank

Vermont Department of Fish and Wildlife

Wagner Forest Management

Wells River Savings Bank

**The Northern Forest Partnership Small Grants Program is supported by the USDA Forest Service, The Northern Forest Center, and the North East* State *Foresters Association.*

About This Guide

The Place You Call Home: A Guide to Caring for Your Land in the Upper Valley is an "owner's manual" for people who own land in the Upper Valley. It has been produced by the staff of Northern Woodlands in Corinth, Vermont, with the generous support of the New Hampshire Charitable Foundation's Wellborn Ecology Fund and the local organizations and businesses listed inside the back cover.

Our intended audience includes everyone in the Upper Valley who owns 10 or more acres of land and anyone who believes that, with careful stewardship, the landscape that makes this place so special can support and sustain us for many generations to come. For more information or to request additional copies of this guide for a friend or neighbor, visit www.northernwoodlands.org or call (800) 290-5232.