



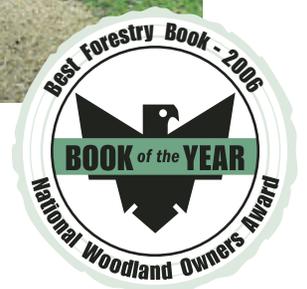
# FOREST RESOURCE MANAGEMENT

A Landowner's Guide  
to Getting Started



Natural Resource, Agriculture,  
and Engineering Service

Cooperative Extension



## Acknowledgments

The authors thank the following peer reviewers whose thoughtful comments helped to improve the accuracy and usefulness of this book: David Apsley, The Ohio State University; Karen Bennett, University of New Hampshire; Robert Lee Edmonds, University of New Hampshire; James Oehler, New Hampshire Fish and Game Department; Mark Vodak, Rutgers University; Robert Tjaden, University of Maryland; Jonathan Kays, Maryland Cooperative Extension. The authors also appreciate anonymous reviews provided through NEFREC, the Northeast Forest Resources Extension Council.

The authors thank the following for agreeing to let their photos or illustrations be used in this book: Tom Barnes, Department of Forestry, University of Kentucky; Robert L. Beyfuss, Cornell Cooperative Extension; Chris Carlson, North Carolina Division of Forestry; Paul D. Curtis, Department of Natural Resources, Cornell University; Ricky Layson, Forest Resource Consultants, Inc., [www.forestryimages.org](http://www.forestryimages.org); Jillian Liner, Audubon New York; Stephen J. Morreale, Department of Natural Resources, Cornell University; Charles R. Smith, Department of Natural Resources, Cornell University; Christina Rockwell, Natural Resources Student, Cornell University; New Jersey Division of Fish and Wildlife; and the Ruffed Grouse Society.

The illustration on page 37 was adapted from Figure 2 in *Enhancing Wildlife Habitats: A Practical Guide for Forest Landowners*, NRAES-64. Diana Bryant, Department of Natural Resources, Cornell University, prepared the illustration of a rolling dip for this book.

The book was copy edited by Marty Sailus, NRAES Director, and designed by Joy Freeman, [www.pagesbyjoy.com](http://www.pagesbyjoy.com). Additional production support was provided by NRAES editors Cathleen Walker and Jeff Popow.

Support for this project was provided through the Renewable Resources Extension Program in partnership with the USDA CSREES. Institutional support was provided through Cornell University College of Agriculture and Life Sciences, Cornell Cooperative Extension, and the Pennsylvania State University School of Forest Resources Cooperative Extension.

**On the Cover:** A 250-year-old oak tree at Huntington Wildlife Forest in Newcomb, NY. A red eft (terrestrial phase of the eastern newt) at Cornell's Arnot Forest, Van Etten, NY. A sugar maple tree with two sap collection buckets attached in Greene County, NY. And, a hiking path at Cornell's Arnot Forest. The sugar maple picture was provided by Robert Beyfuss and the other three were taken by Kristi Sullivan.

# Forest Resource Management

## A Landowner's Guide to Getting Started

Written by

**Kristi L. Sullivan,**

Extension Associate—Wildlife Conservation  
Cornell University

**Peter J. Smallidge**

State Extension Forester  
Cornell University

**James C. Finley**

State Extension Forester  
The Pennsylvania State University

**Michael G. Jacobson**

Associate Professor of Forest Resources  
The Pennsylvania State University

*Natural Resource, Agriculture, and Engineering Service (NRAES)  
Cooperative Extension  
PO Box 4557  
Ithaca, New York 14852-4557*

---

---

NRAES-170  
March 2006

© 2006 by NRAES (Natural Resource, Agriculture, and Engineering Service).  
All rights reserved. Inquiries invited.

ISBN-13: 978-1-933395-01-2  
ISBN-10: 1-933395-01-X

Library of Congress Cataloging-in-Publication Data

Forest resource management : a landowner's guide to getting started / written by Kristi L. Sullivan... [et al].  
p. cm. — (NRAES ; 170)  
ISBN-13: 978-1-933395-01-2 (pbk.)  
ISBN-10: 1-933395-01-X (pbk.)  
1. Woodlots—Northeastern States—Management. 2. Forest management—Northeastern States.  
3. Woodlots—Management. 4. Forest management. I. Sullivan, Kristi L., date. II. NRAES (Series) ; 170.

SD387.W6F673 2006  
634.9'9—dc22

*Requests to reprint parts of this publication should be sent to NRAES.  
In your request, please state which parts of the publication you would  
like to reprint and describe how you intend to use the material. Contact  
NRAES if you have any questions.*

To order additional copies, contact:  
Natural Resource, Agriculture, and Engineering Service (NRAES)  
Cooperative Extension  
PO Box 4557, Ithaca, New York 14852-4557  
Phone: (607) 255-7654 • Fax: (607) 254-8770  
E-mail: [NRAES@CORNELL.EDU](mailto:NRAES@CORNELL.EDU) • Web site: [WWW.NRAES.ORG](http://WWW.NRAES.ORG)

---

---

# Contents

<b>I</b>	<b>Introduction</b> .....	1
	You and Your Forest .....	1
	Forests are Important .....	3
	Forests are Constantly Changing .....	4
	<b>QUIZ:</b> Forest Ecology .....	5
<b>II</b>	<b>Developing a Vision and a Plan</b> .....	6
	Seek Professional Assistance .....	7
	Working with a Forester .....	7
	Engaging Other Natural Resource Professionals .....	8
	<b>SIDEBAR:</b> Choosing a Forester .....	8
	Selecting a Logger .....	9
	Get to Know Your Forest .....	9
	Determine Your Objectives and Goals .....	11
	Formulate a Ten-year Activity Schedule .....	11
	Review Your Plan .....	12
	<b>SIDEBAR:</b> Stewardship Planning Summary .....	12
	<b>ACTIVITY:</b> Pacing .....	13
	<b>ACTIVITY:</b> Get to Know Your Property .....	14
	<b>ACTIVITY:</b> Discover Your Ownership Priorities .....	16
	<b>ACTIVITY:</b> What to Ask Your Forester .....	18
	<b>QUIZ:</b> Forest Stewardship Planning .....	19
<b>III</b>	<b>Exploring the Possibilities</b> .....	21
	Shaping the Character of Your Forest .....	21
	Managing a Mature Stand .....	21
	<b>SIDEBAR:</b> High-grading .....	24
	Tending a Middle-aged Stand .....	25
	Renewing a Forest .....	27
	Enhancing Habitat for Wildlife .....	30
	Benefits of Wildlife .....	30
	Wildlife Basics .....	31
	Understanding Wildlife Habitat .....	36
	Succession and Wildlife Habitat .....	36
	<b>SIDEBAR:</b> Habitat Complexity .....	36
	Setting Your Wildlife Objectives .....	38
	Species of Special Concern .....	38
	Featured Species .....	39
	Groups or Guilds .....	39
	Species Richness .....	40

---

Managing for Your Enjoyment: Aesthetics and Outdoor Recreation.....	40
Enhancing the Beauty of Your Forest .....	40
<b>SIDEBAR:</b> Controlling Public Access .....	42
Increasing Recreational Opportunities.....	42
Agroforestry Options .....	43
Producing Maple Syrup .....	43
Forest Farming.....	44
Alley Cropping.....	44
Riparian Buffers.....	44
Windbreaks.....	45
<b>ACTIVITY:</b> Your Forest Resources.....	46
<b>ACTIVITY:</b> An Eye For Wildlife.....	48
<b>ACTIVITY:</b> Agroforestry .....	50
<b>CROSSWORD:</b> Forest Management .....	51
<b>QUIZ:</b> Wildlife Management.....	52
<b>QUIZ:</b> Aesthetics and Outdoor Recreation .....	53
<b>CROSSWORD:</b> Agroforestry as an Option .....	54
<b>IV Protecting Your Soil, Water, and Forest Resources .....</b>	<b>55</b>
Riparian Buffers .....	55
<b>SIDEBAR:</b> Riparian Buffer Best Management Practices .....	56
Controlling Water on Roads and Trails .....	57
<b>SIDEBAR:</b> Road and Trail Best Management Practices.....	57
Timber Regeneration and Harvest BMPs .....	59
Regeneration BMPs.....	59
Harvest BMPs .....	59
BMPs for Pesticide Application .....	60
<b>ACTIVITY:</b> The Quest for Water .....	61
<b>QUIZ:</b> Water Management .....	62
<b>V Economic Issues .....</b>	<b>64</b>
Does Money Grow on Trees? .....	64
Timber Taxation.....	65
Income Taxes .....	66
Estate Taxes and Planning.....	66
<b>SIDEBAR:</b> Three Steps to Estate Tax Planning .....	67
Property Taxes.....	67
<b>SIDEBAR:</b> Preventing Timber Theft .....	68
<b>ACTIVITY:</b> Economic Issues.....	70
<b>QUIZ:</b> Economic Issues .....	71
<b>VI Summary of Action Steps.....</b>	<b>72</b>
<b>VII Appendices</b>	
Appendix A: References.....	73
Appendix B: Web Sites for Forest Owners.....	75
Appendix C: Sources of Assistance (by State).....	76
Appendix D: Glossary of Forest Stewardship Terms .....	79
Appendix E: Keys to Quizzes and Puzzles.....	83

---

---

# Introduction

As a forest landowner, you hold the key to providing healthy forests for generations to come. In the Northeast, private landowners own nearly 70 percent of the region's 170 million acres of forests. This region includes some of the most diverse, productive forests in America. Whether your forestland supports the cool, moist spruce and fir forests of northern Maine, the towering maples, oaks, and cherries of New York's and Pennsylvania's rich soils and temperate climate, or the intriguing pines and Atlantic white cedars of southern New Jersey and Maryland, your woodlands offer more than a pleasant environment for work and play. Forests protect our air and water quality, provide habitat for scores of wildlife species, offer us numerous recreational opportunities, and make a vital contribution to the region's economic health. Because most forestland in the Northeast is privately owned, the future of forests in our region depends upon the collective decisions of private landowners like you. Private forest owners make decisions, and thus manage their land. Management is beneficial because it helps owners achieve their goals. We manage our bank accounts, we manage people at work, and we manage our forestland. Good management

decisions require an understanding of the resource being managed. This guide will help you understand your forest and make decisions about your land.

## YOU AND YOUR FOREST

You can realize your full potential as a steward of your forest by using this guide, entitled *Forest Resource Management: A Landowner's Guide to Getting Started*. Forest stewardship means setting and achieving objectives for your land while maintaining its integrity for future generations. You have the ability to shape your forest to meet your objectives. As a steward, and with the guidance of this manual, you will learn how different features of your property may affect your options and the



Kristi L. Sullivan

*Private landowners hold the key to providing healthy forests for generations to come.*

---

methods you can use to reach your objectives. You will learn how to determine your priorities and establish goals for your land. You will discover compatible goals for the same acre and goals that need attention at different places or times on your property. For example, many types of recreation are compatible with other forest management activities. Following a timber harvest, a properly established skid trail provides a great trail for hiking, horseback riding, or skiing. More importantly, the same skid trail gives you access where you might not otherwise have gone! Managing your forest to provide habitat for a variety of wildlife species enhances the opportunity to view or photograph animals. Some forms of recreation can even help you achieve other goals. For instance, deer hunting can help keep populations in balance with their habitat, allowing wildflowers to flourish. Wildflowers in turn provide habitat for insects eaten by forest birds. As you see, forest stewardship emphasizes the variety and interaction of the many qualities of your property.



Kristi L. Sullivan

*Wildflowers, like purple trillium (Trillium erectum), provide enjoyment and add diversity to our forests.*

Not all goals are compatible, however. Developing a park-like appearance with little or no vegetation in the understory may limit your opportunity to see a variety of bird species. The ability to enjoy peace and solitude may conflict with uses such as snowmobiles or all-terrain vehicles (ATV). Cutting trees will favor some plant and animal species but

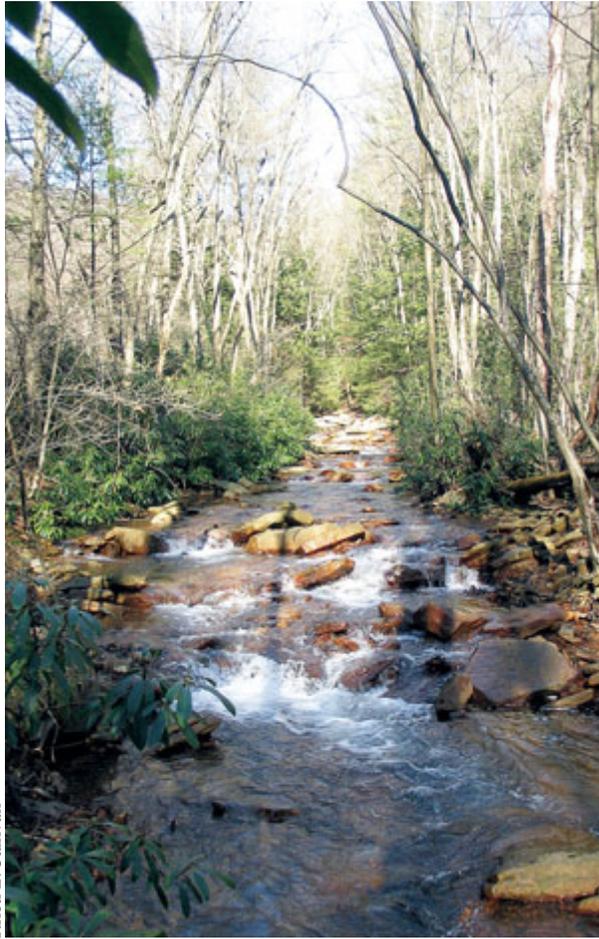
may exclude others. You may meet many different stewardship objectives on your property, but depending on the specific circumstances, you may not be able to have them all.

Use this guide to help develop your objectives and priorities based on realistic possibilities. Read the information provided, then take the quizzes and complete the activities. Develop a plan to serve as a guide to achieving your objectives. Consider joining a local forest landowner's association so you can



Paul D. Curtis

*When deer are abundant, they can limit plant diversity in the forest, and affect the habitat of other wildlife species.*



Kristi L. Sullivan

*Forests provide us with clean water.*

stay informed about the issues important to you. Work with your local cooperative extension office and state forestry agency for educational and technical assistance. Above all, learn as much as you can and have fun!

## FORESTS ARE IMPORTANT \_\_\_\_\_

Forests provide many environmental, economic, and aesthetic benefits we simply cannot live without. They provide many critical ecosystem services, protecting soils from erosion, purifying our water, and improving air quality. For example, for every ton of new wood that grows, trees remove about 1.47 tons of carbon dioxide from the air, and produce 1.07 tons of life-giving oxygen. The diversity of plants and animals that inhabit our forestlands

across the region represents a wealth of cultural, medicinal, and environmental resources that we are just beginning to discover. The health of our forests is a prime indicator of the health of our total environment.

Forests are vital to our regional economy. Forest-based recreation like hunting, fishing, viewing fall foliage, and wildlife watching, generates millions of dollars, much of it in small communities with limited job opportunities. Timber harvest and processing in the Northeast United States employs over half a million people and generates over \$20 billion in income. This makes the Northeast a significant player in national and international markets. Visit [www.na.fs.fed.us](http://www.na.fs.fed.us) for more information on forests in the Northeast.

Most people recognize the human need for the natural beauty and peace of mind that forests provide. As the pace of our lives and the demands on our time seem only to increase, the value of time spent in the forest—whether we camp, hunt, hike, watch wildlife, or simply collect our thoughts—becomes more important. The forest also fulfills the aesthetic needs of those who simply enjoy viewing the wooded landscape from afar, as well as those who feel good just knowing the forest is “there,” even if they never venture into it.



Peter J. Smallidge

*The forest industry is a vital part of the economy in the Northeast.*



Kristi L. Sullivan

*Walking in the forest gives people the opportunity to relax, recharge, and enjoy time “away from it all.”*

## **FORESTS ARE CONSTANTLY CHANGING**\_\_\_\_\_

The forest has many parts that, together, make up the forest ecosystem. Because each part—such as the birds, the trees, the insects, the soil, etc.—continuously changes, the whole forest continues to change. Thus, the forest ecosystem is dynamic—as a result, change is inevitable. This continuous change provides opportunities and challenges for forest owners to achieve their objectives.

In general, plant communities progress in a fairly predictable manner known as forest succession. If an open field remains undisturbed, shrubs and saplings will seed in the field over time. Eventually, the forest will change from an early-successional forest to a mature forest. As the forest matures,

early-successional and short-lived species like aspen, pin cherry, and black locust will die leaving the later successional and shade tolerant species to dominate. The rate of forest succession on any one property is difficult to predict. The rate varies depending on a variety of factors, such as:

- species that colonize the field
- soil types and depths
- deer abundance
- groundwater patterns
- steepness and directional slope of the terrain
- various microbial and other invertebrate populations in the soil
- presence and fluctuating population sizes of numerous species of fungi, plants, and animals

- regional climate
- microclimate on the forest floor
- conditions that exist in adjacent or nearby areas
- human activity and past land use
- previous timber harvests
- natural disturbances such as wind, fire, ice, and disease

- the never-ending, cyclic process of growth, aging, death, decay, and renewal.

Although you cannot influence most of these factors, remember that they may vary from one part of your property to another and thus affect how easily you can achieve an objective. Where possible, work with, not against, these natural conditions and processes.

## FOREST ECOLOGY

## QUIZ

*Circle the correct answer.*

- Forest landowners hold the key
  - To providing healthy forests for generations to come
  - To the stars
  - To providing jobs for everyone
- Forest-based recreation like hunting, fishing, and wildlife watching, generates
  - Hundreds of dollars in revenue
  - Thousands of dollars in revenue
  - Millions of dollars in revenue
- Forests provide many important ecosystem services including
  - Protecting soils from erosion
  - Improving our air quality
  - Maintaining clean water
  - All of the above
- Plant communities grow and change in a predictable order. This order is known as
  - The Natural Way of Life
  - Forest Succession
  - Forest Ecology
- Late-successional species tend to be
  - Shade tolerant
  - Short-lived species
  - Weak
- The rate of forest succession can vary from one part of your property to another.
  - True
  - False
- A change in any of the parts that make up the forest (birds, insects, plants, etc.) can change the entire forest ecosystem?
  - True
  - False
- The Northeast is not a significant contributor to forest-based products and employment in the United States and in the World.
  - True
  - False

*See the key to this quiz on page 83*

---

# Developing a Vision and a Plan

Careful planning will optimize the short-term and long-term benefits of forest management activities. Management activities that take place without planning can produce undesirable environmental, economic, and aesthetic consequences. Unfortunately, you and your family are the ones most likely to suffer the consequences of poor planning. By planning, you can become better informed about the values of your forestland, define what you can attain from your land, and engage resource professionals in helping to plan for the short-term and long-term future of your forest.

A forest stewardship plan is your road map to responsible forest management. Developed in cooperation with a forester, it is a guide that tells you what your resources are, what condition they are in, and what you can do to help you achieve your ownership goals. It helps you consider your short- and long-term objectives; analyze the capabilities, limitations, and unique features of your land; look at how your land fits into the surrounding landscape; and evaluate a wide range of the environmental and financial benefits and consequences of management options.

Your plan need not emphasize timber resources but should emphasize the variety of resources and aspects of long-term forest management that relate to your interests as the owner. Your interests may include soil and water quality, riparian and wetland areas, wildlife and fish habitat, outdoor recreation and aesthetics, maintenance of biological diversity (the different varieties and variations of plants and animals), and threatened or endangered species.

If you are interested in all the benefits your forest has to offer, you will need a plan that describes your forest's present condition, lists recommendations,

and describes the desired forest condition or how the forest should look in the future. The plan should consider the types and sizes of trees, wildlife habitat, transportation layout, recreational opportunities, and financial returns.

A plan provides many important advantages to a landowner.

1. It is a guide to what you have, what you want to do with your property, and when you want to take actions.
2. If the plan meets the US Forest Service Federal standards for a stewardship plan you may be eligible for additional technical or cost-share assistance, if any is available. Sometimes, cost-share assistance is available to help in plan preparation or a plan may be developed free of charge by your state forestry agency. To inquire about assistance in your state, contact the private land coordinator for your state forestry agency (Appendix C).
3. A plan that meets state standards may allow you to receive benefits under your state's forest tax law, if one exists.
4. A plan can document the extent to which you are an active participant in growing the forest and thus define your role for IRS tax purposes. There may be tax advantages to you for being an active manager with a profit objective.

There are five basic steps to developing a forest stewardship plan. The order of the first three steps may vary depending upon how familiar you are with the resources on your property and how certain you are of your objectives.

- Seek professional assistance.
- Get to know your forest.
- Determine your objectives and goals.
- Formulate a ten-year activity schedule.
- Review your plan.

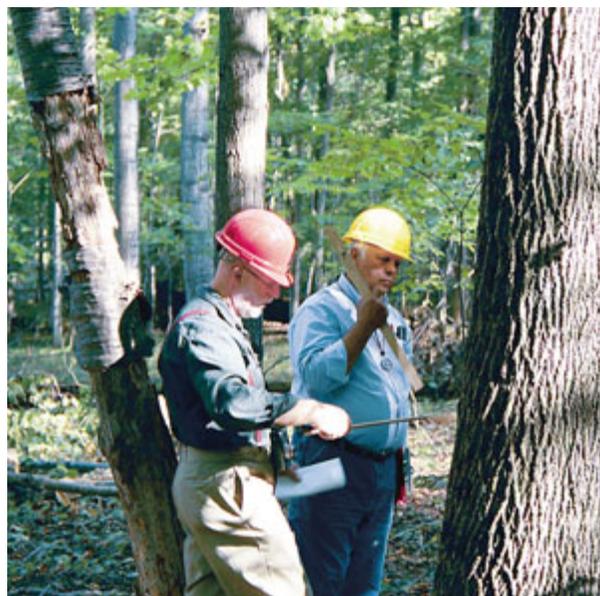
## SEEK PROFESSIONAL ASSISTANCE

It is a rare forest owner who can do all that needs to be done without assistance from others. This section describes some of the professionals who can help you sort through your objectives, develop a plan to serve as your road map to achieving those objectives, and provide technical assistance along the way. Special considerations apply to selecting the various types of professionals. Regardless of the professional, you must clearly communicate what you want them to do. Often, if you can walk with them in the woods you can better express your desires. They work for you (or should clarify if they do not) and should accommodate your requests or help you understand other more suitable options you may not have considered. Problems or frustrations with services often happen because of poor communication, vague contracts, and too many assumptions.

### *Working with a Forester*

Forestry professionals are an important part of the forest management process. While we have all spent time walking in and enjoying various aspects of forests, forests are complex in their function and diverse in what they have to offer. Just as you seek assistance from professionals with other complex tasks, a forester helps you efficiently complete your tasks and pays attention to your objectives. A forester can help you develop a stewardship plan that addresses your ownership objectives. Foresters can detail the resources of your forest and prescribe how to manipulate them should you elect to have a harvest.

A landowner who finds the right forester will better and more easily achieve her/his ownership



Peter J. Smallidge

*A forester can provide technical assistance and help you develop a forest stewardship plan for your property.*

goals, will typically receive more net profit, and will have a healthier forest remaining following a harvest than a landowner who tries to conduct a harvest without a forester. With current prices, a forester's advice can increase income by thousands of dollars.

Foresters fall into one of four categories:

#### **Public foresters**

- Are employed by the state forestry agency.
- Provide assistance free of charge.
- Help landowners write forest stewardship plans.
- Provide technical assistance with forest improvement, tree planting, timber management, forest health issues, erosion control, and timber contracts.
- Connect landowners with cost share assistance, if available.

#### **Private consulting foresters**

- Provide technical assistance (for a fee) with forest improvement, tree planting, timber management, forest health issues, erosion control, and timber contracts.

- 
- Determine the value of your timber and carry out timber sales.

#### **Industrial foresters**

- Work for a forest industry (a sawmill for example) and offer services to forest owners to generate timber and other forest products for their employer.

#### **Extension foresters**

- Offer local education programs and publications.
- Provide information on timber and non-timber forest products, wildlife, and rare plants.

Outside the categories of foresters are people who call themselves “foresters,” but lack the education and experience to provide the services you need. These individuals, often called “timber brokers” by others, will assist with selling timber, or will buy your timber, but they do not typically concern themselves with maintaining the integrity of your forest, managing your forest, or the objectives you have for your land.

Select a forester based on a combination of factors, including:

- educational background
- work experience
- demonstrated commitment to sustainable practices
- references
- visits to her/his previous jobs
- involvement in continuing education
- involvement in landowner education programs
- participation in their professional forestry society
- certification through a professional society or independent organization
- her/his personal interactions with you.

These factors can help you determine the forester’s commitment to helping you achieve your ownership objectives and sustain your forest resources. Price for services is an issue, but this

### **Choosing a Forester**

To choose the right forester for you, talk to several individuals. Ask for a resume and references from other landowners. Contact the references to make sure they were satisfied with the forester’s work. A good, and inexpensive, first step is to contact a state forester, Extension forester, or Cooperative Extension educator. They can direct you to the right type of forester based on your needs, and may be able to provide a list of foresters in your area. If your state requires that foresters are licensed, contact your State Board of Licensure.

is a secondary factor after you are satisfied with the other factors. Would you want a doctor who does not know the latest techniques, who is not aware of the specific symptoms of a new disease, or who does not support their professional society? The best way to accumulate the information needed to evaluate several foresters is to write down what you want the forester to do based on your objectives, then ask several foresters to submit a letter of intent or brief proposal outlining the services they would provide and for what price. Foresters who are eager to serve landowners will respond to such a request. Foresters unwilling to invest time into this type of a process probably should not be in your employ.

### **Engaging Other Natural Resource Professionals**

If your primary goals and objectives are wildlife-related, you may also want to enlist the help of other natural resource professionals, such as a wildlife biologist. A wildlife biologist can help you think through your wildlife management objectives and develop prescriptions to manage wildlife habitat. He/she should help you safeguard any rare, threatened, or endangered animal species on your property. To locate a wildlife biologist, contact your

---

state wildlife agency or cooperative extension. You can also locate certified wildlife biologists in your area by visiting The Wildlife Society's web site at [WWW.WILDLIFE.ORG](http://WWW.WILDLIFE.ORG). You can search for biologists by state by clicking on "Certification Directory." Although not all Certified Wildlife Biologists do private consulting, this site is a good first step to finding someone in your area.

Professionals with your county or state cooperative extension system specialize in educational programs and can often assist you with a variety of technical questions. Some cooperative extension educators will visit your property and give guidance on topics such as forest farming, maple syrup production, or other natural resource based enterprises. All cooperative extension educators can help you find information and educational resources even if they do not provide site visits. Contact your local cooperative extension office to find out about forestry, wildlife, and other natural resource programs in your area.

Finally, other agencies such as Soil and Water Conservation Districts and the Natural Resource Conservation Service can assist with many soil, water, wildlife and other natural resource needs. For example, your soil and water district office is the place to obtain aerial photos, topographic maps, and soils information.

### **Selecting a Logger**

Selecting a skilled logger ensures that harvesting happens with the care and safety it deserves. A logger is a person who cuts or harvests timber. In most states, loggers have opportunities to participate in continuing education programs that help them operate in your woods with more efficiency, higher levels of safety, and with a solid understanding of how harvesting affects the interactions of plants and animals. Your forester should be familiar with all the local loggers and should be able to refer you to a logger who has demonstrated her/his skills. Typically, each logger has a certain type of machinery, a style of doing business, and markets where they

sell sawlogs or pulpwood. Thus, one logger will not serve the needs of all forest owners—find the one that is best for you and your property.

### **GET TO KNOW YOUR FOREST** \_\_\_\_\_

One of the first steps to developing a forest stewardship plan is to get to know your forest and the resources you have available to you. One of the best ways to get to know your forest is to map, inventory, and evaluate your resources. Your plan should include a set of maps that delineate the boundaries of your property and illustrate natural features.

A topographic map (U.S. Geological Survey map) or aerial photograph can be useful for looking at the general habitat features that comprise your land and the way in which your property fits into the surrounding landscape. The soil and water conservation district office or the Farm Services Agency in your county or area often has aerial photos and topographic maps for you to view and order. Aerial photos and topographic maps are available online at: [HTTP://TERRASERVER-USA.COM](http://TERRASERVER-USA.COM). A plat (tax) map, often available at your county courthouse or town office, will illustrate your property boundaries and show ownership of adjacent properties. However, typically tax maps are not as accurate as survey maps.

Using maps and aerial photos, you can work with a forester to delineate management units, or stands, that reflect vegetation types, land-use history, and unique features. The forest stand is the smallest unit recognized in forest management. Each stand is an area of forest with similar species composition, age, and site conditions. Stands can range in size from a few to dozens of acres. A stand can be pure (at least 80 percent of the dominant trees are of one species) or mixed. It also can be even-aged (all the trees in the stand are approximately the same age) or uneven-aged (trees in the stand are of at least three distinct ages). In at least one respect, trees are like people—larger diameter trees are not necessarily older than smaller diameter trees. Larger trees may have slightly better soil conditions, better

*Topographic maps can be useful tools for looking at the features that comprise your land, and the way in which your property fits into the surrounding landscape.*



---

genetics, or better moisture. The composition, the species present, the structure, and the variety of tree diameters and heights, depend on stand age, local conditions, and past history. A pure, even-aged stand like a plantation has the simplest structure, while a mixed-species, uneven-aged stand is the most complex. Composition and structure affect what you can do with your forest and what wildlife may use it.

The “Overview of Your Property” activity at the end of this chapter will help you to get to know your property and begin the inventory process. After you complete the activity, share it with your forester to complete the inventory process. Your forester can systematically walk through each stand noting (inventorying) the type and condition of the resources. The resources to measure or record depend on your objectives. Some of the resources to note include the types and sizes of trees, woody shrubs, and herbaceous plants; landscape features like soil types, amount of rocks, and slope; wildlife species present, what they eat, and where they nest; location of streams, seeps, wetlands, and vernal pools; and special habitat features like caves. You should collect similar information in each management unit. A forester or other resource professional(s) can evaluate the data in the context of your objectives.

During the inventory process, your forester should contact your state natural heritage program to learn whether any threatened or endangered species are recorded for your property or nearby areas. Contact information for your state heritage program can be found online at: [WWW.NATURESERVE.ORG](http://WWW.NATURESERVE.ORG). Click on “Visit Local Programs” and search for the program in your state.

If a species of concern could be present on your property, a field check might be appropriate. If the species is found on your property, management recommendations can be developed and incorporated into the stewardship plan. The presence of a species of concern probably will not preclude management, but it may require some consideration to

manage the species’ habitat in combination with your other ownership goals.

You and your forester should evaluate the resource information together. Your forester will then use it as the basis for recommending the steps you can take to achieve your goals.

## **DETERMINE YOUR OBJECTIVES AND GOALS**\_\_\_\_\_

The most important part of your plan is a statement of your ownership objectives. Your forest can provide you with many benefits. Most owners have multiple goals. For instance, do you want your forest to provide periodic timber income? Provide wildlife habitat? Support a variety of plants and animals? Supply firewood? Or just provide an attractive, peaceful place to spend time? Your forest’s existing conditions (tree size, age, health, etc.), combined with management actions you take, will shape your forest’s future and affect your options. Use the worksheet at the end of this chapter to help you identify and prioritize the goals you have for your forest. Keep these priorities in mind while developing both long-term (> 10 year) goals that are general in nature, and short-term, targeted objectives with specific practices and timetables.

## **FORMULATE A TEN-YEAR ACTIVITY SCHEDULE**\_\_\_\_\_

Because you probably will not be able to achieve all your goals right away, you need a step-by-step schedule, starting with a ten-year activity schedule. This is an action-oriented schedule of practices or projects to meet your goals. The practices should help you move towards your goals and enhance your resources. Be realistic in what you or people you hire can accomplish in a given time period.

Practices might include restoring an eroded streambank to improve water quality and fish habitat, or timber harvesting to increase the health and vigor of your forest, generate income, and improve habitat for certain wildlife species. There is a cost and benefit to each practice. For example, if you

---

### Stewardship Planning Summary

- Think about what you want and need from your property during the current year, in five years, and in ten years. Develop some preliminary goals and objectives.
- Contact your state forestry agency for their input on the planning process.
- Mark and maintain property boundary lines.
- Inventory resources on the property, including general plant/tree communities, water resources (streams, spring seeps, wetlands, vernal ponds), soils, and unique areas (endangered, threatened, or rare species habitat, rock outcroppings, caves, notable views or vistas). Be aware of how the resources on the property fit in with the surrounding landscape.
- Work with a natural resource professional to develop realistic objectives based on the resource inventory and the amount of time and money you have available to devote to your land. Prioritize your goals for current versus future action.
- Consider the effects of planned activities on surrounding properties. Create a written management plan based on the resource inventory and landowner objectives. Include a map showing stands or management units and a timetable for completion of recommended activities.

choose to harvest only small trees on your property to maintain a component of big trees for aesthetic reasons, the management activity will cost you money and you probably will not have those wildlife species on your property that require thick under-story cover. You should also consider the effect of each project on the surrounding landscape.

Your forester or other resource professional should note or explain the pros and cons of each activity they recommend to you. If you are not comfortable with a recommendation, you should discuss this with your forester. Give specific reasons why you do not think a particular suggestion will work or meet your objectives. Tell the resource professional(s) your concerns, to modify the plan to benefit both you and the forest. After all, this is your plan and you are paying to have it done to your satisfaction. Detailed prescriptions and practice outlines can be developed for each project when you are ready to work on it.

### REVIEW YOUR PLAN

Just as road maps need to be updated periodically to be of any use, so does your management

plan. Each year, you should review your plan and the scheduled activities. You also need to monitor progress towards the recommendations. After you have completed several activities, you need to ask yourself, “Is it working? Are the woods what I expected?” Perhaps the plan recommended a timber sale to improve grouse habitat by encouraging aspen to sprout. If a few years later there are still no aspen sprouts, then timber harvesting did not help you meet your objective, or other factors limited aspen reproduction. But to find this out, you must inspect the site. If the planned activities do not work, you should revise the plan with the help of your forester or resource professional. The monitoring process can be both formal and informal. After a regeneration cut, you can examine the regeneration and see what tree species are present, or whenever you walk in the woods, you can look for the results you expected to find. For example, are you seeing more songbirds, wildflowers, or other wildlife you want on your land? Change is a constant in life so your plan should be flexible. Damage caused by an insect infestation or a sudden need for extra cash might require you to change the activity schedule.

The ability to pace off a distance with reasonable accuracy is useful for a variety of woodland management practices and is easy to master. A tape measure should be used when exact distances are critical such as when one needs to know the radius of a sample plot or determine exact property boundaries. But pacing can be used to find boundaries easily and reliably, to create transect lines, to pace off 66 feet when calculating tree height with a scale stick, to check the width of buffer zones, and to estimate the sizes of compartments. Complete this activity to prepare you for the “Get to Know Your Forest” activity.

Follow these steps to determine the length of your pace.

1. Starting with one foot, count a pace every time that foot is put down. With a measuring tape or length of rope, mark off 100 feet in a moderately dense forest stand.
2. Using a normal, comfortable stride, pace the 100 feet about 4 times, noting each time the number of paces it takes to cover the distance. (Note: An exaggerated pace is less standard in length and impossible to maintain through forest cover.)
3. Divide the sum of the total number of paces by the number of times you paced the distance. This figure represents the average number of paces it took to walk the 100 feet.
4. The length of your pace will be equal to 100 feet divided by the average number of paces it took to travel the 100 feet (calculated in step 3).



### Example 1

A person with an average pace of 5 feet wishes to find a boundary marker 138 yards away. How many paces will it take to cover this distance?

1. First convert 138 yards to feet:  $138 \text{ yd.} \times 3 \text{ ft.} = 414 \text{ ft.}$
2. Then divide the distance (in feet) by the pace length:  
 $414 \text{ ft.} \text{ divided by } 5 \text{ ft.} = 83 \text{ paces (rounded to the nearest whole pace).}$

### Example 2

A person with an average pace of 5.6 feet found that a rectangular compartment measured 64 paces by 97 paces. What is the area (in acres) of the compartment?

1. First convert paces to feet:  $64 \text{ paces} \times 5.6 = 358.4 \text{ ft.}$ , and  $97 \text{ paces} \times 5.6 = 543.2 \text{ ft.}$
2. Next calculate the area of the compartment in square feet:  
area of a rectangle = length x width, so area =  $358.4 \text{ ft} \times 543.2 \text{ ft.} = 194,682.9 \text{ sq. ft.}$
3. Then divide the area of the compartment by the number of square feet in an acre (43,560):  
thus  $194,682.9 \text{ sq. ft.} \text{ divided by } 43,560 \text{ sq. ft.} = 4.5 \text{ acres.}$

*Goff, G., Lassoie, J., Layer, K. Timber Management for Small Woodlands, Information Bulletin 180, Cornell Cooperative Extension, Cornell University, Ithaca, NY 14853*

Spending time on the land is the first step to understanding your forest and the resources you have. Do this activity to get to know your forest and the resources in it. Before setting your ownership objectives, you should have a good idea of what your possibilities are based on the make-up of your forest. As you walk out on your land, think about what forces have made your forestland the way it is today. What was the land used for in the past? What is the climate like in your area? Have any natural disturbances changed the character of your land?

As part of this exercise, you will also mark your property boundaries. By marking your property boundaries you can prevent accidental trespass or conflicts with adjacent landowners and help your forester to clearly see which resources belong to you.

Once you have considered your forestland as a whole, you can map and characterize the different forest stands. Each stand will represent a distinct management unit that will require specific management practices based on the stand characteristics. By taking time to understand and document your forest resources, you will get to know your land better. Take this activity with you while you walk your land. Then share your results with your forester so that he/she can have a clear understanding of the resources you own.

For this activity, obtain an aerial photograph and/or topographic map of your property and surrounding properties as described on page 9 of this guide. Use this map to complete the activity sheet. You will also need to use pacing for this activity.

1. As you walk out on your land, think of the factors that have influenced your forest in the past and those that are influencing your forest today.
  - a. How did people use the land in the past? Was it agricultural land that has regrown to forest? Are there rock walls or old fence lines indicated by unusually large trees to suggest that it was previously farmed or pastured?
  - b. Are there tree stumps indicating a previous harvest?
  - c. Is the slope of your land steep in some areas, and flat in others? Do the trees that grow in flat areas differ from the trees that grow on steep sites? If so, how?
  - d. Are there areas where groundwater seeps to the surface? Do different tree species and understory plants grow in these wet areas?
  - e. Is there evidence that deer are browsing on tree seedlings and saplings? When deer feed on trees, they eat the buds

**WALKING NOTES**

---

and softer plant material at the end of the branch. Deer like some plants better than others. In areas with many deer, they can affect the tree species that will grow by eating some and not eating others. Do you notice that deer have eaten some tree species more than others in your forest? Which ones do they seem to prefer?

- f. Have there been any natural disturbances in the recent past like high wind events, ice storms, a forest fire, or infestation of a disease or pest (e.g., beech blight, gypsy moth, hemlock woolly adelgid). What pests are a concern in your area (hint: this is a good question to ask your forester)?

#### WALKING NOTES

2. Mark your property boundaries! Accurate maps of your woodland are helpful in conducting an inventory and are an important tool for management planning. You can locate and mark your property boundaries with little effort as long as there are at least the remains of previous markers. You need a compass, some bright paint (use a water-based paint), and the property deed. If you need a copy of your deed, often you can obtain one from your county clerk's office. Review the map from your survey and talk to neighbors to learn their thoughts on shared boundary lines.

Follow these steps to mark your boundaries:

- a. Use your deed to locate a corner of your property. Corners may be marked with a pile of stones, a pipe, a cement piling, a wooden stake, or some other durable structure.
  - b. Next, walk along the boundaries and find the other corners by following the topographic features and bearings described in the deed. Use pacing to help you get close to the corner.
  - c. If you cannot locate all the corners or if you are unsure of the boundaries, do not guess. A boundary dispute could lead to a lawsuit. Consult a surveyor if necessary. He or she can do an accurate, professional job for a reasonable fee.
  - d. Once you have located all the corners, make them more obvious by clearing away brush or making new corner markers. Mark the boundary trees between the corners with a bright, exterior, water-based house paint. Mark just enough trees for you to see a visible boundary from a distance.
3. Once you have marked your property boundaries, you can organize your forest into stands. Remember that a stand is an area of forest with similar species composition, age, and site conditions. It is useful to delineate the different stands on your property because different stands may require different management activities. For example, you would manage a young deciduous forest differently than a mature coniferous forest. Some stands may have greater timber-producing potential than others, and some stands may have more potential as wildlife habitat. Draw stand boundaries on the map of your property.

---

**DISCOVER YOUR OWNERSHIP PRIORITIES**

ACTIVITY

Complete this form to help you assess your priorities, the resources you have available, and any constraints. Fill this out before or during a meeting with your forester.

Name: \_\_\_\_\_ Property Size (ac): \_\_\_\_\_ Date: \_\_\_\_\_

Property Location: \_\_\_\_\_

Rank the importance you place on the following management objectives as either: high (H), medium (M), low (L), not interested (NI), not applicable (NA), or don't know (DK).

- \_\_\_ Maintaining habitat for a variety of plants and animals
- \_\_\_ Maintaining habitat for specific wildlife (specify) \_\_\_\_\_
- \_\_\_ Protecting rare and endangered plant and animal species or unique natural communities
- \_\_\_ Managing the forest for periodic income from:
  - \_\_\_ timber, fuelwood, pulpwood
  - \_\_\_ agroforestry products
  - \_\_\_ recreation
  - \_\_\_ maple sugaring
  - \_\_\_ trees and shrubs for landscaping
  - \_\_\_ other \_\_\_\_\_
- \_\_\_ Protecting water quality
- \_\_\_ Preventing soil erosion
- \_\_\_ Protecting wetlands
- \_\_\_ Maintaining a healthy forest
- \_\_\_ Peace and solitude
- \_\_\_ Scenery (views, special trees, rock formation, special areas, etc.)
- \_\_\_ Cutting fuelwood for personal use
- \_\_\_ Protecting historic sites (stonewalls, old foundations, etc.)
- \_\_\_ Becoming/staying a certified Tree Farm
- \_\_\_ Enrolling/maintaining current use property tax assessment
- \_\_\_ Developing an estate plan
- \_\_\_ Protecting property from development
- \_\_\_ Considering a conservation easement or other permanent land protection
- \_\_\_ Developing or maintaining access roads
- \_\_\_ Providing recreation for your family:
  - \_\_\_ cross-country skiing
  - \_\_\_ hunting
  - \_\_\_ camping
  - \_\_\_ mountain biking
  - \_\_\_ birding
  - \_\_\_ fishing
  - \_\_\_ snowmobiling
  - \_\_\_ hiking/walking
  - \_\_\_ nature viewing
  - \_\_\_ off-road vehicles
  - \_\_\_ collecting fruits, nuts, or mushrooms
  - \_\_\_ other \_\_\_\_\_
- \_\_\_ Providing recreation for others (specify types allowed) \_\_\_\_\_
- \_\_\_ Limiting the use by others (specify) \_\_\_\_\_
- \_\_\_ Working in the forest. Describe the time, experience and equipment you have to work in your forest:  
\_\_\_\_\_  
\_\_\_\_\_

*Adapted from University of New Hampshire Cooperative Extension*

---

Other management objectives:

Comment on the most important values that you place on your land.  
For those rated H, tell why they are important.

Comments on your objectives for the property.

What would you like your land to be and look like in ten years?

What activities have you conducted on your land to achieve your goals?

Is there anything that you cannot or will not do? List any circumstances or opinions toward particular kinds of management that may limit activities on your land.

What factors have limited you from achieving your goals?

What assistance do you need to help you reach your goals?

Before you select a forester, you should become familiar with her/his credentials and work experience. Use this sheet to record information for each forester you contact.

1. What is your educational background?

How many credit hours of continuing education do you get each year?

---

2. How long have you been a forester?

Tell me about your work experience.

---

3. Do you have a license (note: not all states require foresters to be licensed)? If so, what is your license number?
- 

4. Could I talk to some of your other clients and visit their woodlots? If so, what are their names and contact information?
- 

5. Are you a member of the Society of American Foresters or any other professional society?
- 

6. Do you participate in landowner education programs? What has been your role?
-

*Circle the correct answer*

1. What is forest stewardship?
  - a) Setting realistic goals for your land
  - b) Maintaining the health of the forest for future generations
  - c) Getting the most out of your land while you still can, regardless of future consequences
  - d) Answers a and b
2. The forest stewardship planning process can help you:
  - a) Learn more about your land
  - b) Consider your short- and long-term objectives
  - c) Evaluate environmental and financial benefits
  - d) All of the above
3. Which of the following is NOT needed in a stewardship plan?
  - a) A map and description of your forest
  - b) A step-by-step plan to help you achieve your goals
  - c) Measurement of each and every tree on your property
  - d) A description of how you would like your forest to look in the future
4. To receive benefits under your state's forest tax law, you may need:
  - a) Letters of recommendation
  - b) A Bachelors Degree
  - c) A management plan
  - d) A really good reason why you should receive benefits
5. A professional who helps you develop a stewardship plan and address your ownership objectives is:
  - a) A forester
  - b) A logger
  - c) A planner
  - d) An agent
6. The first step to developing a forest stewardship plan is to . . .
  - a) Get to know your forest
  - b) Determine your objectives and goals
  - c) Seek professional assistance
  - d) Formulate a ten-year activity schedule
7. Before choosing a forester, you should ask her/him for the following:
  - a) A business card
  - b) A resume
  - c) A letter of intent that outlines what he/she will do and at what price
  - d) b and c
8. Timber brokers are:
  - a) People who trade timber futures as day traders with the NY Stock Exchange
  - b) Individuals with a variety of education and experience, sometimes foresters by training, but who focus just on buying and selling timber
  - c) People who have broken logs in the past
  - d) Professional foresters who represent a landowner in a timber sale
9. The most important part of your plan is:
  - a) A statement of your ownership goals
  - b) An inventory of trees
  - c) A financial budget
  - d) Pictures of your forest
10. A topographic map or aerial photograph can be useful for:
  - a) Seeing how many trees you have
  - b) Locating specific wildlife habitats
  - c) Looking at the general habitat features that comprise your land

*continued on next page*

- 
11. Because you probably will not be able to achieve all your goals right away, which of the following is a good idea?
- a) To give up now
  - b) Create a step-by-step ten-year activity schedule
  - c) Pick up the speed so you can get everything done
  - d) Do not create a forest stewardship plan at all
12. What should you do to your forest stewardship plan each year?
- a) You should add new ideas and goals
  - b) Discard an activity
  - c) You should review your plan and activities that are scheduled
  - d) You should not look at your plan every year!
13. The smallest unit recognized in forest management is
- a) An inch
  - b) A forest booth
  - c) A forest stand
14. Larger trees can be attributed to
- a) Taking vitamins
  - b) Better soil and moisture conditions
  - c) Genetics
  - d) Both b and c
15. When a stand is even-aged all the trees are approximately
- a) The same height
  - b) The same age
  - c) The same species
16. A pure forest stand
- a) Has never been cut
  - b) Has no shrubs in the understory
  - c) Has one dominant species in the overstory
- See the key to this quiz on page 83*

---

# Exploring the Possibilities

This section of the guide provides background information to help you realize and appreciate the complex nature of your forest. It is intended to be a primer on managing forests for timber, agroforestry, wildlife, aesthetics, or recreation. Use the information provided to evaluate what goals are feasible given the characteristics of your land and how to manage your property to achieve your goals. Complete the “Your Forest Resources” activity at the end of the chapter to become more familiar with the resources on your property.



Kristi L. Sullivan

*Mature forests typically have large-diameter trees, a diverse understory, and abundant snags.*

## SHAPING THE CHARACTER OF YOUR FOREST

---

Over the years, scientists have learned more about the complex web of ecological principles at work in the forest, and have found ways to speed up or slow down these natural successional processes. Silviculture is the art and science of manipulating the pace of succession in the forest and controlling forest establishment, composition, structure, and growth.

When deciding how to manage your forest, you need to carefully assess the following:

- your objectives
- your financial, physical, and time limitations
- the size and condition of your forest
- expected or existing markets.

The silvicultural system you use will depend upon the tree species you wish to favor. Certain tree species that thrive in full sun to partial shade grow best in even-aged stands, where all the trees are approximately the same age. Other species can grow in full or partial shade and can be cultured to grow in uneven-aged stands, where there are trees of three or more age classes. Your forester can help you plan the range of practices, or silvicultural system, best suited to your forest.

### *Managing a Mature Stand*

Mature forests are characterized by large-diameter trees and a more diverse understory than middle-aged forests. As trees die from disease or lack of sunlight, the openings left behind allow more sun to reach the forest floor. Woodland wildflowers, ferns and shrubs, like blueberry or spicebush, add diversity to the forest. Snags, or

---

dead standing trees, are more abundant than at early stages of forest growth, providing feeding and nesting places for wildlife.

Forest management activities focus on the process of naturally regenerating the forests. The focus is on the next forest. All the methods have specific advantages and disadvantages depending on your particular circumstances. Discuss your objectives and circumstances with your forester before selecting a method of forest regeneration.

### CLEARCUTTING

Clearcutting, in its pure form, removes all the trees in an area at once. However, as management plans have evolved to include multiple objectives, it is not unusual to find that even in a clearcut area, some trees of diverse or singular species are kept. These reserve trees may be isolated or in clumps and are designed to serve specific goals for biodiversity, wildlife habitat, or aesthetics. Reserve trees may include rare or slow-growing species, good mast producers, and wolf trees, den trees, and some snags. In some cases, strips or patches of a few acres are clearcut, while adjacent strips and patches are retained.

Clear-cutting is a controversial silvicultural practice, and is often the target of public outcry. Technically speaking, clearcutting is a regeneration strategy that is required to establish early to mid-successional trees such as aspen, black locust, black cherry, yellow poplar, pine, and paper birch, which require

full sunlight. Removing all trees without the intent of regeneration is deforestation, not clearcutting. Deforestation happens during land conversion for development, for example. Clearcutting produces significant changes in the environment at the forest floor. These changes benefit many wildlife species such as the chestnut-sided warbler and American woodcock. Thus, clearcutting can create habitat for wildlife species that require early successional forests, many of which have experienced significant population declines in recent decades.

### SEED TREE

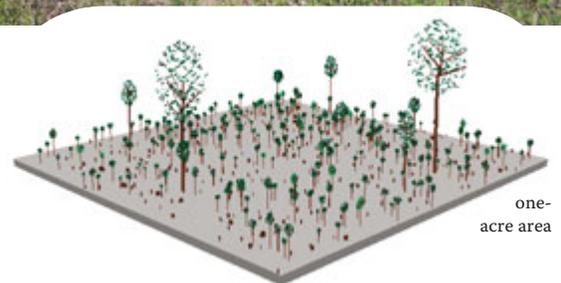
The seed tree method is a modification of clearcutting where a few of the best trees are left standing to become the parent trees for the new forest. This method will leave between 7 and 10 mature healthy trees per acre. Trees are left widely scattered on the site to provide seeds for regeneration.



Photo: Kristi L. Sullivan

Illustration: James Finley

*Clearcutting removes almost all of the overstory trees from an area to allow trees that require full sunlight to become established.*

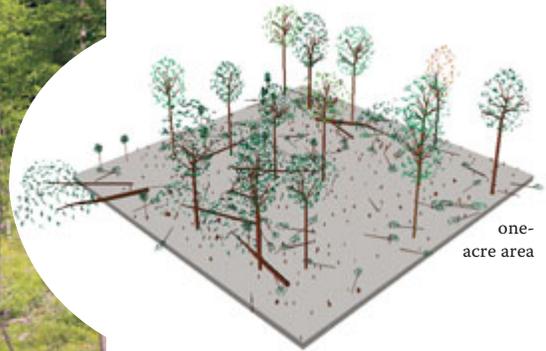


one-acre area

Photo: Kristi L. Sullivan



Illustration: James Finley



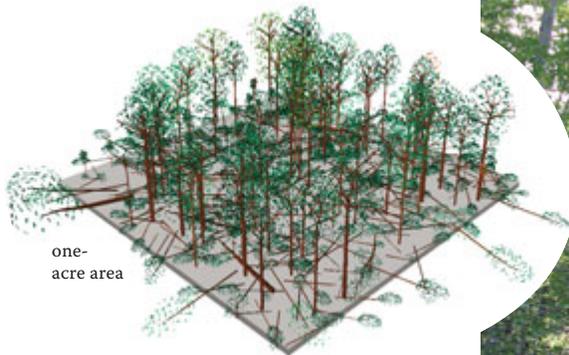
*Seed trees can be left behind to provide a source of seeds for the future forest.*

These trees should be windfirm, light-seeded species. After the next forest becomes established, the seed trees can be harvested or left as a scattered overstory.

### SHELTERWOOD

The shelterwood method is like the seed tree method in that trees are retained as a seed source, but you leave more trees (20 to 35 per acre). This

method is useful for regenerating species such as oak that are not light seeded and won't blow in from surrounding areas. When using the shelterwood method you allow more shade until the seedlings are well established. After regeneration is well established, some or all of the sheltering trees must be harvested to increase sunlight to the seedlings and permit the new trees to occupy the site fully.



*A shelterwood cut can be used to regenerate heavy-seeded tree species.*



Photo: Kristi L. Sullivan

Illustration: James Finley

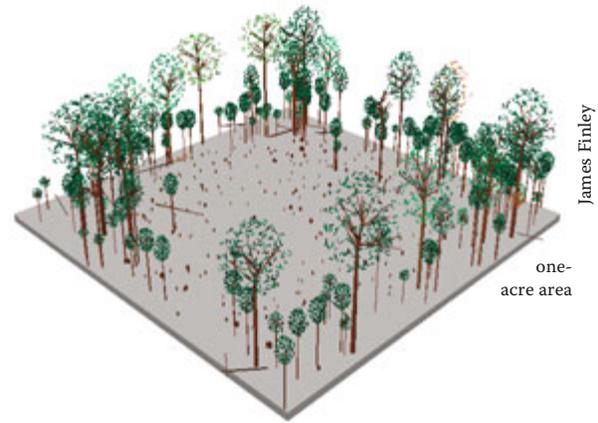
## GROUP SELECTION

Group selection is used to create an uneven-aged forest. When using the group selection method, small groups of trees are removed from areas  $\frac{1}{2}$  to 1 acre in size to allow sunlight to reach the forest floor, promoting forest regeneration. Before groups are identified for harvest, it is important to identify areas where advanced regeneration or adequate seed sources are present.

## HIGH-GRADING

High-grading is harvesting the best trees of highest value from a woodlot, leaving the low-value, often diseased and malformed trees behind. Few people admit they high-grade, rather they use terms like diameter-limit cutting and selective cutting. Regardless of the label, removing only the best trees degrades the forest and can limit your

long-term options. This practice is inconsistent with maintaining a healthy forest for sustained production and many other values.



*Group selection can be used to create an uneven-aged forest.*

### High-grading

Cutting the best trees (those of highest value) and leaving the low value, often diseased or malformed trees, is all too common. In the Northeast, this practice may happen on as many as 65 to 80% of all timber harvests. This practice is high-grading, where the highest grade (or value) trees are removed. High-grading at any level degrades the forest and reduces the options available to the forest owner. By cutting only



the largest and most valuable trees you remove those best suited to that site. The trees that are less well adapted remain as the next forest and as the seed source for future forests. The financial gain of high-grading exists only briefly, yet you may sacrifice your ownership objectives for decades. A similar analogy from livestock is the farmer or stable manager who shoots the blue ribbon bull or winning racehorse and uses the losers for breeding stock. The quality of the herd, just as the quality of the forest and woodlot, declines rapidly!

---

A public or private consulting forester, chosen as described earlier in this guide, should be the one to select trees for harvest. The trees marked for harvest depend on numerous factors including landowner objectives, prior management, tree species, the number of trees in the woodlot, and tree health. Foresters can integrate these factors into a sustainable silvicultural system. Trees best suited to a particular site grow faster, bigger, and taller. These are the winning trees that you want to produce seeds for the next forest. Taking the winning trees first leaves the losers for future forest growth and seed production. These losing trees also grow slower, have less volume, and lengthen the time until the next harvest. This will reduce forest quality and value.

To avoid high-grading, carefully select a qualified

forester and trained logger. Ask for references, and consider potential conflicts of interest. Specifically tell the forester your intention to achieve a sustainably managed forest. Visit forests where they have worked in the past, and remember—the forester or logger who offers the best price may not provide the best land treatment.

### *Tending a Middle-aged Stand*

As a forest ages, the growing trees shade out the grasses, weeds, wildflowers, and shrubs that were present during the earlier years, and trees prevail. Middle-aged forests, from 15 to 70 years old, are typically open woodlands, with little brushy understory remaining.

Management activities that take place at this stage focus on selecting the trees that will dominate



Kristi Sullivan

*Middle-aged forests are typically open woodlands, with little brushy understory present.*



*Thinning trees that are next to “crop trees” allows more light to reach them and hastens their growth.*

the mature stand later on. Like your garden, if you actively tend your forest, it will be healthier, more productive and produce many desired attributes more quickly. Managing established stands includes manipulating the number of trees per acre, the types of trees in the forest, and competition among trees. Trees or other vegetation that do not contribute to your objectives can be reduced to favor those that do.

#### TIMBER STAND IMPROVEMENT

Timber stand improvement, or TSI, is a common term used to describe cutting practices that improve the existing forest stand. The two main reasons for TSI are to favor tree species that best suit the site or meet your management objectives or to thin the stand to increase the growth rate of the remaining trees. TSI is to forests as weeding and thinning are to gardens. You do not get an immediate benefit, but the final crop is improved. Thinning reduces the number of stems and increases the

sunlight, soil nutrients, and moisture available to remaining trees. The purpose is to concentrate growth on the most desirable trees and thus promote tree and forest health.

The crop tree method of thinning focuses on improving growth of desirable crop trees by eliminating competition from neighboring trees. Crop tree management improves the growth of trees selected for retention based on an owner’s objective for wildlife, timber, aesthetics, or water quality. Crop trees are selected and retained

in the stand to grow to maturity. It is not used to regenerate the forest, rather to redistribute growth to desirable trees and hasten tree growth, helping landowners reach their objectives sooner.

#### CONTROLLING INSECTS AND DISEASE

Insects, fungi, and bacteria naturally occur in the forest. Most of these organisms do not typically attack healthy trees. They are part of the forest ecosystem and contribute to its ever-changing quality. Some insects are beneficial as pollinators. Other insects, fungi and bacteria, called decomposers, break down dead animal and plant parts. A forest can have a “healthy level” of insect activity without compromising most landowner objectives. As a stand changes from young through middle-aged to mature, some trees must die to free growing space for other trees. Insects, fungi, and bacteria help with this thinning process. They also provide food for other wildlife and start the decomposition process to

---

release nutrients back to the environment. Your forester can inspect your forest for unhealthy levels of insects or disease.

### PRUNING

Removing low branches improves wood quality by restricting knots to the center of the tree and increases the percentage of valuable clear and knot-free wood produced. This is important for growing quality sawtimber. Pruning can also improve access to an area. For best results, prune trees when branches are less than two inches in diameter and the trunk diameter is less than four inches. Prune potential sawtimber trees up to 17 feet above ground because the majority of value occurs in the bottom section of the tree. Pruning is

time-consuming and because some wildlife species use low dead branches as perches, be deliberate in which trees you prune. Your forester or local cooperative extension office can provide information for proper pruning techniques.

### *Renewing a Forest*

Young forests, those up to 10 years of age, usually occur as a result of some type of disturbance or change in land use. In the Northeast, these disturbances can include tornadoes, ice storms, or fire. Young forests also result from abandoned farmland, from cutting mature forest, or from intentionally planting trees in a previously open habitat. Young forests are characterized by an abundance of young tree growth, mixed with blackberry



Kristi Sullivan

*Young forests have an abundance of young tree growth, mixed with blackberry and raspberry brambles, forbs, wildflowers, and native grasses.*

---

and raspberry brambles, forbs, wildflowers, and native grasses.

Establishing or regenerating a new forest happens by either artificial means or natural methods. These two approaches each have their own advantages and disadvantages.

### NATURAL REGENERATION

Natural regeneration is the least expensive way to regenerate a stand. This approach relies on available seed stored in the soil or from nearby trees, stump sprouts, and existing seedlings to produce the new stand. Success depends on whether there is an adequate supply of seeds, advanced seedlings or sprouts, adequate moisture, a well-prepared seedbed, and control of competing vegetation and browsing animals like deer. Careful planning is needed to ensure success. Fortunately, in the eastern United States, we can regenerate less expensively through natural methods once we control competing vegetation and browsing.

### ARTIFICIAL REGENERATION

Sometimes a landowner wants to regenerate species that do not exist in the area and thus lack a seed source. Or, some landowners may desire plants cultured for improved qualities such as high sugar-producing maple trees. In these cases, artificial regeneration is appropriate.

#### *Seeding*

Seed can be sown by either spreading at ground level, by aerially broadcasting, or by drilling. The same factors that affect natural regeneration, like consumption of seeds by birds and animals, competing vegetation, and an improper seed bed, can also affect seeding, and it can be more costly. Because of cost and the uncertainty of success, few private landowners use direct seeding.

#### *Planting*

Tree planting allows you to choose the tree species and spacing. Planting can be successful if

the selected species are healthy, well adapted to the site, and carefully planted. You can plant seedlings by hand or machine. Because of the investment in planting, you should work with a forester to control weeds and prevent browsing before and after planting the seedlings. Most planting occurs in the spring, so preparation may begin the previous summer. Sometimes fall planting will occur. Your cooperative extension office or state forestry agency can provide information on planting.



*When planting trees, take measures to control weeds and prevent deer browsing.*

Kristi L. Sullivan

---

### *Fertilization and Liming*

Trees, like all plants, require nutrients from the soil to establish and thrive. Some soils have natural limitations in nutrient availability or limitations resulting from past land uses like mining or erosion. Although landowners can add nutrients through fertilizers or lime, the cost, for even modest acreage, often prohibits this practice. If you think treatment is necessary, contact your local cooperative extension office for assistance with a soil test and either match the species you plant to the site conditions or think carefully about the costs and the benefits of trying to change those conditions.

### THREATS TO REGENERATION

#### *Competing Vegetation*

All plants compete for sunlight, soil moisture, and soil nutrients—the three basic requirements for growth. When trees compete in an unmanaged forest, one tree wins (it lives) and another loses (it dies) because one tree has an advantage of height. One tree may be taller than another because of age, genetics, species, or plain good luck. The tree that wins may or may not be the one that you most desire for timber, wildlife food, or aesthetics. In a managed forest, you make sure that the trees you want to win have a competitive advantage by removing other nearby trees or shrubs. This process takes some effort, but the investment pays long-term dividends. You must consider if competing or interfering vegetation will reduce the growth of desired tree seedlings whether you plant seedlings, direct seed, or naturally regenerate your next forest.

#### *Invasive Species*

When you add roads to an area, soil is disturbed and light penetrates into the forest, allowing aggressive “weedy” plants adapted to younger forests and disturbed areas to move in. Those “weedy” plants can be invasive, exotic (not native) species. These plants can outcompete native plants, preventing



Kristi L. Sullivan

*Garlic mustard, an invasive herbaceous plant, should be pulled in the spring before it goes to seed.*

desirable species from becoming established and limiting your ability to reach your timber or wildlife objectives. Examples of troublesome exotics include Japanese barberry (*Berberis thunbergii*), multi-flora rose (*Rosa multiflora*), glossy buckthorn (*Rhamnus frangula*), tree-of-heaven (*Ailanthus altissima*), kudzu (*Pueraria montana*), garlic mustard (*Alliaria petiolata*), and others. You can take the following steps to prevent or minimize the effects of invasive species on your forest.

- Become familiar with the non-native invasive species in your area and learn to recognize them.
- Plant native species on your property whenever possible.
- Minimize soil disturbance, reducing the chance for invasion by non-native plants.
- Monitor your property for invasive species annually.
- Remove invasive species as soon as you find them. Because these plants spread rapidly, it is important to remove them before they have the chance to spread and become well established.

#### *Deer*

A dramatic increase in deer populations is causing concern for many landowners in most, though not all, northeastern states. The white-tailed deer



Kristi L. Sullivan

*Deer can actually eliminate some plant species from a forest.*

is a keystone species. A keystone species is one that can influence its own habitat, the habitat of other species, and the forest ecosystem. Browsing by deer can affect the kinds and numbers of plants present in an area, the ability to grow or regenerate new trees, and the overall structure of the forest. By changing the structure of the forest, deer change the forest habitat. This affects many other wildlife species in the forest.

As selective browsers, deer prefer certain species over other less desirable species. Although the species preferred may vary from state to state, or region to region, many of the species deer prefer are valued for timber or as wildlife food trees. This is also true of herbaceous vegetation. Deer will eat many wildflower and understory plants like trillium, and lady slipper, but tend to avoid ferns and other plants. By feeding on certain species and leaving others behind, deer can actually change the plant species growing in a forest.

In addition to changing the types of plants, deer can also cause changes in the vertical structure and composition of forest vegetation. For example, over-browsing of tree seedlings creates open, park-like stands with few preferred food species near the ground, and little or no forest understory. Loss of forest understory affects other

forest wildlife, particularly those forest songbirds that rely on the understory for nesting and feeding sites. Some species may no longer live in heavily browsed areas, and others may be less abundant. When deer populations are too high, they can reduce the diversity of forest vegetation, simplify the forest, and thus reduce the wildlife species that occur. Excessive browsing in many areas is changing the composition, biodiversity, and sustainability of our forests. Although not irreversible, effects of excessive browsing may exist for generations.

## ENHANCING HABITAT FOR WILDLIFE

Your forest can provide important habitat for wildlife on your land. Consider the options that interest you. Then read on to evaluate what goals are possible given the characteristics of your land, and how to manage your property to achieve your wildlife goals. Develop “An Eye for Wildlife” by completing the activity at the end of this chapter.

### *Benefits of Wildlife*

A healthy forest needs to have wildlife, and many wildlife species occur only in forests. Forests provide food and shelter for numerous wildlife species, which in turn provide recreational, aesthetic, and ecological benefits to us. Hunting, fishing, photography, nature study, and wildlife watching are activities that you may be able to enjoy on your property. Having the ability to manage for, and see, animals that interest you can be a rewarding experience.

The benefits of wildlife go far beyond our enjoyment. Each species performs specific functions in the ecosystem like seed dispersal, forest pest control, or pollination. These functions directly benefit other living organisms, as well as people. Squirrels bury acorns for food but fail to retrieve many of them. Acorns that aren't uncovered may become a new generation of oak trees. In this way, squirrels help to provide for continued forest

---

growth. Bees, butterflies, and hummingbirds feed on nectar, pollinating many of our native trees and wildflowers. By feeding on insects, animals such as bats, birds, frogs, or dragonflies help to control insect pests that may be harmful to forests or people. Moles and other small mammals aerate and mix the forest soil. Amphibians may help control the rates of decomposition by eating insects and other invertebrates that break down leaf litter on the forest floor. Their pollution-sensitive, semi-permeable skin also allows them to serve as indicators of environmental health. Forest landowners play an important role in ensuring that present and future generations can enjoy the many ecological, recreational, and aesthetic benefits of wildlife.

### *Wildlife Basics*

To survive, every animal requires four basic habitat elements—food, cover, water, and space. The arrangement and ratio of habitat types, plant cover, water, topography, geology, human activity, and presence of other wildlife species all influence the number and kinds of wildlife that can live on

your land. Although factors like topography and geology seldom change, you can manage your forest to provide optimum cover, food, and sometimes water, for species of interest.

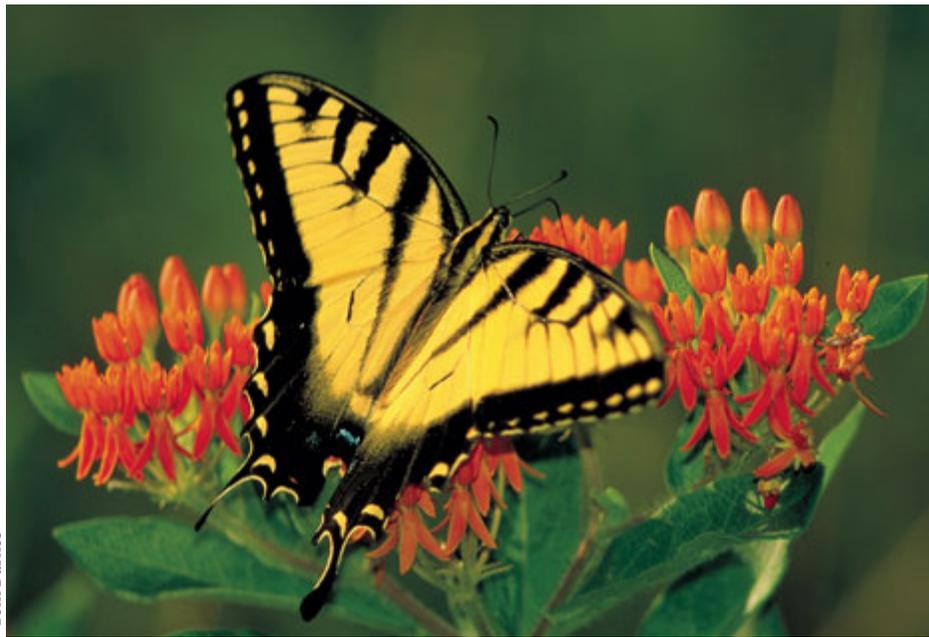
As you think about the wildlife on your property, consider your property within the larger landscape. Because many wildlife species can move between your property and your neighbors, your actions may attract some desired wildlife but may not have a large impact on the total variety of wildlife species in the area.

### FOOD

A diversity of trees, shrubs, vines, and herbaceous plants will provide food for a variety of wildlife throughout the changing seasons. Native plants that produce soft or hard mast are valuable wildlife food sources. Soft mast refers to berries and fruits. Hard mast is a term used to describe nuts and seeds. American beech, oaks, black cherry, hickories, dogwoods, and grapevines are examples of plants that produce mast. Having a variety of mast-producing species in your forest increases the

probability of providing abundant wildlife food every year. For example, red and white oaks may produce acorns in different years. By having both types of oak in your forest, you are more likely to provide a continuous food supply.

Though many animals feed on plants, other wildlife species feed on insects or other animals. Habitat for insects such as rotting logs, stumps, dead trees, or snags, provide feeding areas for insectivorous wildlife from red-backed salamanders and



Tom Barnes

*Insects, such as bees, moths, and butterflies, pollinate many of our native trees and wildflowers.*



Charles R. Smith

*Soft mast such as berries, and hard mast like hickory nuts, provide excellent sources of food for wildlife.*



Kristi L. Sullivan



Kristi L. Sullivan

*Leaving ample amounts of deadwood on the forest floor provides cover for insects, salamanders, small mammals, and other wildlife.*

---

garter snakes, to bluebirds, warblers, shrews, bats, and black bears. These habitat structures also provide cover for amphibians, reptiles, and small mammals, which in turn serve as food for carnivorous species like hawks, owls, some snakes, shrews, and red and gray foxes. A healthy forest results in a complex web of wildlife interactions.

#### COVER

All wildlife requires cover for protection from predators and adverse weather conditions to successfully breed, nest, rest, feed, and travel. The amount and types

of cover available on your property will partly determine what species can live there. You can enhance cover for wildlife by taking the following steps to add texture to your forestland. Many of these steps can occur in conjunction with other forest management activities.

- Add or retain evergreens such as hemlock, white pine, and rhododendron for winter cover from snow and winter winds, and to provide nest sites for birds in the summer.
- Add deadwood. Create brush piles or leave cut treetops to provide cover for rabbits, birds, and small mammals. Leave logs and stumps lying on the forest floor to provide shelter for salamanders and small mammals.
- Seed small openings, such as log landings, with native grasses and forbs to provide feeding areas for turkeys, grouse, songbirds and other animals, and basking sites for



Kristi L. Sullivan

*Rock piles and individual rocks on an open hillslope provide basking habitat and cover for snakes, like the ring-necked snake, that live in forest openings.*

snakes and skinks. Ask your logger to push undesirable logs into a pile at the edge of the landing, rather than “cleaning up” the landing. These piles provide excellent havens for reptiles and amphibians.

- Keep rock piles or maintain open hillslopes with exposed flat rocks. Snakes, skinks, and lizards, as well as other animals use these areas.
- Protect cavity trees and snags. Many species of birds, mammals, reptiles, and amphibians use cavities in trees. Retain a combination of both living and dead trees with cavities of different sizes.
- Retain medium to large diameter trees with flaps of bark as habitat for bats. Trees like sugar maple and shagbark hickory are examples of species that often have bark flaps.
- Maintain cover close to areas where food or water is available.



*Many species of birds, mammals, and reptiles depend on cavities for nesting and protection from predators and the elements.*



## WATER

Water is essential for the survival of all wildlife. Some species can obtain water from the food they eat or from dew. However, many species of wildlife require a source of open water. Protection and



*The wood frog is just one of several species that depend on pools of water to complete their life cycle.*

management of streams and rivers, wetlands, spring seeps, and vernal pools can provide outstanding benefits for wildlife.

- **Forested wetlands** provide rich areas of habitat, with abundant food and excellent cover. The combination of increased availability of water, lush and diverse foliage for nesting and cover, and rich invertebrate food supplies, attracts a higher density and different species of wildlife than found on upland sites.
- **Spring seeps** are areas where groundwater comes to the surface. Because groundwater temperature remains above freezing, seeps often remain free of snow throughout most of the winter, providing access to vegetation and insect larvae. Wild turkey rely on spring seeps for winter food when snowfall is heavy.
- **Vernal pools** are small wetlands that are often shallow and may dry up in the



Kristi L. Sullivan

*Shallow pools of water that dry up for part of the year provide valuable habitat for many wildlife species.*

summer or fall. Because they do not support predatory fish, these pools are critical breeding areas for many northeastern species like spotted salamanders, spadefoot toads, and wood frogs that court and lay eggs in these ponds, then return to the forest for the rest of the year. Despite their small size, vernal pools also provide a rich supply of food for many organisms.

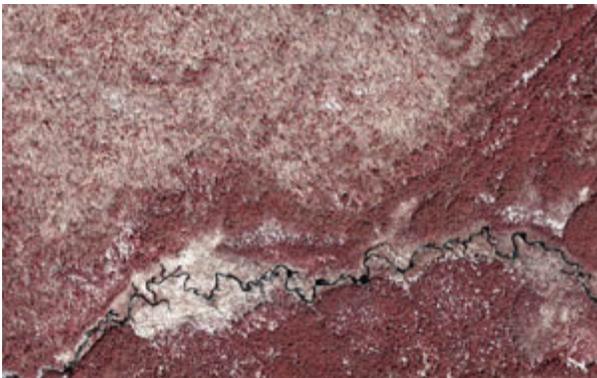
#### SPACE

In addition to food and cover, the size and distribution of habitat influences the species present. Many species are area-sensitive, which means

that they are absent from or rare in small patches of habitat, and depend on large areas of habitat. Some species need large areas of habitat because they have large home ranges. The goshawk, for example, requires continuous areas of forest free from human disturbance. Other species require large areas of habitat even though their territories are relatively small. For instance, some songbirds, including scarlet tanagers, ovenbirds, and others, are area-sensitive. Although they have small territories, they may not nest successfully in small patches of forest, where nest predators are more abundant. There are also some animals that require large areas of unbroken habitat because other habitat types

pose a danger. For example, many amphibians and reptiles have limited dispersal (or movement) abilities. For a salamander moving from the forest to its breeding pond in the spring, a road, open field, or heavily cut forest can be a barrier.

While some species require extensive areas of forest, others can live in smaller forests or areas with a mixture of habitat types. Black-capped chickadees, gray squirrels, northern cardinals, and white-footed mice, which can live in smaller forested areas, usually are more familiar to us because they often live near residential areas or agricultural fields. Many game species, like the white-tailed deer and wild turkey, prefer areas of forest mixed with fields or openings.



*Large, unbroken tracts of forest provide homes for animals that have large territory sizes or are area-sensitive.*



*Some species, like the wild turkey or the white-tailed deer, do best in areas with small patches of forest mixed with open fields.*

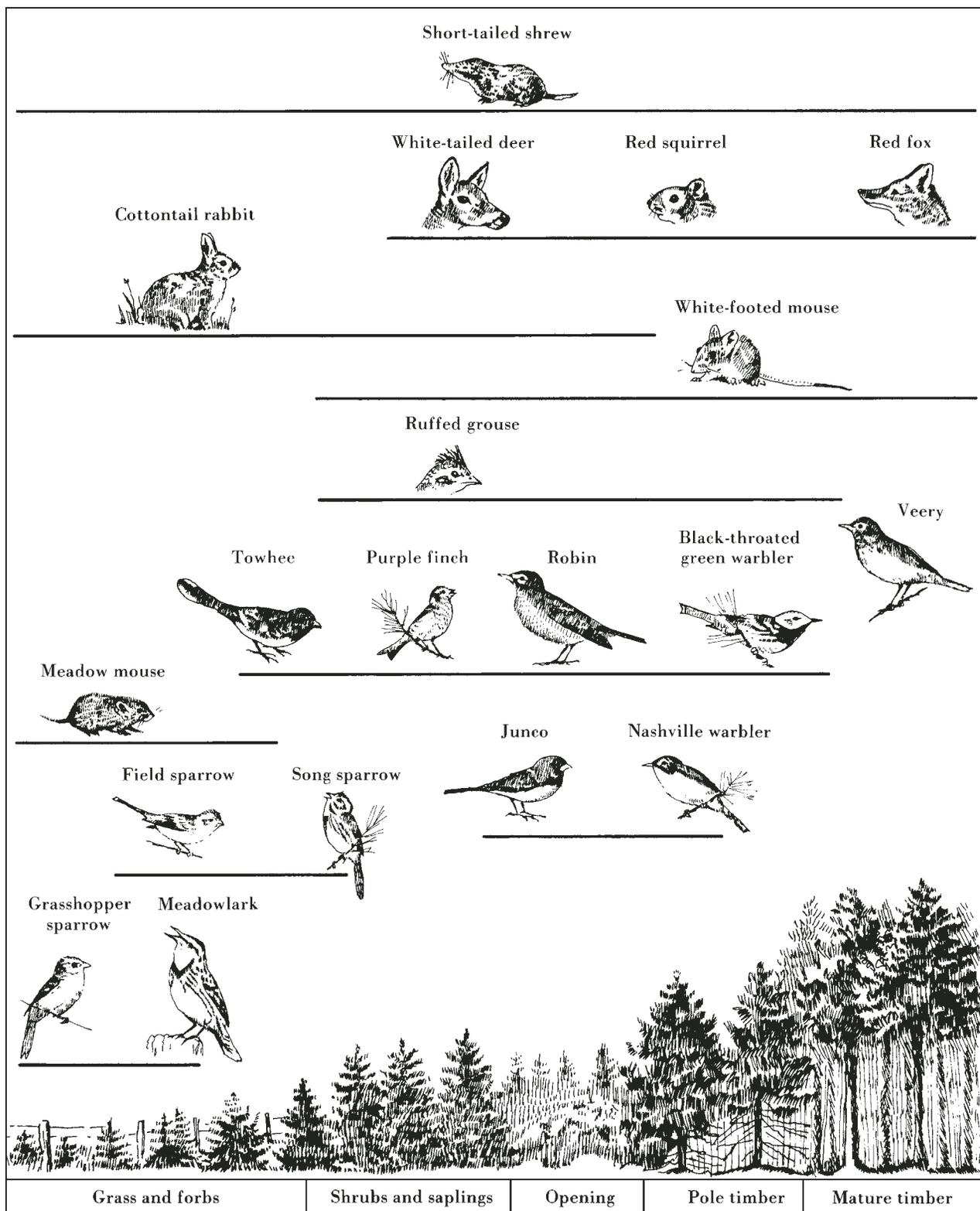
## UNDERSTANDING WILDLIFE HABITAT

### *Succession and Wildlife Habitat*

Just as forests are dynamic, the abundance and kinds of wildlife also change as a forest matures, and the quantity and quality of food, water, cover, and space changes. Young, even-aged forests, for example, often have an abundance of berry-producing shrubs and brushy cover, but few hard mast (acorns, hickory nuts) or cavity trees. As a result, species that feed on acorns (e.g., squirrels) or nest in large decaying trees (e.g., pileated woodpeckers) are typically more abundant in older forests. Some species of wildlife, including the white-tailed deer

#### Habitat Complexity

Often times, human activity simplifies habitat. For instance, a park-like forest with little debris on the forest floor looks nice to us. Wildlife, however, can benefit from making our forest habitats less simplified and more complex. You can make forest habitats more complex by enhancing the variety, size, and shape of biotic and abiotic (not living) elements in the forest. For instance, having a variety of different tree and shrub species that provide cover at many heights within the forest increases the complexity of the forest. Other features such as rotting logs, standing dead trees, rock piles, and water features, provide a variety of hiding and feeding places for wildlife. Unique habitats like old growth forest, and sensitive habitats such as caves, also add diversity and complexity to the landscape. These elements can all contribute to the species richness and biodiversity of an area. Careful forest management is a tool to create or accentuate certain habitat features.



*As forests change, their structure and available food and cover change as well, providing habitat for different wildlife species at each stage.*

---

and wild turkey, prefer a combination of plant succession stages. Deer need the cover provided by thickets of shrubs and saplings, but they also feed extensively on acorns found under trees in a mature forest, and seek out succulent green vegetation and grains in agricultural fields.

As the forest structure changes through succession, the size and arrangement of trees also changes. Maintaining complexity in the vertical structure of a forest—a well-developed overstory, understory, shrub, and herbaceous layer—allows a greater variety of plants and animals to coexist. Many species, particularly birds, divide the habitat vertically. For example, ovenbirds, scarlet tanagers, and chickadees are all found in mature forests, but ovenbirds feed mostly on the ground, tanagers prefer the top of the canopy, and chickadees like intermediate heights. Therefore, more species can exist in a forest with multiple layers than in a forest where all trees are the same height. Vertical

structure is typically more complex in uneven-aged forests or small patches of even-aged forest. Within similar forests, vertical structure is often greater in areas with fewer deer.

Whether you wish to manage your land for a variety of wildlife species or for a single species, understanding what stage(s) of forest succession each species depends on for food and cover will help you to make important forest and wildlife management decisions.

## SETTING YOUR WILDLIFE OBJECTIVES

---

### *Species of Special Concern*

Once you have identified the important habitat types and their stages of development in your forest, you can begin to explore your wildlife management objectives. Rare species and habitats, or animals of special concern, should receive deliberate



Ricky Layson, Forest Resource Consultants, Inc., [www.forestryimages.org](http://www.forestryimages.org)

*The American woodcock requires a moist, early-successional forest habitat.*

---

consideration. If you are uncertain whether or not a species or habitat of special concern might occur on your property, you or your forester can contact your state wildlife management agency or natural heritage program. For contact information for the natural heritage program in your state, visit [WWW.NATURESERVE.ORG](http://WWW.NATURESERVE.ORG). Click on “Visit Local Programs” and select your state.

The Ruffed Grouse Society



*The ruffed grouse is a favorite of sportsmen and sportswomen.*

### **Featured Species**

You may also want to manage for a particular featured species. For instance, you may have an interest in managing for ruffed grouse, which thrive in forests subject to periodic disturbance. You can create optimum grouse habitat by clearcutting in small, dispersed patches to create a mosaic of brushy areas for food and cover, dense saplings for brood cover, and mature forest stands with an understory of grape, greenbriar, hawthorn, witch-hazel, and dogwood. Managing for a featured species often has trade-offs. Species whose habitat requirements are similar to those of the featured species will benefit, while those with different habitats will not.

### **Groups or Guilds**

Another option is to manage your forestland to emphasize a particular guild, or group of species that uses the same environmental resources in a similar way. Guilds may require the same cover type, age class, habitat component, or combination of these factors. For example, you may wish

New Jersey Division of Fish and Wildlife



*Black bears range over large areas and thrive in forested landscapes.*

to use timber harvests as a means for managing for species like ruffed grouse, deer, woodcock, rabbits, chestnut-sided warblers, rufous-sided towhees, and indigo buntings, which prefer early successional forest habitat. Or, you may choose to manage your property for other species like the ovenbird, red-eyed vireo, black-throated green warbler, and others that thrive in mature forests. Maintaining large areas of forest can benefit these birds, as well as other

---

mature forest species like the fisher, black bear, and goshawk. Some other examples of guilds include cavity-nesters, mast-eaters, canopy nesters, insectivores, ground-feeders, and bark-feeders. You can manage for some guilds in conjunction with others, while some are mutually exclusive.

### *Species Richness*

If you are interested in managing for species richness, or the greatest diversity of species, you can achieve this objective by creating a mosaic of age class and cover type combinations. You will observe a greater increase in species by increasing the contrast of your property to the habitats in the surrounding landscape. For example, forest openings in a heavily forested area, mature forest in a landscape dominated by fields, or conifers in an otherwise deciduous forest, will provide landscape-scale texture that will attract diverse wildlife. By creating a diversity of habitat types, you can satisfy the needs of a variety of species. Work with your forester and state wildlife biologist to set realistic goals for species richness given the

size and characteristics of your property and the surrounding landscape.

## **MANAGING FOR YOUR ENJOYMENT: AESTHETICS AND OUTDOOR RECREATION\_\_\_\_\_**

Your land can be a great source of pride and recreational opportunity. Depending upon the size and make-up of your property, you may be able to enjoy a wide range of outdoor activities right in your own backyard. To learn what elements of your forest contribute to the beauty you value on your property, complete the first step of the “Your Forest Resources” activity sheet at the end of this chapter.

### *Enhancing the Beauty of Your Forest*

You can manage your forest simultaneously for profit, wildlife, recreation, and beauty. Properly planned forest management activities can increase recreational opportunities and maintain or even enhance visual appearance. Planning forest management activities with aesthetic goals in



Steve Morreale

*Open vistas provide excellent opportunities to view fall foliage.*

mind can be viewed as landscaping on a grand scale—arranging sizes, colors, textures and form across your forest. Maintaining pleasing views, softening forest edges, or managing for a variety of fall colors are all activities that can enhance the aesthetic beauty of your land.

### SOFTENING FOREST EDGES

Minimizing the contrast between the opening and the forest is the primary goal in managing aesthetics along the forest edge. The edge defines the shape and texture of the forest setting. A soft transition from the low vegetation of the opening to shrubs and then to taller trees may be desirable, and can be attained by following these steps.

- Create or maintain wavy, irregular forest edges rather than straight edges.
- Establish or maintain irregular outlying groups of trees to create a natural appearance.
- Favor a mixture of hardwood and conifer species for variety in texture and color along the edge.
- Retain or establish trees and shrubs that vary in shape, form, foliage, and flower color.
- Plant native shrub and tree species that provide food—nectar, fruit, nuts, buds—for a variety of wildlife species.

### MAINTAINING OPEN AREAS AND VISTAS

Openings in large contiguous timber tracts with similar age and species provide plant diversity and attract additional wildlife species. In addition, openings can enhance the scenery and may provide pleasing views and vistas.

### ENHANCING FALL COLORS

Leaf-watching is a popular autumn pastime in the northeastern states. You can enjoy a breathtaking display of colors on your land by managing for a diversity of overstory and understory trees that will provide a variety of showy colors. Table 1 shows typical fall colors for common overstory and understory trees of the Northeast.

TABLE 1. Typical fall colors of common overstory and understory trees of the Northeast.

TREE SPECIES	FALL COLOR
American basswood ( <i>Tilia americana</i> )	Green or chartreuse
American beech ( <i>Fagus grandifolia</i> )	Yellow
Black gum ( <i>Nyssa sylvatica</i> )	Bright yellow
Chestnut oak ( <i>Quercus prinus</i> )	Chartreuse to yellow brown
Flowering dogwood ( <i>Cornus florida</i> )	Bright red
Quaking aspen ( <i>Populus tremuloides</i> )	Yellow
Red maple ( <i>Acer rubrum</i> )	Brilliant red or orange
Red oak ( <i>Quercus rubra</i> )	Variable—brick red to scarlet, golden yellow, yellow-brown
Scarlet oak ( <i>Quercus coccinea</i> )	Scarlet
Serviceberry ( <i>Amelanchier canadensis</i> )	Yellow, orange or brilliant red
Shagbark hickory ( <i>Carya ovata</i> )	Golden yellow to yellow-brown
Sugar maple ( <i>Acer saccharum</i> )	Bright yellow, orange or red
Sycamore ( <i>Platanus occidentalis</i> )	Yellow
Tulip poplar ( <i>Liriodendron tulipifera</i> )	Yellow
White ash ( <i>Fraxinus americana</i> )	Brilliant yellow to dark maroon
White oak ( <i>Quercus alba</i> )	Yellow, reddish brown to reddish purple
Yellow birch ( <i>Betula alleghaniensis</i> )	Yellow

---

## Increasing Recreational Opportunities

Many people enjoy hiking, birdwatching, hunting, camping, picnicking, picking berries, and just being outdoors. In the Northeast, most of the land suitable for outdoor recreation is privately owned. You may wish to open your lands for others to enjoy or you may choose to restrict the use of your land.

### BLAZING TRAILS

Trails provide access for monitoring the growth and health of your forest, exercising, recreation use, educational activities, and observing or photographing nature. If well planned, they will provide low-cost access and require minimal maintenance.

Proper trail construction can enhance scenic beauty and recreation. Trails should be built with proper drainage and adequate slope and grade to minimize erosion and maintenance. Post and gate your trails if you would like to discourage trespassing.

For proper trail or road construction, pre-plan the trail using aerial photographs, topographic maps, field maps, and personal knowledge of your property. Avoid areas with wet soils, frequent flooding, unstable or highly erosive soils, steep slopes, hazards such as cliffs and ledges, or locations requiring expensive bridges and culverts. Avoid environmentally sensitive areas and high maintenance areas such as those requiring constant mowing or pruning. Add variety by routing your trail past

## Controlling Public Access

### Liability issues

Any time people outside your family use your property there is some increased risk of liability. Laws governing the extent of your liability vary by state but often depend on the nature of the activity and your relationship with the user. Consult with your state forestry agency for information on public access liability laws and with your Cooperative Extension office for information on possible changes to property insurance that can control your exposure to liability.

### Open access

Uncontrolled public access requires no effort for you but may decrease the quality of recreational opportunities available to you and your friends and family. In addition, it could expose you to liability claims.

### Restricted access

Restricted access allows access to family, friends, neighbors, and responsible individuals who ask permission. This requires that you post your land or issue guest permits. The advantages

of posting and granting written permission are better control of activities on your land and reduced abuse of your property.

### Lease your land

Landowners who lease recreational rights usually charge at least enough to pay their property taxes. Often, through a contract, the lessee can be required to post the land, police trespassers, maintain roads, trails and gates, and pick up litter.

### Permit daily use for a fee

The owner issues daily written permits. Owners of hunting or fishing preserves, campgrounds, and wetlands or impoundments used for waterfowl hunting often use this approach.

### Form a cooperative with neighbors

Landowner cooperatives build a sense of community among neighbors with similar recreational or wildlife management goals. The acres entered into the cooperative can be used for personal enjoyment or can be available to the public through one of the above-mentioned methods.



Kristi L. Sullivan

*A well-maintained trail offers landowners comfortable access to the forest and encourages outdoor recreation.*

large trees, through different plant communities and habitat types, and past interesting vistas. Use curves to add interest and suspense, and provide greater opportunities to view wildlife.

## AGROFORESTRY OPTIONS

Agroforestry is the practice of combining trees and shrubs with crops and/or livestock to increase and diversify farm and forest production while conserving natural resources. All agroforestry practices provide goods and services that balance the landowner's profits with environmental stewardship. In the Northeast as well as other regions of the country, agroforestry practices such as maple syrup production, forest farming, alley cropping, windbreak development, and riparian buffer creation are practiced by a growing number of private landowners. You may choose to adopt agroforestry practices as a hobby, for economic gain, and/or to solve specific environmental concerns on your land. Agroforestry can increase your farm or forest profitability by adding new crops that increase and diversify overall production. For

example, combining annual crops with perennial nut and/or timber crops shortens the time for financial return and reduces risk associated with long-term investments in trees. In harsh climates, the protection afforded by windbreaks can increase the production of adjacent crops and livestock, more than offsetting the displacement of land to crops for trees.

In addition to profits, agroforestry practices also supply services that benefit the environment and society in general. Windbreaks and alley cropping are effective in reducing wind erosion and loss of valuable topsoil. Riparian buffers help provide clean water by trapping and filtering sediments, animal wastes, and chemicals from adjacent crop or pasture lands. Agroforestry practices can provide additional habitat for wildlife, creating opportunities for hunting and recreation, and beautifying the rural landscape.

Although agroforestry practices may have many benefits, they may or may not be suitable for your situation or land. To be a successful producer of agroforestry products you must also be willing to invest time and effort in marketing your products. Careful research and planning are an important part of any enterprise.

### *Producing Maple Syrup*

The production of maple products in North America occurs primarily in the northeastern United States and southeastern Canada, where sugar maple (*Acer saccharum*) is most abundant. Sap from the sugar maple tree is about 98 percent water and 2 percent sugar, other nutrients, and minerals. Making pure maple syrup requires boiling and evaporating a lot of the water away. Maple syrup is 33 percent water and 67 percent sugar. Therefore, it takes a lot of sap (about 40 gallons) to make one gallon of maple syrup.

A grove of sugar maple trees is called a sugarbush. The number and size of trees you have in your sugarbush will determine how much sap you can collect and how much syrup you can produce.



Robert Beyfus

*Producing maple syrup is an income-generating option for some landowners with sugar maple on their property.*

Location of the maple trees is also important and will determine the kind of maple syrup operation that is feasible. Ideally, your sugarbush should be close to where you will process the sap.

### **Forest Farming**

Forest farming is the intentional cultivation of edible, medicinal, or decorative specialty crops beneath native or planted woodlands. It does not include the gathering of naturally-occurring plants from native forests, also known as wildcrafting. Forests can sustainably produce more than just wood, and the cultivation of specialty crops in a forest setting can provide new sources of annual or periodic income between, or instead of, timber harvests.

A wide variety of edibles such as mushrooms, honey, and nuts; medicinal plants, such as ginseng and goldenseal; and decorative and craft products, such as mosses and ferns, can be grown in a forest to produce natural or processed (value-added) products. Some of these plant species may be rare in the wild due to over-harvesting, and

actively and intensively cultivating these plants is a responsible alternative to wildcrafting. Many states have laws that govern how and when plants like ginseng can be harvested and sold, so check with your state forestry agency or county cooperative extension office for more information. Shade-tolerant plants that are naturally adapted to growing in forest conditions are good candidates for cultivation. Thinning and pruning the forest canopy can provide optimum light levels for understory crops while improving tree growth and wood quality.

### **Alley Cropping**

Alley cropping is the cultivation of food, forage, or specialty crops between rows of trees. It is a larger version of intercropping and companion planting conducted over a longer time scale. Alley cropping benefits both humans and the environment by helping landowners diversify their income, and improve marginal lands. For example, you can interplant crops such as pumpkins and raspberries between rows of nut or maple trees. Crop production before the nut or maple trees come into bearing or before hardwood timber is harvested, can create cash flow, diversify your income, and improve the return on your long-term investments in trees. By planting rows of nut or timber trees on land where annual crop production is low due to erosion or other limitations, you can convert marginal croplands to higher value woodlands. The rows of trees reduce wind speed. This controls wind erosion and creates sheltered microclimates that can improve the yield and quality of crops growing in the alleys. Alley cropping also increases the diversity of cropland and creates new habitat for wildlife.

### **Riparian Buffers**

Riparian buffers are strips of perennial vegetation (tree/shrub/grass) planted between crops, pastureland, or developed land and streams, lakes, wetlands, ponds, or drainage ditches. Riparian

---

buffers reduce runoff and non-point source pollution from lands adjacent to the stream by trapping sediment, filtering excess nutrients, and intercepting and degrading pesticides. They can also stabilize streambanks, protect floodplains (as “waterbreaks”), enhance wildlife habitat, and provide harvestable and saleable products such as timber, pulpwood, fruits, nuts, and floral products.

### **Windbreaks**

Windbreaks are linear plantings of trees and shrubs designed to enhance crop production, protect people and livestock, supply wildlife habitat, and provide for soil, energy, and water conservation. Windbreaks are an important conservation practice in areas with relatively flat landscapes and light soils. Although a typical windbreak may have as few as 1–3 rows of plants, it can protect the soil from blowing for a width up to 10 times the height of the trees.

Windbreaks can also provide wind and snow protection for the home, farm buildings, feedlots, and livestock enclosures. Windbreaks can also

reduce snow accumulation on roads, and thus reduce plowing costs. A good windbreak also can reduce home heating costs 10 to 20 percent and serve as a sound barrier, dulling the noise of traffic, machinery, and animals.

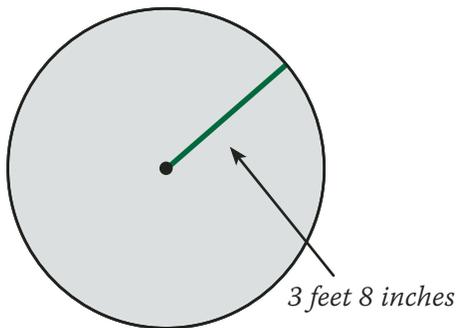
You can thin multiple-row windbreaks of fast-growing species like poplar while maintaining the continuity of shelter. By planting trees and shrubs that produce specialty food or decorative products like chokecherry, or corkscrew willow, you can produce marketable products and extra income in your windbreaks.

Windbreaks can also provide food and cover for wildlife. To benefit wildlife, choose a variety of trees that have wildlife benefits, and plant them so there is a mix of tree types within and among rows. Alternate trees and shrubs within the row, or consider adding one or more shrub rows immediately next to the tree row on the leeward side. Stagger the tree and shrub rows to better fill gaps. Shrubs can provide ground cover and add foraging and nesting sites near the ground. Wide windbreaks of eight or more rows may provide wildlife with ample protection from weather.

To fully understand your timber and wildlife options, you need to be familiar with the tree species you have in your forest. This activity will help you get to know your forest as it exists today and to evaluate its future potential. Before setting your ownership objectives, you should have a good idea of your possibilities based on the species composition of your forest. As you complete these activities think about which tree species are valuable timber species, which species provide vivid fall foliage, or which species provide food or habitat for wildlife.

By reading the “Forest Management” section, taking the quiz, and taking time to understand and document your forest resources, you will get to know your land better. Don’t forget to share your results with your forester so that he/she can have a clear understanding of the resources you own.

1. Learn to identify your trees! Being able to identify your trees can provide a great sense of satisfaction. Once you are able to see which trees you have on your property, you will begin to see your forest in a whole new way. To learn how to identify your trees you can attend a local workshop, use a field guide, or visit [HTTP://BHORT.BH.CORNELL.EDU/TREE/TREES.HTM](http://BHORT.BH.CORNELL.EDU/TREE/TREES.HTM) to view the publication “Know Your Trees” online.
2. Seedling survey. The number of tree seedlings you have in your forest represents your potential to grow a new forest if you choose to harvest large or mid-sized canopy trees. These seedlings are your next generation! Complete a seedling survey by randomly selecting 10 points in your forest. Make a rope that is 3 feet 8 inches long with a loop on one end. To survey each point, anchor the rope through the loop at the selected point. The rope represents the radius of your sample plot. Count all of the tree seedlings within the circle that are from knee to head high. Then, for each plot, multiply the number of seedlings in your circle times 1,000. The resulting number is the number of seedlings per acre. Average the number of trees per acre for the 10 plots to find the average number of seedlings per acre in your forest.



PLOT NUMBER	NUMBER OF SEEDLINGS IN PLOT	NUMBER OF SEEDLINGS × 1,000
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

3. High-grading takes place when you “take the best and leave the rest.” This approach may yield the most money in the short-term. However, your long-term options will be seriously limited. The result of this approach is that trees of poorer form, or trees that have grown slowly because of poor genetics or not being well-adapted to the site, are all that you have left as a seed source for your next generation. This practice reduces the future forest quality and may change the species composition of your forest. To complete this activity, select a forest stand on your property and record the tree species in each size category. Next to each species write “common” or “uncommon.” Circle the two or three most common species in each size class. These are the dominant species. The dominant species are the most common or abundant species growing in your forest. Tree size is calculated using the diameter of the tree trunk at breast height (dbh) (about 4.5 ft high).

CATEGORY	DBH	SIZE COMPARISON
Small	1–5 inches	Coffee cup
Medium	5–10 inches	Paper plate
Large	10–15 inches	Hubcap
Extra large	15–20 inches	Car tire

List the tree species by size class below.

1–5 inches	5–10 inches	10–15 inches	15–20 inches

Describe how the forest would look if one whole size class was removed. Would you lose any species from your forest? How would this affect wildlife? What would the forest look like? Would you limit your future options for producing timber?

Before setting your wildlife objectives, you should have a good idea of what your possibilities are based on the features of your property. This activity is designed to help you look at your property with the needs of wildlife in mind. As you walk out on your land, think about what successional stages of forest you have. Are these stages consistent with the types of wildlife you would like to attract? For instance, are you interested in having more ruffed grouse? If so, do you have young, early successional forest on your property? Would you like to manage for a variety of salamanders and songbirds like the ovenbird? Meeting this objective would require mature forest cover.

Once you have looked at the general make-up of your forestland, consider the special habitat features (like cavities or seeps) that already exist on your property. Then think about what features you could add to improve wildlife habitat. Regardless of the forest stages you have on your property, there are many things you can do to improve your forest for wildlife. For example, do you have snags throughout your property? Are there places where you could protect and maintain mast trees for wildlife food? Could you build some brush piles or leave woody debris lying on the forest floor following a cut?

Once you have walked your property, try looking at your property as part of the “big picture.” Obtain an aerial photograph of your property and the surrounding area. See page 9 in this guide for sources of aerial photos. What does your property have that is missing from the surrounding area? For example, do you have a stand of hemlock trees in an otherwise deciduous landscape? If so, you may have an important wildlife habitat feature for an area larger than your property. Do you have a large acreage of mature forest but your neighbors have mostly young forest? If you do, then you are providing variety in the types of habitat that are present in the area. Likewise, if you live in an area that is surrounded by thousands of acres of mature forest, then cutting to create young, early-successional habitat could add a habitat component that might attract new species to the area.

By reading Chapter 4 and then walking your forest with an “eye for wildlife,” you will start to see your land in an exciting new way! Take this activity with you while you walk your land. Then share your results with your forester so that he/she can help you evaluate your wildlife objectives in conjunction with your other objectives.

1. Draw a sketch of your property. Include areas with different successional stages, forest openings, and special habitat features.

---

2. Complete this checklist to identify the habitat features you have on your property.

<b>Habitat Features on My Property</b>					
YES	NO		YES	NO	
_____	_____	Young forest	_____	_____	Cave
_____	_____	Middle-aged forest	_____	_____	Rock pile or rocky hillslope
_____	_____	Mature forest	_____	_____	Cavity trees
_____	_____	Conifers	_____	_____	Woody debris
_____	_____	Spring seeps	_____	_____	Mast trees
_____	_____	Stream	_____	_____	Berry or fruit (soft mast) trees or shrubs
_____	_____	Wetland			

3. Obtain an aerial photograph of your property and surrounding properties.

a. How would you characterize the area? Is it mostly forested, or mostly open. Are the forests mostly deciduous or mostly coniferous? Are there many wetland areas or streams?

b. How does your property fit into the “big picture”? Do you have any unique features on your property that aren’t present in the surrounding area? What could you add that could make a difference for wildlife?

Agroforestry can help to supplement the income you receive from your forest while you wait for your timber resources to mature. If timber management is not one of your objectives, agroforestry may provide an alternative source of income. You may also wish to grow products in your forest as a hobby, or just for personal use. There are a variety of products that you may be able to grow in your forest, or as a complement to agricultural crops—products like maple syrup, nuts, forest berries, medicinal plants, and craft items.

Take this worksheet along with you to at least three different businesses. Visit a grocery store, a craft supply store, a local farm stand, a drugstore, a restaurant, or a natural foods store. List the items that you find in the store or on the menu that can be grown in a forest, or that are products of trees and shrubs that can be grown in agricultural fields. Once your list is complete, research a few products that interest you. Find out if you have the conditions, time, and resources required to grow the product as well as a place or people to buy your product. For more information on many agroforestry products, go to the national web-based learning center web site at [WWW.FORESTANDRANGE.ORG](http://WWW.FORESTANDRANGE.ORG), click on “Learning Options” and then click on “The How, When, and Why of Forest Farming.”

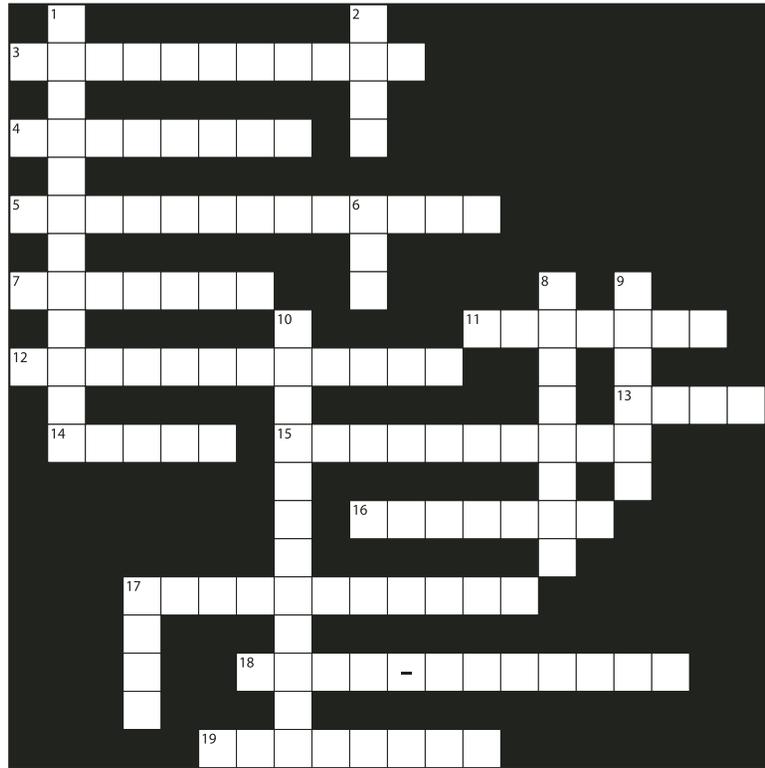
List the potential agroforestry products that you find in the stores you visit.

- Are there any berries, or jellies, jams, butters, or other products made from berries grown in the forest? Some examples include raspberries, blackberries, serviceberries, or elderberries.
- What types of nuts can you find that can be grown in the Northeast? Examples include walnuts, chestnuts, and hickory nuts.
- Mushrooms such as shiitake, oyster, or morels, can be cultivated in northeastern forests. What types of mushrooms did you find?
- A variety of products can be made from maple sap. List the examples you find.
- There are several medicinal or herbal plants that can be grown in northeastern forests—plants like ginseng, goldenseal, and cohosh. What examples can you find?

NOTES:

**Down**

1. When your forest stands mature, you may want to concentrate your management activities on the process of naturally \_\_\_\_\_ a new forest.
2. The \_\_\_\_\_ tree method focuses on improving the growth of specific trees, the crop trees, by eliminating shading from neighboring trees.
6. \_\_\_\_\_ is a common term used to describe cutting practices to improve the existing forest stand.
8. All plants compete for \_\_\_\_\_, soil moisture, and soil nutrients—the three basic requirements for growth.
9. Management activities that take place at the \_\_\_\_\_-aged forest stage focus on selecting the trees that will dominate the mature stand later.
10. \_\_\_\_\_ removes most of the trees in an area at once.
17. The \_\_\_\_\_ tree method is a modification of clear-cutting where 7–10 of the best trees on each acre are left standing to become the parent trees for the new forest.



**Across**

3. Adding nutrients through \_\_\_\_\_ is an option, although the cost to do so even on the modest acreage often prohibits this practice.
4. A \_\_\_\_\_ species is one that can influence or change its own habitat, the habitat of other species, and the forest ecosystem.
5. When all trees are removed without the intent of regeneration that practice is \_\_\_\_\_ and is not clearcutting.
7. The success of \_\_\_\_\_ regeneration depends on whether there is an adequate supply of seeds, moisture, and a well-prepared seedbed.
11. \_\_\_\_\_ is used to improve wood quality by removing persistent low branches.
12. The art and science of controlling the pace of forest establishment, composition, structure, and growth is called \_\_\_\_\_.
13. Competing vegetation or too many \_\_\_\_\_ can reduce your ability to naturally regenerate a forest.
14. To create an uneven-aged forest, use \_\_\_\_\_ selection.
15. \_\_\_\_\_ regeneration is establishing a new forest by planting seedlings or by direct seeding.
16. Planting seedlings can be successful if the seedlings are \_\_\_\_\_, well-adapted to the site, and carefully planted.
17. When 20–35 trees are retained on each acre as a seed source, this is called the \_\_\_\_\_ method.
18. \_\_\_\_\_ is cutting the best trees and leaving the low value, often diseased or malformed trees.
19. High-grading at any level \_\_\_\_\_ the forest and reduces the options available to you.

See the key to this crossword puzzle on page 83

Fill in the blanks using the following words.

above	different	mast	similar
bark flaps	diversity	mutually exclusive	species richness
berry-producing	food	parasitism	spring seeps
birds	forest management	predatory fish	succession
cover	holes	rock piles	water

1. To survive, every animal requires four basic habitat elements—food, \_\_\_\_\_, water, and space.
2. American beech, oaks, black cherry, hickory, raspberry, and grapevines are examples of plants that produce \_\_\_\_\_.
3. Snakes, skinks, and lizards, as well as other animals visit \_\_\_\_\_ to find food and regulate their body temperature.
4. Cavity trees are live or dead trees with \_\_\_\_\_ in them.
5. Trees like sugar maple and shagbark hickory are examples of species that often have \_\_\_\_\_.
6. \_\_\_\_\_ is essential for the survival of all wildlife.
7. Forested wetlands provide rich areas of habitat, with abundant \_\_\_\_\_ and excellent cover.
8. Vernal pools do not support \_\_\_\_\_, and therefore are critical breeding areas for many northeastern species that lay eggs in these ponds.
9. \_\_\_\_\_ are areas where groundwater comes to the surface.
10. Groundwater temperatures remain \_\_\_\_\_ freezing, therefore seeps often remain free of snow.
11. In small patches of forest, nest predation and \_\_\_\_\_ often occur more frequently than in large, unfragmented forests.
12. Young, even-aged forests often have an abundance of \_\_\_\_\_ shrubs and brushy cover.
13. As a forest changes through \_\_\_\_\_, its structure, size and arrangement of trees, also change.
14. Many species, particularly \_\_\_\_\_, divide the habitat vertically.
15. Habitat features can be accentuated or created through careful \_\_\_\_\_.
16. Species whose habitat requirements are similar to those of the featured species will benefit, while those with \_\_\_\_\_ habitat requirements will not.
17. A guild is a group of species that uses the same environmental resources in a \_\_\_\_\_ way.
18. You can manage for some guilds in conjunction with others, while some are \_\_\_\_\_.
19. By creating a mosaic of age class and cover type combinations, you can manage for \_\_\_\_\_.
20. By creating a \_\_\_\_\_ of habitat types, you can satisfy the needs of a variety of species.

*See the key to this quiz on page 83*

*Circle the correct answer*

1. Open areas can
  - a) Provide plant diversity
  - b) Attract wildlife
  - c) Add pleasant views
  - d) All of the above
2. What is the primary goal in managing aesthetics along the forest edge?
  - a) Minimizing the contrast between the opening and the forest
  - b) Distinguishing between tall and short trees
  - c) To allow people to see a pretty forest
3. Which of the following is NOT a way to create a soft transition from low vegetation to taller trees?
  - a) Cut all the vegetation down to one height
  - b) Create wavy, irregular forest edges
  - c) Favor a mixture of hardwood and conifer species for variety along the edge
4. Most of the land suitable for outdoor recreation is . . .
  - a) Owned by the government
  - b) Privately owned
  - c) Owned by non-profit organizations
5. True or False. There is increased liability every time a non-family member uses your property.
  - a) True
  - b) False
  - c) It varies by state
6. Which of the following options has the highest risk of liability?
  - a) Don't let anyone on your property
  - b) Open access
  - c) Restricted access
  - d) It varies by state
7. Which of the following is a way to control public to access your land?
  - a) Issue daily permits for a fee
  - b) Blaze trails
  - c) Post a sign that says "Open to all"
8. Which of the following is NOT a tool for pre-planning proper trail or road construction?
  - a) Aerial photographs
  - b) Topographic maps
  - c) Road map
9. Landowner cooperatives can
  - a) Solve all of your problems
  - b) Build a sense of community
  - c) Help landowners achieve similar goals
  - d) b and c

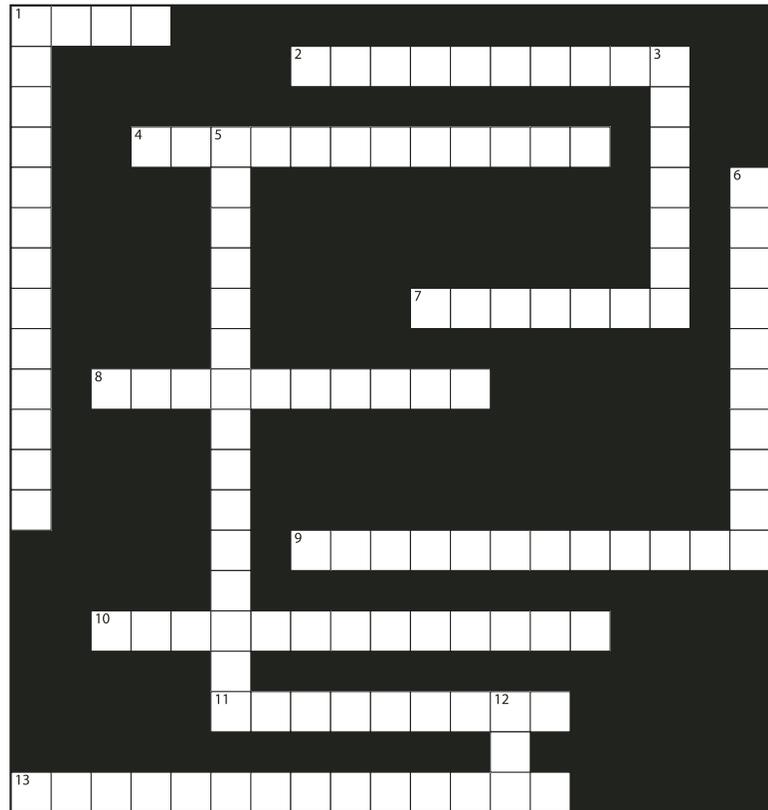
*See the key to this quiz on page 83*

**Down**

1. The intentional cultivation of edible, medicinal or decorative specialty crops beneath native woodlands is called \_\_\_\_\_.
3. \_\_\_\_\_ can provide optimum light levels for understory crops.
5. \_\_\_\_\_ help provide clean water by trapping and filtering sediments, animal wastes and chemicals from adjacent crop or pasture lands.
6. \_\_\_\_\_ can be used in harsh climates as protection to increase the production of adjacent crops and livestock.
12. \_\_\_\_\_ is composed of 98 percent water and 2 percent sugar.

**Across**

1. Windbreaks can provide \_\_\_\_\_ for wildlife.
2. \_\_\_\_\_ contains 33 percent water and 67 percent sugar.
4. The practice of combining trees and shrubs with crops and/or livestock to increase and diversify farm and forest production while conserving natural resources is called \_\_\_\_\_.
7. Many states have laws that govern how \_\_\_\_\_ is harvested and sold.
8. \_\_\_\_\_ is most abundant in northeastern United States and southeastern Canada.
9. A good windbreak can reduce \_\_\_\_\_ up to 20 percent.
10. The cultivation of food, forage, or specialty crops between rows of trees is called \_\_\_\_\_.
11. A grove of maple trees is called a \_\_\_\_\_.
13. \_\_\_\_\_ are a great new source of annual or periodic income.



*See the key to this crossword puzzle on page 84*

---

# Protecting Your Soil, Water, and Forest Resources

Best Management Practices (BMPs) are widely accepted and usually voluntary activities that have positive effects or minimize negative effects on the forest ecosystem. They may benefit individual forest stands, several properties, or an entire watershed. Some BMPs are multipurpose. For example, buffer strips along streams designed to control soil erosion and sedimentation can also serve as wildlife travel corridors, result in habitat diversity, and maintain stream water temperature and nutrient levels. BMPs define the basics—minimal acceptable standards—of good forest management, although some landowners may choose to do more. The BMPs you select will be a unique combination of practices suited to the needs of your property. By walking your property and identifying such things as sensitive zones around water bodies and

streams, soil types, areas of steep slopes, unique natural areas, and important wildlife habitats, you will get an idea of what issues you need to address before you undertake forestry practices that might disturb soil. By becoming familiar with the BMPs and using them as a guideline for both short-term and long-term forest management activities, you can become a good forest steward, contributing to a brighter future for Northeast forests. To identify areas on your property that require special consideration or protection, complete the “Quest for Water” activity at the end of this chapter.

## RIPARIAN BUFFERS

Riparian buffers, or stream management zones (SMZ), include the land and vegetation adjacent to water bodies such as streams, rivers, lakes, and



Kristi L. Sullivan

*Maintaining buffers along stream banks prevents erosion, improves water quality, and provides wildlife habitat.*

wetlands. These buffer areas are critical for filtering sediment and pollutants, preventing them from entering water bodies. They slow, filter, and spread surface water. This cleanses the water, allows time for more water to infiltrate into the soil, and reduces erosion. You can still access and use the buffer area, but because of its role in maintaining water quality, you will want to take special precautions.

Riparian buffers also provide important fish and wildlife habitat. When forested, they shade adjacent waters, keeping water temperatures cool and dissolved oxygen high. Some aquatic species, like brook trout, require cool temperatures and plenty of dissolved oxygen to survive. In addition, trees within buffers contribute leaf litter and branches to the water. This organic matter in turn provides habitat for aquatic insects and other organisms that fish, amphibians, and others need for food. Riparian buffers also provide travel and feeding corridors, as well as important riparian habitat for wildlife.

The recommended width of any buffer will vary according to the topography of the land, soil type, and purpose of the buffer (Table 2). However, the minimum width of any streamside buffer should be 25 feet on each side of the stream. For each 10 percent increase in slope, the buffer width should extend 20 additional feet. Buffers should also be left

around wetlands and vernal pools. Many wildlife species that breed in these habitats, like wood frogs and spotted salamanders, depend on the water for completing only part of their life cycle. The remaining seasons are spent in the surrounding upland habitat. Buffers intended to provide the greatest benefits to wildlife should be a minimum of 100 to 300 feet in width. If buffers contain sensitive or unique habitat types or species, or are located adjacent to a body of water that supports such species or habitats, wider zones may be desired. Always check your state guidelines, as recommendations will vary. Management activities are not excluded from buffers, but a lighter activity level and extra precautions may be necessary to maintain the integrity of the buffer.

TABLE 2. *Riparian Buffer Width Guidelines*

SLOPE OF LAND	MINIMUM WIDTH OF FILTER STRIP (FT)*	
0	25	* If harvesting activity is located on municipal water supply lands or within the watershed of a municipal water supply, check with the municipal forester for any special considerations or guidance.
10	45	
20	65	
30	85	
40	105	
50	125	
60	145	

### Riparian Buffer Best Management Practices

1. Maintain wide enough zone to capture and filter soil and other pollutants before they reach the stream or water body.
2. Provide adequate ground cover to slow water flow, with no more than 40 percent bare ground, evenly distributed.
3. Maintain the streamside shade and water temperature by keeping about 75% of the number of trees that were on-site before the harvest.
4. Do not apply any broadcast pesticide or fertilizer within the buffer.
5. Do not manage with prescribed burns.
6. Never locate roads or trails within a riparian buffer, except where physical or topographic restrictions require it or when stream crossings are essential.
7. Do not locate sawmills, log landings, or log storage areas within the buffer unless special water control practices are used.

## CONTROLLING WATER ON ROADS AND TRAILS

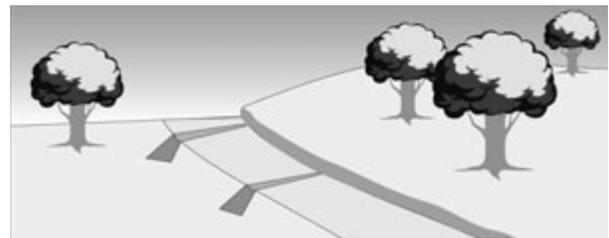
Road or trail systems, temporary or permanent, can provide access for timber harvesting, management activities, recreation, or wildlife enjoyment. However, improper road construction and maintenance is the leading cause of erosion and sediment from forestry. The primary source of erosion in forest management is not cutting trees, but rather soil disturbance associated with roads, skid trails, and landings. Therefore, careful planning is essential to maintain water quality. Most erosion happens during brief episodes of rain or high water. The goal of erosion-control is to slow down fast moving water during these episodes.

Forest harvesting and management activities often require crossing intermittent or perennial streams. You can minimize the effects of road crossings by planning as few crossings as possible. Road and trail approaches to stream crossings must have good surface drainage that turns water into

undisturbed areas away from the stream course. In some states, permits may be required before installing culverts or other features in a stream.

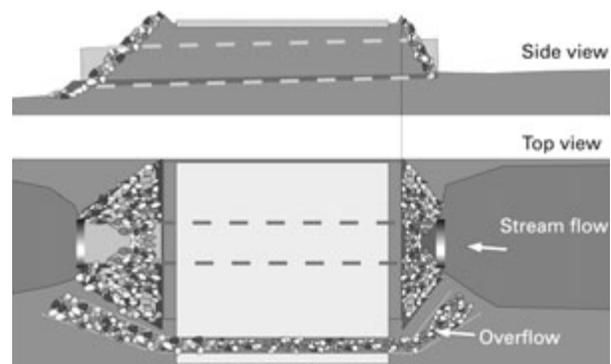
There are several different management techniques to divert or drain water off of roads or trails. They include:

**Water turnouts** — Water turnouts are ditches, trenches, or waterways that divert water away from the road surface. They carry water into an undisturbed area where the flow slows and sediments are filtered and trapped.



*Water turnout*

**Culverts** — Cross-road drainage is the transfer of water across or under the road, usually by a round culvert. It is used on any road or trail where storm water runoff, ditch-to-ditch transfer, slope, or overland seepage might cause erosion. Pipe culverts 14 inches in diameter or larger are normally installed on permanent roads and trails. The actual size of the culvert will depend on many factors including the area of watershed above the culvert.

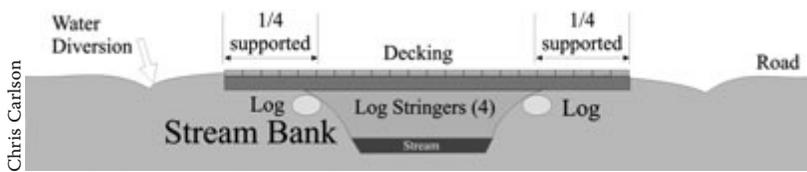


*Culvert*

**Bridges** — Temporary or permanent, there are numerous styles of bridges used to cross streams

### Road and Trail Best Management Practices

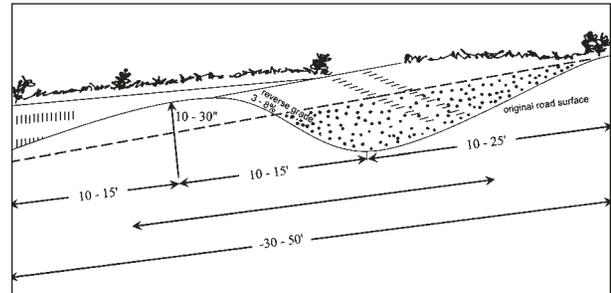
1. Allow roads to stabilize before use.
2. Keep roads as narrow as possible.
3. Locate roads on gentle slopes, avoiding flood plains when possible.
4. Avoid placing roads within riparian buffers.
5. When stream crossings are necessary, construct bridges, culverts, or fords perpendicular to the stream.
6. Open the forest canopy adjacent to roads to maximize drying and promote vegetation growth.
7. Inspect and maintain roads frequently.
8. Control water by diverting or draining water from road and trail surfaces.



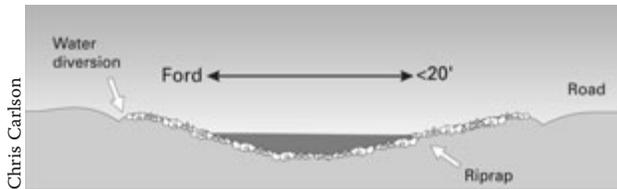
Bridge

where culverts cannot handle the stream flow. Bridges should be built to handle heavy loads using the proper type, size, and materials. It is best to seek professional assistance for help designing your bridge. Stream channels and stream banks should be protected from erosion during construction using continual mulching or vegetated ground cover. Abutments and headwalls may be needed to handle flood conditions and stabilize the approaches to the crossing area. Use vegetation or ground cover to stabilize road approaches and road banks.

**Rolling dips** — Rolling dips are a rounded hump that creates a reverse slope and turnout. They are often used in skid trails where logs are skidded to a log loading area. The rolling dip provides cross drainage, slows water flow, and holds up better under heavy traffic.



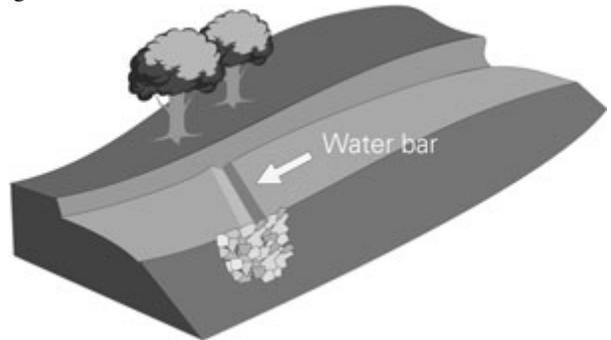
Rolling dip



Ford

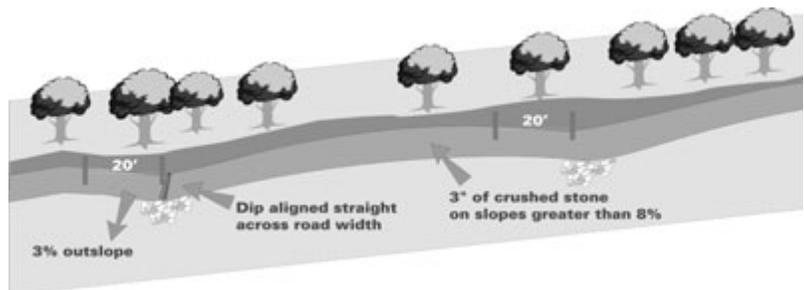
**Fords** — For temporary or minimum-use crossings, fords should only be used where the stream has an applied or existing firm base. Riprap stone, brush, poles, or other materials are used to stabilize the road or trail approaching a ford. They are also used on the streambed to protect the stream channel. After road use ceases, brush and other materials should be removed but stone is usually retained.

**Water bars** — Water bars are a combination mound/trench built into a road or trail and sloped slightly downslope to move water off the road surface into an undisturbed, adjacent area. Water bars are usually installed after the road is no longer used.



Water bar

**Broad-based drainage dips** — Broad-based dips create a reverse uphill slope in a road surface, effectively slowing and moving water off the road surface into an undisturbed adjacent area.



Broad-based dip

---

## TIMBER REGENERATION AND HARVEST BMPs

Many forests are maturing, and if harvested, the forest owner should strive for the regeneration of a healthy, productive future forest. However, in many Northeast forests, advanced regeneration of desirable species is lacking due to the effects of high-grading, deer browsing, and/or competing vegetation. If existing mature trees are harvested and the seed source of desirable species is removed before seedlings have grown beyond the reach of deer (> 5 feet), and before competing vegetation is controlled, it will be difficult to use natural methods to reproduce a productive forest. Talk to your forester about the BMPs below. Discuss the amount and species of regeneration in your forest, what factors might limit regeneration, and what steps your forester will take to prevent problems from occurring.

### *Regeneration BMPs*

You and your forester should discuss these issues before you initiate a harvest. Any harvest that removes large diameter trees will affect future regeneration and needs your attention to ensure a healthy and productive forest.

1. Assess advanced regeneration, seed sources for postharvest regeneration, and potential stump and root sprouting.
2. Assess and, if necessary, control competing vegetation such as ferns, grasses, and other undesirable understory tree and shrub species.
3. Assess and, if necessary, control the potential loss of seed, seedlings, and sprouts to deer and other wildlife.
4. Provide for regeneration each time harvests are made under even-aged and uneven-aged systems.
5. Consider the biological requirements of the species you want to regenerate, whether by natural reproduction or planting.

Once you and your forester have taken the necessary steps to ensure regeneration and you are ready to harvest timber, take steps to minimize the negative impacts of harvesting on vegetation that will remain on the site. Poor harvesting practices and careless operation of equipment can damage the trees that remain. Proper planning can minimize the chances of damaging or degrading the residual stand. Intermediate treatments, such as thinning and timber stand improvement, should always leave the forest in better condition than it was in before the activity. Talk to your forester about the Harvest BMPs listed below.

### *Harvest BMPs*

1. Put primary attention on protecting the trees you leave behind (the residual trees) rather than on the trees being cut.
2. During thinnings and other intermediate harvests, keep the species whose seed you will need to achieve your long-term management objectives.
3. Before you harvest know if you will need to control weedy vegetation to allow desired regeneration to survive.
4. Design and lay out skid trails and skid roads to minimize damage to residual trees. Lay out relatively straight trails and roads and use bumper trees to protect residual trees from skidding damage.
5. Harvesting during the growing season, April to August, requires special attention. The growing season usually brings softer soils, tree bark that slips more easily when bumped, and nesting wildlife.
6. Avoid harvesting in areas with unique vegetation, or do so during the dormant season when above-ground portions are less susceptible to damage.
7. During thinning, timber stand improvement (TSI), and other intermediate treatments, ensure that you have retained all

---

your options for a future forest that is healthy and productive.

8. Avoid high-grading (see sidebar on page 24).

## **BMPS FOR PESTICIDE APPLICATION**

Pesticides include herbicides, insecticides, fungicides, and rodenticides. Delivering the appropriate type and amount of pesticides to the right place at the right time is the key to minimizing their effects on water quality, as well as non-target species. Be certain that you or your agent carefully plans any pesticide application and be certain to read and follow all label directions carefully. Before applying any pesticides, find out which state and federal regulations apply. Many states require applicator certification. The practices below should be followed by you or any person you hire to apply pesticides on your land.

1. Apply pesticides only according to label directions, using the minimal rate to accomplish desired results.
2. Carefully apply pesticides, avoiding direct and indirect entry of pesticides into streams or water bodies. When controlling unwanted trees or competing vegetation in riparian buffers, use injection, stump treatment, or directed spray in areas immediately adjacent to open water. Do not use broadcast applications in these areas.
3. Mix chemicals and clean tanks only where spills will not enter streams, lakes, or ponds.
4. Maintain and adjust application equipment to prevent spillage and excessive application. If a spill occurs, immediately contain it and notify appropriate authorities.
5. Dispose of containers according to label recommendations and applicable state laws.
6. If hiring a professional applicator, require a written contract and proof of appropriate licenses, insurance, and bonding of the contractor.

To protect your water resources you need to know what resources you have. This activity is designed to help you locate important sources of water on your land so you can protect and enjoy them. As you walk your land, think about the value that various sources of water have for wildlife. Are there any vernal pools or wetlands on your property? Do you have any wetlands? What about streams? Or spring seeps? Water is not only beneficial for wildlife, it can also be a source of comfort for us. Consider the beauty of a fast-moving stream or the peaceful sound of running water. Water can also provide great places for recreational activities, like fishing, photography, and nature study.

Once you have located all the different sources of water on your land, think about ways that you can protect them. For instance, have you left a buffer zone around your streams and wetlands? Even the animals that use ponds, vernal pools, and spring seeps benefit when an area of minimal disturbance is left around the sources of water that they use for habitat. Buffer zones can also filter sediments and contaminants, and prevent them from reaching adjacent waters. In addition to areas where buffer zones might be helpful, are there steeper areas on your property that might be prone to erosion or need special attention? Would any of these areas benefit from the best management practices discussed in this chapter?

By reading Chapter 5 and then searching your forest for water, you will start to see the special water treasures that are part of your property! Take this activity with you while you walk your land. Then share your results with your forester so that he/she can help you evaluate your water objectives in relation to other objectives you have for your land.

## NOTES:

1. Obtain a topographic map of your property. See page 9 of this guide for sources of topographic maps. Using the map, identify areas with steep slopes, and areas that are close to streams or wetlands. Shade or circle these areas. These are areas that require special considerations. For instance, roads should be placed outside of buffer zones and on gentle slopes.
2. Sketch all of the water features you have on your property on the topographic maps. Include areas of groundwater seeps, vernal pools, wetlands, streams, and ponds. Larger water features, like ponds, may show up on the map already. However, seeps and vernal pools will not usually show up on a topographic map. Label all of the water features.
3. On the topographic map, draw buffer zones around all of your water resources. Make each buffer at least 25 feet wide on each side of a stream. Remember that wider buffer zones are needed in areas with steep slopes (consult the table on page 56). If you would like to provide maximum benefits for wildlife, you can establish buffers that are 100 to 300 feet wide on all water sources. Sketch all of your buffers on the topographic map. These will be areas where you will want to pay special attention to BMPs.
4. As you walk around your property, do you notice any areas that are eroding and need special care? Are there any areas where water bars, rolling dips, culverts, or other BMPs could be established to protect water quality? Identify areas you suspect may be problematic on the topographic map of your property and discuss these areas with your forester.

Fill in the blanks using the following words.

10	cross-road	oxygen	soil type
25	culvert	pesticide	stream crossings
Best Management Practices	drainage	pesticides	travel
bridges	erosion	riparian buffers	trenches
broad-based	fords	road construction	water
cross drainage	injection	roads	water turnouts

1. \_\_\_\_\_ are actions you can take to protect the health of your forest before, during, and after management activities.
2. The land and vegetation adjacent to water bodies like streams, lakes, wetlands, etc. are called \_\_\_\_\_.
3. Trees within riparian buffers help shade adjacent waters, keeping water temperatures cool and dissolved \_\_\_\_\_ high.
4. Riparian buffers provide \_\_\_\_\_ and feeding corridors for wildlife.
5. The recommended width of any buffer will vary according to the topography of the land, \_\_\_\_\_, and purpose of the buffer.
6. The minimum width of any buffer should be \_\_\_\_\_ feet on each side of the stream.
7. For each \_\_\_\_\_ percent increase in slope, the buffer width should be extended 20 additional feet.
8. While maintaining your riparian buffer, do not apply any broadcast \_\_\_\_\_ or fertilizer within the buffer.
9. The leading cause of soil erosion and sedimentation from forestry is improper \_\_\_\_\_.
10. Most \_\_\_\_\_ happens during brief episodes of rain or high water.
11. The guiding rule in erosion control is to slow down fast moving \_\_\_\_\_.
12. Avoid placing \_\_\_\_\_ within riparian buffers except when physical or topographic conditions require it or when stream crossings are essential.
13. Use diversion or \_\_\_\_\_ to control water on roads.
14. Ditches, trenches, or waterways that divert water away from the road surface are called \_\_\_\_\_.
15. \_\_\_\_\_ drainage is the transfer of water across or under the road.
16. \_\_\_\_\_ is one example of a structure that can be used on roads where storm water runoff or seepage might cause erosion.

- 
17. A reverse uphill slope in a road surface that slows and moves water off the road surface is called a \_\_\_\_\_ dip.
  18. The rolling dip provides \_\_\_\_\_, slows water flow, and holds up well under heavy traffic.
  19. Water bars are a combination of mounds and \_\_\_\_\_ built into a road or trail.
  20. Road and trail approaches to \_\_\_\_\_ must have good surface drainage that turns into undisturbed areas .
  21. Stream channel and stream banks should be protected from erosion during construction of \_\_\_\_\_ by vegetated ground cover.
  22. For temporary-use crossings, \_\_\_\_\_ should only be used where the stream has an applied or existing firm base.
  23. \_\_\_\_\_ include herbicides, insecticides, fungicides and rodenticides.
  24. When using pesticides in riparian buffers, use \_\_\_\_\_, stump treatment or directed spray in areas adjacent to open water.

*See the key to this quiz on page 84*

---

# Economic Issues

The actions or inactions you take in your forest can result in greater economic gains or perhaps increased loss. In most cases, an ounce of prevention is worth a pound of cure. Take the time now to position yourself for your desired level of economic security. Consider woodland investments and returns from investments in terms of revenues and non-market benefits. You should also consider tax issues, whether selling timber, reporting expenses, or settling an estate.

## DOES MONEY GROW ON TREES?\_\_

Forests and trees are unique assets because they produce multiple products that have value in private markets and as public goods. Marketable

products from private lands include timber (saw-timber and pulpwood), firewood, floral and medicinal plants, wildlife, mushrooms, maple syrup, and many others too numerous to name. Forests also provide public benefits that extend to society at large including clean water and air, and much of the world's biodiversity.

Even if you do not actively manage your land for income, you should consider the economic and financial aspects of forest management during stewardship planning. Considerations for financial planning require that you understand the different values from your forest and the management options available to you. For example, you may select among several silvicultural harvests that

have different ecological outcomes and provide different values. During a financial analysis, you can consider the costs and benefits of these various alternatives. For example, spraying herbicides and erecting deer fencing are costs that may be important to achieve your management objectives. Before making such an investment, financial analysis allows you to see what the revenues or benefits are from those upfront costs. For example, some benefits may be better tree growth and size, improved wildlife



Kristi L. Sullivan

*A very old tree, like this 250-year-old sugar maple, may have passed its prime economic value but still has wildlife, aesthetic, and historical value.*

---

benefits, and the knowledge that you've sustained the health of the forest. Further, you may receive revenues from hunting or recreation leases, or selling timber and other forest products, that result from, or offset, those upfront costs.

One unique aspect of forest management is the long growing period. In many northeastern states, trees may require many decades to a century or more to mature to their maximum economic value. However, trees often reach their maximum economic value a century or two (or even more) before they reach the end of their natural lifespan. Just because the trees in your forest reach their peak economic value does not mean that you need to hasten to action. Forests that are "past their prime" economically ("old growth") are rare, provide unique and valuable habitat for plants and animals, and provide us with a window to the past. Depending upon your resources and objectives, you may not gain economic returns on timber in a lifetime. However, there are many ways to receive annual or periodic income from other sources such as hunting leases and the sale of non-timber forest products.

There are a number of factors to consider when analyzing your forest investments. First, determine the planning horizon. If economic return from timber production is your goal, then the planning horizon is a timber rotation or cutting cycle. Next, develop a time-line laying out all the costs and revenues expected to occur over the planning horizon. Costs include annual payments such as property taxes and necessary operating expenses. There may be initial costs such as establishing the stand or intermediate costs such as herbicide applications or pre-commercial thinning harvests. There may be annual revenues from hunting leases, periodic income from selling non-timber forest products, and timber income at the end of the rotation.

Timber is generally the most lucrative asset for a forest landowner. Well-established markets for timber are present in all states. Most states also have periodic timber market pricing reports. To

maximize revenues from a timber sale it is important to carry out a formal process that includes a forester, a sale prospectus to bidders describing the products for sale, and a clearly written contract describing the role of each participant (landowner, forester, logger, etc). Several cooperative extension publications describe the process of working with a forester and logger to conduct a timber sale.

One needs to be aware of timber theft from forestlands, which can destroy generations of careful forest stewardship and cause irreparable environmental damage as well as economic losses. Many landowners do not realize that timber theft is a severe problem that could affect their landholdings. Prosecuting individuals who remove timber without a landowner's permission is expensive and convictions are often very difficult to obtain. (See the side bar at the end of this section on ways to prevent timber theft.)

Economic and financial analysis of forestland can help you make money from your land and ensure that you achieve your objectives. Keep good records of past activities to use as a guide to whether you are achieving your goals. Wise economic decisions will benefit and support your objectives for wildlife, recreation, and aesthetics.

## TIMBER TAXATION

---

Taxes, whether income, estate, or property, can influence your forest management decisions, and you should consider them an integral component of forest management planning. Forest landowners across the United States cite income and estate taxes as one of their major management concerns. Taxes may significantly affect your financial analysis of forest investments. Because taxes are an essential source of government revenue they must be fair and equitable so as not to inhibit forest management activities. Forest landowners are responsible for a variety of taxes at the federal, state, and perhaps local level. Tax laws affecting forest management are complex and constantly changing so it is important that you receive good

---

tax advice. Generally, you should consult with a tax accountant, a lawyer, and a forester as part of your tax team. The government does provide tax incentives to timber growers so it is essential that you keep accurate, complete, and well-organized records to minimize tax burdens and save money. Forest landowners are responsible for three types of taxes: a) federal and state income taxes, b) estate taxes, and c) property taxes.

### *Income Taxes*

You are obligated to report any income you earn from your forest land. Similarly, you may be able to deduct expenses associated with forest management as part of your annual income tax filing. It is important for you to establish a 'cost basis' for your property and timberland. The basis is the book value of capital assets—the value of the property, structural improvements, and the trees when you acquire it. After establishing a basis, you may deduct the original value when you sell or dispose of that asset. A forester can help you determine basis years after you acquire property, but after many years the cost of the estimate may exceed the value you would gain.

The IRS classifies forest landowners into one of three groups if they are growing trees for profit. These are (i) investors, (ii) passive in the trade or business, and (iii) active in the trade or business. The classifications determine the extent to which landowners can deduct normal and ordinary operating expenses. Generally, the more active you are, the more deductions you can make of your forest management expenses.

You should distinguish between capital expenses and normal operating expenses. Capital expenses include those that improve a capital asset that has a life generally of a year or more and must be added to the basis. There is a special exception for reforestation expenses. The IRS allows deductions of those expenses in the year they are incurred.

As a forest landowner, you can deduct expenses associated with timber sales. These may include

lawyer or consulting fees, surveys, maps, advertising, and state and local taxes. In addition to these expenses you may also deduct the basis of the timber sold. Depending on the method of timber sale, (lump-sum vs. pay as cut), the length of ownership, and ownership classification (investor or trade and business), you may receive capital gains treatment. Capital gains tax rates are lower than those for ordinary income. All other income sources such as cost-share payments, hunting leases, maple syrup sales, and firewood permits are considered ordinary income.

### *Estate Taxes and Planning*

When the owner of an estate dies, the heirs pay federal estate taxes. It is important that forest landowners, who have invested a great deal of time and effort in the management of their forest, plan ahead to minimize the tax burden. Careful planning can ensure that your heirs do not end up with a large estate tax obligation that they are unable to pay. Without careful planning, heirs may be forced to hold a quick sale of property or timber to pay the tax and satisfy the urgency of the Internal Revenue Service. As a result, many years of careful forest stewardship can be lost.

The first step to careful estate planning is to keep abreast of the value of your property. A forest management plan that contains a record of volumes and growth of timber resources should be updated as timber prices change. It is important to recognize that the assessed value of your property for paying property taxes, which is based on current use value for forestry or agriculture, is not the same as its assessed value for estate taxes. The value of your estate is based on its full value, which includes its current value for development. This may amount to several thousands of dollars per acre. Therefore, it is important not to confuse your assessment for property taxes with fair market value. By practicing wise estate planning, you can minimize or eliminate estate tax burdens for your heirs.

---

Rising real estate values and stumpage prices have resulted in many landowners being unknowingly liable for federal estate taxes. The estate tax liability often requires heirs to sell timber and/or land, which leads to loss of ownership opportunities, parcelization, or forest fragmentation. Given that forest management decisions often extend beyond one's lifetime, landowners need to make wise decisions to ensure continuation of

their objectives. Estate planning is critical to avoid or minimize these concerns.

There are a number of planning opportunities to minimize the estate tax burden. First is the exclusion equivalent of the unified credit which an owner can apply against federal estate tax liability. The exclusion is at \$2 million for 2006–2008. The exclusion will increase until it reaches its maximum amount of \$3.5 million in the year 2009. In 2010, the federal estate tax is repealed; but in 2011 it reverts back to \$1 million exclusion equivalent. Another opportunity is to use the marital deduction in which one spouse can transfer property to his or her surviving spouse free of federal estate tax.

Selling or donating conservation easements is an innovative tax-planning tool that applies well to forest landowners. A conservation easement is a legally binding agreement that permanently restricts the development and future use of the land to ensure protection of its conservation values. Essentially a landowner gives up some of the proverbial 'bundle of sticks' associated with private property. The landowner is eligible for income tax deductions on the value of the donated easements and estate tax reductions and exclusions. There are numerous other tools available to minimize the estate tax burden and help you achieve your estate-planning objectives. You should consult with an estate tax attorney for more information.

Many states also impose inheritance or succession taxes. Unlike the exemption credits with federal estate taxes, most states start taxing at relatively low estate values.

### **Property Taxes**

Property taxes are assessed annually on the market value of the land. Almost every state has a preferential property tax program for forest landowners either to encourage timber production and forest management or to protect open space. There are many different types of programs and eligibility requirements. Some states provide an exemption for a period of time and others assess the land

### **Three Steps to Estate Tax Planning**

**1. Learn all that you can about the subject.**

By educating yourself you can determine the best ways to keep your land intact and in your family, minimize the cost of transferring ownership when the estate is dispersed, and provide for your dependants and heirs.

**2. Make decisions about who will be the executor of the estate and talk to your heirs about their future plans.**

Find out whether your heirs are really interested in holding onto the property and continuing the activities that you began. Good communication is essential to successful estate planning.

**3. Assemble an estate planning team.**

Depending upon the size and value of your estate, your team may include your consulting forester, an attorney, an insurance underwriter, your personal representative or executor, an accountant, and, possibly, one or more of your children. Having an attorney who is qualified in estate planning is critical. A good source for locating a qualified estate planner is the American College of Trust and Estate Counsel. Go to their web site [WWW.ACTEC.ORG](http://WWW.ACTEC.ORG) and click on "Find an ACTEC Fellow."

---

on its ability to produce income, not the market value. It is important to consider these programs, as substantial property tax savings may be available.

However, be aware that there are often expectations on how you manage the land or penalties for withdrawing from such programs.

### Preventing Timber Theft

*By following the guidelines presented here, you will be taking important precautions that can prevent theft from occurring.*

1. Identify and mark your property lines. Having a surveyor blaze and paint the boundaries of your property is very important to show that any theft, if it occurs, was intentional. It is also important to maintain the boundary markings every few years so that property lines remain highly visible.
2. Walk your property on a fairly regular basis to ensure that theft has not already occurred. This will also allow you to detect any harvesting operations occurring on neighboring properties. This is a particularly crucial issue for absentee landowners. Having someone walk the property at least once every year or so will keep you apprised of any legal issues which may be arising in your absence, such as illegal dumping or squatters. If you are an absentee landowner, ask neighbors to notify you of any logging operations adjacent to your property.
3. Closely monitor neighboring logging operations. When an adjoining landowner is harvesting their property, risk of theft or trespass is at its greatest. If nothing else, contact the adjoining landowner to obtain the name of the contractor harvesting the timber, in case an issue arises. This will ensure that they are aware of the harvesting operation on their property.

The operation could be a theft from your neighbor. Introduce yourself to the logger, and make sure they know you are alert to their presence and that they know where your property begins. Also, let your neighbors know when you have sold timber. Good communications reduce theft and make for good neighbors.

4. Work with a reputable forester, and have a good timber sale contract if you intend to harvest your timber. Having a forest management plan, being an active forest steward, and using professional, reputable foresters and loggers can protect your forest and prevent your property from being used to steal your neighbors' trees. Select good foresters and loggers by checking references and credentials. See page 8 in this book for a list of considerations in selecting a forester. Foresters can be responsible for marking the area you want to harvest, and should inspect the logging job regularly (preferably every few days) to ensure that contractors stay within harvest boundaries, comply with water quality laws, and protect physical structures such as roads and fences. Also, mark trees with paint prior to a timber harvest. Mark trees at chest height so loggers will know what trees to cut and also mark those trees at ground level so you will know if a tree was cut without

---

your knowledge (be suspicious of loggers or buyers who carry paint cans). You should mark the perimeter of the harvest area to limit access to other areas of your forest. Also, include in your sale contract your policy for cutting unmarked trees. For example, some timber sale contracts stipulate that, for any unmarked trees that are cut, the landowner will be paid a base fee per tree plus three times the stumpage value. Discuss with your forester your expectations for regular inspections during your harvest and a post-harvest inspection. Your forester should be familiar with and only recommend reputable loggers.

5. Stay informed of changes or proposals to change your state laws that protect landowners against timber theft. Your state department of forestry, cooperative extension, private-sector foresters, and groups such as the Society of American Foresters (SAF) are all reputable sources of information on possible changes in the laws.
6. Participate where you can in strengthening legal landowner protections. Contact your state assembly or senate representatives for information on current or pending timber theft legislation. Find out the extent of theft in your state and what might be done to improve conditions. 

1. Knowing the value of the forestland is important for a number of reasons. Make a list of all the investments/assets (e.g., timber, equipment, buildings, roads, fences, ponds, tree shelters) you have on the property and consider getting a forester and real estate appraiser to value them. This information is useful for estate planning and making other financial decisions.
2. Forest ecosystems exceed our lifetimes and many landowners are concerned about what will happen to their land when they pass away. In many situations, decisions about estate planning need to be discussed among family members to ensure sustainable continuation of forest management activities. What are the long-term goals and/or expectations of your children or heirs with respect to the forest? To what extent are they similar to (or different from) yours?
3. Visit [WWW.TIMBERTAX.ORG](http://WWW.TIMBERTAX.ORG), the National Timber Tax Website, and familiarize yourself with basic forest taxation information. Click on “Estate Planning” for more information on estate planning.
4. Visit [WWW.FORESTANDRANGE.ORG/MODULES/MODULES.ASPX](http://WWW.FORESTANDRANGE.ORG/MODULES/MODULES.ASPX) and click on the module entitled, “Making Estate Planning More Accessible for Forest Landowners.” This module allows you to assess the potential benefits of a conservation easement on your land. The module leads learners stepwise through a decision tree. Completing the module will allow you to make an informed decision about whether or not you might want to include conservation easements as part of your estate plan.
5. Visit your state’s extension websites and look at publications about forest economics. For example, Penn State’s website, [HTTP://RNREXT.CAS.PSU.EDU](http://RNREXT.CAS.PSU.EDU), has a Forest Finance publication series, showing examples of cost/benefit analysis, recordkeeping, and management costs for deer fences, tree shelters, and other activities.

NOTES:

---

**ECONOMIC ISSUES****QUIZ**

*Fill in the blanks using the following words.*

annually                      costs                      estate                      local                      timber  
capital assets                      deductions                      hunting leases                      real estate                      timber theft

1. Financial analysis helps you to understand the \_\_\_\_\_ as well as the benefits of different management choices.
2. You may be able to receive annual or periodic income from \_\_\_\_\_ or other activities.
3. \_\_\_\_\_ is generally the most lucrative asset for a forest landowner.
4. \_\_\_\_\_ can lead to economic loss and ruin generations of careful forest stewardship.
5. Forest landowners are liable for taxes at the federal, state, and perhaps \_\_\_\_\_ level.
6. The value of your property and the trees when you acquire it are referred to as \_\_\_\_\_.
7. The more actively you manage your forest, the more \_\_\_\_\_ you can make of your forest management expenses.
8. When the owner of an estate dies, the heirs pay federal \_\_\_\_\_ taxes.
9. Property taxes are assessed \_\_\_\_\_ on the market value of the land.
10. Rising \_\_\_\_\_ values have resulted in many landowners being unknowingly liable for federal estate taxes.

*See the key to this quiz on page 84*

---

# Summary of Action Steps

Owning your own land not only brings endless opportunities for enjoyment, but also many challenges. You want to do what's best for your land while meeting your ownership goals and financial commitments. The best way to achieve positive results is to develop a long-term plan that you will use as a guide to achieving your objectives. By creating a reasonable, year-by-year schedule of activities with the help of a professional, you can make steady progress in the care of your property. Below is a list of steps that will help you think through your own interests and needs as they relate to your land, and provide a guide through the planning process.

- Read this guide.
- Determine your objectives and prioritize them.
- Complete the activities in this book.
- Identify topics for additional study through cooperative extension publications or other educational programs.
- Join a local forest landowner organization or the Tree Farm Association to help you stay informed about forest resource issues and educational opportunities.
- Work with a resource professional to characterize your forest.
- Develop a stewardship plan and work schedule.
- Implement your work schedule.
- Evaluate your progress.
- Enjoy your success!

---

## APPENDIX A: REFERENCES

---

- Alban, L.M., S.A. Thomasma, and M.J. Twery. 1996. *Forest Stewardship Planning Guide*. Gen. Tech. Rpt. NE-203. USDA Forest Service. WWW.FS.FED.US/NE/BURLINGTON/NED
- Baker, S., and M. Mortimer. 2002. *Dealing with Timber Theft*. Publication Number 420-136. VA: Virginia Cooperative Extension.
- Beattie, M., C. Thompson, and L. Levine. 1983. *Working with Your Woodland: A Landowner's Guide*. Hanover, NH: University Press of New England.
- Bihun, Y.M., J. Finley, and S.B. Jones. 1995. *Forest Stewardship 7: Timber Harvesting: an Essential Management Tool*. University Park, PA: Penn State Cooperative Extension.
- Brittingham, M.C., and C.A. Delong. 1998. *Management Practices for Enhancing Wildlife Habitat*. University Park, PA: Penn State Cooperative Extension.
- Chunko, S.E., and W.E. Wolf, Jr. 2001. *Best Management Practices for Pennsylvania Forests: Promoting Forest Stewardship Through Education, Cooperation, and Voluntary Action*. University Park, PA: Penn State University, College of Agricultural Sciences. 48p.
- Cullen, J.B. January 2001. *Best Management Practices Manual for Erosion Control on Timber Harvesting Operations in New Hampshire*. Durham, NH: University of New Hampshire Cooperative Extension.
- DeGraaf, R.M., and M. Yamasaki. 2001. *New England Wildlife: Habitat, Natural History, and Distribution*. Hanover, NH: University Press of New England. 482 p.
- Delong, C.A., and M.C. Brittingham. 1997. *Pennsylvania Wildlife 1: Wildlife-Habitat Relationships*. University Park, PA: Penn State Cooperative Extension.
- Fajvan, M.A. *Pennsylvania Woodlands 9: Developing a Woodland Management Plan*. University Park, PA: Penn State Cooperative Extension, College of Agricultural Sciences.
- Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*. 1997. NH: New Hampshire Division of Forests and Lands, DRED, and Society for the Protection of New Hampshire Forests.
- Harvey, H., and J.C. Finley. 1994. *Forest Stewardship 6: Planning Your Forest's Future*. University Park, PA: Penn State Cooperative Extension.
- Hilts, S. 1999. *The Woodlot Management Handbook*. NY: Firefly Books, Ltd.
- Hobson, S., J. Barclay, and S. Broderick. 1998. *Enhancing Wildlife Habitats: A Practical Guide for Forest Landowners*. Northeast Forest Resources Extension Council series. NRAES-64. Ithaca, NY: Natural Resource, Agriculture, and Engineering Service.
- Jones, S.B., and R.S. Cochran. *Pennsylvania Woodlands 11: Managing Your Woodlot with the Help of a Consulting Forester*. University Park, PA: Penn State Cooperative Extension, College of Agricultural Sciences.
- Kays, J.S., and J. Drohan. 2004. *Forest Landowner's Guide to Evaluating and Choosing a Natural Resource-Based Enterprise*. NRAES-151. Ithaca, NY: Natural Resource, Agriculture, and Engineering Service.
- Kays, J.S., G.R. Goff, P.J. Smallidge, W.N. Grafton, and J.A. Parkhurst, Eds. 1998. *Proceedings of Natural Resources Income Opportunities for Private Lands Conference*, University of Maryland Cooperative Extension, Hagerstown, MD, April 5-7, 1998.
- Kays, J.S., and V.M. Schultz. 2003. *Tax and Estate Planning for Maryland Forest Landowners*. Fact Sheet 630. College Park, MD: University of Maryland Cooperative Extension.

- 
- Kays, J.S., and R.L. Tjaden. 2002. *Developing a Forest Stewardship Plan: The Key to Forest Management*. Fact Sheet 625. College Park, MD: University of Maryland Cooperative Extension.
- Makuch, J.R. 1997. *Forest Stewardship 10: Watershed Management*. University Park, PA: Penn State Cooperative Extension.
- Martin, A., H. Zim, and A. Nelson. 1951. *American Wildlife and Plants: A Guide to Wildlife Food Habits*. NY: Dover.
- McEvoy, T. 1998. *Legal Aspects of Owning and Managing Woodlands*. Washington, DC: Island Press. 239 pp.
- Ochterski, J. 2004. *Forest Land Best Management Practices in the Finger Lakes Region of New York State*. Ithaca, NY: Cornell Cooperative Extension. [WWW.DNR.CORNELL.EDU/EXT/BMP](http://WWW.DNR.CORNELL.EDU/EXT/BMP)
- Patmos, W. 1995. *New Hampshire's Native Trees, Shrubs, and Vines with Wildlife Value*. Durham, NH: University of New Hampshire Cooperative Extension.
- Perkey, A., B.L. Wilkins, and H.C. Smith. 1993. *Crop Tree Management in Eastern Hardwoods*. Tech. Pub. NA-TP-19-93. Morgantown, WV: USDA Forest Service. [WWW.FS.FED.US/NA/MORGANTOWN/FRM/PERKEY/CTM/CTM\\_INDEX](http://WWW.FS.FED.US/NA/MORGANTOWN/FRM/PERKEY/CTM/CTM_INDEX)
- Koelling, M.R., and R.B. Heiligmann, Eds. 1996. *North American Maple Producers Manual*. Bulletin 856. Columbus, OH: Ohio State University Extension. [HTTP://OHIOLINE.OSU.EDU/B856](http://OHIOLINE.OSU.EDU/B856)
- Schneider, R. 1997. *Stand by Your Stream*. Ithaca, NY: Cornell Cooperative Extension.
- Smallidge, P.J., et al. 2003. *Enhancing the Stewardship of Your Forest*. Ithaca, NY: Cornell University, Department of Natural Resources. [WWW.FORESTCONNECT.INFO](http://WWW.FORESTCONNECT.INFO)
- Sullivan, K.L., and M.C. Brittingham. 1997. *Forest Stewardship 5: Wildlife*. University Park, PA: Penn State Cooperative Extension.
- Sullivan, K.L., D. Bryant, P.J. Smallidge, M. Rickenbach, and G. Herman. 2004. *You and Your Forest: A Guide to Understanding and Managing Your Forest Resources*. [WWW.FORESTANDRANGE.ORG/MODULES/PLANNING/INDEX.HTM](http://WWW.FORESTANDRANGE.ORG/MODULES/PLANNING/INDEX.HTM)
- Tjaden, R.L., and J.S. Kays. 2003. *Forest Management Account Book*. Extension Bulletin 360. College Park, MD: University of Maryland Cooperative Extension.
- Tjaden, R.L., and G.M. Weber. 1997. *An Introduction to the Riparian Forest Buffer*. Fact Sheet 724. College Park, MD: University of Maryland Cooperative Extension.
- Tjaden, R.L., and G.M. Weber. 1997. *Riparian Forest Buffer Design Establishment and Maintenance*. Fact Sheet 725. College Park, MD: University of Maryland Cooperative Extension.
- Tjaden, R.L., and J.S. Kays. 1992. *Introduction to Wildlife Management*. Fact Sheet 597. College Park, MD: University of Maryland Cooperative Extension.
- Tjaden, R.L., and J.S. Kays. 2000. *Brush Piles for Wildlife*. Fact Sheet 599. College Park, MD: University of Maryland Cooperative Extension.
- Vodak, M.C., and G.L. Fox. 2004. *Crop Tree Management*. New Jersey Forest Stewardship Series FS032. New Brunswick, NJ: Rutgers Cooperative Research and Extension.
- Yorke, D.E. September 1995. *Wildlife Habitat Improvement: Woodlands and Wildlife*. Durham, NH: University of New Hampshire Cooperative Extension.

---

## APPENDIX B: WEB SITES FOR FOREST OWNERS

---

Developing Forest Stewardship Plans: [WWW.DNR.CORNELL.EDU/EXT/STEWARDSHIP](http://WWW.DNR.CORNELL.EDU/EXT/STEWARDSHIP)

This site provides links to federal standards for stewardship plans, examples of plans, guides for writing, and articles or other publications related to forest stewardship plan development.

Forestry Correspondence Course: [WWW.NATURALRESOURCES.UMD.EDU](http://WWW.NATURALRESOURCES.UMD.EDU)

This site, offered by MD Cooperative Extension, provides valuable information on forest and wildlife management as well as a general forestry correspondence course.

Forest Landowner's Guide to Internet Resources: States of the Northeast:

[WWW.NA.FS.FED.US/PUBS/MISC/IR/INDEX.HTM](http://WWW.NA.FS.FED.US/PUBS/MISC/IR/INDEX.HTM)

This site provides a listing of internet resources for the private forest landowner. Links to publications, brochures, and fact sheets, as well as state-by-state information is provided. Topics such as wildlife and biodiversity, timber harvests, silviculture, estate planning, riparian forests and wetland management, and many others are included.

National Agroforestry Center: [WWW.UNL.EDU/NAC](http://WWW.UNL.EDU/NAC)

This site provides access to the federal guidelines and suggestions on developing and maintaining numerous agroforestry practices.

National Learning Center for Private Forest and Range Landowners: [WWW.FORESTANDRANGE.ORG](http://WWW.FORESTANDRANGE.ORG)

This site provides an interactive environment where landowners can improve their knowledge and learn new strategies for managing and improving their forest and range resources.

Natural Resource Income Opportunities: [WWW.NATURALRESOURCES.UMD.EDU](http://WWW.NATURALRESOURCES.UMD.EDU)

This site provides information on natural resource income opportunities through links to on-line resources such as websites, proceedings, and fact sheets for general and specific income opportunities.

National Timber Tax Web Site: [WWW.TIMBERTAX.ORG](http://WWW.TIMBERTAX.ORG)

The most comprehensive resource available on the web about tax treatment of timber. Developed by Purdue University in cooperation with the U.S. Department of Agriculture Forest Service, it is intended for use by forest landowners, as well as a reference source for accountants, attorneys, consulting foresters, and other professionals. From this site you can download Form T, other tax forms, and "Forest Owner's Guide to the Federal Income Tax" (718). Contains information about specific transactions, forms, tax strategies, financial and estate planning, and more.

---

## APPENDIX C: SOURCES OF ASSISTANCE (BY STATE)

---

In this section, you will find contact information for people, agencies, and organizations that can serve as good first points of contact as you take action to become a good forest steward. If you are looking for more information about a particular topic or educational opportunities in your area, you should contact the cooperative extension specialist listed under your state. You will also find the contacts for your state forestry agency. These agencies can provide you with forestry and stewardship planning information, and help you find the forester that is right for you. Last but not least, to stay informed about the latest issues facing forest owners, as well as educational opportunities, consider joining a forest owners association.

### *Land Grant University Contacts*

#### CONNECTICUT

University of Connecticut  
Stephen H. Broderick, Extension Forester  
Extension Office  
139 Wolf Den Rd., Brooklyn, CT 06234  
Phone: (860) 774-9600  
E-mail: [STEPHEN.BRODERICK@UCONN.EDU](mailto:STEPHEN.BRODERICK@UCONN.EDU)  
[WWW.CANR.UCONN.EDU/CES/FOREST/](http://WWW.CANR.UCONN.EDU/CES/FOREST/)  
[WWW.CANR.UCONN.EDU/NRME/  
PROGRAMS/WILDLIFE/WILDLIFE.HTML](http://WWW.CANR.UCONN.EDU/NRME/PROGRAMS/WILDLIFE/WILDLIFE.HTML)

#### DELAWARE

University of Delaware  
Dorothy Abbott  
Extension Agent—Renewable Resources  
Delaware Cooperative Extension  
69 Transportation Circle, Dover, DE 19901  
Phone: (302) 730-4000  
E-mail: [DOTAD@UDEL.EDU](mailto:DOTAD@UDEL.EDU)

#### MAINE

University of Maine  
James F. Philp, Forestry Specialist  
Cooperative Extension Service  
261 Nutting Hall, Orono, ME 04469-5755  
Phone: (207) 581-2885  
E-mail: [JPHILP@UMEXT.MAINE.EDU](mailto:JPHILP@UMEXT.MAINE.EDU)  
[WWW.UMAINE.EDU/UMEXT/FORESTRY.HTM](http://WWW.UMAINE.EDU/UMEXT/FORESTRY.HTM)

#### MARYLAND

University of Maryland  
Extension Specialist—Natural Resources  
Maryland Cooperative Extension  
18330 Keedysville Road, Keedysville, MD 21756  
Phone: (301) 432-2767 ext. 323  
E-mail: [JKAYS@UMD.EDU](mailto:JKAYS@UMD.EDU)  
[WWW.NATURALRESOURCES.UMD.EDU](http://WWW.NATURALRESOURCES.UMD.EDU)

#### MASSACHUSETTS

University of Massachusetts  
David. B. Kittredge, CF  
Professor and Extension Forester  
Department of Natural Resources Conservation  
Holdsworth Hall, Amherst, MA 01003  
Phone: (413) 545-2943  
E-mail: [DBK@FORWILD.UMASS.EDU](mailto:DBK@FORWILD.UMASS.EDU)  
[WWW.UMASS.EDU/NRC](http://WWW.UMASS.EDU/NRC)

#### NEW HAMPSHIRE

University of New Hampshire  
Karen Bennett, Extension Professor—Forest Resources  
Rm 212 Nesmith Hall  
131 Main Street, Durham, NH 03824  
Phone: (603) 862-4861  
E-mail: [KAREN.BENNETT@UNH.EDU](mailto:KAREN.BENNETT@UNH.EDU)  
[HTTP://CEINFO.UNH.EDU/FORESTRY/FORESTRY.HTM](http://HTTP://CEINFO.UNH.EDU/FORESTRY/FORESTRY.HTM)

#### NEW JERSEY

Rutgers University  
Mark Vodak  
Dept. of Ecology, Evolution and Natural Resources  
80 Nichol Ave., New Brunswick, NJ 08901  
Phone: (732) 932-8993 ext. 10  
E-mail: [VODAK@AESOP.RUTGERS.EDU](mailto:VODAK@AESOP.RUTGERS.EDU)  
[WWW.RCE.RUTGERS.EDU/NRE/DEFAULT.ASP](http://WWW.RCE.RUTGERS.EDU/NRE/DEFAULT.ASP)

#### NEW YORK

Cornell University  
Peter J. Smallidge, State Extension Forester  
Cornell Cooperative Extension  
116 Fernow Hall, Ithaca, NY 14853  
Phone: (607) 255-2115  
E-mail: [PJS23@CORNELL.EDU](mailto:PJS23@CORNELL.EDU)  
[WWW.FORESTCONNECT.INFO](http://WWW.FORESTCONNECT.INFO)

---

## PENNSYLVANIA

Penn State University  
James C. Finley  
School of Forest Resources  
7 Ferguson Bldg., University Park, PA 16802  
Phone: (814) 863-0401  
E-mail: [FJ4@PSU.EDU](mailto:FJ4@PSU.EDU)  
[HTTP://RNREXT.CAS.PSU.EDU/](http://RNREXT.CAS.PSU.EDU/)

## VERMONT

University of Vermont  
Thom J. McEvoy, Extension Forester  
340 Aiken Center  
School of Natural Resources  
Burlington, VT 05405  
Phone: (802) 656-2913  
E-mail: [TMCEVOY@UVM.EDU](mailto:TMCEVOY@UVM.EDU)  
[HTTP://STUMPAGE.UVM.EDU](http://STUMPAGE.UVM.EDU)

## VIRGINIA

Virginia Cooperative Extension  
Jennifer Gagnon  
Virginia Forest Landowner Education  
Program Coordinator  
228 Cheatham Hall, Blacksburg, VA 24061  
Phone: (540) 231-6391  
E-mail: [FORESTER@VT.EDU](mailto:FORESTER@VT.EDU)  
[WWW.CNR.VT.EDU/FORESTUPDATE](http://WWW.CNR.VT.EDU/FORESTUPDATE)

## WEST VIRGINIA

West Virginia University  
David W. McGill, Ph.D.  
Forest Resources Extension Specialist  
Percival Hall, PO Box 6125,  
Morgantown, WV 26506-6125  
Phone: (304) 293-2941 ext. 2474  
E-mail: [DMCGILL@WVU.EDU](mailto:DMCGILL@WVU.EDU)  
[WWW.WVU.EDU/~AGEXTEN/FORESTRY/FORESTRY.HTM](http://WWW.WVU.EDU/~AGEXTEN/FORESTRY/FORESTRY.HTM)  
[WWW.WVU.EDU/~AGEXTEN/WILDLIFE/INDEX.HTM](http://WWW.WVU.EDU/~AGEXTEN/WILDLIFE/INDEX.HTM)

## State Forestry Agency Contacts

### CONNECTICUT

Fred Borman  
860-424-3634  
[FRED.BORMAN@PO.STATE.CT.US](mailto:FRED.BORMAN@PO.STATE.CT.US)

### DELAWARE

James Olson  
302-856-2893  
[JAMES.OLSON@STATE.DE.US](mailto:JAMES.OLSON@STATE.DE.US)

### MAINE

Morten Moesswilde  
207-287-8430  
[MORTEN.MOESSWILDE@MAINE.GOV](mailto:MORTEN.MOESSWILDE@MAINE.GOV)

### Be Woods Wise

207-287-2791  
[FORESTINFO@MAINE.GOV](mailto:FORESTINFO@MAINE.GOV)  
[WWW.BEWOODSWISE.ORG](http://WWW.BEWOODSWISE.ORG)

### MARYLAND

Patrick Meckley  
410-260-8508  
[PMECKLEY@DNR.STATE.MD.US](mailto:PMECKLEY@DNR.STATE.MD.US)  
[WWW.DNR.STATE.MD.US/FORESTS](http://WWW.DNR.STATE.MD.US/FORESTS)

### MASSACHUSETTS

Steve Anderson  
413-256-1201  
[STEVE.ANDERSON@STATE.MA.US](mailto:STEVE.ANDERSON@STATE.MA.US)

### NEW HAMPSHIRE

Karen Bennett  
603-862-4861  
[KAREN.BENNETT@UNH.EDU](mailto:KAREN.BENNETT@UNH.EDU)

### NEW JERSEY

David Edelman  
609-984-3860  
[DAVID.EDELMAN@DEP.STATE.NJ.US](mailto:DAVID.EDELMAN@DEP.STATE.NJ.US)

### NEW YORK

Bureau of Private Land Services  
518-402-9425  
[LFLANDS@GW.DEC.STATE.NY.US](mailto:LFLANDS@GW.DEC.STATE.NY.US)

### PENNSYLVANIA

Gene Odat  
717-787-6460  
[GODATO@STATE.PA.US](mailto:GODATO@STATE.PA.US)

### RHODE ISLAND

Paul Dolan  
401-647-3367  
[PDOLAN@RIDEM.NECOXMAIL.COM](mailto:PDOLAN@RIDEM.NECOXMAIL.COM)

### VERMONT

Brian Stone  
802-241-3675  
[BRIAN.STONE@STATE.VT.US](mailto:BRIAN.STONE@STATE.VT.US)  
[HTTP://VTFPR.ANR.STATE.VT.US/FPR/RESOURCE/FOR\\_FORRESMGMNT.CFM](http://VTFPR.ANR.STATE.VT.US/FPR/RESOURCE/FOR_FORRESMGMNT.CFM)

### VIRGINIA

Virginia Department of Forestry  
434-977-6555  
[WWW.DOF.VIRGINIA.GOV](http://WWW.DOF.VIRGINIA.GOV)

### WEST VIRGINIA

Todd Groh  
304-558-2788  
[TGROH@WVFORESTRY.COM](mailto:TGROH@WVFORESTRY.COM)

---

## Forest Owners Associations

There are many state and national organizations that can provide private landowners with information, workshops, and guidance. These organizations also give landowners the opportunity to meet, and interact with, people with similar interests and concerns. In addition to the organizations listed below, there may be landowner associations in your local area.

American Tree Farm System  
c/o American Forest Foundation  
1111 Nineteenth Street, NW, Suite 780  
Washington, D.C. 20036  
(202) 463-2462  
E-mail: [INFO@TREEFARMSYSTEM.ORG](mailto:INFO@TREEFARMSYSTEM.ORG)  
[WWW.TREEFARMSYSTEM.ORG](http://WWW.TREEFARMSYSTEM.ORG)

National Woodland Owners Association  
374 Maple Ave. E, Suite 310  
Vienna, VA 22180  
(800) 476-8733  
E-mail: [INFO@WOODLANDOWNERS.ORG](mailto:INFO@WOODLANDOWNERS.ORG)  
[WWW.WOODLANDOWNERS.ORG](http://WWW.WOODLANDOWNERS.ORG)

### CONNECTICUT

Connecticut Forest and Park Association  
16 Meriden Road, Rockfall, CT 06481  
(860) 346-2372  
E-mail: [INFO@CTWOODLANDS.ORG](mailto:INFO@CTWOODLANDS.ORG)  
[WWW.CTWOODLANDS.ORG](http://WWW.CTWOODLANDS.ORG)

### MAINE

Small Woodland Owners Association of Maine  
P.O. Box 836, Augusta, ME 04332-0926  
(207) 626-0005  
(877) 467-9626 (toll free)  
E-mail: [INFORMATION@SWOAM.COM](mailto:INFORMATION@SWOAM.COM)  
[WWW.SWOAM.COM](http://WWW.SWOAM.COM)

### MASSACHUSETTS

Massachusetts Forestry Association  
P.O. Box 1096, Belchertown, MA 01007-1096  
(413) 323-7326  
E-mail: [INFO@MASSFORESTS.ORG](mailto:INFO@MASSFORESTS.ORG)  
[WWW.MASSFORESTS.ORG](http://WWW.MASSFORESTS.ORG)

### NEW HAMPSHIRE

New Hampshire Timberland Owners Association  
54 Portsmouth Street, Concord, NH 03301  
(603) 224-9699  
E-mail: [OFFMGR@NHTOA.ORG](mailto:OFFMGR@NHTOA.ORG)  
[WWW.NHTOA.ORG](http://WWW.NHTOA.ORG)

### NEW JERSEY

New Jersey Forestry Association  
PO Box 367, Flemington, NJ 08822  
(908) 237-0900  
(908) 782-6907 fax  
E-mail: [INFO@NJFORESTRY.ORG](mailto:INFO@NJFORESTRY.ORG)  
[WWW.NJFORESTRY.ORG](http://WWW.NJFORESTRY.ORG)

### NEW YORK

New York Forest Owners Association, Inc.  
P.O. Box 541, Lima, NY 14485  
(800) 836-3566  
E-mail: [NYFOAINC@HOTMAIL.COM](mailto:NYFOAINC@HOTMAIL.COM)  
[HTTP://NYFOA.ORG](http://HTTP://NYFOA.ORG)

### PENNSYLVANIA

Pennsylvania Forestry Association  
56 East Main Street, Mechanicsburg, PA 17055  
(717) 766-5371  
(800) 835-8065 (toll free)  
E-mail: [THEPFA@JUNO.COM](mailto:THEPFA@JUNO.COM)  
[HTTP://PFA.CAS.PSU.EDU](http://HTTP://PFA.CAS.PSU.EDU)

### VERMONT

Vermont Woodlands Association  
P.O. Box 196, Poultney, VT 05764  
212 Main St., Ste. 1, Poultney, VT 05764  
(802) 287 4284  
E-mail: [DIRECTOR@VERMONTWOODLANDS.ORG](mailto:DIRECTOR@VERMONTWOODLANDS.ORG)  
[WWW.VERMONTWOODLANDS.ORG](http://WWW.VERMONTWOODLANDS.ORG)

### VIRGINIA

Virginia Forestry Association  
3808 Augusta Avenue, Richmond, VA 23230-3910  
Phone: (804)278-8733  
E-Mail: [VFA@VERIZON.NET](mailto:VFA@VERIZON.NET)  
[WWW.VAFORESTRY.ORG](http://WWW.VAFORESTRY.ORG)

### WEST VIRGINIA

Woodland Owners Association of West Virginia Inc.  
P.O. Box 13695, Sissonville, WV 25360  
(304) 532-4351  
E-mail: [WOAMEM@WAOFWV.ORG](mailto:WOAMEM@WAOFWV.ORG)  
[WWW.WAOFWV.ORG](http://WWW.WAOFWV.ORG)

---

## APPENDIX D: GLOSSARY OF FOREST STEWARDSHIP TERMS

---

**Aesthetics** — forest value, rooted in beauty and visual appreciation, affording inspiration, contributing to the arts, and providing a special quality of life.

**Agroforestry** — a cultivation system combining agriculture and forestry where trees and crops are interplanted.

**Biological diversity** — the variety of plants and animals, the communities they form, and the ecological functions they perform at the genetic, stand, landscape, and regional levels.

**Biological maturity** — the point in the life cycle of a tree at which there is no net biomass accumulation; the stage before decline when annual growth in one part of the tree is offset by breakage and decay in other parts of the tree.

**Browse** — portions of woody plants including twigs, shoots, and leaves used as food by animals such as deer.

**Buffer strips** — forestland left relatively undisturbed to lessen visual or environmental impacts of timber harvesting, usually along a road or waterway.

**Canopy** — the upper level of a forest, consisting of branches and leaves of taller trees. A canopy is complete (or has 100 percent cover) if the ground is completely hidden when viewed from above the trees.

**Cavity tree** — a tree with holes in which birds, mammals, or insects such as bees may nest (also known as den tree.)

**Clearcutting** — a harvesting and regeneration technique that removes all the trees, regardless of size, on an area in one operation. Clearcutting is most often used to establish species like aspen or black cherry, which require full sunlight to reproduce and grow well, or to create specific habitat for certain wildlife species. Clearcutting results in an even-aged forest stand.

**Community** — a collection of living organisms in a defined area that function together in an organized system through which energy, nutrients, and water cycle.

**Conservation** — the wise use and management of natural resources.

**Corridor** — a strip of wildlife habitat, unique from the landscape on either side of it, that links one isolated ecosystem “island” (e.g., forest fragment) to another. Corridors allow certain species access to isolated habitat areas, which contributes to the genetic health of the populations involved.

**Crown class** — Any class into which trees of a stand may be divided based on both their crown development and crown position relative to crowns of adjacent trees. The four classes commonly recognized are dominant, co-dominant, intermediate, and suppressed.

**Crop tree** — a term traditionally reserved to describe a tree of a commercially desirable species, with the potential to grow straight, tall and vigorously. However, a crop tree can be one selected for nontimber purposes (varying with landowner objectives), such as mast production or den tree potential.

**Cutting cycle** — the interval between harvest entries for a forest managed under an uneven-aged system. The age of trees at maturity divided by the cutting cycle determines the number of age classes.

**dbh** — diameter at breast height, or 4.5 feet above ground level. The abbreviation generally is written without capital letters and without periods.

**Deforestation** — the unintentional or intentional conversion of land use from forest to nonforest. Associated with nonrenewable timber harvesting practices in ecologically sensitive areas, such as tropical rainforests.

**Den tree** —see cavity tree.

**Diameter-limit cut** — a timber harvesting treatment in which all trees over a specified diameter may be cut. Diameter-limit cuts often result in high-grading.

**Disturbance** — a natural or human-induced environmental change that alters one or more of the floral, faunal, and microbial communities within an ecosystem. Timber harvesting is the most common human disturbance. Windstorms and fire are examples of natural disturbance.

---

**Dominant tree species** — one that appears more frequently in a forest stand or tends to be much taller with a higher canopy, receiving full light from above.

**Economic maturity** — when the current value growth rate of the stand equals the alternative rate of return.

**Ecosystem** — a natural unit comprised of living organisms and their interactions with their environment, including the circulation, transformation, and accumulation of energy and matter.

**Edge** — the boundary between open land and woodland or between any two distinct ecological communities. This transition area between environments provides valuable wildlife habitat for some species, but can be problematic for sensitive species, due to increased predation and parasitism.

**Endangered species** — species in danger of extinction throughout all or a significant part of their range. Protection mandated by the United States Endangered Species Act, 1973.

**Even-aged stand** — a group of trees that do not differ in age by more than 10 to 20 years or by 20 percent of the rotation age.

**Forbs** — non-grass herbaceous plants such as weeds, wildflowers, and herbs. Forbs provide food for many wildlife species.

**Forest** — a biological community dominated by trees and other woody plants.

**Forest structure** — forests come in many shapes, sizes, types, and ages. Some forests have thick brushy understories with little or no canopy. Others have closed overhead tree canopy that provides shade and moisture. Others have a mix of plant layers, including herbs, shrubs, understory, and canopy. Structure is both vertical, as layers, and horizontal, as patches.

**Fragmentation** — the segmentation of a large tract or contiguous tracts of forest to smaller patches, often isolated from each other by nonforest habitat. Results from the collective impact of residential and commercial development, highway and utility construction, and other piecemeal land use changes. (compare with parcelization)

**Group selection** — a process of harvesting patches of trees to open the forest canopy and encourage the reproduction of uneven-aged stands.

**Guild** — species similar in their habitat needs as well as their response to habitat changes (e.g., ovenbird and woodthrush). One species in a guild is often used to represent the others when developing a stewardship management plan.

**Habitat** — the geographically defined area where environmental conditions (e.g., climate topography, etc.) meet the life needs (e.g., food, shelter, etc.) of an organism, population, or community.

**High-grading** — a type of exploitive harvesting in which larger trees of commercially valuable species are removed with little regard for the quality, quantity, or distribution of trees and regeneration left on the site; typically results when a diameter-limit harvest is imposed.

**Keystone species** — A species that influences the ecological composition, structure, or functioning of its community far more than its abundance would suggest.

**Light-seeded** — tree species which bear seed capable of being dispersed by the wind. This includes ash, aspen, basswood, birch, balsam fir, hemlock, larch, maple, pine, and spruce.

**Management plan** — a document prepared by natural resource professionals to guide and direct the use and management of a forest property. It consists of inventory data and prescribed activities designed to meet ownership objectives.

**Mast** — all fruits of trees and shrubs used as food for wildlife. Hard mast includes nutlike fruits such as acorns, beechnuts, and chestnuts. Soft mast includes the fleshy fruits of black cherry, dogwood, and serviceberry.

**Old growth** — forests that approximate the structure, composition, and functions of native forest prior to European settlement. They vary by forest type, but generally include more large trees, canopy layers, standing snags, native species, and dead organic matter than do young or intensively managed forests.

**Parcelization** — The separation of single ownerships into multiple smaller ownerships. Common throughout the United States and associated with significant changes in the expectations a landowner can have for smaller parcels and an increase in the difficulty of managing small tracts (compare with fragmentation).

---

**Patch** — a small area of a particular ecological community surrounded by distinctly different ecological communities, such as a forest stand surrounded by agricultural lands or a small opening surrounded by forestland.

**Population** — a group of individuals of one plant or animal taxon (species, subspecies, or variety).

**Rare species** — species that exist only in one or a few restricted geographic areas or habitats or occur in low numbers over a relatively broad area.

**Reforestation** — the re-establishment of forest cover by natural or artificial means on areas previously supporting forest cover.

**Regeneration** — the replacement of one forest stand by another as a result of natural seeding, sprouting, planting, or other methods; also young trees which will develop into the future forest.

**Regeneration cut** — a timber harvest designed to promote and enhance natural establishment of trees. Three types of regeneration cuts perpetuate even-aged stands: seed tree, shelterwood, and clearcutting. Uneven-aged stands are perpetuated by selecting individual or small groups of trees for removal.

**Release** — removal of overtopping trees to allow understory or overtopped trees to grow in response to increased light.

**Riparian buffer** — an area adjoining a body of water, normally having soils and vegetation characteristic of floodplains or areas transitional to upland zones. These areas help protect water quality by removing or buffering the effects of excessive nutrients, sediments, organic matter, pesticides, or pollutants.

**Rotation** — the planned time interval between regeneration cuts in an even-aged forest.

**Sapling** — a small tree, usually defined as being between 1 and 4 inches dbh.

**Seed tree** — a mature tree left uncut to provide seed for regeneration of a harvested stand.

**Seedling** — a young tree originating from seed that is less than 4 feet tall and smaller than 2 inches in diameter at ground level.

**Selective cut** — also known as select. Both terms are synonymous with high-grading or diameter-limit cut. Not to be confused with selection cut.

**Shade tolerant** — species that can survive in the shade.

**Shade intolerant** — species that need full sunlight in order to survive.

**Shelterwood** — a regeneration cut designed to stimulate reproduction by removing all overstory trees. This is achieved by a series of cuts over several years. Gradual reduction of stand density protects understory trees and provides a seed source for stand regeneration.

**Silviculture** — the art, science, and practice of controlling the establishment, composition, growth, and quality of forest stands to achieve the objectives of ownership.

**Site** — the combination of biotic, climatic, topographic, and soil conditions of an area; the environment at a location.

**Size Class** — categories of diameter used to describe trees, or a forest based on the tree of average size. Categories include: seedling – less than 1 inch dbh, sapling 1 to 4.9 inches dbh, pole 5 to 10.9 inches dbh, small sawtimber 11 to 17.9 inches dbh, medium sawtimber 18–23.9 inches dbh, and large sawtimber greater than 24 inches dbh.

**Snag** — a standing dead tree with few branches, or the standing portion of a broken-off tree. Snags may provide feeding and/or nesting sites for wildlife.

**Species** — a subordinate classification to a genus; reproductively isolated organisms that have common characteristics, such as eastern white pine or white-tailed deer.

**Species richness** — the number of species present in a community or a defined area.

**Spile** — A small tube or spout inserted in a tree to aid flow of sap out of the tree and into the collection system.

**Spring seeps** — a class of wetland created by groundwater emerging on lower slopes in small pools surrounded by vegetation. These create snow-free zones critical for wildlife feeding during winter.

**Stand** — a grouping of forest vegetation sufficiently uniform in species composition, age, history, topography, and condition to be distinguished from surrounding vegetation types and managed as a single unit.

---

**Stewardship** — the wise management and use of forest resources to ensure their health and productivity for the future with regard for generations to come.

**Stream management zones** — areas adjacent to water bodies where unique management strategies are applied to protect water quality and maintain stream temperature through shading. Zone width is normally 50 feet, but varies according to the site.

**Succession** — the natural series of replacements of one plant community (and the associated fauna) by another over time and in the absence of disturbance.

**Sugarbush** — a forest used for producing maple syrup.

**Thinning** — removal of trees to encourage growth of other selected individual trees. May be commercial or pre-commercial.

**Threatened species** — a species likely to become endangered in the foreseeable future, throughout all or a significant portion of its range, unless protected.

**Timber stand improvement (TSI)** — a combination of intermediate treatments designed to improve growth and composition of the forest; often spoken of as TSI.

**Tolerance** — a characteristic of trees that describes the relative ability to thrive with respect to the growth factors (light, heat, water, nutrients, anchorage). For instance, a “shade tolerant” species will tolerate low light levels, but may not thrive.

**Understory** — the smaller vegetation (shrubs, seedlings, saplings, small trees) within a forest stand, occupying the vertical zone between the overstory and the herbaceous plants of the forest floor.

**Uneven-aged stand** — a forest stand having at least three distinct age classes.

**Vernal or autumnal ponds** — a class of wetland characterized by small, shallow temporary pools of fresh water present in spring and fall. They typically do not support fish but are important breeding grounds for many species of amphibians. Some species are totally dependent upon such ponds; examples are spring peepers and mole salamanders.

**Vertical structure** — the arrangement of plants in a given community from the ground (herbaceous and woody shrubs) into the main forest canopy; a complex vertical structure is characterized by lush undergrowth and successive layers of woody vegetation extending into the crowns of dominant and co-dominant trees. (See *crown class*.)

**Watershed** — a region or area defined by patterns of stream drainage. A watershed includes all the land from which a particular stream or river is supplied.

**Wetlands** — areas which are either transitional between land and water (where the water table is at or near the land surface) or areas of land which are covered by shallow water (such as marshes, swamps, bogs, and fens). These areas fulfill an essential role in our landscapes by maintaining water quality, stabilizing shores and stream banks, controlling floods and erosions, and providing critical habitat to many plant and animal species.

**Wildcrafting** — the gathering of naturally-occurring plants from native forests.

**Windfirm** — deep-rooted tree species that are not easily uprooted by wind.

**Wolf tree** — a large older tree with a spreading crown and little or no timber value, but often great value for wildlife.

## APPENDIX E: KEYS TO QUIZZES AND PUZZLES

KEY

### Forest Ecology Quiz, page 5

- |        |        |
|--------|--------|
| 1. (a) | 5. (a) |
| 2. (c) | 6. (a) |
| 3. (d) | 7. (a) |
| 4. (b) | 8. (b) |

KEY

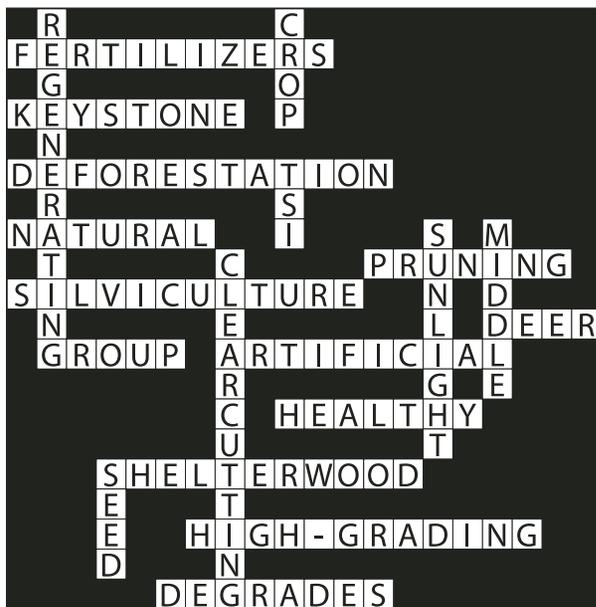
### Forest Stewardship Planning Quiz, page 19

- |        |         |
|--------|---------|
| 1. (d) | 9. (a)  |
| 2. (d) | 10. (c) |
| 3. (c) | 11. (b) |
| 4. (c) | 12. (c) |
| 5. (a) | 13. (c) |
| 6. (c) | 14. (d) |
| 7. (d) | 15. (b) |
| 8. (b) | 16. (c) |

KEY

### Forest Management

#### Crossword Puzzle, page 51



KEY

### Wildlife Management Quiz, page 52

- To survive, every animal requires four basic habitat elements—food, **cover**, water, and space.

- American beech, oaks, black cherry, hickory, raspberry and grapevines are examples of plants that produce **mast**.
- Snakes, skinks, and lizards, as well as other animals visit **rock piles** to find food and regulate their body temperature.
- Cavity trees are live or dead trees with **holes** in them.
- Trees like sugar maple and shagbark hickory are example of species that often have **bark flaps**.
- Water** is essential for the survival of all wildlife.
- Forested wetlands provide rich areas of habitat, with abundant **food** and excellent cover.
- Vernal pools do not support **predatory fish**, and therefore are critical breeding areas for many northeastern species that lay eggs in these ponds.
- Spring seeps** are areas where groundwater comes to the surface.
- Groundwater temperatures remain **above** freezing, therefore seeps often remain free of snow.
- In small patches of forest, nest predation and **parasitism** often occur more frequently than in large, unfragmented forests.
- Young, even-aged forests often have an abundance of **berry-producing** shrubs and brushy cover.
- As a forest changes through **succession**, its structure, size and arrangement of trees, also change.
- Many species, particularly **birds**, divide the habitat vertically.
- Habitat features can be accentuated or created through careful **forest management**.
- Species whose habitat requirements are similar to those of the featured species will benefit, while those with **different** habitats will not.
- A guild is a group of species that uses the same environmental resources in a **similar** way.
- You can manage for some guilds in conjunction with others, while some are **mutually exclusive**.
- By creating a mosaic of age class and cover type combinations, you can manage for **species richness**.
- By creating a **diversity** of habitat types, you can satisfy the needs of a variety of species.

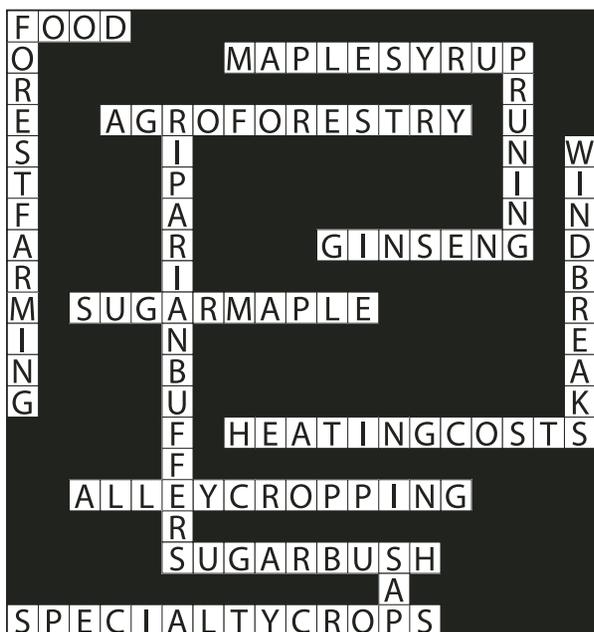
KEY

### Aesthetics and Outdoor Recreation Quiz, page 53

- |        |        |
|--------|--------|
| 1. (d) | 6. (d) |
| 2. (a) | 7. (a) |
| 3. (a) | 8. (c) |
| 4. (b) | 9. (d) |
| 5. (c) |        |

KEY

*Agroforestry as an Option*  
Crossword Puzzle, page 54



KEY

*Water Management Quiz, page 62*

1. **Best Management Practices** are actions you can take to protect the health of your forest before, during, and after management activities.
2. The land and vegetation adjacent to water bodies like streams, lakes, wetlands, etc. are called **riparian buffers**.
3. Trees with riparian buffers help shade adjacent waters, keeping water temperatures cool and dissolved **oxygen** high.
4. Riparian buffers provide **travel** and feeding corridors for wildlife.
5. The recommended width of any buffer will vary according to the topography of the land, **soil type**, and purpose of the buffer.
6. The minimum width of any buffer should be **25** feet on each side of the stream.
7. For each **10** percent increase in slope, the buffer width should be extended 20 additional feet.
8. While maintaining your riparian buffer, do not apply any broadcast **pesticide** or fertilizer within the buffer.
9. The leading cause of soil erosion and sedimentation from forestry is improper **road construction**.
10. Most **erosion** happens during brief episodes of rain or high water.
11. The guiding rule in erosion control is to slow down fast moving **water**.

12. Avoid placing **roads** within riparian buffers except when physical or topographic conditions require it or when stream crossings are essential.
13. Use diversion or **drainage** to control water on roads.
14. Ditches, trenches, or waterways that divert water away from the road surface are called **water turnouts**.
15. **Cross-road** drainage is the transfer of water across or under the road.
16. A **culvert** is one example of a structure that can be used on any road where storm water runoff or seepage might cause erosion.
17. A reverse uphill slope in a road surface that slows and moves water off the road surface is called a **broad-based dip**.
18. The rolling dip provides **cross drainage**, slows water flow, and holds up well under heavy traffic.
19. Water bars are a combination of mounds and **trenches** built into a road or trail.
20. Road and trail approaches to **stream crossings** must have good surface drainage that turns into undisturbed areas.
21. Stream channel and stream banks should be protected from erosion during construction of **bridges** by vegetated ground cover.
22. For temporary-use crossings, **fords** should only be used where the stream has an applied or existing firm base.
23. **Pesticides** include herbicides, insecticides, fungicides and rodenticides.
24. When using pesticides in riparian buffers, use **injection**, stump treatment or directed spray in areas adjacent to open water.

KEY

*Economic Issues Quiz, page 71*

1. Financial analysis helps you to understand the **costs** as well as the benefits of different management choices.
2. You may be able to receive annual or periodic income from **hunting leases** or other activities.
3. **Timber** is generally the most lucrative asset for a forest landowner.
4. **Timber theft** can lead to economic loss and ruin generations of careful forest stewardship.
5. Forest landowners are liable for taxes at the federal, state, and perhaps **local** level.
6. The value of your property and the trees when you acquire it is called **capital assets**.
7. The more actively you manage your forest, the more **deductions** you can make of your forest management expenses.
8. When the owner of an estate dies, the heirs pay federal **estate** taxes.
9. Property taxes are assessed **annually** on the market value of the land.
10. Rising **real estate** values have resulted in many landowners being unknowingly liable for federal estate taxes.

## About NRAES

NRAES, the Natural Resource, Agriculture, and Engineering Service, is a not-for-profit program dedicated to assisting land grant university faculty and others in increasing the public availability of research- and experience-based knowledge. NRAES is sponsored by fourteen land grant universities in the eastern United States (see map below). We receive administrative support from Cornell University, the host university.

When you buy books from NRAES, you are helping to improve the accessibility of land grant university knowledge. While 15% of NRAES' annual income is provided by member universities, the funds to publish new books and coordinate new conferences come from our customers through book sales, conference registrations, and occasional project-specific grants.

NRAES publishes practical books of interest to fruit and vegetable growers, landscapers, dairy and livestock producers, natural resource managers, SWCD (soil and water conservation district) staff, consumers, landowners, and professionals interested in agricultural waste management and composting. NRAES books are used in cooperative extension

programs, in college courses, as management guides, and for self-directed learning.

NRAES publishes two types of books: peer-reviewed books and conference proceedings. Our peer-reviewed books are evaluated prior to publication for technical accuracy and usefulness to the intended audience. The reviewers may include university faculty, extension educators, potential users, and interested persons from government and agribusiness. Conference proceedings are not peer-reviewed. However, the authors of papers presented at NRAES-sponsored conferences are chosen for their recognized expertise. NRAES also distributes some videos related to waste management and fruit and vegetable production.

NRAES was started in 1974 and was originally known as the Northeast Regional Agricultural Engineering Service. In 1987, with encouragement from member university extension directors, NRAES began offering its services to faculty from all disciplines at member universities. In 1998, Virginia Polytechnic Institute and State University joined the original thirteen member universities. Our name was changed in 1998 to reflect the expansion of NRAES beyond the Northeast and the broadening scope of our books and conferences.

*Contact us for more information or a free book catalog:*

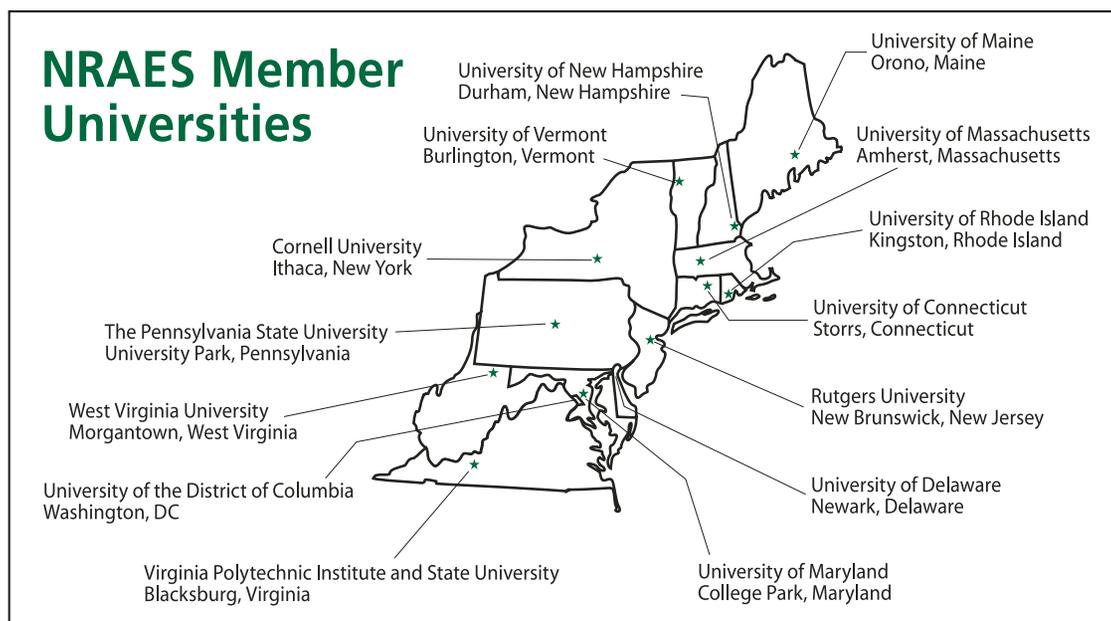
### **NATURAL RESOURCE, AGRICULTURE, AND ENGINEERING SERVICE (NRAES)**

Cooperative Extension, PO Box 4557, Ithaca, New York 14852-4557

Phone: (607) 255-7654 • Fax: (607) 254-8770

E-mail: [NRAES@CORNELL.EDU](mailto:NRAES@CORNELL.EDU) • Web site: [WWW.NRAES.ORG](http://WWW.NRAES.ORG)

Marty Sailus, NRAES Director • Jeffrey S. Popow, NRAES Managing Editor



NRAES-170



Recycled Paper

ISBN 1-933395-01-X



9 781933 395012