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Home, NRAES-184

By Jonathan Kays, Joy Drohan, Adam Downing, and Jim Finley

Published by NRAES, September 2006

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The Woods in Your Backyard

Learning to Create and Enhance Natural Areas Around Your Home



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NRAES-184

September 2006

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and Engineering Service). All rights reserved. Inquiries invited.

ISBN-13: 978-1-933395-10-4

ISBN-10: 1-933395-10-9

Library of Congress Cataloging-in-Publication Data

The woods in your backyard : learning to create and enhance natural areas around your home
/ written by Jonathan Kays ... [et al.].

p. cm. -- (NRAES ; 184)

Includes index.

ISBN-13: 978-1-933395-10-4 (pbk.)

ISBN-10: 1-933395-10-9 (pbk.)

1. Natural landscaping. 2. Gardening to attract wildlife. 3. Garden ecology. I. Kays, Jonathan,
1954- II. Series: NRAES (Series) ; 184.

SB439.W66 2006

635.9'77--dc22

2006018890

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Acknowledgments

The authors wish to thank the U.S. Fish and Wildlife Service for the substantial grant funding that initiated and sustained this project. The Virginia Department of Forestry and the Potomac Watershed Partnership through the USDA Forest Service also contributed significant funding part way through the project that made its completion possible. The authors gratefully acknowledge the in-kind contributions of their universities—the University of Maryland, Virginia Tech, and Penn State. They also acknowledge the valuable contributions of Penn State and University of Maryland photographers Howard Nuernberger and Edwin Remsberg, respectively, and the many photographers who have contributed photos to the invaluable collections at [HTTP://WWW.FORESTRYIMAGES.ORG/](http://www.forestryimages.org/) and [HTTP://WWW.INVASIVE.ORG](http://www.invasive.org) and [HTTP://INSECTIMAGES.ORG](http://insectimages.org). Design is by Andrea Gray of Burlington, Vermont.

The authors also wish to thank the following peer reviewers for offering comments to improve the quality and accuracy of the text:

Charlie Becker
Utilization and Marketing Manager
Virginia Department of Forestry

Karen P. Bennett
Extension Professor, Forest Resources
University of New Hampshire Cooperative Extension

George Bulin
New York State Master Forest Owner/
COVERTS Volunteer

Sue and Charlie Carpenter
New York State Master Forest Owner/
COVERTS Volunteer

Art Coleman
New York State Master Forest Owner/
COVERTS Volunteer

Catherine A. Elliott
Extension Wildlife Specialist
University of Maine Cooperative Extension

Dan Goerlich
Central District Program Leader
Virginia Cooperative Extension

Gary Goff
Senior Extension Associate
Cornell University

William Hubbard
Southern Regional Extension Forester
Cooperative Extension Service-Southern Region
University of Georgia

Jim Miller
New York State Master Forest Owner/
COVERTS Volunteer

James A. Parkhurst
Associate Professor of Wildlife Sciences and Extension
Wildlife Specialist
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Georgette F. Plaugher
Extension Agent
West Virginia University Extension Service

Chris Schnepf
Area Extension Educator-Forestry
University of Idaho Extension

Sandra West
Maryland Coverts Cooperator

Dozens of Maryland, Pennsylvania, and Virginia landowners who participated in focus group sessions to test the efficacy and clarity of the manual and activities.

Disclaimer

This manual covers issues related to the natural parts of your land: areas that are currently forested; areas that you don't mow, which may be covered with small trees, shrubs, and/or tall grass; wetland and waterside areas; and mowed areas that you want to convert into forest. The manual does not address areas you plan to continue to mow.

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Herbicide/Pesticide Precautionary Statement

Herbicides and pesticides used improperly can be injurious to humans, animals, and plants. Follow label directions and heed all precautions on the label. Store all such chemicals in original containers and out of reach of children.

About the Authors

Jonathan Kays is an extension specialist in natural resources with statewide responsibility for programs in the areas of forest stewardship, wildlife damage management, natural resource income opportunities, and biosolids and trees. This manual is partially based on his personal experience of transforming his 3-acre residential lot from a cornfield to a “woods in his backyard” over the course of 12 years. He is also the owner of 265 acres of forestland in West Virginia that he manages using sustainable forestry practices. Information on his integrated extension and research education program can be found at [HTTP://WWW.NATURALRESOURCES.UMD.EDU](http://www.naturalresources.umd.edu).

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Jim Finley is a professor of forest resources and extension forester and coordinator at Penn State University. His extension interest focuses on private forestland management and forest sustainability. Extension audiences for his work include private forest owners, loggers, foresters, the forest industry, and the public. To improve outreach programs his research involves social research studies and forest management. Jim and his wife, Linda, own and manage 280 acres of forestland in north central Pennsylvania and have a suburban woodlot of nearly two acres where they strive to invite wildlife to share their property.

— PART I —

Introduction



Purpose

This manual promotes the stewardship of small parcels of land for the personal enjoyment of the owners and improved environmental quality for society. If you have 1–10 acres of land in the Mid-Atlantic/Northeast region that is forested or has unmowed natural areas, this manual is for you. It is also for you if you have a mowed lawn area that you want to turn into a forest.

One of the most effective ways you can improve water and air quality, wildlife habitat, and natural area health is by shifting areas of lawn into unmowed natural areas or forests. Over a period of years, this will reduce the time you spend mowing your lawn and give you more time to enjoy your family, property, and hobbies. This manual will teach you how to do this.

Part V of the book (pp. 79–119) includes blank activity sheets through which you can apply the lessons in Parts I–IV to your own land. Points at which you should pause your reading in Parts I–IV and complete an activity in Part V are noted throughout the text.



An alternative type of yard.

Overview of Contents

Here's an overview of what this manual and the accompanying workbook cover:

- Learn why you should manage your land.
- Map your land and assess why you bought the land and what you hope to get out of it.
- Understand how your land relates to the land around you.

- Identify land management units on your property.
- Learn basics of tree identification, forestry, and wildlife habitat management.
- Assess your property's water resources, recreational possibilities, and aesthetic appeal, and ways to improve each.
- Choose a few land management projects to help meet your goals.
- Set a timetable and mark progress.

Throughout the book, we'll follow the case study of one family, the Nelsons, as they complete the activities and realize how they can fulfill their land management goals. The Nelsons' answers to each activity are included as a sample (in light gray boxes). Two more abridged case studies appear on pages 105–119. We suggest you read through these early in your learning process and refer back to them as needed for specific examples.

A glossary of terms appears on page 137. Terms in the glossary are in boldface type the first time they occur in the text.

For More Information

This book is designed to complement existing research-based information on forest resource and wildlife management and should be used with this information to learn more about the subjects of particular interest to you. The resource list (pp. 131–136) points you to some of this information. Your local cooperative extension office, soil and water conservation district, and state forest agency are great places to begin looking for more information about the topics of greatest interest to you. Find your nearest office on-line or in the blue pages of the phone book.

If you complete all or most of the activities in this manual and still want to know more, check with your local cooperative extension office for information about forest landowner education programs in your state. Cooperative extension partners with many organizations to offer more intensive training programs for forest landowners about the many topics covered in this book. Educational programs may be an evening, day-long, or more intensive weekend-long training. For more information on your state cooperative extension service contact [HTTP://WWW.CSREES.USDA.GOV/EXTENSION/INDEX.HTML](http://www.csrees.usda.gov/extension/index.html).

Dividing Property According to Use

Most people can divide their property into three categories according to intensity of use.

- The *intensive-use areas* include buildings, decks, patios, paved areas, driveways, roads, and gardens.
- *Intermediate-use areas* include lawns, orchards, Christmas tree plantations, pastures, and any other semi-natural areas of the property.
- *Natural areas* include wooded and/or shrubby areas, waterside areas, and other areas that you don't now regularly manage or maintain. This manual focuses only on natural areas and intermediate-use areas you want to stop mowing.

Conversion of Lawn to Natural Area

Most intermediate-use area is lawn, which is of little or no value to most wildlife. If you are tired of spending so much time mowing your lawn, you may consider converting some of this intermediate-use area into a natural area. Other benefits to reduced lawn mowing include:

- improved wildlife habitat through increased plant diversity
- probable decreased reliance on fertilizers and herbicides
- reduced oil and gas consumption
- reduced air and noise pollution
- cost savings
- more time with family.



Natural areas can include many different kinds of landscapes.



If you stop mowing the grass, nature will slowly take its course and over a period of years the area will gradually develop into a young forest or treed meadow. If you prefer to take a more active approach and give your future forest a jump start by planting trees, this manual will help you do that.

Lesson 1



Identify Your Interests in the Land

So you've got this land. What are you going to do with it? Many people buy land with an idea of how it will feel to live there and how they want the land to look. Many envision wildlife living tranquilly on their land. But often landowners have to work at making the land suitable for a variety of wildlife or making it look the way they want.

Land Stewardship

Surveys show that people own woodland properties primarily to enjoy wildlife and scenery, have more privacy, feel a part of the land, or work outdoors toward a goal. Many people who own land feel a responsibility—a sense of stewardship—to care for the land for future generations. When we view land and nature as a larger community of which we are just a tiny part, we tend to have more respect for the land. The naturalist and author Aldo Leopold wrote in the classic book *A Sand County Almanac*:

“We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.”

Land management by owners of small lots is becoming more important because land is being divided into smaller and smaller pieces. In the Mid-Atlantic/Northeast region, about two-thirds of forest landowners own 10 or fewer acres. Similar trends in land ownership are seen throughout the country. Unfortunately, in many states people who own less than 10 acres do not qualify for assistance from public land managers. This makes fulfillment of their land management role more difficult and necessitates resources such as this book.

Actively managing your land can increase its value and provide exercise, hobbies, inexpensive family activities, firewood, improved wildlife habitat, aesthetic beauty, and supplemental income. It can also help maintain the rural character of your area and improve water quality. As woodland properties are sliced into smaller and smaller pieces, communities will increasingly depend on these small properties for “ecosystem services” such as water filtration, flood control, wildlife habitat, and air quality control.

Many people think that ecologically the best thing to do with land is to leave it alone and let nature take its course. Depending on your objectives, this often is not true. Intervention at the appropriate time can help you reach your objectives. You can leave your land alone, but the inevitable changes nature will bring may or may not accomplish your objectives. Consequences arise from doing nothing, and they may or may not be what you're looking for from the land. By managing the vegetation on your land, you can make it more productive and enticing for wildlife and a more efficient purifier of air and water. We'll show you how.

Developing a Plan

By completing the activities in Part V, you will create a basic land management plan. The process of developing a plan will help you realize the variety of options possible. Having a plan can save you money and time by guiding you through the most efficient steps toward your goals. A plan can help you get and stay motivated to accomplish land management projects, especially when you have multiple goals.

For example, if your natural area contains trees, you might want to harvest some firewood. If another member of your family wants to see more wildlife on the property, you can both achieve your goals by selecting firewood trees carefully. Cutting firewood can improve the health of your land and its attractiveness to wildlife. Managing land for wildlife usually means managing the vegetation that wildlife depend on for food and shelter.

Many landowners are interested in deriving income from their natural areas. Income expectations may range from a modest objective of offsetting the costs of a hobby to helping pay the property taxes. Some options for earning income from natural lands in our area include mushrooms, maple syrup, Christmas trees and wreaths, and medicinal plants such as ginseng. See the resource list (pp. 131–136) for more information.

Let's start by getting to know our case study family, the Nelsons, and their land. Then you'll begin to assess your interests in the natural areas of your land. You need to know what you want out of your natural area before you can make a plan to achieve those goals.



Case Study: The Nelsons

Property description and why we bought the land

My wife, Ellen, and I and our children, ages 4 and 2, have been living on our 4.5-acre lot for a little more than 2 years. We bought our wooded lot because of its great location, space for our children to explore, privacy, and a bit of space to “play with the land.” During the purchase process and in talking with locals, we learned that our lot was part of a larger farm that was sold in three pieces to separate buyers. Some of the pieces were slated for development. According to an old local logger, much of the original property was wooded and had been harvested several times. It was also good hunting ground, according to long-time residents. Development began on the part of the farm where our home is about 7 years ago. We bought our house and the 4.5 acres that came with it from a young family who had lived there for 4 years. As best we can tell, the only thing they did outside was to cut down a few trees that had been injured during construction.



Frequent outdoor activities can help cultivate children's inherent curiosity about nature.

We enjoy having nature close to us. Red fox, wild turkey, white-tailed deer, cottontail rabbits, and lots of squirrels frequent our view from the kitchen table. We've also seen pileated woodpeckers working on a dead tree just over our property line. We enjoy watching the wildlife come to us, but we also enjoy being outside in “their environment.” Our only problem with the wildlife is that deer often eat the shrubs and flowers we plant around the house.

We are excited to have Oak Creek along the back edge of our lot. At first we hoped we might be able to construct a little dam at our corner for a swimming hole. Well, we quickly found out we couldn't do that because of environmental regulations, but we did find out from the county cooperative extension office about streamside areas and how to protect them with forest buffers. The banks of the stream are now covered mostly in raspberry and green briar thicket.

What we have done with the property

We haven't done a lot in our first 2 years here except to clear out a small patch of woods behind the kids' play area. We cut the underbrush so they can play in there and felled a few dead and potentially hazardous trees. It's difficult to find time with two children under the age of five and home improvement projects to do too. Most recently, we've tried to kill some **invasive** and/or nonnative plants (mostly tree-of-heaven). A few dead hickory trees stand in the midst of the wooded areas. We're debating if we should cut these down or maybe leave a few for woodpeckers and other wildlife.

Where to go from here

For starters, we want to mow less grass. We currently mow about 1.5 acres. We're interested in converting the lawn in front of the garden into trees for more privacy. Because our mostly wooded lot is long and narrow and oriented roughly north-south, quite a bit of shade comes our way in the morning and evening from neighboring wooded lots. So sunlight is somewhat limiting, and only getting more so as the medium-sized forest trees on our boundaries grow.

We'd like to help improve the water quality in Oak Creek by planting trees and shrubs on our bank. We've begun to learn how important streamside areas are for

water quality and wildlife diversity, so we definitely want to enhance this area. We'd like to encourage reptiles and amphibians to live there and include the area on a walking trail, so the kids can discover these neat creatures.

We'd like to improve the privacy of our lot so we can see less of our neighbors and more of the stars throughout the year. Their floodlight dims our nighttime sky. We'd also love to have more fall color among our trees.

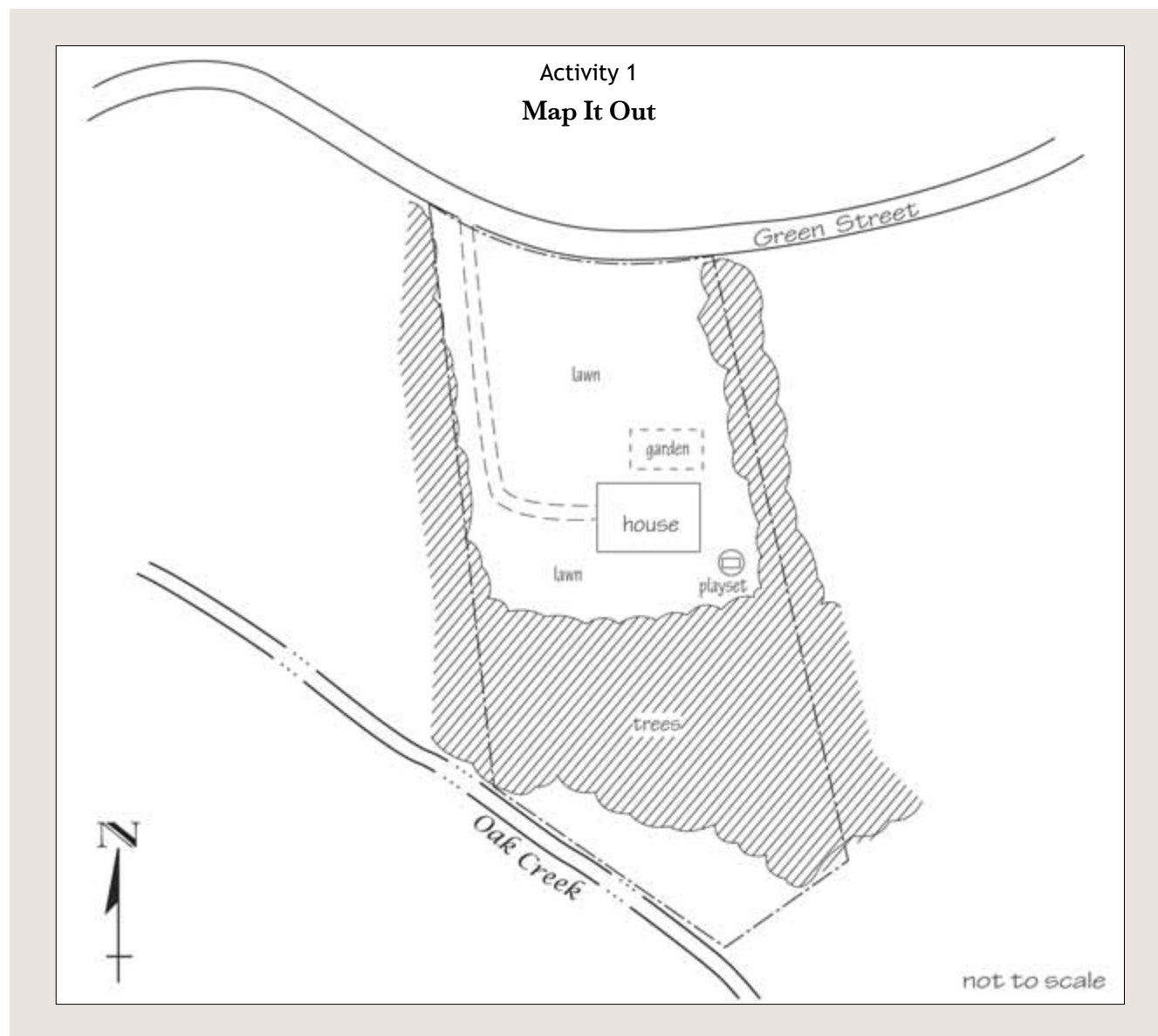
Now that you've met the Nelsons and learned about some concerns of typical small natural area owners, Activities 1 and 2 will help you begin to realize your natural area's assets and what you want from the land.

Complete Activity 1: **Map It Out** (p. 81).

Below is the Nelsons' map for Activity 1.

Complete Activity 2: **What Have You Got and What Do You Want?** (p. 83).

The Nelsons' answers to Activity 2 are on the following page.



Activity 2

What Have You Got and What Do You Want?

1) Complete the table below for your land.

	Intensive use (buildings, driveways, paved areas)	Intermediate use (lawn, garden, pasture, orchard)	Natural areas (forested; unmowed areas with small trees, shrubs, tall grass; streamside, etc.)
	(% of total property)		
Total land owned 4.5 acres*	~25	~25	~50

*An acre is a square about 210 feet on each side (43,560 ft²) or a rectangle a little smaller than a football field.

2) In what year did you buy or acquire the land? 2003

3) Why did you buy the land? What did you hope to get out of owning the land?
pretty location, close to town, yet fairly private, space for children to play, opportunity to work with the land

4) Have your reasons for owning the land changed since you bought or acquired it? How?
We originally wanted to dam Oak Creek to create a pond. But we soon found out we couldn't. We're not really upset about it because the creek is pretty itself.

5) What do you most enjoy about your land? seeing wildlife, safe place for kids to play, some privacy, sense of possibility about what we could do with the land, adjacent to Oak Creek

6) What do you least enjoy about your land? mowing all that grass, not quite enough privacy

7) What do you want from your natural land now? (some possibilities: protect and enjoy wildlife, protect view, produce firewood, pay taxes, etc.) more privacy, more wildlife, place to teach kids about wildlife, more fall color, less time spent mowing grass, improve water quality in Oak Creek, block neighbor's light to see more of night sky

In 10 years? maintenance of the same

8) How much land could you/do you want to convert from intermediate use to natural area? Where is it?
about an acre in front of house by road

Lesson 2



Reality Check: Is Your Family with You?

Developing and implementing a land management plan should account for the needs and opinions of all family members. Many land management projects have been abandoned because one member of the family wrongly assumed that another member wanted to help. Some projects are quick and easy, but others are time-consuming and require continued maintenance. Working together, you can accomplish big jobs quickly and share the sense of accomplishment. You'll also have an easier time if your family agrees on the goals for your natural areas or if you work out mutually agreeable ways to reach multiple goals.

For many people the limiting resource for land management is free time. If you have extra money but are short on time, you might want to hire help to complete some or

all of your planned activities. Your county extension agent can help identify a certified arborist. The International Society of Arboriculture ([HTTP://WWW.ISA-ARBOR.COM/FINDARBORIST/FINDARBORIST.ASPX](http://www.isa-arbor.com/findarborist/findarborist.aspx)) maintains a searchable list of certified arborists. Arborists and tree services are just beginning to attempt to meet the needs of owners of small acreages, so working with them may require flexibility and innovation. If both time and money are scarce, take your time and break big projects into more manageable parts.

Activity 3 will help you assess the degree to which your family and other work team members share common land management goals.

Complete Activity 3: **Family Goals Assessment** (p. 85).

Here are the Nelsons' answers to Activity 3.

Activity 3 Family Goals Assessment		
	Agree	Disagree
I would like to have more natural areas and less mowed land.	T, E*	
I do not understand what kind of land management projects are possible and what is involved with each.	E	T
I'm very enthusiastic about land stewardship of our property.	T, E	
Any new land management projects are too much for us to handle now.		T, E
I am worried about how land management projects will affect our time for other family and/or personal activities.	T, E	
I am concerned that other family members do not understand what I value most about our property.		T, E
I believe we could handle the financial cost of carrying out some land management activities on our property.	T	E
It's important for the children to learn to work the land, even if other activities have to be reduced.	T, E	
I believe my opinions and feelings about potential new projects on the property are taken seriously.	T, E	
*T=Tim's response; E=Ellen's response		
<p><i>Summary by Ellen:</i> Most of our concerns and enthusiasms match. But the project is really Tim's baby, so he will do most of the implementation work, with help from me when possible. We don't have a lot of extra time or money, but feel we can tackle the work in small projects over several years.</p>		

Lesson 3



Interests Table

Many landowners will begin reading this manual having little idea what their interests are for their properties or how to identify them. This lesson will help you answer those questions.

Your Interests in Natural Area Management

Natural area management interests can be looked at in two ways: first, according to the human values we want to achieve (those across the top of Table 1 below), and second, according to the benefit to the resource we want to maximize (listed down the side of the table). See the sidebar “Sample Projects for Each Resource Benefit” (p. 11) for examples of projects. Activity 4 will help you identify your interests in the land. But before you complete it, let’s use the Nelsons’ answers below to explain how the table works.

Activity 4

Identify Your Interests in the Land

Recall the Nelsons’ interests from Activity 2:

- 1. Reduce time spent mowing lawn and improve wildlife habitat.
- 2. Improve the water quality of Oak Creek.
- 3. Improve aesthetic beauty and sense of privacy.

The table works like this: For their primary interest (Table 1), the Nelsons chose wildlife habitat as a resource interest to achieve the human benefit of reduced lawn mowing. For the secondary interest, the Nelsons chose improving the water quality resource for their own personal satisfaction. The Nelsons’ third priority is to enhance the aesthetic beauty and privacy of their property.

Table 1
Identify Your Interests

Resource benefits	Human values				
	Income production	Enhance property value	Personal satisfaction	Privacy and sanctuary	Reduced lawn mowing
Natural area improvement*					
Forest products					
Wildlife habitat					1
Water resources			2		
Recreation					
Aesthetics				3	

* In general, landowners who choose interests from the upper left side of the table (darker brown shading) must be more active, hands-on managers, while those who choose combinations from the lower right can be more passive managers. Active managers will need detailed information before making land management decisions, so they may have to find more information and professionals who can help. Passive managers will need considerably less detail, and their interests will require less effort to pursue.

Adapted from: *Legal Aspects of Owning and Managing Woodlands* by Thom J. McEvoy. Copyright © 1998 by Island Press. Reproduced by permission of Island Press, Washington, D.C.

Sample Projects for Each Resource Benefit*

Natural area improvement – remove damaged trees and/or limbs; control **exotic** and/or invasive species; improve tree growth by thinning; plant trees

Forest products – firewood for personal or others' use; ginseng or other medicinal plants from the natural areas of the property; grapevines for wreaths; shiitake mushrooms; maple syrup; Christmas trees

Wildlife habitat – create brush or rock piles; encourage growth of wildlife food trees; improve shelter opportunities

Water resources – establish or enhance forest cover around streams, **seeps**, **springs**, or drainage areas

Recreation – create or improve trails; create a campfire or camping area; create a natural-area haven; improve opportunities for hunting or wildlife watching

Aesthetics – create or enhance a scenic vista; improve fall color of trees; clean up natural areas damaged by insects, disease, or storms; increase privacy; plant flowering trees and shrubs.

*The appropriateness of any of these projects for any parcel of land depends on the owner's objectives. There may be conflicts and tradeoffs between objectives.

The case studies in Part V (pp. 105–119) provide additional examples of interests in the land.

Complete Activity 4: **Identify Your Interests in the Land** (p. 86).

Now that you have a better sense of what you want from your land, let's step back and consider a few constraints you may encounter so that you set realistic goals.



Lawn mowing can be time-consuming. Lawn is low in wildlife habitat value.

Lesson 4



Constraints to Land Management

As you formulate goals for your natural area, it's important to be realistic. Economic, physical, biological, ecological, social, and legal factors may constrain what you can accomplish on your natural land.

Economic and Physical Constraints

If you and/or your family and friends will do most of the work, you'll need some basic equipment, skills, and strength. Completing the activities in the workbook will help you devise a long-term timetable of goals that you can achieve. Consider hiring people (e.g., a tree service, a consulting forester, or maybe a forestry student) to implement your land management plan if you need help.

Ecological Constraints

Ecological constraints are the most difficult to overcome. Short of buying a new property, you can't do much to change the basic quality of your land, the lot size, or the location. The quality of your land depends on:

- whether it is sloped or flat,
- whether it is subject to flooding or drought,
- past land use and the types of land use around your property,
- the latitude, altitude, and **aspect** (direction in relation to the sun) of the site
- soil type, and
- other factors we'll explore as we go through this book.

It's important to realize that a 1–10-acre lot can't meet the needs of every kind of wildlife. Therefore, try to work with your neighbors to jointly provide the habitat elements that some species require. The landscape around your property will influence what kinds of wildlife you can attract. A healthy forest surrounded by ½-acre house lots will have lower wildlife diversity than the same lot surrounded by other forested lots.

Social Constraints

Social constraints are not officially codified into any law or regulation, but they can still cause tension and trouble

with neighbors. Practices such as disturbing the aesthetics of a neighborhood by cutting down trees at property boundaries, especially along a road, and allowing grass to grow into a tall meadow (see below for further discussion) can disturb your neighbors. Other practices that may raise your neighbors' ire include anything that generates an unpleasant odor (such as fertilizing with animal manure) or noise (such as excessive chain sawing), or disturbing a scenic view. Your best defense against these kinds of complaints is education. Before you begin, politely explain to your neighbors what you're planning, why you're doing this, and how long the practice is likely to continue. Give the same explanation to other people who express concern during the process.

Legal Constraints

Several potential legal constraints may affect how you can manage your natural land. Before you begin any work, it is best to check your property deed to see if you are affected by an easement, right-of-way, or homeowners association covenants. The Nelson case study (p. 13) and case study 1 in Part V (p. 105) include examples of legal constraints and how landowners can integrate them into land management plans. Some typical legal constraints are:

Easements and Rights-of-Way. An easement gives another person or party a right to be on or use your land. An easement is usually a long-term or permanent agreement that passes from owner to owner with the land. An easement might, for example, give a neighbor the right to cross your land to reach a stream.

A right-of-way is similar to an easement, but the party that has the right-of-way is usually a corporation or government agency, often a utility or transportation company.

If there's an easement or right-of-way on your land, there might be limits to what you can do on that section of the property. For example, many power line and gas line rights-of-way must be maintained in tall grasses and small shrubs, not trees. Check your deed before you plan any land management activities in a right-of-way or easement area.

Covenants. Many newer neighborhoods have homeowners associations and accompanying rules, or covenants, about what you can and cannot do on your land. Some covenants may provide challenges to application of some land management practices discussed in this manual, such as converting a lawn area to forest. Check your homeowners association documentation before you plan land management activities.

Regulations. Some activities, such as altering a wetland or waterway, may involve federal, state, and/or local regulations. Check first with your local conservation district if you have any doubt whether you can legally implement a management practice on your land.

Comprehensive Zoning Plan. Most communities have a zoning ordinance that permits certain land uses in different areas. Zoning helps minimize potential conflicts between incompatible land uses. In some cases the zoning may not allow certain kinds of land management

activities. For example, you might not be able to have horses or sell products such as Christmas trees from your house if you are in a residential area. Check with your local planning office.

A Note about Commercial Logging

Commercial loggers will occasionally work on property less than 10 acres, providing a valuable service to landowners. Never agree to a harvest before you educate yourself about the process and potential benefits and pitfalls. State and county cooperative extension staff offer publications and advice on these issues. See the resource list (pp. 131–136) for more information.

Activity 5 will help you investigate the constraints on your land.

Complete Activity 5: **Investigate the Legal Constraints on Your Land** (p. 87).

Here are the Nelsons' answers to Activity 5.

Activity 5

Investigate the Legal Constraints on Your Land

Easements – None

Rights of way – None

Covenants – The homeowners association covenants include a provision that grass not be more than a foot tall. This might prevent us from turning some of the lawn into a forested natural area. We figured our best chance of getting an exception to this covenant was accurate information and thorough planning.*

Other constraints – We originally wanted to dam Oak Creek to create a pond. But we soon found we couldn't because of state and federal wetland regulations.

*P.S. from Ellen: We continued to work our way through the exercises in this book, and when we were done, Tim presented our land management plan at a meeting of the homeowners association. He emphasized the benefits of improved water quality in Oak Creek and improved air quality and reduced noise pollution from less lawn mowing. In the end the homeowners association agreed to the plan as long as the lawn area to be planted in trees was at least 25 feet back from the road. We agreed to mow between the trees until the forest canopy closes.

— PART II —

Inventory Your Property



Lesson 1



Your Place in the Landscape

Landowners often express a strong interest in having wildlife visit their property. Nearly everyone enjoys seeing wildlife, and knowing that you are managing your property to provide important habitat components makes it especially rewarding. Each wildlife species has specific requirements for space, **cover**, food, and water. As you look around your property and your neighbors' and

beyond that to the larger landscape, evaluate how much habitat diversity is around you. Are almost all the trees around you large? Are there any open fields or areas of brush? You might attract the most wildlife by providing a kind of habitat that is in short supply in your area.

Nationwide, land is being split into smaller and smaller parcels. The health of our natural ecosystems increasingly depends on the sound management of these smaller lots. In the suburban environment we are discussing in this manual, a single owner's property probably cannot meet all the habitat needs of many species. See the sidebar on page 19 for information about how aerial photos can help you take a wider view of your area.

When considering wildlife needs, it is useful to think of your property as an island (Figure 1). You may have



Intact forest.



The fragmentation of the forest into smaller lots.

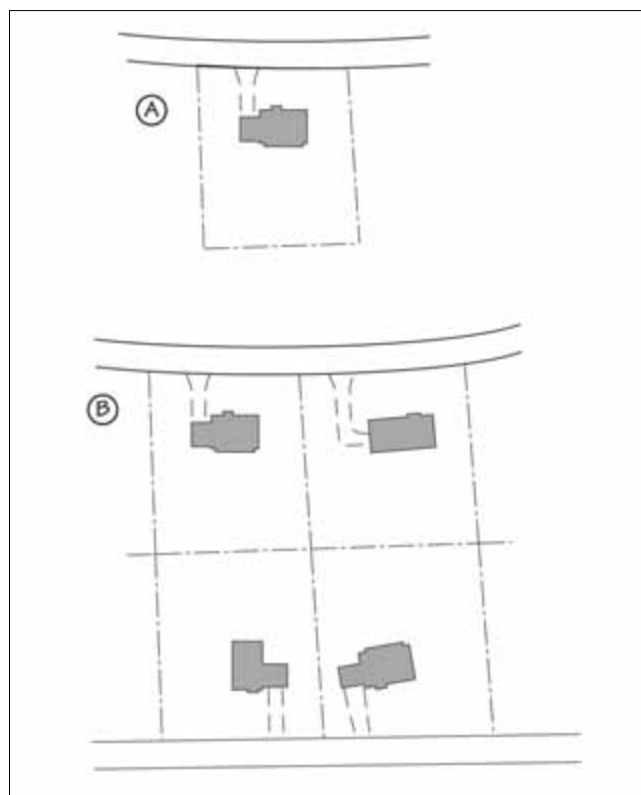


Figure 1: The larger the patch of habitat, the more species it may contain. (A) Your house and lot; space and habitat diversity are limited. (B) The larger view incorporating neighbors' properties. Cooperating with neighbors may increase your options for habitat diversity and size of habitat.

everything some species need right on your property for at least part of the life cycle, but often you can't meet all the needs all the time. For example, during breeding season, a species may move to other locations. Therefore, a basic premise in managing your island, or "patch," as wildlife managers refer to a single kind of habitat (e.g., an old field), is to make patches as large and as close together as possible or to physically link them.

Forested properties of all sizes are often mixed with other land uses, such as agriculture and residential housing. This creates smaller fragments of forests. Some animals, such as some songbirds, require large unbroken tracts of forest to meet their needs for food and shelter. You will not normally find these animals on a small isolated tract of natural land surrounded by houses.

Figure 2 provides a way to evaluate patch size and location. If patches are small, it is important to have them as close together as possible (Figure 2 C and D). Similarly, patches should be close to important habitat components, such as water.

Edge occurs at the interface between two or more habitats. A **soft edge** is a gradual transition from one area to another (e.g., a crop field whose edges consist of tall grass, brush, and then forest). **Hard edge** has little to no transitional area (e.g., a crop field bordered immediately by mature forest). Wildlife species diversity is often high in edge areas, especially soft edge, because they offer a wider variety of food and cover options. However, with increased opportunity comes higher risk. For example, predators know that prey species frequent



Soft edge (top). Hard edge (bottom).

the edge. Therefore, try to minimize narrow (less than 50 feet) hard edge and maximize interior space away from the edge of a habitat type. This is best accomplished by having circular spaces. Figure 3 provides an example of increased edge as the individual parcel size decreases.

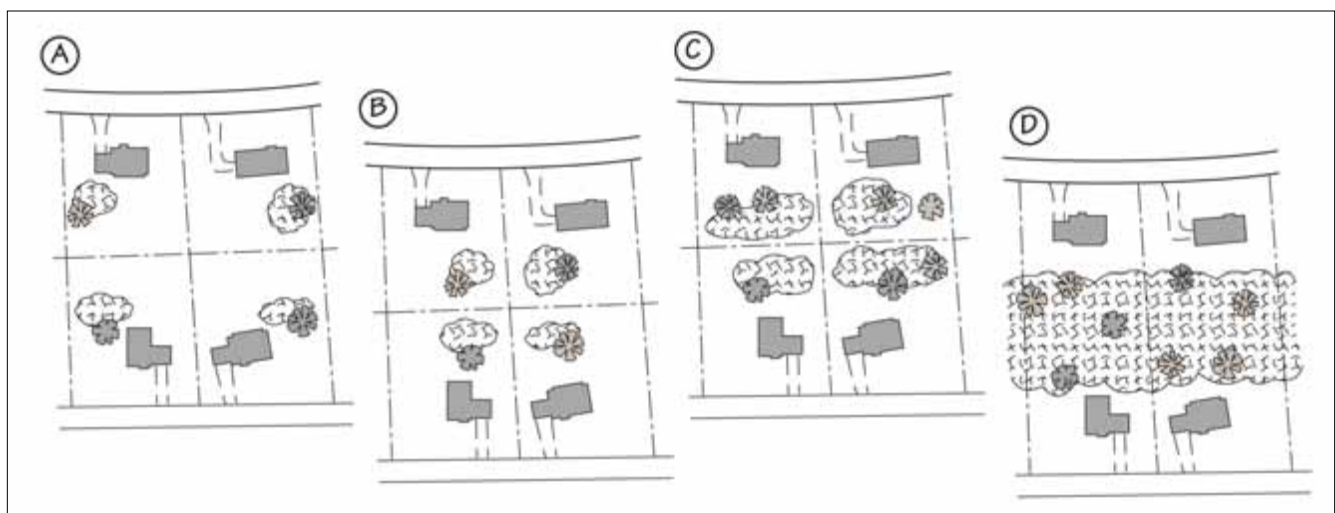


Figure 2: Patch size and proximity affect wildlife habitat. Larger, closer, and connected habitat is more useful to wildlife. Arrangement (B) is better than (A)—habitat is closer. (C) is better than (B)—habitat is larger. (D) is better than (C)—habitat is connected.

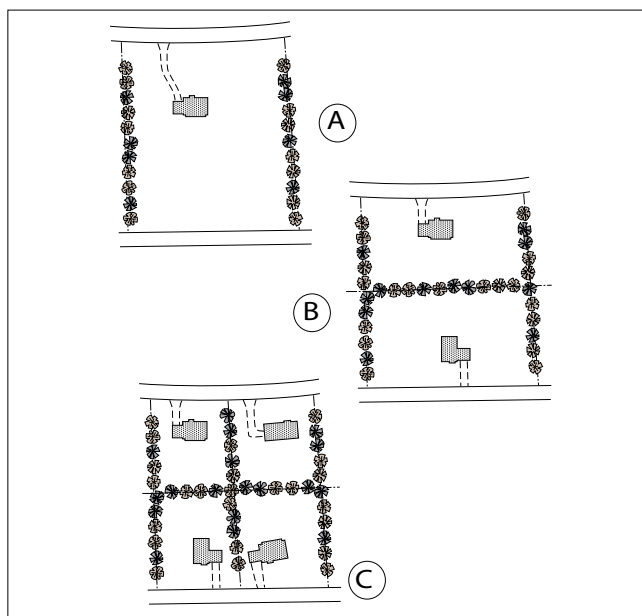


Figure 3: As lot size decreases, total edge along property boundaries will increase. (A) A 4-acre lot with 1,620 feet of edge. (B) Two 2-acre lots, each with 1,080 feet of edge (total 2,160 feet). (C) Four 1-acre lots, each with 816 feet of edge (total 3,264 feet). How the edge is managed will affect wildlife habitat in a positive or negative way, depending on the species.

Cooperate to Achieve Shared Goals

Because animals don't observe property boundaries, your neighbors' land provides an extension of the habitat on your land. For example, if a neighbor's property includes a water body, you will see a greater variety of wildlife than you would without water nearby. You may improve the quality of wildlife habitat by planting trees and/or shrubs to make a safe corridor between your natural area and a neighbor's natural land or water body.

Talk to your neighbors about your land management plans. Explain what you want to do and why. Find out if they're currently working toward any land management goals or if they're interested in doing so. Find out what they think about what you're doing so you can head off trouble before it starts. For example, a neighbor with a passion for gardening may not appreciate your efforts to attract more deer. If you find common interests, discuss how you might work together to achieve shared goals. Maybe they are as interested in privacy screening between your houses as you are. Coordinated planting can reduce the costs and the amount of work required, as well as the time required to reach the goal.

Working with Aerial Photos

An aerial photo may help you get a bigger perspective of the types of land use around you. Aerial photos are taken from a plane or satellite, so they give you a bird's eye view of the world and can reveal landscape patterns that are difficult to discern from the ground. Analysis of aerial photos is best suited to larger pieces of property (> 3 acres) because the photo scale is usually coarse. In many aerial photos either 4 or 8 inches on the photo equal one mile on the ground. Where newer photos are available, resolution will be better.

You should be able to obtain an aerial photo of your land on the World Wide Web at TerraServer USA, <http://terraser.com>, or from your local conservation district office. Look on-line or in the blue pages of the phone book to find the office. Another resource is Google Maps at <http://maps.google.com/>.

If you're using TerraServer:

- 1) Type in the address of the property you want to view.
- 2) Click "Go."
- 3) Choose "Aerial Photo."

- 4) Click on the arrows in the map frame to recenter the map. Use the bar to the left of the map to pan out or zoom in. Use the street and landscape patterns to locate your property. Keep in mind that some of the photos may be about 10 years old.
- 5) You can learn more about aerial photos at <http://www.terraser.com/about.aspx?N=AboutFAQ>



Aerial photos provide a unique perspective.

Good neighbor relations start with clear boundaries. Mark the boundaries of your property and respect your neighbors' boundaries unless you have explicit permission to enter their property. Try to minimize your land management activities (e.g., cutting trees, hunting, using ATVs) at your property boundaries, especially if your neighbors don't share your land management goals.

Activity 6 will help you analyze how you might work with your neighbors to achieve mutual goals. The Nel-

sons' answers to Activity 6 and the additional case studies (pp. 105–119) provide some examples of interactions between neighbors.

Complete Activity 6: **Beyond Your Boundaries** (p. 88).

Below are the Nelsons' answers to Activity 6. Their property map, updated to show the features of their neighbors' properties, is on page 21.

Activity 6

Beyond Your Boundaries

Describe important features of your neighbors' property (e.g., house lots with large lawns, farm fields, or other forested properties, etc.).

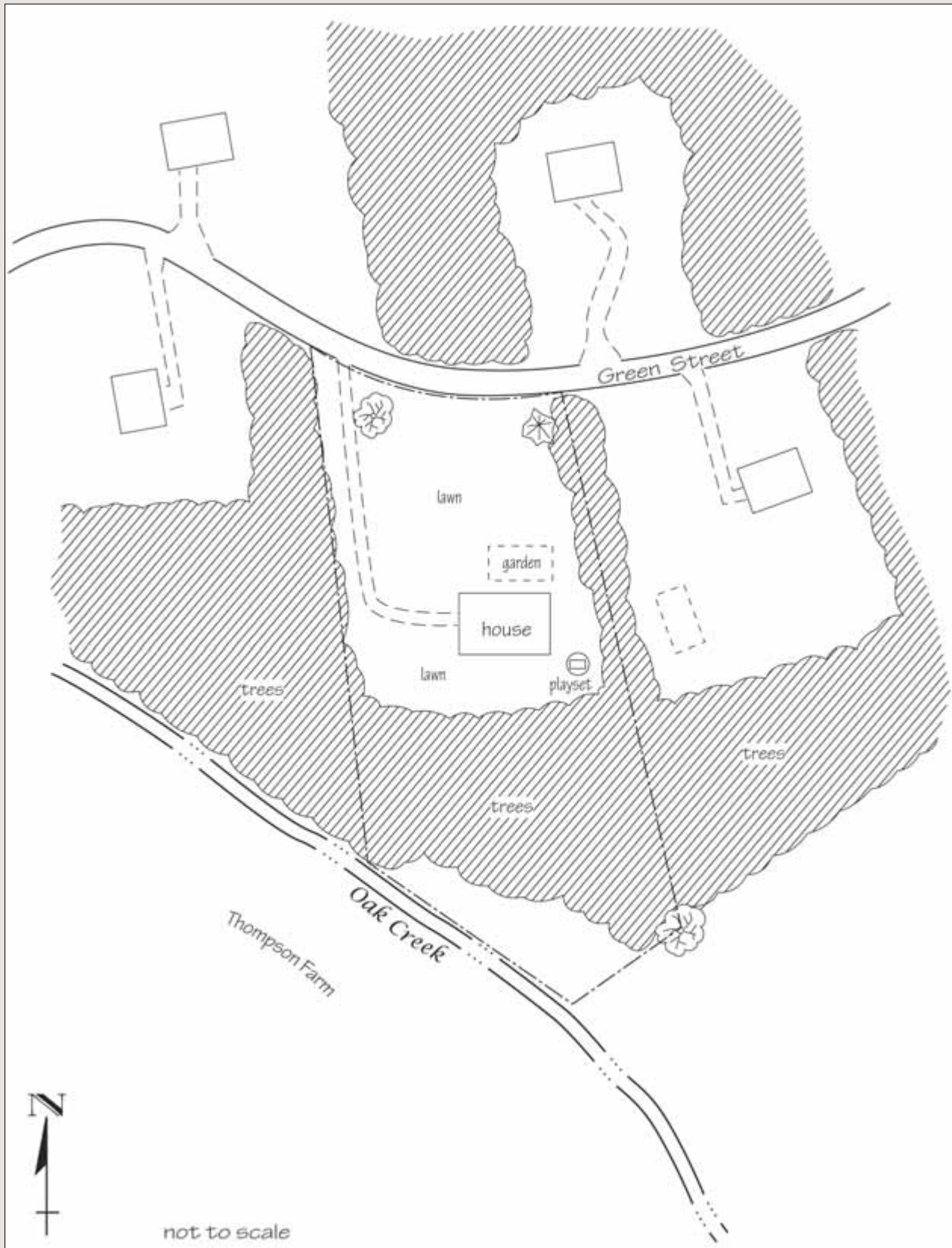
To our west are medium-sized mixed deciduous trees. Across the street, one neighbor's yard is all grass and the other has eastern white pines along the road and mixed deciduous trees behind them. To our east, our neighbor's property is bordered on our side with medium-sized mixed deciduous trees, and those extend throughout the back half of that property. In back of us (south), on the other side of Oak Creek, there's a big corn field and a smaller alfalfa field. The field edges are shrubby by the stream. There is a very large oak tree at the southeast corner of our lot.

Describe any features (such as forested patches or water bodies) on your neighbors' property that might help attract wildlife to your property.

The stream will attract wildlife. A number of large oak trees are scattered throughout the mixed deciduous plots on our and our neighbors' land. Some animals might like the white pine stand across the street, especially in winter.

How could you modify your property to take advantage of those habitat features? For instance, could you plant trees to create a safe passage way to a neighbor's habitat element?

We're not sure right now. Connections between natural areas doesn't seem much of a problem right around us, except for the road. We intend to talk with the neighbors on either side of us about whether they're interested in building a shared trail.



Lesson 2



The Concept of Land Management Units

The vegetation in a natural area of even just a few acres is usually not uniform. Many natural areas can be subdivided into two to five subareas, based on type and/or size of vegetation. Subareas with similar vegetation are usually managed the same. The various subareas are called *land management units*. Some possible land management units include:

- a patch of lawn or other intermediate use that the manager wants to stop mowing and convert into a natural area,
- a shrubby area,
- a group of fruit and/or nut trees,
- a stream, river, or pond and its banks,
- a stand of oaks,
- an old field (pasture),
- a stand of eastern white pine.

Activity 7 will help you designate land management units on your property.

Complete Activity 7: **Designate Management Units** (p. 89). (See p. 25 to learn about **deciduous** and **coniferous** trees.)

On the following page you can see how the Nelsons divided their property into land management units. The update to their map, showing their management units, is on page 24.

Note that the headings of Table A on page 23 match those of Table A in Part V (p. 90). The Nelsons' answers are shown here in this format to guide you as you fill in your own answers in Part V. You will fill in the remaining columns of Table A (p. 90) as you complete activities 8 and 9.

The next sections discuss basics about how natural areas change over time, forestry, water resources, wildlife management, and the recreational and aesthetic possibilities for your natural area. Along the way you will assess the current state of these issues in your natural area. This will allow you to clarify your objectives and prioritize land management goals.

Let's start by learning to identify some common trees.



Various kinds of management units: a brushy field and a streamside area.

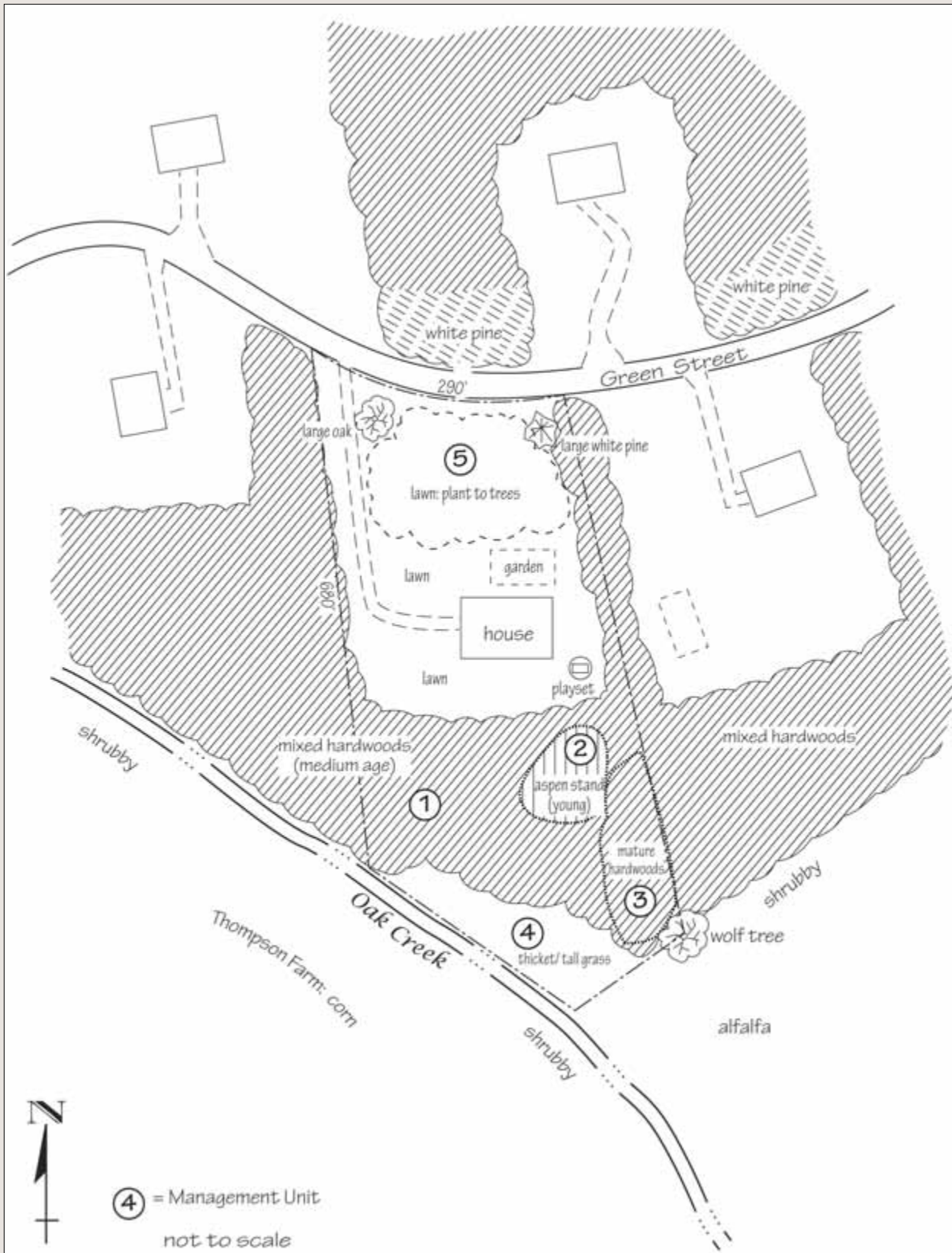
Activity 7

Designate Land Management Units

- 1) mixed deciduous trees of various species, medium-sized
- 2) young aspens
- 3) mature deciduous trees
- 4) streamside riparian area (tall grass/thicket)
- 5) lawn (plant to trees)

Table A: The Vegetation on Your Land

Management unit	Vegetation type	Three most common tree species	Three most common shrub species	Succession stage
1	mixed deciduous trees			
2	young aspen			
3	mature deciduous trees			
4	streamside riparian area			
5	lawn			



Lesson 3



Identify the Trees and Shrubs on Your Land

Trees have distinguishing features. If you look closely, you'll see that different kinds of trees look very different. Their bark; fruit; leaf shape, edge, and arrangement; buds; twigs; and growth patterns differ. Once you know what to look for, you'll be able to identify many trees.

Note: This section covers only tree identification basics. Dozens of tree keys and guides in print and on-line can help you distinguish common trees. See the resource list for suggestions (pp. 131–136).

Step 1-Deciduous or Coniferous?

One of the first distinctions you need to make is whether a tree is deciduous (broad-leafed) or coniferous (has needles). Most deciduous trees (also known as **hardwoods**)

lose most or all of their leaves each autumn, and their seeds are usually fleshy fruits or nuts. Maples, oaks, ashes, locusts, and birches are examples of deciduous trees. Most conifers (also known as **softwoods** or evergreens) retain their needles throughout the year (exceptions include cypress and larch), and their seeds are usually in cones. Pines, spruces, and firs are examples of coniferous trees. Cedars and junipers are also conifers, although their leaves are more scale-like than needle-like.

Another class of vegetation is broad-leafed evergreens such as rhododendrons and mountain laurel. These large shrubs have leaves shaped like those of deciduous trees, but the leaves do not fall off in autumn.

Identifying deciduous trees when leaves have fallen can be challenging. Don't forget to look on the ground near the tree in question for leaves and fruits that can aid identification.



(Above) Conifer needles:
Eastern white pine.



(Right) Conifer leaves
(scale-like): *Eastern red cedar.*

(Above right) Deciduous
leaves: *Black locust.*

(Far right) Deciduous
leaves: *Sugar maple.*





Broad-leafed evergreen: Mountain laurel.

Step 2-Type of Branching?

The second distinction you need to make is whether the tree's buds, leaves, and branches are *alternate*, *opposite*, or *whorled*. Each leaf grows from a bud formed the previous year, so start by checking the position of the buds. *Alternate* leaf spacing is by far the most common. In this configuration, the leaves are not directly across from each other on the stem, but rather they alternate up the sides of the stem.



Alternate leaf arrangement: Black birch.

Opposite arrangement means that pairs of leaves and branches occur across from each other on the stem. Only a few kinds of trees have opposite leaf arrangement, so if you find one, this is a big clue to its identity. A handy phrase to help remember which trees have opposite leaf arrangement is "MAD CAP HORSE."

Maples

Ashes

Dogwoods



Opposite leaf arrangement: Red maple.

Caprifoliaceae (a family of large shrubs or small trees including honeysuckles, coralberry, nannyberry, and elderberry)

Horse chestnut

Whorled leaf arrangement is similar to opposite, but at least three leaves occur around the stem at each growth point.

Step 3-Simple or Compound?

The third distinction is whether the leaf is *simple* or *compound*. A simple leaf is attached directly to the twig. A compound leaf includes more than one leaflet, each of which is attached to the stem of the leaf, which is then attached to the twig.



Simple leaf: Eastern redbud.



Compound leaf: Black walnut.



Lobed leaf: White oak.

Step 4-Leaf Shape and Edge

Look next at the shape of the leaf. Is it round, heart-shaped, oblong, or something else? And what about the edge of the leaf? Is it smooth (entire), toothed, or lobed?



Entire leaf: Common pawpaw.



Poison ivy often grows as a hairy vine. These two sayings will help you identify it: Leaves of three, let it be. Hairy rope, don't be a dope.



Toothed leaf: Quaking aspen.

We've included a photo of poison ivy so you can watch for it. Poison ivy often grows as a hairy vine whose leaves are reddish in spring and fall.

In Activity 8 you will put these steps into practice to identify the most common trees and shrubs in your natural area. You'll need a tree guide. See the resource list (pp. 131–136) for suggestions.

Complete Activity 8: **Get to Know Your Trees** (p. 91). The Nelsons' answers to Activity 8 are shown on page 28.

Activity 8 Get to Know Your Trees

Table A: The Vegetation on Your Land

Management unit	Vegetation type	Three most common tree species	Three most common shrub species	Succession stage
1	mixed deciduous trees	yellow poplar, hickory, oak, maple	dogwood, musclewood, green briar	
2	young aspen	aspen, yellow poplar	dogwood, green briar	
3	mature deciduous trees	red oak, hickory, yellow poplar	dogwood, cedar, service berry	
4	streamside riparian area	n/a	raspberry, green briar	
5	lawn	n/a	n/a	

— PART III —

Ecological Principles



Ecology is the study of natural communities and how they function and interact. The dominant feature of all natural communities is change over time. The next section introduces the concept of **succession**, which refers to the way natural areas change over time.

Lesson 1



The Dynamic Natural Area: Principles of Succession

Principle 1

All natural areas change over time, whether or not you do anything to them.

New plants grow, older plants become diseased or damaged and die, animals come and go and eat and nest in various plants. Big trees grow over the tops of smaller trees and shrubs and block the sunlight. Each of these processes has an effect on the forest, and each will happen over time in a managed or unmanaged natural area. Barring repeated natural disasters such as wildfires or severe windstorms, most times, an area in the eastern United States left unmowed will over a period of years sprout tall grass, then shrubs, then small trees, which will grow into big trees. The sum of these processes of natural change and replacement of plant and associated animal communities over time is known as succession.



Succession stage 1: Herbaceous opening



Succession stage 2: Shrub/seedling brush.



Succession stage 3: Sapling/pole.



Succession stage 4: Mature forest.

Principle 2

You can alter the process of succession by using select land management activities. For example, by not mowing or mowing less often, and/or by planting trees, you will encourage advanced growth found in later stages of succession. Conversely, you can retard succession by mowing frequently or harvesting trees.

By mowing a lawn every week during the growing season, you're halting succession and not allowing the land to go through the natural progression of development toward a forest. You can let succession occur by no longer mowing. You can also aid the process of succession to forest by planting trees or shrubs in the area. As the trees grow, they'll shade the grass, which, over a period of years, will be replaced by shrubs and other **herbaceous** vegetation. See "Planting" (pp. 68–70) for specific information on planting trees and shrubs.

An alternate land management strategy is to mow only once or twice per growing season to encourage the development of a meadow. This creates stage 1 habitat of **native** grasses and herbaceous vegetation that promotes wildlife diversity by providing food and cover. If you decide to do this, it's best not to mow between mid-April and late July, when ground-nesting birds and mammals raise their young. Even just brush-hogging the area every

2 or 3 years may be adequate to keep woody shrubs from invading the grassland.

If you want to increase the diversity of wildlife on your land, but you're happy with the amount of lawn you have, you could add plant diversity by cutting trees in an area of mature forest to create stage 1 or 2 successional habitat. See "Create an Opening" (p. 64) for more information. You may have to keep invasive and exotic plants in check as the forest grows. (For more information on invasives/exotics, see page 42. See also "Herbicide Application" [p. 67]).

Principle 3

Trees vary in their requirement for sunlight.

Some plants need full sunlight and cannot grow under other trees; we call these **shade-intolerant** species. Many of our common forest trees, such as some birches and pines, yellow poplar, aspen, and eastern red cedars, are intolerant of heavy shade and need full sunlight throughout most of the day to grow into healthy, mature trees.

The first trees that grow in an unmowed area will be those that thrive in full sun. What species actually grow will depend on seed sources available from surrounding trees and seeds stored in the soil or transported by birds and other animals. Once shade-intolerant trees grow large enough to shade the forest floor, growing conditions

Table 2
Shade Tolerance of Some Common Eastern Trees

Shade-tolerant	Intermediate	Shade-intolerant
Beech, American	Ash	Aspen, quaking
Blackgum	Birch, sweet	Birch, gray
Cedar, Atlantic white	Birch, yellow	Birch, paper
Dogwood, flowering	Cherry, black	Cedar, eastern red
Hemlock, eastern	Hackberry	Larch
Hickories	Magnolia, cucumber	Oak, pin
Maple, red	Oak, northern red	Pine, red
Maple, sugar	Oak, white	Pine, shortleaf
Sourwood	Pine, eastern white	Pine, Virginia
		Poplar, yellow
		Sycamore
		Willows

there begin to change, favoring more shade-tolerant trees such as hemlock, sugar and red maple, oaks, hickories, and dogwood (Table 2). Some coniferous trees will die if they are **overtopped** by taller trees. If you want to ensure the long life of a conifer, plant it in a place where it will continue to receive a lot of direct sun.

Principle 4

Different successional stages of vegetation provide different kinds of wildlife habitat and meet different aesthetic and recreational needs. Tailor your land management practices to meet your interests in the land.

If you decide to plant trees, you should choose ones with specific benefits that help meet your management goals. For example, nut-bearing trees (nuts are also called “hard mast”) can encourage certain wildlife species to frequent your property. You might choose other trees for their showy flowers or colorful autumn foliage. To improve your privacy in winter, you might plant conifers or leafy evergreens such as mountain laurel or American holly. If you want to maintain a scenic view, you might select trees and shrubs that will reach only 10–20 feet in height.

You could do a **crop tree** release or thinning (see “Timber Stand Improvement, p. 71) to encourage growth of preferred trees already in place. In some cases, you

Selecting Trees for Planting

If you’re considering planting trees to reduce the size of your lawn, shade-intolerant or intermediate tolerant species are the best choices to start with. They will thrive in the full or partial sun that was your lawn. Shade-tolerant seedlings will do best when planted in the shade of larger trees. Planting in full sunlight will require considerable care and maintenance to help ensure success (see “Planting” sidebar, pp. 68–70 for more information). You might want to consider value to wildlife when choosing species (see Table 6, p. 51, and Appendix B, p. 124).

Something else to consider when selecting trees is whether the species are vulnerable to insect pests and other diseases. If you select trees with known pest or disease issues, they may require special care in the years ahead. For example:

- Oak species in the Northeast are vulnerable to spring defoliation by gypsy moth. The gypsy moth caterpillar can kill or seriously stunt older trees. Younger forests are more resilient. Planting less than 50% oak species can reduce the susceptibility of forest areas.
- Flowering dogwood are vulnerable to dogwood anthracnose. This fungal disease has been detected from Massachusetts to Georgia. Heavy infection for consecutive years can kill the tree. Leaf symptoms, which appear in a variety of forms, develop first in the lower crown and progress up the tree.
- Eastern hemlock are vulnerable to the insect hemlock woolly adelgid, which can kill a tree over several

years. The hemlock woolly adelgid is a problem from the Smoky Mountains north to the middle Hudson River valley and southern New England. Infestation is detected by the presence of white cottony sacs on the base of the needles.

- Pines are vulnerable to southern pine beetles. They occur from southeastern Pennsylvania throughout the Southeast. The southern pine beetle attacks all species of pines, but prefers loblolly, shortleaf, Virginia, pond, and pitch pines.

For more information about invasive insects in eastern forests, see [HTTP://WWW.INVASIVESPECIESINFO.GOV/PROFILES/MAIN.SHTML](http://www.invasivespeciesinfo.gov/profiles/main.shtml) and other Internet sites. For more information about common tree diseases in your state or region, contact your state forest agency or state department of agriculture.

Make sure you choose trees and shrubs suited to your soil and environmental conditions. The U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) has compiled soil surveys for the entire country. This resource includes information about kinds of vegetation suited for various areas and soils as well as detailed soil maps. Ask at your local soil and water conservation district or USDA office for the local soil survey. NRCS is putting soil survey maps online at [HTTP://WEBSOILSURVEY.NRCS.USDA.GOV/APP/](http://websoilsurvey.nrcs.usda.gov/app/), although data for all areas may not yet be available. Professionals at your local soil and water conservation district, USDA office, or cooperative extension office should also be able to recommend trees and shrubs for your region.

Wildlife Use of Various Successional Stages

Different kinds of wildlife prefer different successional stages as habitat.

Herbaceous openings (stage 1), in which the ground is covered with a mix of grasses and other nonwoody plants, are important for nesting, young-rearing, and cover. Rabbits and young turkeys are often found in these areas.

Shrub/seedling brush areas (stage 2) contain young trees, shrubs, and vines. The dense vegetation provides nest sites for birds and cover for many other species. These areas may contain small trees and shrubs that serve as important wildlife food sources, such as various dogwoods, elderberry, green briar, hawthorn, and viburnum.

Sapling/pole stands (stage 3) have trees that are 1–12 inches in diameter at breast height (about 4.5 feet above the

ground). This stage is of little value for some kinds of wildlife because the tree branches are out of reach of most browsing wildlife, there is too much shade to allow **understory** plants to grow, the trees provide little cover for ground-dwelling animals, and the trees do not yet produce fruit. However, it is an ideal stage for ruffed grouse and rabbits that require a high density of stems to protect them from predators.

Mature stands (stage 4) produce fruits, nuts, and seeds that are food sources for many kinds of wildlife. Their value for nesting birds and cavity-dwelling animals continues to increase with age. Insects in decaying wood provide great bird food. Trees die, and increased sunlight reaching the forest floor encourages new growth to replace them. **Vertical stratification** (plants of many different heights) of the **forest canopy** develops over time.

may want to maintain early successional habitat, like an old field area, for wildlife by removing trees that establish themselves and shade out grasses and shrubs.

Principle 5

Every small wooded lot may not contain every stage of succession.

The usefulness of wildlife habitat depends on the size of a habitat area, the plant species composition, and how the areas are arranged. Different wildlife species have different habitat needs. You might attract more wildlife by concen-

trating on supplying a stage of succession that is scarce in your immediate area. Look again at the map of your and your neighbors' properties with management units marked (p. 24). Which kinds of successional habitat are missing or scarce? What would it take to fill that need?

Activity 9 will help you identify the successional stages on your natural area.

Complete Activity 9: **Identify Successional Stages** (p. 91).

On the following page are the Nelsons' answers to Activity 9. Also see the additional case studies in Part V (pp. 105–119) for more guidance.

Activity 9 Identify Successional Stages

Table A: The Vegetation on Your Land

Management unit	Vegetation type	Three most common tree species	Three most common shrub species	Succession stage
1	mixed deciduous trees	yellow poplar, hickory, oak, maple	dogwood, musclewood, green briar	3
2	young aspen	aspen, yellow poplar	dogwood, green briar	2-3
3	mature deciduous trees	red oak, hickory, yellow poplar	dogwood, cedar, service berry	4
4	streamside riparian area	n/a	raspberry, green briar	2
5	lawn	n/a	n/a	1

Look back at the map showing your neighbors' property (p. 24 for Nelsons). What stages of succession are least represented on your and your neighbors' property? stages 1 & 2

Lesson 2



Principles of Forestry

Because many natural areas are dominated by forests, we will focus our attention here on trees.

It's time to learn a few basic principles of forestry and **silviculture**, which is the development and care of forests. Several of the principles introduced in this section are followed up with activities that will help you assess the potential for improving your natural area and meeting the interests you noted in Activity 4 (p. 86).

Principle 1

Tree size is not directly related to age.

Most people assume that all small trees are young. But some kinds of trees, such as redbuds and dogwoods, just don't ever get very big. Other kinds, such as oaks and maples, often grow quite large. But not every individual oak and maple tree will grow large or at the same rate. A tree's final size depends on its genes, on the **site quality** (Table 3) where it happens to sprout, and on the quantity and quality of light. If the site is too wet or too dry, too windy, too sunny or too shady, the tree will remain small compared to others of the same species that grow in better circumstances.

If a tree doesn't shoot above the surrounding trees within the first few years of its life, it is likely to remain in the understory. For a shade-intolerant tree, this less than ideal situation can produce a smaller, weaker, misshapen tree that may die before it produces seed.

You may have heard that if you remove all the big trees from a site, the little ones will grow up to replace them. That's not necessarily true. After a number of years of being small and suppressed in the understory, a tree loses its ability to grow big.

Principle 2

Tree species require different conditions to thrive.

Some factors in a site's suitability (Table 3) for a given tree species include:

- the depth of the soil
- whether the soil is rocky, sandy, or clay-based
- how much precipitation and wind the site receives

Table 3

Minimum Site Requirements for Adequate Growth of Selected Eastern Forest Trees

Species	Moisture*	Nutrients	Light
Ash, white	H**	H	H
Aspen	M	M	H
Basswood	M	H	L
Birch, black	M	L	M
Birch, yellow	H	H	M
Cedar, eastern red	L	L	H
Cherry, black	M	M	H
Hemlock, eastern	M	M	L
Hickory	M	L	M
Larch	H	L	H
Locust, black	L	L	H
Maple, red	L	M	M
Maple, sugar	H	H	L
Oak, chestnut	L	L	M
Oak, pin	M	M	M
Oak, red	M	M	M
Oak, scarlet	L	L	M
Oak, white	L	M	M
Pine, loblolly	L	L	H
Pine, red	L	L	H
Pine, Virginia	L	L	H
Pine, white	L	M	M
Poplar, yellow	M	M	H
Sweetgum	M	M	H
Walnut, black	M	M	H

* Use in conjunction with data on soil drainage, such as USDA Natural Resources Conservation Service soil surveys, which are available for the entire country.

** Key: L=low, M=medium; H=high

Adapted from: Mollie Beattie, Charles Thompson, and Lynn Levine. *Working with Your Woodland: A Landowner's Guide*. © 1993 by University Press of New England. Reprinted with permission; and Forest Landowner Fact Sheets, [HTTP://WWW.CNR.VT.EDU/DENDRO/LANDOWNERFACTSHEETS/INDEX.HTM](http://www.cnr.vt.edu/dendro/landownerfactsheets/index.htm)

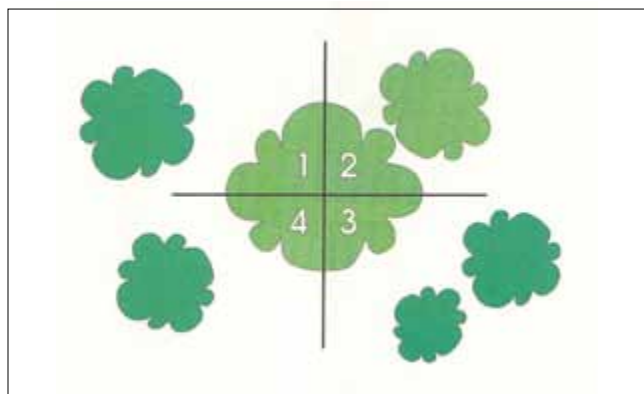
- if the land slopes, which direction the slope faces relative to the sun
- whether the tree is at the top, middle, or bottom of the slope
- where the site is in relation to the species' range of distribution. Species requirements vary by location within their range of distribution. For example, at the middle of a species' range, it may grow in a wider range of site conditions than at the outer edges of its range.

All these factors affect the **site quality**. Some species grow well on many kinds of sites; others prefer a certain kind of site. For example, oaks are adapted to drier sites, whereas yellow poplars require fertile, deeper soils near streams and along the bottom of slopes. White pine does poorly in wetlands; red maple thrives in both wet and dry soils. Site quality is an important consideration in choosing which trees and shrubs to plant.

Principle 3

Trees grow at different rates because of the differences in species and the quality of the site where they grow. Intense competition for light, nutrients, and water will also slow growth rates and reduce vigor. Thinning, or cutting down select trees, reduces the competition, reallocates resources, and produces more vigorous trees.

The trees that first appear after a timber harvest or natural disaster tend to grow very quickly. In doing so, they retain their place in the sun and prepare the site for later successional stages by shading the ground. These early successional species are shade-intolerant. Typically, many more trees (thousands) occur per acre in succes-



The center tree has space to grow on three of its four sides.



Crowded canopy.



Uncrowded canopy.

sional stages 2 and 3 than in a mature forest (20–40 trees/acre) (stage 4). So what happens to all those young trees? The weaker ones and the ones with less desirable positions relative to light, water, and nutrient resources die, freeing additional resources for those that remain. The presence of many trees early in succession results in rapid upward growth.

Trees grow most rapidly and produce the strongest branches if their canopies get light on all sides. Foresters typically recommend spacing new seedlings 10 feet apart on all sides, knowing that as the trees grow they will eventually be close together. Over a few years, some trees will grow taller than their neighbors. When trees begin to get crowded and their growth rate slows down, thinning can accelerate the natural stages of forest development. Choose to keep trees that have already shown their competitive edge (they're bigger, have thicker trunks, and a better shape) and give them more space by cutting the trees around them (see pp. 71–72 for more information). This will encourage new growth. We often use a similar approach in our gardens. We plant more seeds than we know can thrive in an area, then later pull out the weaker plants to obtain proper spacing. In a stand of trees whose trunks are greater than 6 inches diameter at breast height, proper thinning creates space on 2–3 sides of the canopy of individual trees that you're saving. The bigger the tree, the more space it should have around it. The growth of the trees remaining increases after thinning and their vigor improves. The cut trees can be used for firewood or to create brush piles for wildlife.

Activity 10 will teach you how to assess competition among the trees in your natural area.

Complete Activity 10: **Assess Competition Among Trees** (p. 92).

Activity 10

Assess Competition Among Trees

The Nelsons' answers are shown below. We've included the directions for filling out the crown competition table here and in Part V for clarity. Below the crown competition table we can see how the Nelsons transferred the results of this activity into Table B (which matches Table B (p. 93) in Part V, which you will complete). You will fill in the remaining columns of Table B as you complete activities 11–13.

Choose a crop tree (one you want to keep because it helps meet your land management objectives) whose crown is in the main forest canopy for that land management unit. Look for trees that do not have signs of rot and decay or broken tops. Stand underneath the tree and determine if there is open space around 0, 1, 2, 3, or 4 sides of the canopy. Is the crown distinct or does it touch others? Is there a patch of visible sky

on any side of the crown? Record your observations in the crown competition table below. Repeat this process until you've assessed two crop trees in each forested land management unit in your natural area.

Next average the number of open sides in each land management unit (see the example below). If the average number in a land management unit is less than 2, you should consider thinning to reduce competition on your crop trees. In the bottom row of the table below, answer "yes" or "no" to the question, "Is thinning recommended?" (Answer "yes" if the average number of open sides per management unit is less than 2.) Now transfer your yes or no answer to Table B below under the column "Thinning recommended?" See "Timber Stand Improvement" (p. 71) for more information about thinning.

Crown Competition

Tree	1	2	3	4	5	6	7	8
Management unit	1		2		3			
Species, if known	yellow poplar	hickory	aspen	yellow poplar	red oak	hickory		
Canopy open on __ sides	2	0	3	3	0	1		
Average open sides per mgmt. unit	1		3		0.5			
Thinning recommended?	yes		no		yes			

Table B: Natural Area Health

Management unit	Thinning recommended? (yes or no)	Young trees present? (yes or no)	Broken or dead? (yes or no)	Exotics/ invasives? (list names)
1	yes			
2	no			
3	yes			
4	n/a			
5	n/a			

Principle 4

Healthy forests are 3-dimensional.

As openings develop in the forest canopy, vertical stratification (plants of different heights) of the plants occurs. Gaps in the canopy may allow more plants to grow because various light conditions are present. Openings that are as wide as the trees are tall usually will result in more diversity of species and numbers of individuals because they allow a mix of direct sunlight and shade that benefits both shade-tolerant and -intolerant species. A more diverse forest (consisting of a variety of species among those well adapted to the site) can be like diversity in an investment portfolio—it's more balanced and better able to handle natural cycles such as insect and disease



A hole in the canopy lets sunlight reach the forest floor.



A forest with vertical stratification.

outbreaks. It's usually better able to regenerate naturally and may host a wider variety of wildlife.

Principle 5

Trees reproduce either from seeds or stump sprouts.

Deciduous Trees. Deciduous trees can regrow from stumps or root sprouts, depending on the size, age, and species of the tree. You can sometimes cut a deciduous tree to within six inches of the ground and new trees will sprout from the stump if they have enough sunlight. Large (> 1 foot in diameter) mature trees may not sprout as often as smaller trees. (For more information about sprouting potential of various trees, see Appendix A, p. 122.) Sprouts will grow faster than seedlings and become a major part of the next forest. It's more difficult to successfully plant some deciduous seedlings than conifers because deciduous trees are more susceptible to weedy competition and wildlife damage. If you do plant deciduous trees, they will require more care.

Coniferous Trees. Conifers generally do not sprout from stumps, so if you want to establish them, it's always best to plant seedlings or rely on natural seeding, which requires special conditions. See "Planting" (pp. 68–70) for more information.

The future of your natural area depends on having enough plant reproduction. Some species, such as hickory, oak, sugar maple, hemlock, and beech, establish themselves under the existing tree canopy. Sooner or later the mature trees will start to die, and if deer are eating all your young plants, few saplings will be ready



A forest with little vertical stratification.



Young deciduous trees will often sprout from a stump.

to replace them. Seedlings and stump sprouts that grow after trees die or are harvested may not survive if deer are overabundant. (For more on deer management, see pp. 69–70.) The establishment of a forest will be delayed or only fast-growing species or species deer that do not like will survive. Many invasive and/or exotic species are able to establish themselves in these conditions.

In completing Activity 11 you’ll focus on assessing tree reproduction in your forested natural area.

Complete Activity 11: **Assess Tree Reproduction** (p. 94).

Here are the Nelsons’ answers to Activity 11.



Extensive red oak regeneration.

Activity 11
Assess Tree Reproduction

Table B: Natural Area Health

Management unit	Thinning recommended? (yes or no)	Young trees present? (yes or no)	Broken or dead? (yes or no)	Exotics/ invasives? (list names)
1	yes	yes		
2	no	yes		
3	yes	no		
4	n/a	no		
5	n/a	n/a		

Principle 6

Trees don't live forever, but dead trees are still valuable for wildlife and add nutrients to the soil.

Over time, trees grow old and die. Species have different average life spans, just as different kinds of animals do. For example, a tree such as eastern red cedar that thrives in early successional habitat will usually have a shorter life span than will a late successional tree. Many times, early successional species are shaded out as the late successional species grow taller. Appendix A (p. 122) shows the relative longevity of some common Mid-Atlantic/Northeast region tree species.

Trees are usually killed by a series of events or a specific event, such as an insect attack, an ice storm, or a strong wind that topples them. Injuries can leave trees open to diseases and more damage. As trees age, they become more susceptible to injury and disease.

When a tree dies, it may remain standing for quite some time. If you have dead trees in your natural area that don't pose a safety threat to people or buildings, it's best to let 2–3 per acre stand. Others can be cut for firewood. Dead trees, both standing and fallen, provide nesting habitat for cavity-dwelling birds and mammals. Insects feed on the dead wood, attracting insect-eating birds and animals. Other plants may grow right out of



Dead standing trees, called snags, provide important wildlife habitat.

a dead tree. The wood slowly decomposes, helped by insects, microbes, and fungi, which then are eaten by other organisms. In this way nutrients are carried out of the tree and slowly recycle back into the forest soil, where they will eventually nourish another tree.

In Activity 12 you will survey your own natural areas for broken and dead trees.

Complete Activity 12: **Survey for Broken and Dead Trees** (p. 94).

Here are the Nelsons' answers to Activity 12.

Activity 12
Survey for Broken and Dead Trees

Table B: Natural Area Health

Management unit	Thinning recommended? (yes or no)	Young trees present? (yes or no)	Broken or dead? (yes or no)	Exotics/ invasives? (list names)
1	yes	yes	no	
2	no	yes	no	
3	yes	no	yes	
4	n/a	no	no	
5	n/a	n/a	n/a	

Principle 7

No matter how you manage your land, but especially if you practice passive management (see Table 1, p. 10), invasive and exotic species will inhabit it.

We live in a world of global transportation, and virtually every part of the globe is now affected by species that are not **native** to an area (**exotic species**). Some of these exotic species can also be **invasive**, which means that they tend to spread very rapidly. Some native species, such as wild grapevines, can be invasive in some areas. Wild grapevines can become so common in forests that they strangle trees and pull down branches with the extra weight, especially when ice or snow is present. However, if you're managing mainly for wildlife rather than timber, the advantages of having grapevines probably outweigh the disadvantages. By allowing grapevines to live only on certain trees or in certain areas, compromises can be found.

Invasive and exotic plants, animals, and insects (e.g., gypsy moth) often displace native species and upset the balance of an ecosystem. Table 4 lists a few common and particularly troublesome invasive/exotic plants. Check the resource list (pp. 131–136) or the Internet for more information. The additional case studies in Part V will familiarize you with other invasive/exotic plants in our area.

It is virtually impossible to rid your natural area of all invasive/exotic plants, but if you make no effort to control them, they will soon begin to overrun your natural area. The proper use of herbicides is generally accepted as essential to really control invasive species. See “Herbicide Application for Control of Exotic/Invasive Plants” (p. 67) and the resource list for information on control measures. You may be able to control small patchy populations of invasives/exotics by removing the plants or removing and destroying their seedheads.

To limit future problems with invasive/exotic plants, it's best to plant only native species. Most nurseries sell exotic and invasive species as well as natives, so always do some research and/or ask a cooperative extension agent before you buy. (Nursery employees don't always know.) Avoid the species listed in Table 4. Most of the species sold by state-run nurseries (see “Planting,” p. 68) are natives.

In Activity 13 you'll identify invasive and exotic plants in your natural area.

Complete Activity 13: **Assess Invasive and Exotic Plants in Your Natural Area** (p. 94).

The Nelsons' answers to Activity 13 are on page 44.



Extensive grapevines can strangle or pull down trees or branches. However, they are an important wildlife food, which probably outweighs their disadvantages for landowners managing for wildlife.



Nonnative gypsy moth caterpillar.

Table 4
Common Invasive/Exotic Plants
in the Mid-Atlantic/Northeast Region

Tree-of-heaven (ailanthus)	Kudzu
Barberry	Japanese honeysuckle
English ivy	Asian bittersweet
Bamboo	Autumn olive
Multiflora rose	Buckthorn
Japanese stiltgrass	Garlic mustard
Bush honeysuckle	

Common Invasive Plants



Kudzu.



Mile-a-minute.



English ivy.



Golden bamboo.



Autumn olive.



Japanese honeysuckle.



Garlic mustard.



Oriental bittersweet.



Japanese stiltgrass.



Tree-of-heaven (ailanthus).



Multiflora rose.

Activity 13

Assess Invasive and Exotic Plants

Table B: Natural Area Health

Management unit	Thinning recommended? (yes or no)	Young trees present? (yes or no)	Broken or dead? (yes or no)	Exotics/ invasives? (list names)
1	yes	yes	no	tree-of-heaven, multiflora rose, wild grapevine
2	no	yes	no	tree-of-heaven, wild grapevine
3	yes	no	yes	no
4	n/a	no	no	garlic mustard
5	n/a	n/a	n/a	lawn grass

Lesson 3



Water Resources and Your Natural Area

Forests are extremely valuable landscape features. A typical forest acts like a filter and a sponge. Natural area soils, including those in forests, are much less compacted than are soils in intermediate-use areas such as lawns. This is because the leaf litter layer protects the soil, there is less physical use of the land, and burrowing animals such as worms and small rodents are more active in natural areas. The lack of compaction makes it easier for precipitation to penetrate forest soil than a lawn or parking lot. The soil filters out many impurities in water, so water coming from largely forested landscapes is typically among the cleanest water available.

A big part of ensuring high water quality on small acreages involves reducing erosion (keeping soil in place) and slowing down the flow of water so it can seep into the soil and be naturally filtered by the soil. Lawns are much better than paved surfaces at doing this, but natural areas are much better than lawns. Trees and shrubs on the banks are extremely effective at preventing erosion. Some practices that help reduce erosion include:

- replanting any areas that are stripped of vegetation,
- stabilizing eroding gullies, stream banks, or drainage ditches (this kind of work requires the involvement of your local soil and water conservation district),
- locating trails and roads so that they do not accumulate water or direct **runoff** into streams during rain storms (see “Trail and Road Design” and “Trail and Road Drainage,” p. 72 and p. 73, respectively), and
- converting mowed lawn to forest or unmowed field to slow the flow of water and allow water to seep into the soil.

Water is probably the most certain way to attract wildlife. It is important to realize that the decisions you make about how to manage your natural area affect others and affect water and air quality in your area. If you choose to frequently apply herbicides and fertilizers in the quest for that elusive perfect lawn, you may be exposing yourself, your family, and your human and wildlife neighbors to



Stream bank erosion and undercutting.

airborne and/or waterborne chemical contamination. Lawns can be a source of surface water pollution if there is no tall grass or forest buffer between the lawn and the water body (see “Riparian Buffers,” below). Always read and follow herbicide and fertilizer label directions.

Riparian Buffers

The word **riparian** refers to the banks of a stream or river. A **riparian buffer** is an area beside a (usually) freshwater body containing vegetation that protects the water body or wetland from potential pollutants such as sediment (eroded soil) or nutrients. Pollutants headed toward a body of water or wetland with an effective riparian buffer are trapped and stored in plant tissue, absorbed on soil particles, or modified by soil organisms before



This water body has an effective riparian buffer.



A nationally designated demonstration area for riparian buffers.

they reach the water body. Riparian buffers stabilize the banks of water bodies and wetlands, reducing erosion. Forested buffers keep water cool by shading the water. Cooler waters have healthier and more diverse fish and aquatic insect populations. Riparian buffers make great places to view wildlife.

Most riparian buffers are natural, low-maintenance areas that extend beyond the water's edge. Tall grass, shrubs, and trees can all function as riparian buffers. In general, a mixture of these plant communities is beneficial in a riparian buffer. The wider a riparian buffer is, the more effective it is. However, any buffer is always better than no buffer. Steep lots and large waterways call for wide buffers.

Establishing a buffer involves planting trees, shrubs, and grasses native to the site or not mowing and allowing natural vegetation to take over. If you have severe “undercutting” (where the stream is cutting under the bank, potentially causing the stream bank to collapse), talk to the local soil conservation district or the state fish commission or environmental protection agency about

stabilizing the bank before you begin planting a riparian buffer. The National Association of Conservation Districts Web site ([HTTP://WWW.NACDNET.ORG/](http://www.nacdnet.org/)) may help you contact your local conservation district.

Wetlands

The term “wetland” is used to describe areas that have both terrestrial and aquatic characteristics. Wetlands include coastal salt marshes, forested swamps, and bogs, among many others. Some wetlands have standing water present at all times, some for only a few weeks a year.

Wetlands are important for many reasons. They provide habitat for migratory waterfowl, help control flooding, act as filters for pollution, serve as important food sources for many kinds of wildlife, and provide us with recreational opportunities. State and federal regulations often limit modification of wetland areas. Check with your local soil conservation district office before planning or beginning any work in these areas.

In Activity 14 you will assess the water-related resources in your natural area. Don't assume you don't have any just because you don't have an obvious water source. You may not notice springs or seeps until you specifically look for them. Areas that are wet most or all of the year may contain a spring or seep—a natural source of fresh water that emerges from the ground, often at the base of a hill or mountain. Springs and seeps provide habitat for amphibians and reptiles and a year-round source of water for other wildlife. Forested areas may host vernal pools—shallow depressions that fill with winter and spring rains and snow melt. Vernal pools usually dry up by mid-summer, but before that they serve as important breeding grounds for amphibians.



Dragonflies are found near water.

Complete Activity 14: **Water Resources Around You** (p. 95).

Here are the Nelsons' answers to Activity 14. Look back at the map on page 24 for information about the Nelsons' water resources.

Note that the column headings in the table below are the same as in Table C in Part V (p. 96), which you will complete. You will fill in the remaining columns as you complete activities 15–17.

Activity 14 Water Resources Around You

Are there any water bodies on your or your neighbors' property? Can you do anything on your property or in cooperation with your neighbor to enhance wildlife use of those areas or to improve water resources? Oak Creek passes the back of our property and our neighbors'. The stream bank on our property seems to be the least protected of our neighbors.

Table C: Assessing Your Land's Potential

Management unit	Water resources	Wildlife and habitat elements	Recreation	Aesthetics
1	n/a			
2	n/a			
3	n/a			
4	Oak Creek is a small year-round stream with few stones, rocks, or logs. Some of the stream bank is eroded. Tall grasses and thick shrubs grow along the stream by our property.			
5	n/a			

Lesson 4



Introduction to Wildlife Ecology

Many people want to improve wildlife habitat on their property and see more wildlife, but you should understand that land management for wildlife may present new challenges to gardening, tree planting, and tree regeneration if the wildlife you attract continually eat up your efforts. It's all a matter of weighing your priorities and adjusting your methods to minimize wildlife damage. For more information, see the "Unanticipated Issues with Wildlife" section on page 52 and Appendix C (p. 126).

All kinds of wildlife have unique food, cover, water, and space requirements. Together, these four elements make up wildlife habitat. Wildlife populations are limited by the least abundant element of their habitat.

First, we'll discuss each of the four requirements in general, then we'll focus on specific habitat elements that you may be able to provide or enhance in your natural area.

Food

Creating or improving food sources is probably the easiest way to attract more wildlife (quantity or variety) to your land. Food plants that also provide cover are especially valuable for wildlife. You can extend your wildlife viewing season by planting plants that produce food early or late in the year or that provide winter food sources (e.g., seed and berry bushes such as winterberry, hawthorn, staghorn sumac, and holly).



Wild turkeys' food requirements change over their lifetimes.

Some species' food needs change over their lifetimes. For example, adult turkeys need mature oak forests in which to roost and find acorns, but their young eat insects found in clearings. So if you hope to have turkeys on your land over a period of years, your land alone or in combination with your neighbors should contain both of these successional stages.

Cover

Cover protects animals from the weather and predators and affords them safe places to eat, sleep, breed, and nest. Cover can be provided by trees, shrubs, tall grass, thickets, burrows, rock and brush piles, stream banks, caves, and rock ledges, among other things.

Cover is most difficult to find in winter, so providing winter cover such as dense thickets and conifers will improve the likelihood that wildlife will stay on your property year-round. Letting the branches of evergreen trees grow to the ground is one way to provide cover. This will happen only if an evergreen grows in a fairly open, sunny place.



Rock walls provide cover for reptiles and small rodents.

Water

Where there is water, there is wildlife. Aside from the water itself, the moist and fertile soils near water sources often provide good cover and food sources. Some kinds of wildlife live only in or near water. Amphibians must have access to water for breeding.

Space

Home range is the area within which an animal normally travels to meet its food, water, and cover needs (Table 5). Generally, the larger an animal is, the larger its home range is because it needs more food.

Many kinds of wildlife use lands in different stages of succession to meet their year-round habitat needs. For example, white-tailed deer take shelter from the snow in coniferous forests, but during the rest of the year, they are more often found in and around the edges of deciduous forests eating grasses, **forbs**, shrubs, saplings, nuts, and mushrooms. To host a species, all the necessary habitat types must be close enough together that they are within an animal's home range.

Biological carrying capacity refers to the number of animals of a given species that an area can support in good health over time without showing evidence of damage to the habitat. Biological carrying capacity will

change depending on weather trends and plant productivity. When there is a large acorn crop, for example, the biological carrying capacity for deer and squirrels is higher than when the crop is poor.

Cultural carrying capacity refers to the number of individuals of an animal species that society is willing to tolerate. This is the model of carrying capacity used by most state wildlife agencies and reflects most people's attitudes. In many cases the biological carrying capacity is higher than the cultural carrying capacity, resulting in human-wildlife conflicts. This is the situation faced by many landowners with more deer, squirrels, chipmunks, skunks, and other species than they would like (see p. 52, "Unanticipated Issues with Wildlife").

Providing and Enhancing Habitat Elements

You can manage your natural area to provide or enhance important habitat features. This should increase the

Table 5
Typical Abundance and Home Range for Common Eastern Wildlife

Animal	Abundance	Home range
American robin		1,320 feet around nest
Black bear	~70 per 100 square miles	Female with cubs: 6–19 square miles Male: 60–100 square miles
Chipmunk	2–4 per acre	0.5 acre
Deer	Up to 100 per square mile	300–400 acres
Downy woodpecker		5–30 acres
Eastern box turtle		5–12 acres
Groundhog	Up to 10 per acre	160–320 acres
Rabbit	Varies from 1 per 4 acres to several per acre	10–25 acres
Raccoon	~1 per 10 acres	380–1,150 acres
Red fox	~1 per 100 acres	640–1,280 acres
Ruffed grouse	1 per 25 acres or 2–8 per 100 acres	~10 acres
Skunk	Up to 31 per square mile	160–320 acres
Squirrel	1–5 per acre	Up to 10 acres
Turkey	10–100 per 1000 acres	600–1,000 acres

Sources: C. Gilleland. Food, Water, Cover, & Space. Essentials in Wildlife Habitat, Part 2. Windstar Wildlife Institute; *Peterson Field Guides: A Field Guide to the Mammals*. 1980. Houghton Mifflin Co.; The Importance of the American Chestnut to the Eastern Wild Turkey. American Chestnut Foundation; C. Fergus. Wild Turkey. Pennsylvania Game Commission. <http://www.pgc.state.pa.us/pgc/cwp/view.asp?a=458&q=150678>; Ruffed Grouse Facts. Ruffed Grouse Society. http://www.ruffedgrousesociety.org/ruffed_facts.asp; Maryland Department of Natural Resources Wildlife and Heritage Service, personal communication; Eastern Box Turtle. Chesapeake Bay Program. http://www.chesapeakebay.net/info/eastern_box_turtle.cfm; *Picoides pubescens*. Animal Diversity Web; American Robin. California Wildlife Habitat Relations System. <http://www.dfg.ca.gov/whdab/html/B389.html>.

amount and/or variety of wildlife you host. You might choose to manage your natural area specifically for one or more kinds of wildlife. To do this, provide or enhance the habitat features that those animals require. The Land Management Techniques section (pp. 64–73) and the resource list (pp. 131–136) provide information about hands-on management activities to enhance or create the habitat elements that follow.

Brush Piles. Brush piles can be made to provide cover for rodents, rabbits, small birds such as wrens, and snakes. See the “Brush Piles” (p. 64) section for information on how to build a brush pile.



A brush pile provides cover.

Dense Thicket. Dense thickets may be tough for people to walk through, but that’s one reason animals such as rabbits, deer, and ruffed grouse use them for cover. Encouraging dense thickets to grow can improve wildlife viewing and hunting opportunities. Some thicket-forming bushes include blackberries, raspberries, and green briar.

Edge. Where different land uses, plant communities, or age classes of the same plant community come together, this is called edge. Soft edge consists of a gradual transition from one type of plant community to another, such as a mowed lawn bordered by an unmowed area of taller grass and shrubs, which gradually blends into a young forest. Soft edge tends to increase wildlife diversity. Hard edge, an abrupt transition between plant communities, does not enhance wildlife diversity. A mowed area immediately adjacent to a mature forest is an example of hard edge. Soft edge has more plant diversity, so

wildlife food sources tend to abound there, and the taller vegetation provides for safe passage and concealment. Promoting soft edge is an effective way of encouraging early and mid-successional wildlife species such as deer, turkey, quail, rabbits, and foxes.

Forest Openings. An opening in the forest canopy introduces new kinds of plants to the area by allowing more sunlight to reach the forest floor. Grasses and forbs will thrive in an opening for several years and slowly be replaced by shrubs and small trees. Animals that may benefit from an opening include deer, ruffed grouse (if the surrounding area is large enough and contains the other kinds of habitat they need), turkeys, hawks, foxes, and rabbits. Species that depend entirely on woodlands, such as woodpeckers, will be forced into other areas. Creating an opening can be especially valuable to wildlife if there is a lot of relatively unbroken mature forest around your property.

Mast Trees. Trees that produce edible fruits, seeds, or nuts are called **mast trees** (Table 6, p. 51). They include oaks, hickories, beech, persimmon, serviceberry, blackgum, American holly, hawthorn, and dogwood, among others. They are an essential part of many species’ habitat requirements. Hard mast consists of nuts. Soft mast includes berries, **catkins** (drooping, petal-less flowers of trees such as poplars, walnuts, and birches), and other fruits. If you have no or few mast trees in your natural area, you may want to plant some to attract more wildlife. In most cases, mast trees are already present, but they may face so much competition that the canopy can’t expand and produce mast. Thinning the forest to remove



Berries provide soft mast.

Table 6
Use of Mast by Wildlife

Type of mast	Animals attracted
Acorns	Squirrels, deer, turkeys, wood ducks, ruffed grouse, foxes, black bears, raccoons, chipmunks, opossums
Alder catkins	Redpolls, siskins, chickadees, and goldfinches
Beech nuts	Bluejays, chipmunks, finches, ruffed grouse, squirrels, turkeys, black bears, foxes, mice, wood ducks, deer
Berries	Songbirds, bears, turtles
Birch seeds and buds	Deer, rabbits, songbirds
Crab apples	Deer, rabbits, grouse, songbirds, skunks
Dogwood fruits	Songbirds, turkeys, ruffed grouse, skunks, deer, rabbits, squirrel
Hickory nuts	Squirrels, opossums, turkeys, ducks
Walnuts	Squirrels, mice
Wild grapes	Songbirds, foxes, deer, turkey, ruffed grouse

crowding or overtopping tree crowns will allow the crown of a mast tree to expand. See “Timber Stand Improvement” (p. 71) for more information about thinning to ensure the health of your mast trees. See Appendix B (p. 124) for more information about the value of various tree species as wildlife food.

Rock Cliffs, Outcrops, and Piles. Rock cliffs and outcrops and human-made rock piles and stone walls often provide cover for snakes, raccoons, chipmunks, cliff swallows, and bats.

Snags. Dead standing trees are called **snags**, and as long as they don’t pose a danger to property or to people using the land (e.g., they’re not hanging over a trail or poised to fall on a structure), it is best to leave standing 2–3 snags per acre that are greater than 7 inches in diameter at breast height for their wildlife benefit. Insects found in dead and decaying wood are an important food source for many animals. Besides providing an important food source, many animals nest inside hollow cavities in snags. If you don’t currently have any snags but would like to



A great horned owl perched in a snag

attract the kinds of wildlife that use them (e.g., owls, squirrels, woodpeckers, raccoons, foxes, bats, bears), see “Girdling to Kill Unwanted Trees and Create Snags” (p. 66) for more information. Because snags can present a potential hazard to people and property, especially near trails and other well used areas, you might consider installing nest boxes in those areas instead. Check the Internet for information on the kind of nest box preferred by the species you hope to attract.

Streams, Rivers, Ponds, Wetlands, Springs, Seeps, and Vernal Pools. Water sources are often associated with rich soft soil in which many plants can grow. These wet areas provide abundant insect and plant food and cover for wildlife. If you have water on your property, you’re virtually guaranteed to have a higher diversity of wildlife than if you don’t because so many species occur only near or in water.



The red eft form of the red-spotted newt may be found in or near vernal pools, seeps, or springs.

Springs and seeps are areas where **groundwater** comes to the surface. They tend to stay wet all year and provide a water source and snow-free area in which wildlife can find food during winter.

Forested vernal pools are shallow depressions in the ground where water collects during the spring and early summer. They fill with groundwater, snowmelt, and/or spring runoff. Vernal pools are critical habitat for frog, toad, and salamander breeding. By mid- to late summer, vernal pools are usually dry. It's usually best for wildlife to just leave vernal pool areas alone because they are delicate ecosystems.

You can protect a water-based habitat from erosion and water pollution by planting or enhancing a riparian buffer or by leaving it alone if it is an undisturbed natural system. State and local rules apply to alterations of wetlands and waterways, so check with officials before you plan any such work. You should protect these important habitats from disturbance.

Many landowners mow the banks of ponds and streams right to the water's edge, but this is not the best choice for encouraging wildlife or preventing erosion and water pollution. If you remove all vegetation but lawn from the edges of a water body, you're likely to encourage use by Canada geese, which chase off native birds and leave a mess. By allowing trees, shrubs, or tall grass to establish around water bodies, you will encourage a greater diversity of wildlife.

Wolf Trees. A **wolf tree** is a mature tree that has grown out in the open without competition from other trees, such as in an old pasture. They tend to spread laterally and grow very large. They often serve important wildlife food and cover needs. Many kinds of trees can be wolf trees. Many wolf trees are found in the forest because other trees grew up around them, often after abandonment of a pasture. To preserve a wolf tree for wildlife habitat, thin around it if necessary. Be aware that wolf trees can also inhibit growth of potential crop trees through competition for resources in a crowded canopy. Again, it's a matter of setting your land management priorities and implementing practices that help you reach them.

Activity 15 involves an assessment of wildlife habitat elements in your natural area.

Complete Activity 15: **Habitat Elements on Your Land** (p. 95).

On page 53 are the Nelsons' answers to Activity 15.

Which Kinds of Wildlife?

Before you decide which types of wildlife you'd like to encourage, you need to learn more about the habitat needs of various species (see Appendix C, p. 126) and your property's ability to provide them. Every property has natural capabilities to support wildlife, as well as limits to the number and type of species it can support. It is impossible to manage a natural area for all wildlife species. What benefits one species might be detrimental to others, so you need to set priorities before you start managing your natural area.

Maybe your property is too small to provide all the necessary habitat features for the type of animal you had in mind. Your land may still function as a corridor for that species if your neighbors have important habitat features. Say, for example, that one neighbor has a pond with wooded banks. Another neighbor may have a great wolf tree. Animals may use your land as a corridor between these two important elements. By watching wildlife on your property, you will see which animals use certain habitat features. Then you can alter or enhance those features to suit your preferences.

Unanticipated Issues with Wildlife

Land management activities aimed at improving habitat for certain species may also improve habitat for species you hadn't considered. This can lead to human-wildlife conflicts. Creating soft edges and thinning the forest to let more light reach the forest floor may benefit many songbirds and small mammals, but white-tailed deer also benefit.

With the removal of most natural predators and a decline in the number of hunters, deer have become overabundant on smaller woodlands in the suburbs.



Plastic tree shelters protect hardwood seedlings from deer and rodent browsing

Activity 15

Habitat Elements on Your Land

Table C: Assessing Your Land's Potential

Management unit	Water resources	Wildlife and habitat elements	Recreation	Aesthetics
1	n/a	Large oak and hickory for hard mast. Some tree cavities found. Rocky areas provide habitat for small mammals. Hard edge with adjacent lawn. Few snags. Lack of ground vegetation due to deer browsing.		
2	n/a	Losing value as early successional habitat as canopy closes and ground vegetation disappears.		
3	n/a	Cavities in wolf tree (oak) at back corner. Hard and soft mast from other trees. Several snags. Many squirrels, woodpeckers, and other birds.		
4	Oak Creek is a small year-round stream with few stones, rocks, or logs. Some of the stream bank is eroded. Tall grasses and thick shrubs grow along the stream.	Water from stream provides for reptiles and amphibians. Food and cover from brambles and vines surrounding stream. Tracks and other signs indicate stream habitat frequented by deer, raccoons, and other wildlife.		
5	n/a	none		



A deer browse line is evident 5–6 feet above the forest floor.

They become a nuisance by eating herbaceous plants, shrubs, and tree seedlings; by causing car accidents; and by being a part of the Lyme disease cycle. In some areas, deer browsing pressure is so great that you can see a clear **browse line** 5–6 feet high in a wooded area, below which very little vegetation remains. This makes it difficult to grow young trees to replace old dead trees. Often, plastic tree shelters are used to protect seedlings from deer browsing until they grow beyond the reach of deer. (For more information on tree shelters, see p. 69.)

Other kinds of wildlife that can become pests or may be seen as undesirable by some people include raccoons, squirrels, skunks, rabbits, geese, snakes, bees, and wasps. This is an example of when species reach their cultural carrying capacity. If you have conflicts with wildlife, the best solution is to modify the habitat it prefers or remove artificial food sources. You can discourage squirrels by using bird feeders touted as “squirrel-proof” (which at least make it tougher for them to gorge themselves). To get rid of snakes, remove rock and wood piles, but this

Hunting

Hunting has traditionally been an effective tool to manage wildlife. However, recently the number of hunters and the area of land suitable for hunting have declined as natural areas are divided up into smaller lots. Some communities use bow and firearms hunters under managed conditions or hire professional sharpshooters to help reduce the deer population. These hunting programs can be accomplished safely and accurately in residential areas. Your state wildlife agency or cooperative extension wildlife specialist can provide more information.

“Tug on anything at all and you’ll find it connected to everything else in the universe.”

—JOHN MUIR

also removes habitat for chipmunks and other wildlife. Raccoons and skunks will leave if their food source, often garbage or pet food, disappears. In some cases, animals may have to be trapped, hunted, or otherwise destroyed. Your local cooperative extension office can usually provide guidance for specific problems. More strategies for dealing with nuisance wildlife can be found through the resource list (pp. 131–136).

Cats and Wildlife

The Problem

Americans have more than 60 million pet cats. Thankfully they don’t all go outside. When wild or free-ranging cats are included, the total may be more than 100 million. Nationwide, although cats kill mice, rats, and other animals we may consider pests, they also prey upon desirable small animals and migratory songbirds. Free-ranging cats can also transmit diseases to other animals and humans.

The Solution

For cat owners

- Keep your cat(s) indoors. They’ll live longer, healthier lives.
- If they do go out, accompany them so they do not roam free and disturb wild animals.
- Neuter all outdoor cats.

Minimize the damage

- Locate bird feeders where cats do not have hiding places from which to ambush prey.
- Eliminate sources of food, such as garbage, and shelter that attract stray cats.
- Don’t feed stray cats.
- Bring unwanted cats to the local humane society.
- Many areas have leash laws and require vaccination and neutering of pet cats. Ask local officials what can be done to control problem cats.

— PART IV —

Put Your Knowledge into Practice



Lesson 1



Recreation Potential

If you want to encourage and enhance recreation in your natural area, the first issue you will probably have to address is access. Can you now get to the areas where you want to pursue your chosen form of recreation? If not, you may need to create a trail or small road to the area. A trail makes it easier to monitor the health of your natural area and identify management issues. The main purpose for the trail or road will influence where it goes, how wide it is, and how much land clearing and maintenance you'll need to do. There are accepted “best management practices” to minimize the environmental

effects of forest road construction and maintenance. See “Best management practices” (p. 64). You might also want to pursue fishing; bird-watching; nature study; berry, mushroom, or wildflower-picking; camping; firewood harvesting; or having campfires in your natural area. See “Trail and Road Design” (p. 72) and the resource list (pp. 131–136) for more information.

Complete Activity 16: **Assess Your Natural Area's Suitability for Recreation** (p. 95). The Nelsons' answers to Activity 16 are on page 58.



Fishing is just one kind of recreation you might pursue in your natural areas.



Erecting and watching bird houses can be a great way for kids to learn about wildlife.

Activity 16

Assess Your Natural Area's Suitability for Recreation

Table C: Assessing Your Land's Potential

Management unit	Water resources	Wildlife and habitat elements	Recreation	Aesthetics
1	n/a	Large oak and hickory for hard mast, Some tree cavities found, Rocky areas provide habitat for small mammals. Hard edge with adjacent lawn. Lack of ground vegetation due to deer browsing.	Small footpaths go to stream in back, but heavily overgrown in places. No central trail system. Many deer trails.	
2	n/a	Losing value as early successional habitat as canopy closes and ground vegetation disappears.	Small footpath. Many deer trails.	
3	n/a	Cavities in wolf tree (oak) at back corner. Hard and soft mast from other trees. Several snags. Many squirrels, woodpeckers, and other birds.	Small footpaths. Many deer trails.	
4	Oak Creek is a small year-round stream with few stones, rocks, or logs. Some of the stream bank is eroded. Tall grasses and thick shrubs grow along the stream.	Water from stream provides for reptiles and amphibians. Food and cover from brambles and vines surrounding stream. Tracks and other signs indicate stream habitat frequented by deer, raccoons, and other wildlife.	Old fire circle near stream that has not been used in years.	
5	n/a	none	Yard games with family and friends.	

Lesson 2



Aesthetic Potential

Some natural areas are “neat.” They have a park-like appearance, the ground is tidy, and there is little undergrowth. It’s easy to walk through a neat natural area. Other natural areas look a bit more “messy.” There might be dead branches lying on the ground or there might be a dense growth of shrubs through which it’s very difficult to walk. You might guess that a neat natural area is preferable, but that usually is not true. The lack of vegetation on the ground means that there is very little regeneration of future trees. Decaying trees and branches lying on the ground provide important food and cover for wildlife and replenish soil nutrients to support future plant growth. An open park-like view doesn’t give you privacy from your neighbors, and it could indicate an overpopulation of white-tailed deer, which may eat almost every young plant in sight.

You may be concerned about wildfire. You should maintain a distance of at least 30 feet around your home (75 feet in pine forest) and other structures to act as a firebreak. Firebreak can consist of mowed lawn or widely spaced trees and shrubs that would not carry a fire from native vegetation to buildings.

It’s also possible for a natural area to be “too messy.” The trees may be packed in so tightly that none can thrive, and they may be damaged by the weight of grapevines. Overcrowding and invasive and exotic species are problems that should be dealt with to improve natural area health. See “Timber Stand Improvement” (p. 71), “Herbicide Application for Control of Exotic/Invasive Plants” (p. 67), and the resource list (pp. 131–136) for more information.

If you’d like to improve the aesthetic appeal of your natural area, you might consider:

- creating or preserving a scenic view,
- planting trees to increase privacy or block nighttime light, and
- planting or encouraging trees and shrubs with showy flowers and/or bright fall colors.

You might want to create a special peaceful place to rest and relax in a private part of your natural area (a



Leaving dead wood on the forest floor cycles nutrients back to the soil.



Trees won’t thrive in an overly dense forest. Girdling or cutting down some of these trees would allow those left to develop more quickly.



Conifers provide year-round visual screening

“natural haven”). This might include a special tree that you particularly like. You can add vertical stratification to a park-like natural area by planting shade-tolerant wildflowers, shrubs, and small trees under the forest canopy or thinning to encourage natural regeneration. You may have to protect tree seedlings with plastic tree shelters if deer, rabbits, or meadow voles are a problem



A natural haven is a place to relax and enjoy the outdoor world.

in your area. See “Planting” (p. 68) and the resource list for more information.

Through Activity 17 you will think about how you might improve the aesthetic appeal of your natural area.

Complete Activity 17: **How Could You Improve Your Natural Area’s Aesthetic Appeal?** (p. 97).

The Nelsons’ answers to Activity 17 appear on page 61.

Activity 17

How Could You Improve Your Natural Area's Aesthetic Appeal?

Table C: Assessing Your Land's Potential

Management unit	Water resources	Wildlife and habitat elements	Recreation	Aesthetics
1	n/a	Large oak and hickory for hard mast, Some tree cavities found, Rocky areas provide habitat for small mammals. Hard edge with adjacent lawn. Lack of ground vegetation due to deer browsing.	Small footpaths go to stream in back, but heavily overgrown in places. No central trail system. Many deer trails.	Good mix of leaf color but lack of color along lawn edge because we have mowed into the woods to keep brush clear. Include trees and shrubs that flower and/or that have great fall color in planting soft edge along lawn.
2	n/a	Losing value as early successional habitat as canopy closes and ground vegetation disappears.	Small footpath. Many deer trails.	Pretty fall color from aspen trees.
3	n/a	Cavities in wolf tree (oak) at back corner. Hard and soft mast from other trees. Several snags. Many squirrels, woodpeckers, and other birds.	Small footpaths. Many deer trails.	Large trees are majestic and provide lots of wildlife viewing along adjacent farm field. A few spots with open understory provide for a natural haven for solitude.
4	Oak Creek is a small year-round stream with few stones, rocks, or logs. Some of the stream bank is eroded. Tall grasses and thick shrubs grow along the stream.	Water from stream provides for reptiles and amphibians. Food and cover from brambles and vines surrounding stream. Tracks and other signs indicate stream habitat frequented by deer, raccoons, and other wildlife.	Old fire circle near stream that has not been used in years.	Stream is pretty but area nearby gets mushy and buggy. Lots of thorny bushes.
5	n/a	none	Yard games with family and friends.	Green grass attracts deer and rabbits. Plant some of area to trees for more privacy.

Lesson 3



Choosing Projects for Your Natural Area

Now that you have a basic understanding of how trees grow, how a forest changes over time, and the components of wildlife habitat, you're in a better position to develop specific objectives for your natural area. You probably have all kinds of ideas for projects you could do to enhance some aspect of your natural area.

Activity 18 will help you identify and rank your objectives.

Complete Activity 18: **Identify and Rank Your Objectives** (p. 98).

Here are the Nelsons' answers to Activity 18.

Activity 18 Identify and Rank Your Objectives		
	Potential objective	Rank selected objectives
<i>Natural area improvement</i>		
I have a grassy field or lawn I want to plant in trees.	X	1
I want to manage exotic and/or invasive species.	X	
I want to improve the health of my natural area.		
I want to improve forest regeneration (tree reproduction).		
I want my trees to grow faster.		
I want to cut dangerous dead or damaged trees.	X	
I want to cut vines that are strangling and/or weighing down my trees.	X	
Other:		
<i>Forest products</i>		
I want to cut firewood for myself or others.		
I want to start a forest products enterprise for fun and a little extra money.		
Specific enterprise of interest:		
Other:		
<i>Wildlife habitat elements</i>		
I want to create some snags for woodpeckers and other cavity-nesting animals.		
I want to create a soft edge between my lawn and forest to improve wildlife habitat diversity.	X	
I want to provide more shelter and/or food for wildlife.	X	
I want to have more reptiles and amphibians.	X	3

	Potential objective	Rank selected objectives
I want to discourage deer.		
I want to attract more wildlife to my property. Specific species of interest, if applicable:	X	
Other:		
<i>Water resources</i>		
I want to create or enhance a riparian forest buffer.	X	2
I want to protect the water quality in my waterway or spring/seep.	X	
Other:		
<i>Recreation</i>		
I want to build a recreational trail.	X	4
I want to build a road to provide or improve vehicle access.		
I want to create a special place in the woods for reflection, campfires, etc.		
I want to create a place for nature study.	X	
I want to build a tree stand for deer hunting and/or wildlife viewing.		
Other:		
<i>Aesthetics</i>		
I want to make my forest more colorful throughout the year.	X	
I want to block an unpleasant view or have more privacy.	X	5
I want to create a scenic view.		
I want to protect some special trees.		
Other:		

Lesson 4



Land Management Techniques

This lesson provides short introductions to the “how” of the various techniques mentioned throughout the book. Use these descriptions in conjunction with the resource list (pp. 131–136) to find more information about the techniques of greatest interest to you before you begin to implement them.

Best Management Practices (BMPs)

Best management practices in forest trail and road construction and maintenance are widely accepted practices that reduce erosion and prevent or control runoff. They provide basic acceptable standards of good forest management. If you are considering building or improving a road or trail in your natural area or crossing a stream, then follow the BMPs in your state. These are available from the local soil conservation district or state forestry agency. See “Trail and Road Design” (p. 72) for specific BMPs related to forest trail and road construction and maintenance.

Brush Piles

Brush piles may be used by chipmunks, squirrels, quail, songbirds, rabbits and other small mammals, and snakes. They are especially valuable at borders between fields and woodlands. Brush piles can be made from any wood left over from clearing land, pruning branches, cleaning up after a storm, discarding old Christmas trees, etc. Start with large rocks or logs on the bottom, then lay the brush flat in a loose criss-cross pattern to form a pyramid about 5 feet high and 15 feet wide.

Creating a Natural Haven or Campfire/Camping Area

A camping/campfire area and/or natural haven is best situated in a quiet, private, visually interesting place. You might incorporate a scenic view, if possible. Consider water drainage in your siting decision.

Creating an Opening

A canopy opening lets sunlight penetrate to the forest floor and reverts the area to an earlier successional stage.

To create an opening, remove all but a few large and well formed trees of mast-producing species, if possible. The trees that remain act as the seed source for the new forest and will be removed a few years later, after the small trees have grown. The size of the opening you create depends on the size of your property, the size of the land management unit, and your objectives in creating the opening.

Crop Tree Release

See “Timber Stand Improvement” (p. 71).

Firewood Cutting

You can cut firewood at any time of year, but it’s easiest to do so in the fall or winter, when you can better see what you’re doing. There is less moisture in the wood at this time of year, so it dries faster.

On a good site, your trees should grow at the rate of about $\frac{1}{3}$ cord per acre per year. With proper management and harvesting, the rate of growth can be higher. If you rely on wood for your primary heating source, you will need about 11 acres of forested area to supply all your wood, depending on the size of your house. If you’re a more casual user, you may be able to meet your entire



Timber stand improvement can provide firewood.

fuel need from a smaller property. The trees harvested can come from thinning the forest or from small clearcuts that provide excellent wildlife benefits. (The 11 acre figure does not assume clearcutting the whole property.) Cut, split, and stack wood at least one year in advance of burning to season the wood.

Before you cut anything, you need to identify trees that you want to preserve for the future. These trees should be straight and tall and of a species that will help you meet your land management objectives. Remember to

leave enough trees to maintain the forest. For spacing recommendations and more specifics, see “Timber Stand Improvement” (p. 71).

Table 7 will help you decide which trees to choose for firewood. Remember that dead trees contribute to wildlife habitat, so whether you cut them will depend on your priorities.

Know your limits in cutting trees. Seek professional help where needed.

Cut trees in the following order:

Table 7
Value of Selected Woods for Fuel (Dry Wood)

Species	Heat value per cord*	Relative ease of splitting	Ease of starting	Sparks	Coaling quality**
Beech	High	Hard	Poor	Few	Excellent
Black locust	High	Hard	Poor	Moderate	Excellent
Hickory	High	Medium	Fair	Moderate	Excellent
Hophornbeam	High	Hard	Poor	Few	Excellent
Oak	High	Medium	Poor	Few	Excellent
Sugar maple	High	Medium	Poor	Few	Excellent
Apple	Average	Hard	Poor	Few	Excellent
Ash	Average	Easy	Fair	Few	Good
Birch	Average	Medium	Good	Moderate	Good
Black cherry	Average	Medium	Good	Few	Excellent
Black walnut	Average	Medium	Fair	Few	Good
Elm	Average	Hard	Fair	Very few	Good
Black gum	Average	Hard	Good	Few	Good
Larch	Average	Easy	Excellent	Moderate	Good
Red maple	Average	Medium	Fair	Few	Good
Aspen	Low	Easy	Good	Moderate	Poor
Basswood	Low	Easy	Poor	Few	Poor
Cedar	Low	Easy	Good	Many	Poor
Hemlock	Low	Easy	Excellent	Many	Poor
Pine	Low	Easy	Excellent	Many	Poor
Tree-of-heaven***	Low	Easy	Good	Few	Poor
Yellow poplar	Low	Easy	Good	Moderate	Poor

* Based on BTUs per cord of air-dried wood.

** Coaling quality: ability of wood to produce hot, long-lasting coals.

*** Tree-of-heaven is invasive, and when it's cut, more will grow.

Sources: C. Hunt and R. Ramath. 1973. *Enjoy Your Fireplace, Especially During the Energy Crisis*. USDA Forest Service, Upper Darby, PA; Mollie Beattie, Charles Thompson, and Lynn Levine. *Working with Your Woodland: A Landowner's Guide*. © 1993 by University Press of New England. Reprinted with permission; Fazio, J.R. 1994. *The Woodland Steward*. The Woodland Press, Moscow, ID.



The proper protective gear for using a chain saw.

- Standing green trees. In this category, remove first trees whose crowns touch those of crop trees, so that the crown of the crop tree has 2–3 sides clear around it for a distance of about 10 feet. Also remove trees that are of undesirable species, misshapen or forked trees, those that have swellings or bumps (which indicate internal damage), and other poor quality trees. If you have wildlife objectives, you may wish to leave poor quality trees that have active dens or provide large amounts of mast.
- Downed trees, green and dead, only if they're a nuisance.
- Hangers (trees or branches that are already partially broken) and leaners (trees leaning toward the ground or resting on other trees or structures). Be very careful cutting these.
- Standing dead trees, only if they're a hazard.

The safe use of a chain saw or other wood-cutting tool requires chaps for the legs, steel-toed boots, a hard hat, and eye and ear protection. It's also a good idea to have a cell phone or other mobile communication device with you.

Food Plots

Food plots are grain (e.g., corn, sorghum, soybeans) or perennial herbaceous crop (alfalfa, clover) fields left unharvested or incompletely harvested to attract deer, turkey, ducks, geese, rabbits, and other rodents. They are best located between two different kinds of habitat and near natural cover. Food plots are usually planted on larger par-

cels of land by people interested in hunting or viewing the animals that visit the plot. Small food plots can be planted on small acreages, but be aware of possible conflicts that attracting wildlife may cause with neighbors.

Girdling to Kill Unwanted Trees and Create Snags

Girdling is a way to kill unwanted trees. It is most often used on larger trees that overtop or compete with trees you want to nurture. The advantage of girdling a tree over cutting it down is that the tree remains standing, although its leaves die and fall off. This creates a snag, which serves as important wildlife habitat for insect-feeders and cavity- and den-dwelling animals and birds. About three dozen species of birds and almost two dozen species of mammals in our area use snags at some time during their life cycles. Be aware, however, that girdling a tree may eventually make it a hazard to human activity. Regularly assess the safety of any snags and dead trees on your property. It's a good idea to use girdling and leave snags standing only away from trails and other areas people frequent.

Girdling involves using an ax, hatchet, or chain saw to cut a groove into the trunk of a tree to interrupt the flow of sap between the tree's roots and crown. The groove must completely encircle the trunk and penetrate into the wood at least ½ inch on small trees, and two to three times that much on larger trees. The width of the notch varies with the size of the tree. On small-diameter trees 1 or 2 inches is probably sufficient, but on very large-diameter trees the girdle should be 6 to 8 inches wide.



Girdling a tree will slowly kill it, creating a snag.



Herbicide application using a backpack sprayer.

Herbicide Application for Control of Exotic/Invasive Plants

Careful use of herbicide is almost always needed to effectively control invasive and exotic plants. Read the label completely before you begin and follow the directions exactly. Never use herbicide near a spring, stream, or seep. Your county cooperative extension office can offer advice. Minimize the use of insecticides in and near your natural area if children are present or if you are managing for insect-eating wildlife. If you are vigilant, you may have success in controlling small patchy populations of invasives/exotics by pulling the plants or removing and destroying their seedheads.

Mast Trees

Mast is fruits and nuts that serve as food sources for wildlife. Trees that produce mast will attract deer, squirrels, chipmunks, turkeys, wood ducks, and other animals. Mast trees are especially useful to wildlife in areas such as suburban neighborhoods where food sources may be scarce. (See “Planting,” p. 68, for specific planting advice.) Leave fruits and nuts that fall on the ground for wildlife to eat.

Mowing

Avoid mowing a field with tall grass during nesting and young-rearing season (mid-April to late July). Consider strip mowing to allow more development of diverse vegetation. This would involve dividing your mowed area into thirds and mowing only one third once each year.

This frequency maintains a lush grassland habitat but discourages trees and shrubs. You may need to increase the frequency of mowing if you find that invasive weeds such as multiflora rose, autumn olive, and honeysuckle are becoming a problem. It’s important that you not mow the entire area in any one year because wildlife will come to depend on the area’s food and cover resources. Mow to a height of about 8 inches.

Planting Trees or Shrubs

Trees or shrubs planted in a thick row (at least 50 feet wide) across an open area can grow to provide a safe corridor for animals from one habitat to another. You may plant trees or shrubs to create a soft edge, to convert an intermediate-use area to a natural area as you stop mowing, to create or enhance a riparian buffer, or to block an unpleasant view or noise. See the “Planting” sidebar (p. 68) for detailed information.



Creating soft edge by planting seedlings.

Pruning

Pruning forest trees involves removing the lower branches. This will often happen naturally to trees, especially deciduous trees, growing in a forest. However, some species, especially coniferous trees such as white pine, benefit from pruning, which improves the quality of timber by removing knot-forming branches and crooks. Pruning also helps reduce the risk of damage from wild-fire. A pruned conifer forest is more likely to survive a low-burning fire because the flames will not reach into the trees’ canopies. You may have to prune to install a trail or natural haven. You can create wildlife cover by not pruning the lower branches of conifers.

PLANTING

Where can I get seedlings?

Commercial nurseries are one option. Many states also have a state nursery operated by the state forestry agency from which private citizens can buy seedlings for use in converting lawns to natural areas (often called **afforestation**), environmental protection (such as for riparian buffering), and wildlife habitat development. The state nursery prices are typically competitive with those of a commercial nursery. Seedlings from a state nursery are typically 1–3 years old and have been grown from native seeds in a nursery bed. The 12–24-inch seedlings are packaged and shipped in bags with no soil (hence the name “bare root” seedlings). They can be planted easily with a spade or planting bar (see below for how-to specifics). Your county cooperative extension office or local state forestry office can put you in touch with the state nursery. Search the Web for the nursery’s site or look in the blue pages of the phone book under “State government.” Some local soil conservation districts sponsor annual seedling sales with reasonable prices.



A typical bare root seedling

How much will it cost?

The cost of planting will depend on your timetable (do you want big trees right away or can you wait for seedlings to grow) and the size of the area you’re planting. You can buy seeds or small seedlings quite inexpensively. The long-term costs of maintaining a natural area are less than those for maintaining a mowed lawn, both in labor and environmental costs. Your county cooperative extension agent or state

forester should be able to help you figure out how much it will cost or refer you to more specific information. See the Nelsons’ example (p. 75) and the case study examples (pp. 111 and 119) for sample costs of projects you might consider.

When should I plant?

The best time to plant trees and shrubs is in the spring or early fall. If you’re planting bare root seedlings, try to place your order in November or December for spring delivery. The most desirable species sell out quickly.

How large of an area should I plant?

The bigger the area, the bigger the benefit, no matter your goals. However, you should consider the amount of time and money you can devote to planting in any one season.

Where should I plant?

Refer to Activities 1 (p. 81), 6 (p. 88), and 15 (p. 95), in which you assessed the kinds of habitat currently available on your land and around you. Think about where wildlife cover is now and whether there is a valuable habitat resource, such as a pond, that lacks cover. Try to connect different habitats with your new planting and/or increase the area of existing habitat types that are scarce in your neighborhood. Your goals and the layout of habitat now around you should guide where you plant. You might also want to plant trees to shade your house or other structures. This can be a great energy saver for heating and cooling.

What should I plant?

To avoid future problems with invasive/exotic species, it is best to plant native species. Plant three or four different species on a site, if possible. Look back at Tables 2 and 3 (pp. 32 and 36, respectively) to select species most suitable for your site. If you are planting an area that you have been mowing, you’ll want to plant shade-intolerant trees such as eastern white pine, loblolly pine, ash, and aspen. It’s a good idea to have a soil test done before choosing the species you will plant. If your soil is very acidic (approximately less than pH 5), ask your county extension agent about acid-tolerant plants. Appendix D (p. 129) is a table of tree and shrub uses and site requirements. Many state forest nurseries have Web sites that provide guidance on selecting trees and shrubs for different uses and site characteristics.

PLANTING (continued)

How do I prepare the site for planting?

Most lawns in our area consist of fescue grass, which will offer your seedlings stiff competition for moisture, making it difficult for them to survive. Many experts suggest that you kill the grass with an herbicide before planting seedlings. Use the herbicide in the fall in strips 3 feet on each side of where trees will be planted. Plant the following spring in rows 10 feet apart. Always read the label completely before using herbicide and follow the directions exactly. Your county cooperative extension agent or someone at the local conservation district should be able to provide helpful advice on selecting the proper herbicide. Never spray herbicide by a stream, seep, or spring. An alternative

to herbicide is to plow 6-foot-wide strips with small equipment or remove a circle of sod before you plant and mulch around the seedling to discourage weeds.

How close should I plant the seedlings?

Tree seedlings are often planted in rows on a 10 foot x 10 foot spacing.

How can I protect the seedlings from being eaten by deer and other wildlife?

You can use 4–5-foot-tall tubular plastic tree shelters held in place with wooden stakes. You may have seen these in use in fields by streams or lakes. The seedlings grow up and out



(1) Use a shovel or planting bar (shown here) to make a hole for your seedling.



(2) Remove a shovel full of dirt and insert the seedling so that the roots will be just below ground and against the side walls of the hole.



(3) Refill the hole with dirt on all sides of the seedling.



(4) Gently tamp down the soil with your foot.



(5) When you're finished planting a seedling, the roots should feel firmly anchored when you pull on the stem.



A mesh net over the top of the tree shelter keeps birds out.

PLANTING (continued)

of the tree shelters in a few years, depending on the species. Wait at least two years after the branches fully emerge from the top of the shelter before you consider cutting off the shelter. Some trees that grow in shelters may need to be staked after removal of the shelters until their trunks strengthen. See the resource list (pp. 131–136) for information about where to purchase tree shelters and how to use them.

What maintenance will the site need?

If you want access to the site or if you want to maintain a neater appearance, mow between the seedlings several times each growing season until the trees emerge from the tree shelters. For a few years you may need to spray herbicide immediately around the shelters or reapply mulch if you manually removed the sod to kill the grass and keep weeds down. This is done to ensure that the seedlings get adequate water and nutrients. Particularly where you are growing a forest where there was previously lawn, non-native exotics can be a problem. You will probably need regular herbicide applications to discourage nonnatives such as mulberry, tree-of-heaven, and honeysuckle. After a few years the trees should be well established and the grass

will need only occasional mowing. Some trees will grow faster than others, but all are necessary to encourage the development of a forest. Some trees may die in the future and others will fill their place.

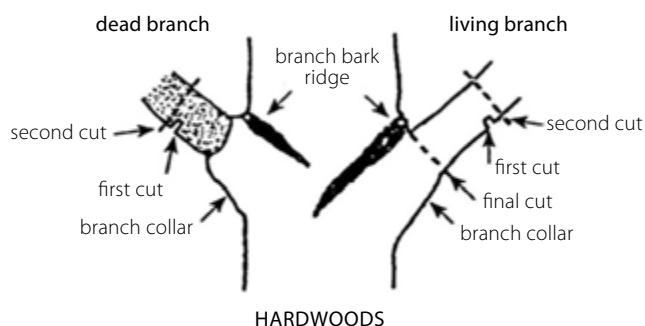
What about shrubs and smaller plants?

Shrubs provide fast-growing cover for small animals. You could plant native herbaceous plants and ground cover to fill in the gaps between shrubs. However, existing tree seedlings may quickly out-compete many shrubs and herbaceous plants. It is usually best to plant only a few shrubs and grasses, if any, along with your main tree species. In many cases, native shrubs and grasses will establish themselves and outgrow those that are planted. Mixing trees, shrubs, grasses, and herbaceous plants will attract the greatest variety of wildlife.

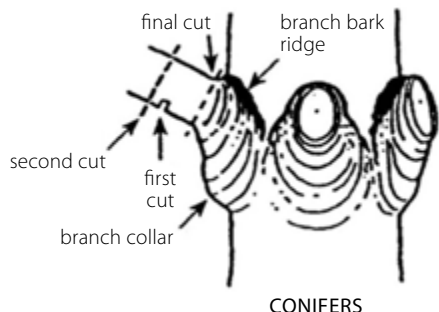
Check with your county cooperative extension office, soil conservation district, or state forester to verify that the trees and shrubs listed in Table 8 are suitable for your site. Appendix A (p. 122) provides more information about the characteristics of some common trees in the Mid-Atlantic/Northeast region.

Table 8
Suggested Plantings for the Mid-Atlantic/Northeast United States

Low shrubs	Tall shrubs	Small trees	Large hardwood trees	Large coniferous trees
Blueberry	Viburnum species	Flowering dogwood	Black locust	Eastern red cedar
Spirea	Bayberry	Serviceberry	Black walnut	Eastern white pine
Huckleberry	Red osier or silky dogwood	Redbud	Blackgum	Loblolly pine
Blackberry	Spicebush	Sassafras	Sugar maple	Red pine
Raspberry	Winterberry holly	Staghorn or smooth sumac	Northern red oak	White cedar
	Juniper		Pin oak	White spruce
			White or green ash	Eastern hemlock
			White oak	Virginia pine
			Yellow poplar	
			Black cherry	
			Aspen	
			Sycamore	
			Willow	



for living or dead branches



Proper methods of pruning

Removing Grapevines

Grapevines provide important wildlife food, so if you're managing for wildlife, it's best to leave some of them. However, they can become a problem if you are managing for a mature forest of healthy trees. A good compromise is to cut the vines wherever you can near the forest floor, but only from trees you want to form the main forest canopy. Leave them in the poorer quality trees, where they will form a grape arbor that has good wildlife value. However, the trees will be seriously damaged and the area may not mature. When vines are cut near the ground in the forest they will eventually dry and fall out of the trees. In more open areas, such as old fields, you may want to apply herbicide to the cut ends of the vines to stop their growth. If you can keep up with them, just cutting them is probably sufficient.

Streamside Stabilization through Planting

A primary goal of streamside planting is to stop or reduce stream bank erosion. Banks that have been undercut by the stream should be stabilized with large rocks or logs. However, it's essential that you talk to your local conservation district for advice before beginning this work. Permits may be needed. Having a healthy riparian buffer will reduce the flow of polluted water and sediment

into the water. Don't mow along a water body. Plant and encourage trees that will grow large and shade the water. Allow tree branches to hang out over and into the water and catch floating debris. Shrubs and low vegetation that provide good cover are also important. Keep trails and roads away from banks to reduce erosion.

Thinning

See "Timber Stand Improvement."

Timber Stand Improvement

Timber stand improvement involves cutting down inferior trees to make space for well formed, superior trees (a practice known as "thinning") and crop trees you want to keep for timber, fruit, mast, animal denning, or any other reason (called a "crop tree release"). Fruit and nut production requires a lot of sunlight, so if you want to attract wildlife with these trees, you'll need to remove trees that are competing with them for resources. The general rule is that when you're finished cutting, a crop tree should have 2–3 sides open for about 10 feet around its canopy. The most effective time to begin thinning is when the tree trunks are 4–10 inches in diameter at breast height. Those left standing will respond quickly to a release from competition at this point. Retain enough trees to ensure that the forest canopy that will continue to grow. This requires good spacing between trees. A rule of thumb is "diameter times two." To apply this rule, estimate the average diameter at breast height of the trees in the stand, measured in inches. Multiply the number by two to get the number of feet to be left between the trunks of



The trees with dark trunks should be removed because they are inferior and/or weak (forked, bent trunk, split trunk, and knobbed, respectively).



This crop tree has been released (freed) of competition.

the remaining trees. For example, if the trees average 5 inches in diameter, the desired spacing would be 10 feet. If wildlife is a major objective, you may add 2–4 feet to the spacing recommendation to open the canopy.

You might need to cut down large old trees that are becoming unhealthy and blocking the light for your young forest. Cutting trees for timber stand improvement can be a major source of firewood.

Timber stand improvement also includes removing trees that are diseased or insect-infested or damaged by storms. Review your results from Activity 10 (p. 92), in which you assessed competition among trees in each of your land management units, to see where your problem areas lie.

Trail and Road Design

Note that for a simple walking path used only by a family, few of the measures cited here will be necessary.

A good trail should be visually interesting and pass through varied terrain. It should follow natural contours, zig-zag across steep slopes, and disturb the area as little as possible. It will be more appealing if it meanders instead of being a straight shot, especially through a small piece of property. A narrower trail is less obtrusive, making you less visible to wildlife. Natural area trails and roads should be designed to accommodate all potential users and uses, and they should allow the users to safely negotiate obstacles such as hard-top road and stream crossings. Trails and roads should respect the privacy of neighbors.

Watch how water moves over your property before you lay out a trail or road. Locate trails and roads so they



Trees with severe bark injury (left) or curved or crooked trunks (below left) should be removed during timber stand improvement.

(Below) Multi-stemmed trees should be removed during timber stand improvement because they are prone to splitting



will not be conduits for water runoff during rain storms. For improved safety and reduced erosion potential, try to keep trails and roads off steep slopes. Consult your hand-drawn map from Activity 1 (p. 82) and Tables A–C (pp. 90, 93, and 96) of Part V and make notes on special features to include or avoid. Lay out a trail or road first using plastic ribbon or flagging. Locate features you want to visit and those to avoid. Walk stone walls to look for breaks in them, which may indicate the locations of old roads or trails you may want to re-create. Walk the trail or road in both directions and adjust it as needed before you start cutting trees or clearing brush.

Trail and Road Design-Wet Areas

If you plan your trail carefully, you will find it a good place to observe wildlife. If you have a wetland or riparian area, you should lay a narrow trail through a buffer strip with occasional extensions to the water's edge. Clear



One type of natural area trail.

away enough brush at such a place so that you can see the wildlife but it can't see you. You may want to install small bridges and walkways in very wet areas if you'll use the trail or road often. This will help minimize erosion. Keep stream crossings to a minimum and cross the stream where it is narrowest. Cross at a 90-degree angle to the stream. You may need a permit from the state department of natural resources to construct a stream crossing.

Trail and Road Drainage

Flowing water should be diverted from a trail or road. The easiest way to do this is to avoid slopes as much as possible. If you can't avoid a slope, water bars will deflect water. Water bars are obstructions on the trail or road surface designed to divert water off the trail or road. They are usually constructed of logs or stones placed at a 30-degree angle from the trail or road edge, and extend well beyond the edge.

Water will pool on a level trail or road at the bottom of a slope. To prevent this and the resulting erosion, it's best to avoid these areas. Alternatively, you could raise



Cleaning out culverts is part of regular trail and road maintenance.

the surface of the trail or road several inches above the surrounding land using boards, stones, or gravel, or make gutters on each side of the trail for drainage. You may also reduce erosion by laying down woodchips on the trail.

Trail and Road Maintenance

Remove branches and leaves from ditches and culverts as needed to maintain drainage flow. Trim weeds around the bases of all sign posts, benches, and bridges. Remove brush and branches that reach into the trail or road. Toss trimmings into the brush alongside the trail or road. Conduct a periodic hazard check for dangling branches, erosion, rocks, blocking trees, protruding roots, and wash-outs.

Lesson 5



Make a Timetable and Spell Out the Details

Now that you have an idea of what it takes to complete some of the projects you’ve learned about, you can make specific plans about what you want to do, where and when you want to do it, and who will do it. Before you begin the work, it is best to do some research to find out approximately how much each project will cost. Be realistic about how long it might take you to complete a project. If you’ve never done this kind of work before, it may be slow in the beginning.



When in doubt, consult a professional.

The additional case studies in Part V (pp. 105–119) and the Nelsons’ answers to Activity 19 (p. 75) provide some details about the scheduled work and cost estimates for sample projects. Information sources identified on the resource list (pp. 131–136) will give you more details. We recommend that you do get more specific information for the topics relevant to your projects before you begin. Especially if you have chosen projects that place you in the realm of “active manager” (see Table 1, p. 10), now is a good time to consult with an expert to rough out the details of how you should proceed. You might seek out the person who taught the introductory session for this project, a Master Gardener or Coverts/VIP cooperator in your area (your county cooperative extension agent should be able to help you get in touch), your county cooperative extension agent, or the state forester. Review your plans with this person and consider incorporating the feedback as you finalize your plans.

Activity 19 includes a table that will help you lay out the projects you want to complete, as well as a tentative schedule.

Complete Activity 19: **Project Schedule and Details** (p. 100).

The Nelsons’ answers to Activity 19 are on the following page.

Activity 19

Project Schedule and Details

Management unit	Goal	Project description (Provide details and step-by-step activities)	Priority	Start date	Projected completion date	Who will do it?	Cost estimate
5-lawn	convert to trees	Use Roundup herbicide on the grass in the fall before planting in the spring. Use trees and shrubs that flower and/or have great fall color and/or produce wildlife food to reforest lawn in front of garden. Seedlings will include yellow poplar, black walnut, red oak, black cherry, and white pine. Order bare root seedlings from state nursery in late fall. Plant on a 10' x 10' spacing in this 3/4-acre area (~225 trees). Install a tree shelter and a wooden stake around each seedling to protect it from deer browsing. Respray the grass between the rows with herbicide in the summer after planting, if needed. Mow between the rows until forest canopy closes because of homeowner association rules.	1	this fall	end of spring 3 years from now (split plot in thirds so the cost and time required per year are less; start closest to the road)	mainly Tim with help from Ellen	\$300 for plants at ~\$1.35 per plant; \$100 for Roundup herbicide and back-pack sprayer. \$900 for shelters and stakes at \$4-5 each
4-riparian area	plant a riparian forest buffer to help protect water quality in Oak Creek	Plant trees and shrubs (~440) recommended for riparian buffers throughout area currently in tall grass and thorny shrubs (1 acre). Plants will include river birch, green ash, sycamore, red maple, dogwood and buttonbush. Use tree shelters as described above. Mow grass before planting and frequently thereafter until trees establish. Do not use herbicide next to the stream.	2	next fall	end of following spring	mainly Tim with help from Ellen	\$600 for plants; \$2,200 for tree shelters and stakes
through-out property	create a trail	Design and clear trail that rings the property and touches each of the management units. Highlights will include Oak Creek (although most of the trail will be back from the water) and the wolf tree in the back corner that will provide a natural haven for solitude. Explore possibility of sharing a trail with one or both neighbors.	3	after priorities 1 & 2 are done	a couple years after start	mainly Tim with help from Ellen	have chain saw; ~\$15 for fuel, \$40 for herbicide
4-riparian area	encourage reptiles and amphibians for nature study	Create small rock piles by the stream. Haul in a log or two to lay by stream. Plant leafy vegetation for cover and food as recommended by reptile and amphibian books.	4	this spring	this summer	mainly Ellen	\$100 for plants at a native plants sale

Lesson 6



Record Your Progress

Before beginning any projects, take note of current conditions so you can look back in a few years at how far you've come. You could chronicle progress in several ways. (This would be a great project to do with a child.) A visual way to record progress is to choose representative points and take photos from the same angles every year or two. You'll be amazed at the changes over time. You could mount the photos in a journal or album in which you also record your accomplishments. You could also use a video camera to document your natural area's progress every few years.

You could keep a journal of what you do, when and where you do it, and anything you learn in the process. You could include details about how long each project takes and how much it costs. This information will help you make realistic plans when you tackle another simi-

lar project. You could record when and where you see different kinds of wildlife, or other evidence that your objectives are being met.

You might want to do periodic surveys for wildlife and/or exotic/invasive plants and record the results. Then you can work the new information into your on-going land management plan. If you do a wildlife survey, try it at different times of day and night and in different seasons to get the best representation of the diversity on your property.

Activity 20 includes space for you to paste in pictures of your land at different times and a table to track your progress. The Nelsons' version of the table appears on page 77.

Complete Activity 20: **Record Your Progress** (p. 102).

Series of photos taken from the same point every twenty years on the Allegheny National Forest in Pennsylvania. The forest recovers from disturbance more quickly than we might expect. The series illustrates the process of succession.



(Above) 1927. (Below) 1947.



(Above) 1968. (Below) 1988.



Activity 20

Record Your Progress

Management unit	Project	Date completed	Actual cost vs. projected cost	Comments
5-lawn	Conversion of lawn to trees	–	N/A vs. \$1,300	Almost finished. So far cost is a little less than projected.
4-riparian area	Plant riparian forest buffer along Oak Creek	spring 2006	\$3,000 vs. \$2,800	Completed. Cost was a bit more than projected because we slightly underestimated the number of plants needed.
throughout property	Create a trail throughout property	fall 2005	\$68 vs. \$45	Completed. Cost was a bit more than projected because we added some trail drainage features. Finished work two seasons after we planned to, but we are now happily using the trail with the kids.
4-riparian area	Enhance habitat for reptiles and amphibians	summer 2005	\$125 vs. \$100	Completed. Cost was a bit more than projected because plants were more expensive than expected. Have seen turtles and frogs on numerous occasions and have seen a couple of small snakes. The kids are fascinated!

— PART V —

Workbook



Part V of *The Woods in Your Backyard* provides space for you to complete the activities discussed in Parts I–IV. Completing the activities for your own property will help you make decisions about how to manage your natural areas.



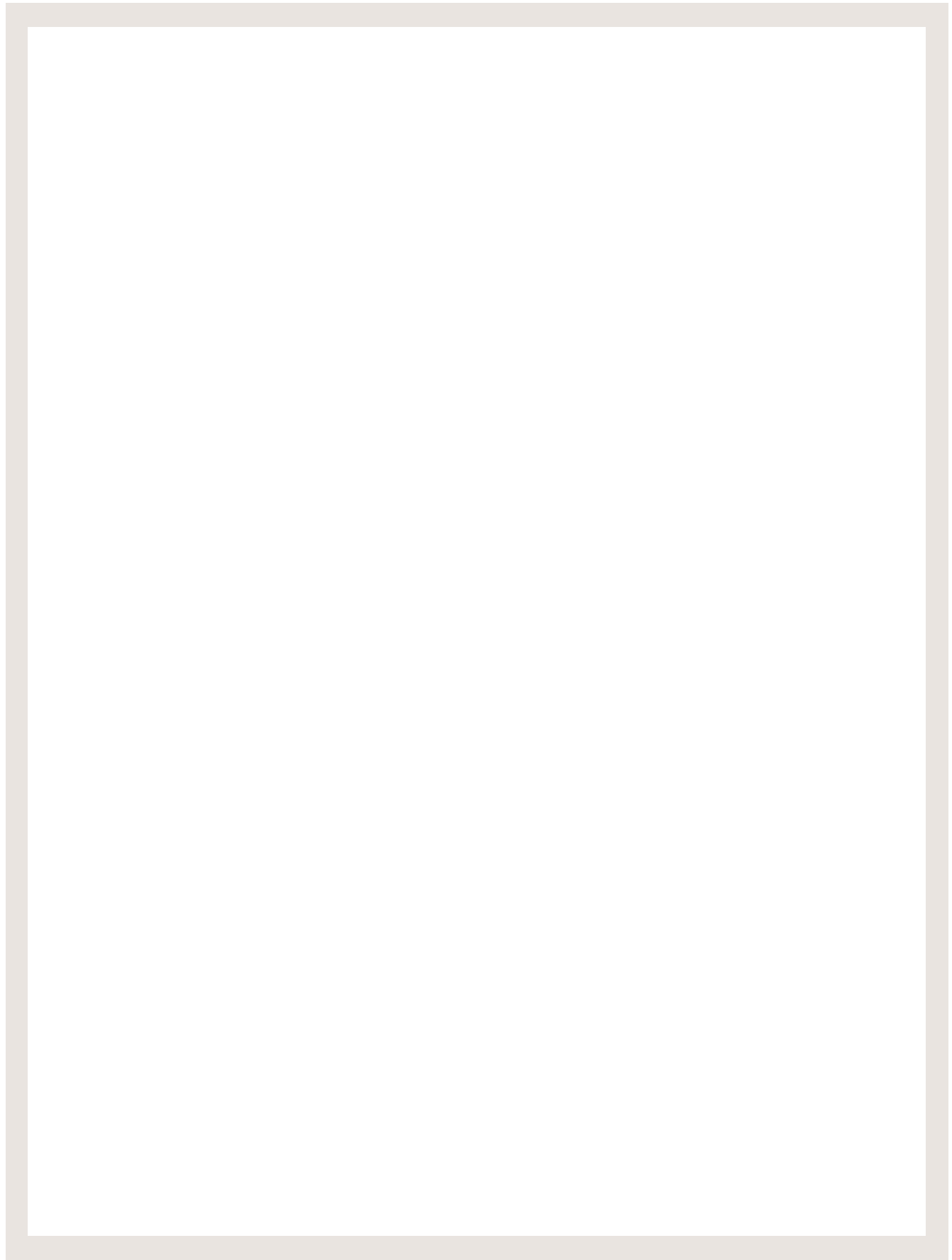
Introduction

Activity 1

Map It Out

You can gain new insights about your property by putting its features on a map, as the Nelsons did (p. 7). Start by making a hand-drawn map of your property similar to the Nelsons'. Use only about $\frac{2}{3}$ of the space on the next page to draw your property because you'll be adding to the map later. The property survey map with your property deed may help you with the overall shape and dimensions of the plot. You could also determine the average length of your step and pace off the distance. Include on the map you draw your water

well, if applicable, and septic or sewer system (keep tree and shrub roots well away from these systems), intensive-use areas, such as your house, driveway, and any other buildings on the property. Then map the intermediate-use areas, such as lawns, gardens, and pastures. Lastly, add the natural areas. Include forests, shrubby and unmowed areas, streams, rivers, ponds, and wetlands. See the additional case studies (pp. 105–119) for more examples of property maps.



Activity 2

What Have You Got and What Do You Want?

1) Complete the table below for your land. The Nelson's answers are on page 8.

	Intensive use area (buildings, driveways, paved areas)	Intermediate use area (lawn, garden, pasture, orchard)	Natural area (forested; unmowed areas with small trees, shrubs, tall grass; streamside, etc.)
	(% of total property)		
Total land owned: _____ acres*			

*An acre is a square about 210 feet on each side (43,560 ft²) or a rectangle a little smaller than a football field.

2) In what year did you buy or acquire the land? _____

3) Why did you buy the land? What did you hope to get out of owning the land?

4) Have your reasons for owning the land changed since you bought or acquired it? How?

5) What do you most enjoy about your land? _____

Activity 2
What Have You Got and What Do You Want?
(continued)

6) What do you least enjoy about your land? _____

7) What do you want from your natural land now? (some possibilities: protect and enjoy wildlife, privacy, produce firewood, pay taxes, etc.)

In 10 years? _____

8) How much land could you/do you want to convert from intermediate use to natural area?

Activity 3

Family Goals Assessment

Photocopy this page for each member of your family or work team. Anyone who is or will be involved in your property should privately answer the ques-

tions below. (Note: Every statement may not apply to everyone's situation.) See page 9 for the Nelsons' answers.

	Agree	Disagree
I would like to have more natural areas and less mowed land.		
I do not understand what kind of land management projects are possible and what is involved with each.		
I'm very enthusiastic about making changes to improve the land stewardship of our property.		
Any new land management projects are too much for us to handle now.		
I am worried about how land management projects will affect our time for other family and/or personal activities.		
I am concerned that other family members do not understand what I value most about our property.		
I believe we could handle the financial cost of carrying out some land management activities on our property.		
It's important for the children to learn to work the land, even if other activities have to be reduced.		
I believe my opinions and feelings about potential new projects on our property will be taken seriously.		

After everyone has completed the questionnaire, gather to discuss the answers. Where do you agree and disagree? Is there adequate family support for devoting time and money to some natural lands management projects? If only one member of the family is really

interested in pursuing land management, it may be best to start small and plan short-term projects. Maybe other family members will become interested as they see progress made. Reconcile misunderstandings or disagreements before proceeding.

Activity 4

Identify Your Interests in the Land

Look back at your answers to Activity 2 (p. 83). Write out three possible interests for your natural area. You can modify these as you learn more through this book. See page 10 for the Nelsons' answers.

- 1) _____
- 2) _____
- 3) _____

Now place each of your interests within the table below. Keep in mind the distinction between active and passive managers made on page 10 as you decide on your priorities.

Human values					
Resource benefit	Income production	Enhance property value	Personal satisfaction	Privacy and sanctuary	Reduced lawn mowing
Natural area improvement					
Forest products					
Wildlife					
Water resources					
Recreation					
Aesthetics					

Adapted from: *Legal Aspects of Owning and Managing Woodlands* by Thom J. McEvoy. Copyright © 1998 by Island Press. Reproduced by permission of Island Press, Washington, D.C.

Activity 5

Investigate the Legal Constraints on Your Land

Check your property deed and homeowners association documents for easements, rights-of-way, and covenants that govern the use of your property. Page 12 provides some examples of these types of legal constraints. Record below any constraints you discover.

Mark where they apply on the map you created in Activity 1 (p. 82). If you find out that your property has none of these constraints, also note that. See page 12 for the Nelsons' answers.

Easements – _____

Rights of way – _____

Covenants – _____

Other constraints – _____

Optional – Talk with municipal or county officials about your area's zoning ordinance, or obtain a copy of a recent growth planning report. Find out where growth is planned or projected around you, what kinds of new facilities and roads are planned, and how they might affect your property and your ability to manage

your land. For instance, if you find out that the farm field behind you will soon become a housing development, the kinds of wildlife you can hope to attract will be limited and your priorities might change. For example, you might want to plant trees for visual and noise screening before construction begins.

Activity 6

Beyond Your Boundaries

Add your immediate neighbors' properties to the map you drew on page 82. (If you need extra space, tape blank sheets to your map.) Label each with the owner's name and indicate the basic landscape features as you

did for your own property. Even if you know your neighbor's land, an aerial photo may help you see how landscape features interrelate (see "Working with Aerial Photos" sidebar, p. 19).

Describe important features of your neighbors' property (house lots with large lawns, farm fields, forested areas, etc.).

Describe any features (such as forested areas or water bodies) on your neighbors' property that might help attract wildlife to your property.

How could you modify your property to take advantage of those habitat features? For instance, could you plant trees to create a safe passage way?

See pages 20–21 for the Nelsons' answers and map.

Activity 7

Designate Land Management Units

These characteristics will help you identify management units:

- vegetation height: tall (> 30 ft.) or short (< 30 ft.)?
- vegetation type: deciduous or coniferous? (see p. 25 for definitions)
- vegetation class: trees, shrubs, tall grasses, lawn, old field, stream, pond, other?

The land management units you designate will likely be different sizes and shapes. Two patches of

the same unit might be disconnected. You might have more than one patch of lawn that you want to stop mowing and plant in trees, for example. See the case studies (pp. 106 and 114) for further examples. See pages 23–24 for the Nelsons’ answers.

Jot down the land management units you see as you walk around your property (e.g., shrubby area by back border, eastern white pine stand behind wood shed). Ignore the intensive and intermediate use areas of your property unless you want to stop mowing an area.

1) _____

2) _____

3) _____

4) _____

5) _____

Now use your answers to fill in the “Management unit” and “Vegetation type” columns of Table A on page 90 with information related to your land. Use the Nelsons’ table (p. 23) and the tables in the case studies (pp. 107 and 115) as guides. If you have more than four land management units, use another sheet. You will fill in the rest of the columns in Table A when you

complete activities 8 and 9. Note that for each column in Table A, the activity with which you will fill in the column is noted.

Refer back to the map you created in Activity 1 (p. 82). Name, outline, and number your property’s various land management units on the map. See page 24 for the Nelsons’ map.

Table A
The Vegetation on Your Land

Management unit (Activity 7)	Vegetation type (Activity 7)	Three most common tree species (Activity 8)	Three most common shrub species (Activity 8)	Succession stage (Activity 9)

Activity 8

Get to Know Your Trees

Using the steps outlined on pages 25–27 and a tree and shrub identification guide, identify the three most common tree species and the three most common shrub species in each land management unit of your natural area. If you can't identify three kinds in each unit, do the best you can. Some units might contain

only one type of vegetation, such as a pure stand of eastern white pines. Fill in the tree and shrub columns in Table A on page 90. The Nelson case study (p. 28) and those on pages 107 and 115 show some typical combinations of species of trees and shrubs in the Mid-Atlantic/Northeast area.

Activity 9

Identify Successional Stages

What successional stages exist in each of the land management units in your natural area (see photos,

p. 31)? Fill in your answers on Table A on page 90. See page 35 for the Nelsons' answers.

Look back at the map showing your neighbors' properties (p. 82). What stages of succession are least represented on your and your neighbors' properties?

Activity 10

Assess Competition Among Trees

Note: This activity is best done when leaves are on the trees.

Choose a tree you want to keep (crop tree) because it helps meet your land management objectives and whose crown is in the main forest canopy for that land management unit. Stand underneath the tree and determine if there is open space around 0, 1, 2, 3, or 4 sides of the canopy. Is the crown distinct or does it touch others? Is there a patch of sky visible on any side of the crown? Record your observations in the crown competition table below. (You may not need all the columns below, depending how many forested land management units you have.) Repeat this process until you've assessed two crop trees in each forested land management unit in your natural area.

Next average the number of open sides in each land management unit (see the example below). If the average number in a land management unit is less than 2, consider thinning to reduce competition on your crop trees. In the bottom row of the crown competition table, answer "yes" or "no" to the question, "Is thinning recommended?" Answer "yes" if the average number of open sides per management unit is less than two. Now transfer your yes or no answer to Table B on page 93 under the column "Thinning recommended?" See "Timber Stand Improvement" (p. 71) for more information about thinning.

See page 38 for the Nelsons' answers. Note that for each column in Table B, the activity with which you will fill in the column is noted.

Crown Competition

Tree	Example		1	2	1	2	1	2
Management unit	1							
Species, if known	yellow poplar	hickory						
Canopy open on __ sides	2	0						
Average open sides per management unit	1							
Thinning recommended?	yes							

	1	2	1	2	1	2	1	2
Management unit								
Species, if known								
Canopy open on __ sides								
Average open sides per management unit								
Thinning recommended?								

Table B
Natural Area Health

Management unit (Activity 7)	Thinning recommended? (yes or no) (Activity 10)	Young trees present? (yes or no) (Activity 11)	Broken or dead? (yes or no) (Activity 12)	Exotics/invasives? (list names) (Activity 13)

Activity 11

Assess Tree Reproduction

A healthy natural area will contain trees of all different heights.

Walk your forested natural area. Are many trees less than 6 feet tall present? In Table B on page 93 under “Young trees present?” mark “yes” or “no” for each land management unit. If there are few young trees

less than about 6 feet tall, you may have an overpopulation of deer or you may need to do some thinning. See pages 69–70 for tips on dealing with deer and see “Timber Stand Improvement” (p. 71) for information on thinning. See page 40 for the Nelsons’ answers.

Activity 12

Survey for Broken and Dead Trees

Survey each forested land management unit for broken and dead trees. Mark “yes” or “no” in Table B on page 93 under the column “Broken or dead?” for each land management unit. Broken or dead trees may result from wind or storm damage, or may indicate

an insect or disease problem that needs attention.

When you have time to address any problems you find, deal first with trees that pose a danger to people or buildings. See “Pruning” (p. 67) for more information. See page 41 for the Nelsons’ answers.

Activity 13

Assess Invasive and Exotic Plants

For each land management unit, note in Table B (p. 93) under the column “Exotics/invasives” the names of

any invasive and/or exotic plants that are widespread. See page 44 for the Nelsons’ answers.

Activity 14

Water Resources Around You

Walk your natural areas and note on your hand-drawn map (p. 82) ponds, rivers, streams, or lakes. Note areas where you could create or enhance a riparian buffer. Also note areas that are wet much of the year, where you suspect or know that a spring, seep, or vernal pool occurs. Note in Table C (p. 96) under the column “Water resources” how you might improve water

resources in any applicable land management unit, and add these features to your map on page 82. See page 47 for the Nelsons’ answers.

Are there any water bodies on your neighbors’ property? Can you do anything on your property or in cooperation with your neighbor to enhance wildlife use of those areas or to improve water resources?

Note that for each column in Table C, the activity with which you will fill in the column is noted.

Activity 15

Habitat Elements on Your Land

Tour your natural area in search of habitat elements such as those named on pages 49–52. Note them in Table C on page 96 for each land management unit,

and add them to your map on page 82. See page 53 for the Nelsons’ answers.

Activity 16

Assess Your Natural Area’s Suitability for Recreation

Take a walk around your natural area and assess where your recreational interests might best be accommodated. Note your results on Table C on page 96. Mark

your ideas on the property map you drew on page 82. See page 58 for the Nelsons’ ideas.

Table C Assessing Your Land's Potential					
Manage- ment unit	Water resources (Activity 14)	Wildlife and habitat elements (Activity 15)	Recreation (Activity 16)	Aesthetics (Activity 17)	

Activity 17

How Could You Improve Your Natural Area's Aesthetic Appeal?

Walk your natural area and assess its current state of physical beauty. Consider how it looks in each season of the year. Do any of the ideas mentioned on pages 59–60 interest you? Note on Table C on page 96 and

on your hand-drawn property map (p. 82) how and where you could improve your natural area's aesthetic appeal. See page 61 for the Nelsons' answers.

Activity 18

Identify and Rank Your Objectives

Look back at the statement of interests you wrote in Activity 4 (p. 86). With those interests in mind, and what you've learned since then, complete the table below to identify and rank your specific objectives for your natural area. If an objective interests you or you agree with the statement, and it seems possible for your natural area given what you now know, mark

an X in the "Potential objective" column. Then in the "Rank selected objectives" column, rank the top five objectives across the whole table. There's a space in each section for you to write your own objective, if you choose. See pages 62–63 for the Nelsons' answers. See the case studies (pp. 109 and 117) for more examples of completed tables.

Objectives to Meet Your Goals	Potential objective	Rank selected objectives
<i>Natural area improvement</i>		
I have a grassy field or lawn I want to plant in trees.		
I want to manage exotic and/or invasive species.		
I want to improve the health of my natural area.		
I want to improve forest regeneration (tree reproduction).		
I want my trees to grow faster.		
I want to cut dangerous dead or damaged trees.		
I want to cut vines that are strangling and/or weighing down my trees.		
Other:		
Other:		
<i>Forest products</i>		
I want to cut firewood for myself or others.		
I want to start a forest products enterprise for fun and a little extra money.		
Specific enterprise of interest:		
Other:		
Other:		
<i>Wildlife habitat elements</i>		
I want to create some snags for woodpeckers and other cavity-nesting animals.		
I want to create a soft edge between my lawn and forest to improve wildlife habitat diversity.		
I want to provide more shelter and/or food for wildlife.		
I want to have more reptiles and amphibians.		
I want to discourage deer.		
I want to attract more wildlife to my property.		
Specific species of interest, if applicable:		

	Potential objective	Rank selected objectives
Other:		
Other:		
<i>Water resources</i>		
I want to create or enhance a riparian forest buffer.		
I want to protect the water quality in my waterway or spring/seep.		
Other:		
Other:		
<i>Recreation</i>		
I want to build a recreational trail.		
I want to build a road to provide or improve vehicle access.		
I want to create a special place in the woods for reflection, campfires, etc.		
I want to create a place for nature study.		
I want to build a tree stand for deer hunting and/or wildlife viewing.		
Other:		
Other:		
<i>Aesthetics</i>		
I want to make my forest more colorful throughout the year.		
I want to block an unpleasant view or have more privacy.		
I want to create a scenic view.		
I want to protect some special trees.		
Other:		
Other:		

The rankings in this table should identify your top five priorities for land management activities.

Congratulations on completing a step-by-step assessment of your natural area resources and identifying

your land management goals, while learning a little about forestry and wildlife along the way! Now let's think about putting your ideas into practice.

Activity 19

Project Schedule and Details

Fill in the table below for specific projects you want to complete. When it's done, you'll know where to begin on your land management projects. Don't get discouraged if you fall behind schedule. Remember that doing any well planned land management work

is better than doing none. Each little step you take will move you closer to your goals. Keep at it and readjust your timetable as needed once you have a better feel for how you're progressing. See page 75 for the Nelsons' project schedule.

Management unit	Goal	Project description (Provide details and step-by-step activities)	Priority	Start date	Projected completion date	Who will do it?	Cost estimate

Management unit						
Goal						
Project description (Provide details and step-by-step activities)						
Priority						
Start date						
Projected completion date						
Who will do it?						
Cost estimate						

Activity 20

Record Your Progress

Paste in pictures of your land at different times as you complete projects. Use the table on page 104 to track your progress and record what you learn through practical experience. See page 77 for the Nelsons’ answers.

Your Natural Area Photos



Activity 20
Record Your Progress

Your Natural Area Photos

Activity 20

Record Your Progress

Actual Project Completion Data

Managed unit	Project	Date completed	Actual cost vs. projected cost	Comments

Case Study 1



The Lees

Property description and why we bought the land

We (my husband, Philip, age 55, and me, Gloria, age 57) bought our 1.5-acre lot 25 years ago as the site for our new home. We wanted to build a passive solar house, so the site had to have good sun exposure. We wanted to buy a lot large enough to have a canning garden, a small orchard, and a Christmas tree plantation yielding about 20 trees a year, and to be separate from our neighbors.

The lot we bought was just about perfect. It's long and relatively narrow, about 480 feet long and 130 feet deep. A wooded fencerow runs behind the house. Behind that on the north side, along the edge of our property, there's a narrow right-of-way that the local electric company keeps open. This provides a path through the thicket that has developed behind the house. We often see deer, turkeys, and rabbits along this pathway. On the west side there's a patch of mixed deciduous trees with some conifers in the back corner and lawn in the front corner. In the back corner on the eastern side we planted Christmas trees soon after we moved in. A stream, Trout Run, lies over the hill about 250 yards to the north on our neighbors' property. It isn't very wide, but it has some small pools—somewhere for animals to drink even in the driest years.

Changes over time

Now, nearly 25 years after buying the lot, things have changed. We didn't really manage it, so the Christmas tree plantation (Douglas firs) no longer provides any

trees. Some of these trees are now pushing 30 feet in height. The wooded patch on the west side of the property has a mix of European alder, Scotch pine, eastern white pine, American elm, basswood, black walnut, and a couple of red oak trees. The tallest trees are probably 40 feet tall. The fencerow behind the house is widening. It now extends about 25 feet in places into our property. The fencerow has some trees, mostly ash, black cherry, black walnut, elm, and basswood, but much of the greenery is bush honeysuckle and autumn olive—exotic, invasive plants.

Where to go from here

We'd like to convert the lawn area on the west side to trees for more privacy. We'd also like to keep all the native trees throughout the woods on the west side and encourage even more trees. We don't like the fact that the fencerow is full of exotic plants, because they are really pushy. Every year, they take over more of the lot and make it hard to see into the edges. We never planted these species; they just showed up on their own. We'd like to open a patch in the Christmas trees, creating a natural haven or quiet place to sit. Deer and birds use this small patch of trees—it is a special place on the property.

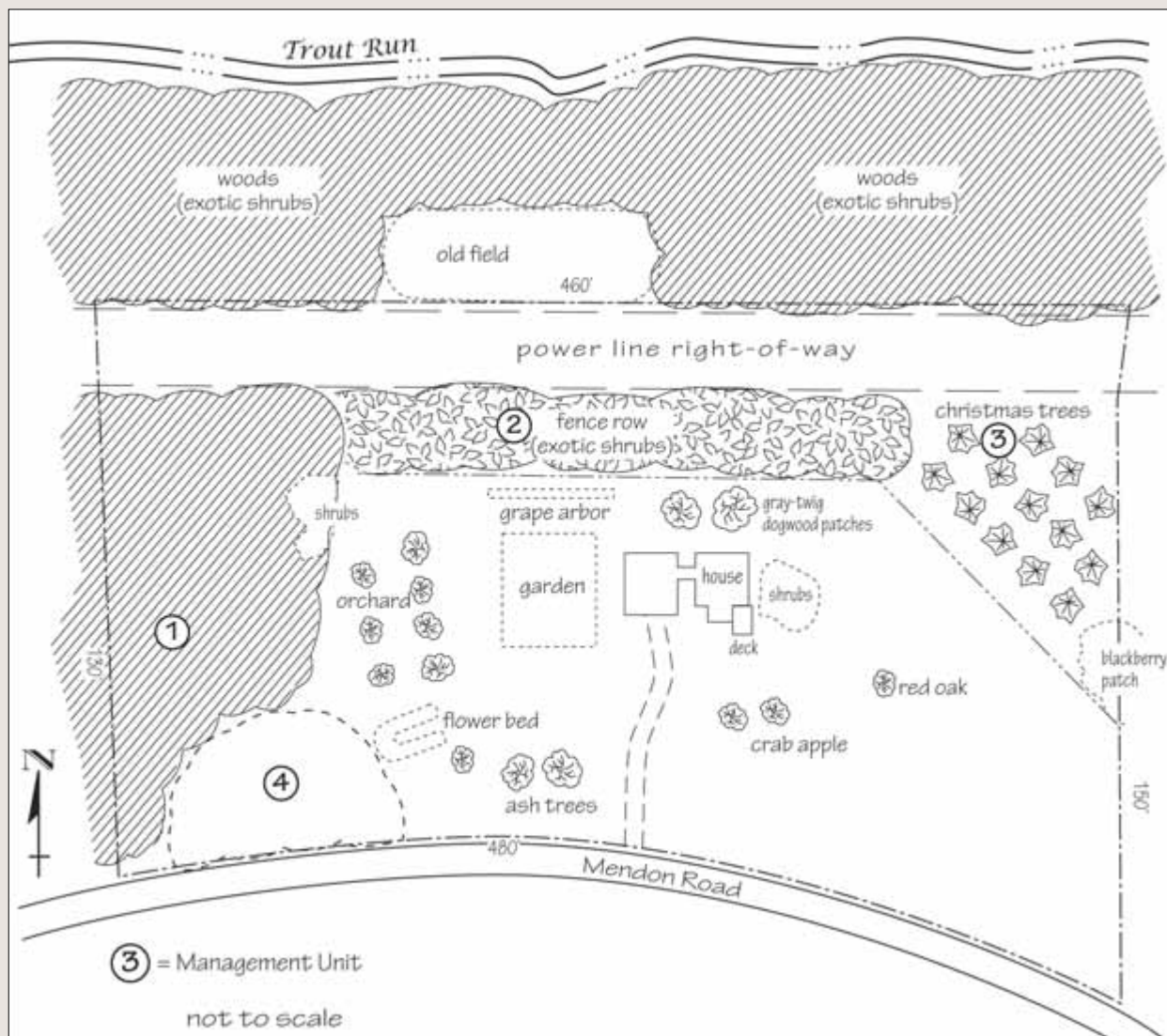
The Lees' statement of interests

1. Remove exotic plants as much as possible; keep native wildlife food plants (walnuts, oaks, some grapes).
2. Plant lawn on west side in trees for more privacy.
3. Develop a natural haven in the Douglas fir area.

Interests Table

Resource benefits	Human values				
	Income production	Enhance property value	Personal satisfaction	Privacy and sanctuary	Reduced lawn mowing
Natural area improvement			1		
Forest products					
Wildlife habitat					
Water resources					
Recreation					
Aesthetics				3	2

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Land Characteristics and Potential
(a combination of Tables A, B, and C in Parts II–IV)

Managment unit	Vegetation type	Three most common tree species	Three most common shrub species	Succession stage	Thinning recommended? (yes or no)	Young trees present? (yes or no)
1	west woods—mixed hardwoods and a few conifers	European alder, Scotch pine, American elm	sumac	3	no	yes
2	north fencerow	ash, black cherry, walnut	bush honeysuckle, autumn olive, mile-a-minute vine	2–3	no	yes, mostly invasive and exotic species
3	Christmas tree planting	Douglas fir	grapevine, blackberry, sumac	3	no	no
4	west lawn	n/a	n/a	1	n/a	no

Land Characteristics and Potential

(continued)

Broken or dead? (yes or no)	Exotics/ invasives (list names)	Water resources	Wildlife and habitat elements	Recreation	Aesthetics
yes	garlic mustard, English ivy	n/a	Soft mast; winter cover	Deer trails present, but no maintained trails for wildlife viewing or access.	Green foliage of pines all winter provides color in winter landscape.
no	bush honeysuckle, autumn olive, multiflora rose	n/a; Trout Run down hill on neighbor's land; close enough to expect occasional wildlife moving to and from the stream.	Soft mast from brambles and shrubs, dense thicket for shelter, soft edge.	Good wildlife viewing opportunities but no maintained trail access.	Invasive species and other vegetation smothering trees and making it hard for tree crowns to develop for fall foliage color.
Yes, some fir trees are dying or dead.	grapevine	n/a	Dense winter cover, soft mast, a few dense thickets.	Some existing deer trails could be developed as walking trails.	Secluded location provides for solitude.
4	lawn grass	n/a	none	Lawn games	Plant in trees for privacy.

Identify and Rank Your Objectives

	Potential objective	Rank selected objectives
<i>Natural area improvement</i>		
I have a grassy field or lawn I want to plant in trees.	X	2
I want to manage exotic and/or invasive species.	X	1
I want to improve the health of my natural area.	X	4
I want to improve forest regeneration (tree reproduction).		
I want my trees to grow faster.		
I want to cut dangerous dead or damaged trees.		
I want to cut vines that are strangling and/or weighing down my trees.		
Other:		
<i>Forest products</i>		
I want to cut firewood for myself or others.	X	
I want to start a forest products enterprise for fun and a little extra money.		
Specific enterprise of interest:		
Other:		
<i>Wildlife habitat elements</i>		
I want to create some snags for woodpeckers and other cavity-nesting animals.		
I want to create a soft edge between my lawn and forest to improve wildlife habitat diversity.		
I want to provide more shelter and/or food for wildlife.	X	5
I want to have more reptiles and amphibians.		
I want to discourage deer.		
I want to attract more wildlife to my property.	X	
Other: I want to attract more hummingbirds and butterflies.	X	
<i>Water resources</i>		
I want to create or enhance a riparian forest buffer.		
I want to protect the water quality in my waterway or spring/seep.		
Other:		
<i>Recreation</i>		
I want to build a recreational trail.		
I want to build a road to provide or improve vehicle access.		
I want to create a special place in the woods for reflection, campfires, etc.	X	3

Identify and Rank Your Objectives

(continued)

	Potential objective	Rank selected objectives
I want to create a place for nature study.		
I want to build a tree stand for deer hunting and/or wildlife viewing.		
Other:		
<i>Aesthetics</i>		
I want to make my forest more colorful throughout the year.		
I want to block an unpleasant view or have more privacy.	X	
I want to create a scenic view.		
I want to protect some special trees.		
Other:		

Project Schedule and Details

Management unit	Goal(s)	Project description (Provide details and step-by-step activities)	Priority	Project start date	Projected completion date	Who will do it?	Cost estimate
4-west lawn	plant to trees	Use Roundup herbicide on the grass in the fall before planting in the spring. Use some conifers for winter privacy. Use mainly shade-intolerant trees, including eastern white pine, yellow poplar, black locust, red oak, black cherry, gray dogwood, and loblolly pine. Order bare root seedlings from state nursery in late fall. Plant on a 10' x 10' spacing in this 1/4-acre area (~75 trees). Install a tree shelter and a wooden stake around each hardwood seedling to protect it from deer browsing. Conifers typically do not need shelters because deer tend not to eat them. If necessary, use wire mesh to protect them. Respray the grass between the hardwood rows with herbicide in the summer after planting if needed. Mow around conifers instead of using herbicide. If desired for a neater appearance, mow between rows until canopy closes.	1	This fall	End of next spring	Phillip and Gloria with help from their child Robin.	\$100 for plants at ~\$1.35 per plant; \$30 for Roundup herbicide and backpack sprayer. \$250 for tree shelters and stakes at \$4-5 each (50 shelters; ~25 conifers)
through-out the property	manage exotic species	The various exotic plants are competing with native species. Herbicide invasive species on ground using Roundup in a backpack sprayer in early spring, late summer, and fall. Cut most grapevines. Start in the north fencerow, then west woods, then Christmas tree grove. Clear trail as necessary to access invasives and to provide access to property.	2	This spring	Continuous in growing season	Phillip, Gloria, and Robin	Estimated \$35 per year for herbicides and \$50 for saw maintenance
3-Christmas tree grove	create a natural haven	Create an opening by removing dead or dying trees. Install a bench and plant some flowering trees and shrubs. If time allows, create openings for a campfire circle or camping area.	3	Next spring	End of next spring	Phillip and Robin will create the opening and Gloria will do the planting.	\$100 for bench materials; \$100 for trees and shrubs
1-west woods	white pine planting	As exotics are cut, replace them with white pine.	4	This spring	Continuous	Gloria	\$50 for seedlings

Case Study 2



The Rothmans

Property description and why we bought the land

Recently, we (my wife, Aliza, age 44; me, Hirsh, age 45; our children, Jody, age 17, and Chris, age 15) purchased a site for our new home. We call it the Pine Woods. For several years, we'd been searching for the ideal place to build. We wanted a forested tract with good access into the woods and the home site, yet isolated enough that we felt we were in the woods. We also wanted a relatively large tract with diverse tree species and wildlife management opportunities.

The Pine Woods meets our needs perfectly. The total area is about 10 acres. The lot is on a dirt road off the road to town. Once the dirt road enters the woods, it loops completely around the property and we own the entire loop. This will give us a place to walk and easy access to firewood to help heat the house.

The property has three streams that flow year-round. Two of them (Rocky Run and Stony Creek) originate from springs on the property. The one on the east side (Farm Creek) starts at a spring just over the property line. We thought maybe we could make a pond on the property, but the soil has limestone under it and we've been told that building a pond here would not be easy. That's okay because we like the streams.

Land management history

The Pine Woods is on the north side near the bottom of a large hill. In some areas there are lots of rocks on the surface, but we are told that the soil is really productive. Because of the rocks, the site was never cleared for farming; however, there is wire in some of the trees, so we think that parts of it may have been pastured.

The previous owner, Chuck Brown, who still owns some of the land to the southwest of us, had done some timber harvesting in the woodlot over the past 20-some years. He had worked with a state forester on each occasion to meet his specific objectives. His objectives closely paralleled our interests, except we

don't need to earn income from timber sales. However, if sometime in the future we make some timber income, that'd be fine.

Anyhow, Mr. Brown did some cutting for wildlife. On the north side, near our neighbor's cornfield, there's a small cut (less than an acre in total) done in the early 1980s to leave nut-producing hickory trees and to make some wildlife cover. This has come back mostly in eastern white pine. Two of the remaining hickories have since blown over, and the area where they stood is full of what we've been told are "exotic invasive plants." Most of them are honeysuckle, multiflora rose, barberry, and autumn olive. We don't know anything about these plants, but have been told that they are not desirable.

In the southeast corner of the property is a 2-acre clearcut that Mr. Brown did for two reasons: first, to make some money to pay for the road that loops through the woods, and second, to open the forest around some aspen trees. Again, we don't know much about these trees, but are told they are important for ruffed grouse. Many little aspens have sprouted in this area, but another invasive plant, Asian bittersweet, is quickly crowding them out. We've been cautioned that we should cut the Asian bittersweet, but we want to leave a bit of it because this fall the plants were full of pretty orange berries that work really well in dried flower arrangements.

To the west of this clearcut, there is another area of cutting. Mr. Brown liked this spot because it's near an old foundation that he says dates back to the late 1700s. In about 1984, Mr. Brown decided to cut most of the black birch trees in this area and to leave some really tall eastern white pine trees. Now, about 20 years later, the whole area is full of young white pine trees that are 6 to 25 feet tall. It's so quiet and restful among all those trees. We plan to build our house among these pines, near the old stone foundation, which we intend to work into our landscaping, preserving its historic value.

The biggest portion of the property is encircled by the road. It consists of a mature deciduous stand with quite a few white pine mixed in. This kind of vegetation also runs along the northern border of the property. The area along the streams is shrubby and dense. There are some standing dead trees with large holes in them. The kids have seen birds flying in and out of these holes. There are some areas of broken and damaged trees.

We've learned a lot about the woods from Mr. Brown. He really loved the area. Like we said earlier, his objectives and ours mostly mesh. He wanted to produce firewood, encourage wildlife, have a place to hunt deer,

and earn some income. We need the firewood, welcome the wildlife, and will still allow Mr. Brown to hunt with a bow on the property as long as he tells us when he'll be out there. We want to keep the deer population in check. We know we have a lot to learn.

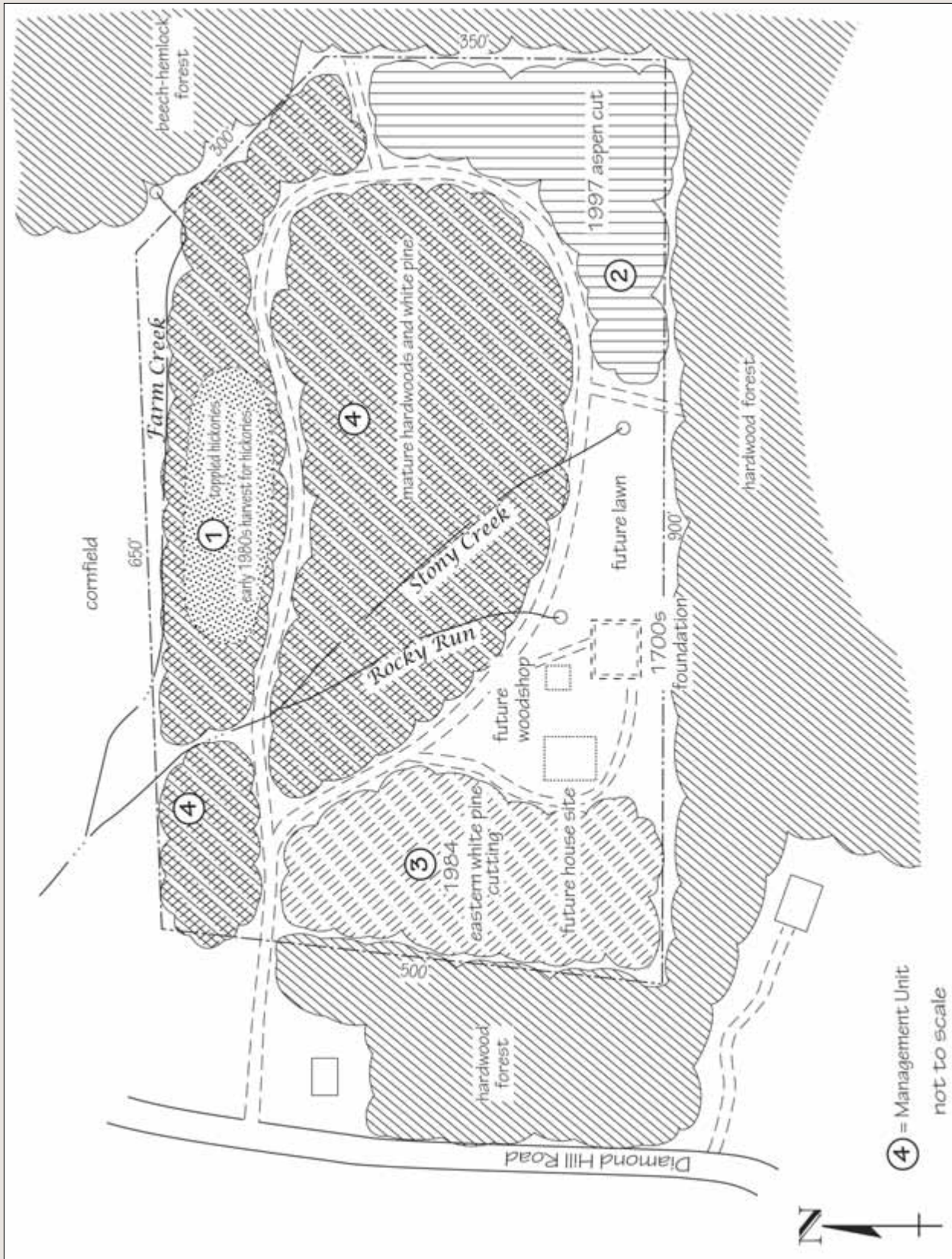
The Rothmans' statement of interests

1. Produce one to two cords of wood annually to heat the house and woodshop.
2. Encourage a variety of wildlife.
3. Maintain a healthy forest.
4. Maintain stream culverts in good repair.

Interests Table

Human values					
Resource benefits	Income production	Enhance property value	Personal satisfaction	Privacy and sanctuary	Reduced lawn mowing
Natural area improvement		3			
Forest products			1		
Wildlife habitat			2		
Water resources		4			
Recreation					
Aesthetics					

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Land Characteristics and Potential
(a combination of Tables A, B, and C in Parts II–IV)

Management unit	Vegetation type	Three most common tree species	Three most common shrub species	Succession stage	Thinning recommended? (yes or no)	Young trees present? (yes or no)
1	north edge hickory wildlife cutting (early 1980s)	hickory, white pine, red oak	honeysuckle	3	no	yes
2	1997 aspen clearcut (2 acres)	aspen, elm	Asian bitter-sweet, grape-vines	2–3	no	yes
3	1984 Pine Woods cut	white pine, red oak, black birch	spicebush	3	no	yes
4	bulk of property	white pine, elm, black birch, red maple, sugar maple, hickory	hop hornbeam	4	yes	yes

Land Characteristics and Potential

(continued)

Broken or dead? (yes or no)	Exotics/ invasives (list names)	Water resources	Wildlife and habitat elements	Recreation	Aesthetics
2 toppled hickories	honeysuckle, autumn olive, multiflora rose, barberry, grapevines	Farm Creek is near edge of this patch.	Hickory and oak mast trees, white pine, grapevines. Farm Creek nearby.	Good place for wildlife watching, but there's no place to sit. Invasives cover up old hiking trails and make access difficult.	n/a
no	bittersweet, grapevines, multiflora rose	n/a	Aspens, grouse habitat, early successional habitat, grapevines.	Good for wildlife watching. Lack of maintained trails to provide easy access.	n/a
no	barberry	Rocky Run and Stony Creek originate here. Dense thicket.	White pine, oak mast, black birch, early successional habitat. 2 springs.	Lack of maintained trails for access.	Clear around old foundation and integrate into yard.
a few	barberry	Rocky Run and Stony Creek pass through. They pass under the dirt road in culverts.	Hard and soft mast. A few snags and cavity trees. Some dense thickets. Stream habitat.	Deer trails but few maintained hiking trails for access. Many secluded areas with open understory that could be used for camping or fire circle. A few old hunter's tree stands scattered throughout the area.	Good fall color from sugar maple.

Identify and Rank Your Objectives

	Potential objective	Rank selected objectives
Forest improvement		
I have a grassy field or lawn I want to plant in trees.		
I want to manage exotic and/or invasive species.	X	4
I want to improve the health of my natural area.	X	3
I want to improve forest regeneration (tree reproduction).	X	
I want my trees to grow faster.	X	
I want to cut dangerous dead or damaged trees.	X	
I want to cut vines that are strangling and/or weighing down my trees.	X	
Other:		
Forest products		
I want to cut firewood for myself or others.	X	1
I want to start a forest products enterprise.	X	
Specific enterprise of interest:		
I want to commercially harvest high-value trees.	X	
Other:		
Wildlife management		
I want to create some snags for woodpeckers and other cavity-nesting animals.	X	
I want to create a soft edge between my lawn and forest to improve wildlife habitat diversity.		
I want to provide more shelter and/or food for wildlife.	X	2
I want to have more reptiles and amphibians.	X	
I want to discourage deer because they eat understory vegetation.		
I want to attract more wildlife to my property so I may enjoy viewing them.	X	
Other:		
Water resources		
I want to create or enhance a riparian forest buffer.		
I want to stabilize a stream bank that is eroding.		
Other: I want to protect the road in the woods from erosion.	X	5
Recreation		
I want to build a recreational trail.	X	
I want to build a road to provide or improve vehicle access.		

Identify and Rank Your Objectives
(continued)

	Potential objective	Rank selected objectives
I want to create a special place in the woods for reflection, campfires, etc.	X	
I want to create a place for nature study.		
I want to build a tree stand for deer hunting and/or wildlife viewing.		
Other:		
Aesthetics		
I want to make my forest more colorful throughout the year.		
I want to block an unpleasant view or have more privacy.		
I want to create a scenic view.		
I want to protect some special trees.		
Other:		

Project Schedule and Details

Management unit	Goal(s)	Project description (Provide details and step-by-step activities)	Priority	Start date	Projected completion date	Who will do it?	Cost estimate
Mainly 4, some 3	Cut 1 to 2 cords of firewood annually; remove black birch trees	Birch occurs throughout units 3 and 4, often competing with more desired trees (e.g., white pine, oak). We will remove various kinds of trees that compete with desired species and good trees, but we will concentrate on cutting birch. We will also cut storm-damaged trees and trees that interfere with good mast-producing trees.	1	Annual	Annual	The family will all participate in cutting as they are able. If we find that it is too much work for us, we may hire a tree expert to help some-times.	\$150 per year for chainsaw depreciation and fuel.
4	Improve wildlife nesting opportunities	Create 2–3 snags per acre by girdling live trees; cut dangerous trees for firewood.	2	ASAP	1 month after start	Hirsh and Chris	\$15 for chainsaw fuel
Through-out the property	Manage exotic species	It is now apparent that exotic species are a problem, occurring in all the stands on the property. Continually remove all invasive plants along road. Apply herbicides to all other invasive plants as found, except around springs and streams.	3	This summer	Continuous in growing season	Aliza and Jody will cut. Hirsh will apply herbicide.	Estimated \$100 per year for herbicide.
4	Maintain road for travel around the woods	There are 3 culverts on the road system and some are starting to wash out. Hire a consultant every other year or as needed to check for necessary repairs. If the headwalls are damaged, they can be repaired with materials from the property. Heavy equipment may be required to reshape the road so water drains properly.	4	This spring, then every other year	Maintenance as needed	Hirsh will monitor culverts and oversee consultant.	3 hours of machine time at \$100 per hour, as needed.

Appendices



Appendix A

Summary of Some Characteristics of Important Tree Species in the Mid-Atlantic/Northeast Region

Species	Seed dissemination			Shade tolerance			Growth rate			Longevity (yrs)			Injurious agents				Sprouting	
	Gravity	Ani- mals	Wind	Intol.	Inter- med.	Tol.	Slow	Med.	Fast	<100	100– 200	>200	Fire	Gypsy moth	Deer	Other	Yes	No
Ash			X	X					X		X				X	X	X	
Aspen			X	X					X	X			X		X	X	X	
Basswood, American	X					X			X			X	X	X	X		X	
Beech, American	X	X				X	X					X	X		X	X		
Birch, sweet			X		X			X			X		X			X		X
Birch, yellow			X		X				X			X	X		X	X		X
Black- gum	X	X				X		X			X		X		X		X	
Cedar, eastern red	X			X			X				X		X		X			X
Cherry, black	X	X		X					X		X		X		X	X	X	
Hemlock, eastern			X			X	X					X	X	X	X	X		X
Hickory	X	X			X			X				X	X			X	X	
Locust, black	X	X		X				X		X			X		X	X	X	
Maple, red			X			X		X			X		X		X	X	X	
Maple, sugar			X			X		X			X		X		X	X	X	
Oak, black	X	X			X			X				X		X	X	X	X	

	Seed dissemination			Shade tolerance		Growth rate			Longevity (yrs)			Injurious agents				Sprouting		
	Gravity	Ani- mals	Wind	Intol.	Inter- med.	Tol.	Slow	Med.	Fast	<100	100– 200	>200	Fire	Gypsy moth	Deer	Other	Yes	No
Oak, chestnut	X	X			X		X					X		X	X	X	X	
Oak, red	X	X			X				X			X	X	X	X	X	X	
Oak, scarlet	X	X		X					X		X		X	X	X	X	X	
Oak, white	X	X			X		X					X	X				X	
Pine, eastern white			X		X				X			X		X	X	X		X
Pine, loblolly			X	X					X		X					X		X
Pine, pitch		X	X	X			X				X					X	X	
Pine, shortleaf		X	X	X				X			X					X	X	
Pine, Virginia		X	X	X				X		X						X		X
Poplar, yellow		X	X	X					X			X	X				X	
Sweet- gum		X	X	X					X			X	X	X			X	
Sycamore, American		X		X				X			X				X	X		
Walnut, black	X	X		X					X		X					X	X	

Adapted from: Hicks, R.R., Jr. 1998. *Ecology and Management of Central Hardwood Forests*. Copyright © 1998, John Wiley & Sons, Inc. Reprinted with permission of John Wiley & Sons, Inc.

Appendix B

Relative Value of Various Tree Species as Wildlife Food*

Species/food value	Buds	Twigs	Bark	Foliage	Mast	Catkins
<i>Very high</i>						
Apple	X	X	X		X	
Cherry, black	X	X		X	X	
Dogwood	X	X		X	X	
Oaks	X	X	X	X	X	
Pine, eastern white	X	X				
<i>High</i>						
Ash, mountain	X	X		X	X	
Aspens	X	X	X	X	X	
Beech	X	X		X	X	
Hemlock	X	X	X	X	X	
Maples	X	X	X		X	
Pine, pitch	X				X	
Serviceberry	X	X	X	X	X	
<i>Medium</i>						
Alder	X	X		X	X	X
Ashes		X		X	X	
Birches	X	X	X	X	X	X
Blackgum	X	X		X	X	
Butternut					X	
Cedar, red		X		X	X	
Cedar, white		X		X	X	
Cottonwood	X	X	X	X		X
Elms	X	X		X	X	
Fir, balsam		X	X	X	X	
Hickories		X	X	X	X	X
Hawthorne	X	X		X	X	
Holly		X		X	X	
Mountain laurel	X	X		X	X	
Mulberry					X	
Pine, red	X				X	
Poplar, yellow		X		X	X	
Spruce			X	X	X	
Sumac, staghorn		X	X	X	X	
Walnut, black		X			X	
Willow						
Yew				X	X	

Species/food value	Buds	Twigs	Bark	Foliage	Mast	Catkins
<i>Low</i>						
Hackberry		X		X	X	
Hophornbeam	X	X		X	X	X
Larch	X	X	X	X	X	
Musclewood	X	X	X	X	X	X
Pine, loblolly	X				X	
Rhododendron	X	X		X		
Sassafras	X	X	X	X	X	X
Spruce, Norway			X	X	X	
Sweetgum	X			X	X	
Sycamore		X			X	
Witch hazel	X	X	X	X	X	X

*Note: These food values are general and will vary with the time of year and the combination of available foods at a site. All species listed are used by both mammals and birds, except for black walnut and butternut, which are used exclusively by mammals.

Sources: Mollie Beattie, Charles Thompson, and Lynn Levine. *Working with Your Woodland: A Landowner's Guide*. © 1993 by University Press of New England. Reprinted with permission. Also adapted from R.J. Gutierrez et al., Managing Small Woodlands for Wildlife, Information Bulletin No. 157. Cornell University, Ithaca, NY, 1979, p. 23.

Appendix C

Basic Habitat Requirements, Food Sources, and Management Opportunities for Common Kinds of Wildlife, Eastern United States

Species	Habitat	Food sources	Management opportunities	Potential consequences
Bats	Sheltered areas such as hollow trees, rock outcrops, ledges, and caves for roosting	Insects	Erect bat houses; provide a water source to attract insects; do not disturb nesting bats; educate neighbors on the benefits of bats; let hollow trees stand	Bats may take up residence where you don't want them. Seal house and other structures tightly before encouraging bats.
Blackbird, red-winged	Very shallow water or wet ground with emergent aquatic vegetation ; nest in dense clumps of vegetation by water	Waste grain, seeds of annual forbs, insects	Encourage cattail wetlands; leave unharvested grain; plant grain food plots, especially by wetlands	Farming neighbors may not appreciate extra birds, which may eat their grain crops.
Bluebird, eastern	Nest in natural tree cavities, nest boxes; mix of shrubby to mature forest	Seeds, insects, spiders, and fruit	Erect bluebird houses; create soft edge	
Butterflies	Bushes and flowers that provide food, egg-laying surface, and shelter from wind, including aster, verbena, zinnia, marigold, lilac, butterfly bush; chokecherry, cottonwood and tulip tree for tiger swallowtail; butterfly weed and milkweed for monarchs; dill, parsley, carrot for black swallowtail; hollyhock, dill, thistle, and sunflower for painted lady; water can help attract butterflies	Sweet liquids such as nectar from flowers	Plant flowers and shrubs known to host all stages of 'butterflies' lives; plant native species; remove invasive plant species; provide a water source	
Coyote	Hunt in forest clearings and edges; den in abandoned burrows, ledges, or caves	Small mammals, birds, eggs, frogs, snakes, insects, carrion, fruit	Create soft edge; keep cats indoors to reduce hunting pressure on small mammals; create forest clearings	Coyotes are not native to the East Coast. They are invasive and probably doesn't need human assistance in spreading their range.
Deer, white-tailed	Mix of grassy, shrubby, and immature forest areas; conifers in winter	Acorns, nuts, shrubs, forbs, grasses, waste grain, tree seedlings, mushrooms, grass, bark, twigs, lichens, conifers in winter	Create soft edge; plant grain food plots; plant small patches of conifers in deciduous plots; plant or release oak trees	Deer eat many kinds of greenery that people plant in their yards and gardens.

Species	Habitat	Food sources	Management opportunities	Potential consequences
Duck, mallard	Thick grass, forbs for nesting; open water with emergent aquatic vegetation; wetlands with open water in winter	Aquatic plants and insects; unharvested grain	Plant grain food plots near wetlands; create or enhance soft edge by wetlands; remove excessive aquatic vegetation	
Foxes	Hunt in forest clearings and edges; den in abandoned burrows, ledges, or caves	Small mammals, birds, eggs, frogs, snakes, insects, carrion, fruit	Create soft edge; keep cats indoors to reduce hunting pressure on small mammals; create forest clearings	
Frogs	Permanent bodies of standing or slow-moving water; shorelines with dense emergent vegetation adjacent to shallow open water with floating and submerged aquatic vegetation; soft mud bottom under unfrozen water for hibernation	Snails, insects, crayfish, other frogs, fish, reptiles, snakes, occasionally small mammals and birds	Create or enhance wetland habitat; create diversity of habitat types in wetland; protect vernal pools from herbicide and pesticide applications; create pond	
Goose, Canada	Water bodies with grassy banks; open lawns	Grass, herbaceous vegetation	Clear vegetation from banks of water bodies; maintain banks in short grass	Banks with short grass are of little value to other kinds of wildlife. Geese can be aggressive towards people and leave a mess with their droppings.
Grouse, ruffed	Moderately dense brush, mature aspens, young forests	Leaves, fruits, insects, snakes, frogs, salamanders, flower buds, catkins	Leave large downed logs for drumming; do small clearcut to encourage shade-intolerant species; provide a variety of age classes of aspen	
Hawks	Open fields, forest edges; often perch in snags	Insects, frogs, salamanders, snakes, birds, crayfish, small mammals	Let snags stand; build brush and/or rock piles to encourage presence of hawks' prey	
Hummingbird, ruby-throated	Shrubby to mature forest; often nest over water; attracted to many flowering plants, including cardinal flower, columbine, bee balm, and hibiscus	Flower nectar, nectar feeders	Plant or hang pots of red or pink tubular flowers; hang nectar feeders; create soft edge	
Owls	Trees with large cavities	Small mammals, snakes, large insects, fish, amphibians	Let trees with cavities or those known to contain nests stand	Snags and hollow trees can be hazardous to human safety.
Rabbit, cottontail	Brushy fields, forest openings, especially intermixed with croplands; stream corridors	Forbs, grasses; bark of shrubs and trees such as red maple, apple, alder; and aspen in winter	Create soft edge; plant grain and/or hay food plots	Rabbits eat many kinds of greenery that people like to plant in their yards and gardens.

Species	Habitat	Food sources	Management opportunities	Potential consequences
Raccoon	Typically near water; prefer areas with mixed and varied successional stages, especially immature to mature riparian forests; large tree cavities for denning	Eggs, fish, small mammals, insects, crayfish, birds, grains, seeds, fruits, pet food, garbage	Create or enhance wetland habitat; create soft edge; let cavity trees stand	Raccoons may eat pet food that is left outside and get into garbage cans.
Salamanders	Small streams; wet forested areas; springs and seeps; under rocks and logs; vernal pools	Earthworms, insects, leeches, crayfish, small crustaceans and snails, frog eggs	Create, encourage, or protect wetland habitat; protect vernal pools from herbicide and pesticide applications	
Squirrels	Immature to mature oak forests; cavity trees	Acorns and other nuts, grains, seeds, mushrooms, buds, fruit	Provide squirrel houses; hang squirrel and/or bird feeders; plant or release oak trees; let trees with cavities or known nests stand	Squirrels may take up residence where you don't want them. Seal house and other structures tightly before encouraging squirrels. They can eat so voraciously that feeding becomes expensive. Birds may have a hard time getting to the feeder. Bird-feeding neighbors may not appreciate squirrels.
Snakes	Wet or moist areas; rocky areas; rock, brush, and log piles	Insects, birds, eggs, snakes, fish, frogs, earthworms, small mammals, turtles	Create rock or brush piles; enhance wetland edge habitat	
Turtles	Small ponds, marshy meadows, bogs, forested swamps, ditches, lakes, rivers	Aquatic plants, insects, crayfish, mollusks, forbs, fish, snails, spiders, earthworms, carrion	Create, encourage, or protect wetland habitat; protect vernal pools from herbicide and pesticide applications	
Turkey, eastern wild	Extensive oak forests intermixed with open land; usually nest within ¼ mile of water	Seeds, nuts, acorns, insects, waste grain, tubers, snails, centipedes, millipedes, grass	Plant grain food plots in forest clearings; create soft edge; enhance wetland edge; release mast trees	
Woodcock	Lush, dense, sunny areas of shrub or young trees; young alders and aspen; old fields and forest clearings of at least ¼ acre	Earthworms, ants, flies, beetles, crickets, caterpillars, grasshoppers, larvae	Maintain an uneven-aged forest ; harvest large trees that block light; create soft edge	
Wood duck	Open, slow-moving, shallow water adjacent to mature forest with mast-producing trees; cavity trees or nest boxes	Nuts, grasses, grain, seeds of aquatic plants, insects	Erect nest boxes; let cavity trees stand	
Woodpeckers	Snags	Insects in rotting wood	Let snags stand; girdle trees to create snags	Woodpeckers may damage wood siding on structures.

Appendix D

Tree and Shrub Uses and Site Requirements, Eastern United States

Species	Water-shed/soil protection	Buffer planting	Wildlife value	Wind-break	Afforestation	Moisture needs	Light needs
<i>Conifers</i>							
Cedar, eastern red	X		X	X	X	Low	High
Hemlock, eastern	X		X	X		Medium	Low
Pine, eastern white	X	X	X	X	X	Low	High
Pine, loblolly	X	X	X	X	X	Medium	High
Pine, pitch	X	X		X		Medium	High
Pine, red	X		X	X	X	Low	High
Pine, Virginia	X				X	Low	High
Spruce, Norway	X	X	X	X	X	Medium to high	Medium
Spruce, white	X	X	X	X	X	Low	High
<i>Hardwoods</i>							
Ash, green	X	X	X		X	High	Medium
Ash, white	X	X	X		X	High	High
Beech, American	X		X			Low to high	Low
Birch, sweet	X		X			Medium	Medium
Birch, yellow	X		X			Medium	Low to medium
Cherry, black	X	X	X		X	Medium to high	Medium
Chokecherry, common	X	X	X		X	Medium	High
Crabapple, sweet	X		X		X	Medium	High
Cottonwood/poplar, hybrid	X	X	X	X	X	Medium	High
Cypress, bald		X	X		X	Low to high	High
Dogwood, flowering	X	X	X		X	Medium	Low
Dogwood, red osier	X	X	X		X	High	Medium
Hickory, butternut	X		X			Medium	Medium
Hickory, shagbark	X		X			Medium	Medium
Hickory, pignut	X		X			Medium	Medium
Locust, black	X		X		X	Low to medium	High
Maple, red	X	X	X		X	Medium to high	High
Maple, silver	X	X	X			High	High
Maple, sugar	X		X		X	Medium	High
Oak, black	X	X	X		X	Medium to low	Medium

Species	Water-shed/soil protection	Buffer planting	Wildlife value	Wind-break	Afforestation	Moisture needs	Light needs
Oak, chestnut	X	X	X		X	Low	High
Oak, northern red	X	X	X		X	Medium	High
Oak, pin	X	X	X		X	Medium to high	High
Oak, swamp chestnut	X	X	X		X	High	High
Oak, white	X		X		X	Medium	Medium
Oak, willow	X	X	X		X	Medium to high	Medium to high
Pawpaw	X		X			High	Low
Persimmon, common	X	X	X			Medium	Medium
Plum, American	X	X	X		X	Medium to low	High
Redbud, eastern	X		X		X	Medium	Low
Sassafras	X	X	X		X	Medium	High
Serviceberry, downy	X	X	X			Medium	Low
Sweetgum	X	X	X			Medium	Medium
Sycamore, American	X	X	X		X	Medium to high	Medium
Walnut, black	X	X	X		X	Medium	Medium
<i>Shrubs</i>							
Arrowwood, southern	X	X	X	X		Medium	Medium to low
Blackhaw	X		X			Medium	Low
Buttonbush	X	X				High	Medium
Chokeberry, black	X	X	X			Medium	Medium
Dogwood, gray	X	X	X			Medium	Medium
Dogwood, silky	X	X	X			High	Medium to high
Hazelnut	X	X	X			Medium	Medium
Indigobush		X	X			High	High
Lespedeza, bicolor			X			Medium	Medium
Nannyberry	X	X	X		X	Medium to high	Medium to high
Sumac, fragrant	X	X	X		X	Medium	High
Sumac, smooth	X	X	X		X	Medium	High
Winterberry, common	X	X	X			Medium to to high	Low
Witch hazel		X	X			Medium	Medium to high

Source: Modified from Maryland Department of Natural Resources Nursery Catalog, [HTTP://WWW.DNR.STATE.MD.US/FORESTS/NURSURY/TREEINFO.ASP](http://www.dnr.state.md.us/forests/nursury/treinfo.asp)



Resources

Web addresses are provided for many publications here. Most can also be obtained in hard copy, often for free, by contacting the publisher. We have provided contact information for the University of Maryland, Penn State, and Virginia Tech Cooperative Extension publications offices because those are the most common sources listed here. However, Extension organizations in other states should be checked for their available resources. The Web addresses listed here represent just a few of the many possible sources of information. Web searches will bring up many additional sources. Resources from “.EDU” sites are unbiased and research-based. Government Web sites (”.GOV”) also provide good sources of unbiased information.

AGNR Publications
University of Maryland
Room 0300 Symons Hall, Bldg 076
College Park, MD 20742
[HTTP://WWW.AGNR.UMD.EDU/MCE/PUBLICATIONS/](http://www.agnr.umd.edu/MCE/PUBLICATIONS/)
E-mail: AGNRPUBLICATIONS@UMD.EDU
Ph: 301-405-4582

Publications Distribution Center
The Pennsylvania State University
112 Agricultural Administration Building
University Park, PA 16802-2602
[HTTP://PUBS.CAS.PSU.EDU/](http://pubs.cas.psu.edu/)
Ph: 814-865-6713
Fax: 814-863-5560
E-mail: AGPUBSDIST@PSU.EDU

Virginia Polytechnic Institute and State University
Extension Distribution Center
112 Landsdowne Street (0512)
Blacksburg, VA 24061
[HTTP://WWW.EXT.VT.EDU/RESOURCES/](http://www.ext.vt.edu/resources/)
Ph: 540-231-1320

Virginia Forest Landowner Update. [HTTP://WWW.CNR.VT.EDU/FORESTUPDATE/](http://www.cnr.vt.edu/forestupdate/)

Forestry and Wildlife Extension Education. University of Maryland Cooperative Extension. [HTTP://WWW.NATURALRESOURCES.UMD.EDU](http://www.naturalresources.umd.edu)

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Tree identification

Virginia Trees. Virginia Department of Forestry. [HTTP://WWW.DOF.VIRGINIA.GOV/TREES/INDEX.SHTML](http://www.dof.virginia.gov/trees/index.shtml)

Common Trees of Pennsylvania. Pennsylvania Bureau of Forestry. [HTTP://WWW.DCNR.STATE.PA.US/FORESTRY/COMMONTR/INDEX.ASPX](http://www.dcnr.state.pa.us/forestry/commontr/index.aspx)

Leaf Keys to Common Trees in Maryland (EB238). Maryland Cooperative Extension. [HTTP://WWW.AGNR.UMD.EDU/MCE/PUBLICATIONS/ORDERPUB.CFM?ID=526](http://www.agnr.umd.edu/MCE/PUBLICATIONS/ORDERPUB.CFM?ID=526)

Apsley, D.K., and K.L. Smith. 2002. Leaf identification key to eighty-eight Ohio trees. Ohio State University Extension. Bulletin 899. [HTTP://OHIOLINE.OSU.EDU/B899/](http://ohioline.osu.edu/b899/)

Index of Ohio's Trees. Ohio Department of Natural Resources. [HTTP://WWW.DNR.STATE.OH.US/FORESTRY/TREES/DEFAULT.HTM](http://www.dnr.state.oh.us/forestry/trees/default.htm)

Virginia Tech Tree ID Key. [HTTP://WWW.CNR.VT.EDU/DENDRO/DENDROLOGY/IDIT.HTM](http://www.cnr.vt.edu/dendro/dendrology/idit.htm)

Virginia Tech Tree Fact Sheets. [HTTP://WWW.CNR.VT.EDU/DENDRO/DENDROLOGY/SYLLABUS/BIGLIST_FRAME.HTM](http://www.cnr.vt.edu/dendro/dendrology/syllabus/biglist_frame.htm)

Many states make available through county cooperative extension offices a guide to the common trees of the state. In addition, there are dozens of commercially available guides such as the *Peterson Field Guide to Trees and Shrubs*, which has an excellent key that will help you through the identification process step by step. The Audubon Society's *Guide to Trees* contains excellent pictures but lacks a good key for identifying trees and shrubs. Look for these and other guide books in your local library or book store.

Tree selection

Virginia Tech Forest Landowner Fact Sheets. [HTTP://WWW.CNR.VT.EDU/DENDRO/LANDOWNERFACTSHEETS/INDEX.HTM](http://www.cnr.vt.edu/dendro/landownerfactsheets/index.htm)

Arbor Day Foundation tree guide. [HTTP://WWW.ARBORDAY.ORG/TREES/TREEGUIDE/](http://www.arborday.org/trees/treeguide/)

U.S. Department of Agriculture, Forest Service Handbook 654. Silvics of North America. [HTTP://WWW.NA.FS.FED.US/SPFO/PUBS/SILVICS_MANUAL/TABLE_OF_CONTENTS.HTM](http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm)

Planting trees

Tree Planting. U.S. Department of Agriculture, Natural Resources Conservation Service. [HTTP://WWW.NRCS.USDA.GOV/FEATURE/BACKYARD/TREEPTG.HTML](http://www.nrcs.usda.gov/feature/backyard/treepg.html)

Relf, D. 2001. Planting Shrubs. Virginia Tech. Pub. 426-701. [HTTP://WWW.EXT.VT.EDU/PUBS/ENVIROHORT/426-701/426-701.HTML](http://www.ext.vt.edu/pubs/envirohort/426-701/426-701.html)

Relf, D. 2001. Planting Trees. Virginia Tech. Pub. 426-702. [HTTP://WWW.EXT.VT.EDU/PUBS/ENVIROHORT/426-702/426-702.HTML](http://www.ext.vt.edu/pubs/envirohort/426-702/426-702.html)

Appleton, B.L., and S. French. 1996. Pub. 430-295. Tree and Shrub Planting Guidelines. [HTTP://WWW.EXT.VT.EDU/PUBS/TREES/430-295/430-295.HTML](http://www.ext.vt.edu/pubs/trees/430-295/430-295.html)

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Virginia State Nursery. 1-540-363-7000 [HTTP://WWW.VIPNET.ORG/SHOPPINGCART/CGI-BIN/HOME506.CGI](http://www.vipnet.org/shoppingcart/cgi-bin/home506.cgi)

Maryland State Nursery. 1-800-TREESMD [HTTP://WWW.DNR.STATE.MD.US/FORESTS/NURSERY/](http://www.dnr.state.md.us/forests/nursery/)

Pennsylvania State Nursery. Check the blue pages of your phone book for your nearest district office of the state Bureau of Forestry.

County cooperative extension offices

Virginia Directory of Local Extension Offices. [HTTP://WWW.EXT.VT.EDU/OFFICES/](http://www.ext.vt.edu/offices/)

Local Maryland Cooperative Extension Offices. [HTTP://WWW.AGNR.UMD.EDU/MCE/OFFICES.CFM](http://www.agnr.umd.edu/mce/offices.cfm)

Penn State Cooperative Extension County Directory. [HTTP://WWW.CAS.PSU.EDU/DIRECTORY/](http://www.cas.psu.edu/directory/)

State forestry departments

Maryland Department of Natural Resources, Forest Service. [HTTP://WWW.DNR.STATE.MD.US/FORESTS/](http://www.dnr.state.md.us/forests/)

Pennsylvania Bureau of Forestry. [HTTP://WWW.DCNR.STATE.PA.US/FORESTRY/](http://www.dcnr.state.pa.us/forestry/)

Virginia Department of Forestry. [HTTP://WWW.DOF.VIRGINIA.GOV/](http://www.dof.virginia.gov/)

State wildlife departments

Maryland Department of Natural Resources Wildlife Division [HTTP://WWW.DNR.MARYLAND.GOV/WILDLIFE/](http://www.dnr.maryland.gov/wildlife/)

Pennsylvania Game Commission [HTTP://WWW.PGC.STATE.PA.US/PGC/CWP/BROWSE.ASP?A=458&BC=0&C=69867&PGCNAV=|](http://www.pgc.state.pa.us/pgc/cwp/browse.asp?a=458&bc=0&c=69867&pgcnav=|)

Virginia Department of Game and Inland Fisheries [HTTP://WWW.DGIF.VIRGINIA.GOV/WILDLIFE/](http://www.dgif.virginia.gov/wildlife/)

Aerial photos and topographic maps

For Virginia: [HTTP://WWW.FORESTRIM.ORG](http://www.foresttrim.org)

For Maryland: [HTTP://MDMERLIN.NET/](http://mdmerlin.net/)

For the U.S.: [HTTP://TERRASERVER-USA.COM](http://terraserfer-usa.com)

Soil surveys

U.S. Department of Agriculture-Natural Resource Conservation Service – Soil Surveys. Access to all soil surveys online with user-friendly mapper. [HTTP://WEBSOILSURVEY.NRCS.USDA.GOV/APP/](http://websoilsurvey.nrcs.usda.gov/app/)

Soil testing

Contact the agriculture or forestry department at your state's university to locate a soil testing lab and get directions for collecting soil.

USDA Service Center. This site will allow you to find the nearest USDA Service Center, where you can ask about soil surveys, cost share program, and other assistance) [HTTP://WWW.SC.EGOV.USDA.GOV/](http://www.sc.egov.usda.gov/)

Forestry equipment

Ben Meadows
[HTTP://WWW.BENMEADOWS.COM/](http://www.benmeadows.com/)
800-241-6401

Forestry Suppliers
[HTTP://WWW.FORESTRY-SUPPLIERS.COM/](http://www.forestry-suppliers.com/)
800-647-5368

Bailey's, Inc.
[HTTP://WWW.BAILEYS-ONLINE.COM](http://www.baileys-online.com)

For more information

Links to federal, Maryland, and non-profit forestry-related organizations. [HTTP://WWW.NATURALRESOURCES.UMD.EDU/COVERT_LINKS_PRIVATE.CFM](http://www.naturalresources.umd.edu/COVERT_LINKS_PRIVATE.CFM)

Maryland Department of Natural Resources, Forest Service. Tree Experts List. [HTTP://DNRWEB.DNR.STATE.MD.US/FORESTS/OFLISTS/LTE/TREEEXPERT.HTML](http://dnrweb.dnr.state.md.us/FORESTS/OFLISTS/LTE/TREEEXPERT.HTML)

Pennsylvania Forest Stewards program. [HTTP://PAFORESTSTEWARDS.CAS.PSU.EDU/](http://paforeststewards.cas.psu.edu/)

Maryland volunteer forest-wildlife program (known as "coverts project") [HTTP://WWW.NATURALRESOURCES.UMD.EDU/COVERT_PROJECT.CFM](http://www.naturalresources.umd.edu/COVERT_PROJECT.CFM)



Glossary

Afforestation. The process of establishing a forest, especially on land not recently forested.

Aspect. The direction in relation to the sun.

Biological carrying capacity. The number of individuals of an animal species that a piece of land can support in good health over time without damaging the habitat.

Browse line. A line about 6 feet high created by heavy deer browsing. Below this line, not much green vegetation remains.

Catkin. The petal-less flower of poplars, walnuts, and birches.

Coniferous. Evergreen trees; most have needles or needle-like leaves.

Cover. Trees, shrubs, tall grass, thickets, burrows, rock and brush piles, stream banks, caves, and rock ledges that protect animals from the weather and predators and provide them safe places to eat, sleep, breed, and nest.

Crop tree. Any tree you want to keep and nurture. Possibilities include those that are particularly well formed, those you want to keep for timber, trees that produce fruit or mast, and those with special wildlife value (e.g., a hollow tree for denning).

Cultural carrying capacity. The number of individuals of an animal species that society is willing to tolerate.

Deciduous. Trees and shrubs that lose their leaves each autumn; most are broad-leaved.

Edge. Where different plant communities or different age classes of the same plant community come together.

Emergent aquatic vegetation. Plants that are rooted in the bottom of a water body and extend above the water surface. Common examples are cattails, bulrush, smartweed, and arrowhead.

Exotic species. An introduced species that, through human intervention, grows where it would not naturally occur.

Forb. A broad-leaved non-woody plant (as opposed to grass); most wildflowers are forbs.

Forest canopy. The crown of the tallest trees in a forest; shades the understory.

Groundwater. Water that is stored underground in cracks in rocks, in porous rock formations, and in the spaces between soil grains.

Hard edge. A place where there is an abrupt transition between plant communities.

Hardwood. A deciduous tree.

Herbaceous. A non-woody plant.

Home range. The area within which an animal normally travels to meet its food, water, and cover needs.

Invasive species. A species that reproduces rapidly, spreads over large areas of the landscape, and has few, if any, natural controls to keep it in check.

Mast trees. Trees that produce fruits, seeds, or nuts edible to wildlife.

Native species. Occurs naturally in a particular place without human intervention.

Overtopping. Occurs when one tree grows taller and shades the crown of another tree.

Riparian. Relating to or located on the bank of a water body, usually of freshwater; the area beside a water body.

Riparian buffer. A waterside area containing vegetation that protects the water body from potential pollutants such as sediment and nutrients and holds the bank in place.

Runoff. The portion of precipitation that flows over land to a water body.

Seep. A place where groundwater surfaces, sometimes forming a pool.

Shade-intolerant plants. Plants that need full sunlight and cannot grow in the shade of other plants.

Silviculture. The development and care of forests.

Site quality. A measure of the suitability of a site for growing trees.

Snag. A dead standing tree, often valuable for wildlife.

Soft edge. A place where there is a gradual transition from one type of plant community to another.

Softwood. A coniferous tree.

Spring. A source of water from the ground.

Succession. The sequential process of natural change and replacement of plant and associated animal communities over time.

Understory. The vegetation below the forest canopy; includes grasses, forbs, shrubs, and small or young trees.

Uneven-aged forest. A stand of trees of three or more distinct age classes, either mixed or in small groups; also called mixed-age stand.

Vertical stratification. Describes a forest canopy with plants of many different heights.

Wolf tree. A large tree, often a remnant from a previous stand. Has a broad crown and many limbs. Often stands alone in a field or on a property boundary.



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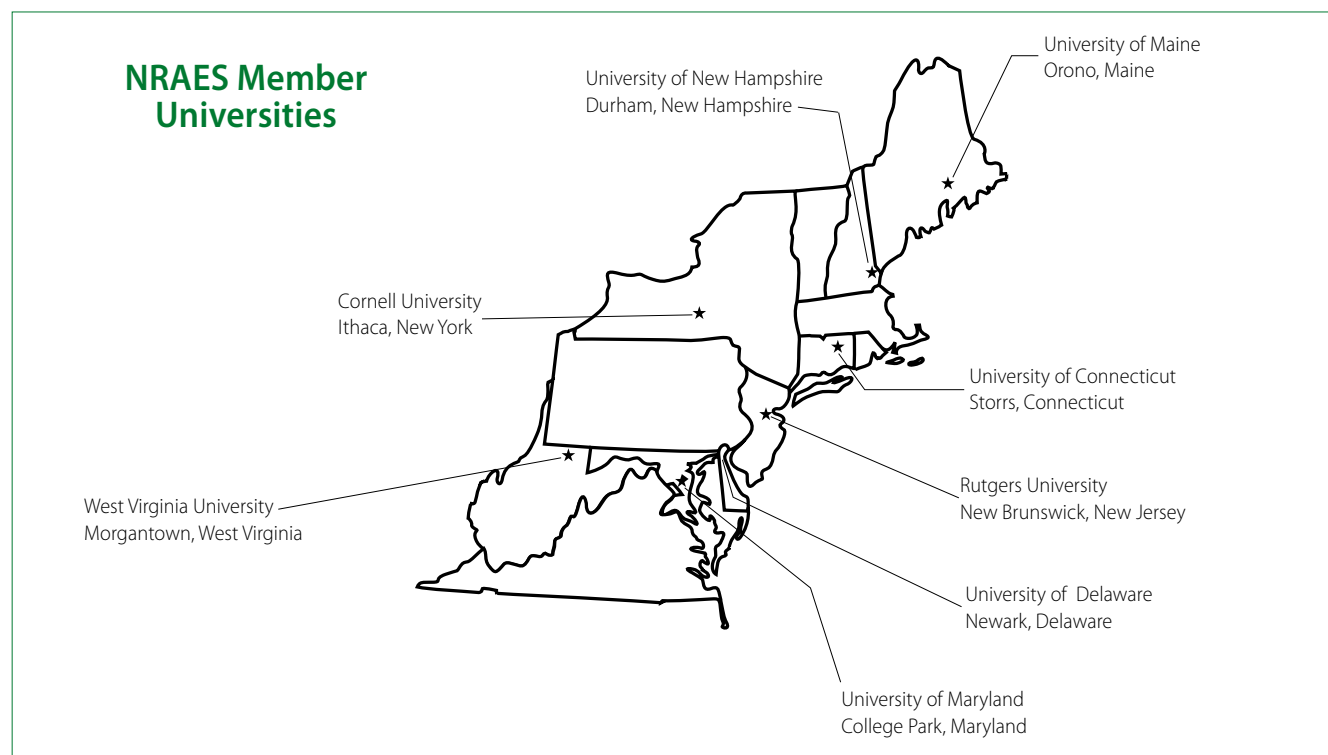
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