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alone, but the inevitable and naturally occurring changes may or may not achieve your objectives. Consequences arise from doing nothing, and they may or may not be what you want from the land. For example, by managing the vegetation on your land, you can make it more productive, entice wildlife, and increase air and water purification efficiency.

In order to care for your small-acreage property, it is important to understand how natural ecosystems operate. This guide presents an overview of the most prominent natural systems in the eastern United States, how they work, and how to manage your property to create, maintain, and enhance them.

Developing a Strategy

Developing a plan or strategy for your land will help you consider options and can save money and time by identifying the most efficient way to achieve your goals. Sometimes these goals become complex as you discover that they overlap and even come into conflict.

For example, if your natural area contains water resources such as a stream or a pond, you may wish to enhance the water quality. If it has large areas of lawn, you may wish to convert it to a more natural setting. If it already has trees, you may consider strategies that enhance that habitat to benefit wildlife and plant communities. You may want to harvest some trees for firewood to improve the health of the land and its attractiveness to wildlife. Managing land for wildlife usually means managing the vegetation that wildlife depend on for food and shelter.



Small-acreage lots can provide important ecological benefits in the eastern United States.

Perhaps you have an interest in deriving income from your natural areas. Income expectations may range from a modest objective of offsetting the costs of a hobby to helping pay property taxes. Some options for earning income from natural lands include mushrooms, maple syrup, Christmas trees and wreaths, and medicinal plants such as ginseng. See the Resources List in the Workbook for more information. You need to know what you want from your natural area and how the native ecosystems work before a strategy can be developed.

Let us start by meeting our case study family, the Nelsons, and their land. After you read the Nelsons' story, begin to assess your own interests in the land by completing Activity 1, *Family Goals Assessment*. Activity 2, *Map It Out*, will help you develop an overall view of your property and the landscapes within it.

CASE STUDY: MEET THE NELSONS

The Nelsons are typical small-acreage landowners who want to be better stewards of their property. Below, we learn what they enjoy about their natural area, and what they would like to do to improve its natural and aesthetic qualities.

Property description and why they 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 two years. We bought our wooded property 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 property was once part of a larger farm 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. About seven years ago, development began on the part of the farm where our home is now. We bought our house and land from a young family who had lived here for four years. As best we can tell, the only thing they did outside was



Succession stage 3: Sapling/pole.



Succession stage 4: Mature forest.

Table 1
Shade Tolerance of Some Common Eastern Trees

Shade-tolerant	Intermediate	Shade-intolerant
Beech, American	Ash	Aspen
Blackgum	Bald Cypress	Basswood
Dogwood, flowering	Birch, black and yellow	Birch, gray and paper
Hemlock, eastern	Boxelder	Cedar, eastern red
Maple, sugar	Cedar, Atlantic white	Cherry, fire
Sourwood	Cherry, black	Cottonwood, eastern
Pawpaw	Hackberry	Larch
Yellow buckeye	Hickories	Oak, pin
	Magnolia, cucumber	Oak, scarlet
	Maple, red	Pine, red
	Maple, silver	Pine, shortleaf and loblolly
	Oak, black	Pine, Virginia
	Oak, chestnut	Poplar, yellow
	Oak, northern red	Sycamore
	Oak, southern red	Sweetgum
	Oak, white	Willow, black
	Pine, eastern white	Walnut, black



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

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. It is tempting to turn all dead trees into firewood, but it is important to leave some to add complexity and value to your wooded area. Studies have suggested woodland can benefit from two to five cords per acre of standing dead trees, downed trees, and woody debris. A healthy woodlot is not necessarily clean and tidy.

In Activity 7, *Survey for Broken and Dead Trees*, you will survey your own natural areas for broken and dead trees. Find your Worksheet B started in Activity 5. Fill in the fourth column with your observations concerning broken and dead trees in each habitat area.

The Nelsons' answers to Activity 7 are on the following page.

Principle 7

Invasive species will always be there.

No matter how you manage your land, invasive and exotic species will be there. We live in a world of global commerce and virtually every part of the globe is now affected by non-native or exotic species. Some of these exotic species are invasive, which means they tend to spread very rapidly and will out-compete native species. Common exotic invasive plant species you might encounter are bush honeysuckle, Japanese honeysuckle, multiflora rose, privet, autumn olive, Russian olive, ailanthus, wine berry and garlic mustard. Invasive and exotic plants, animals, and insects such as gypsy moth, EAB, and HWA often displace native species and upset ecosystem balance. Table 3 lists a few common and particularly troublesome invasive/exotic plants. Photos of these plants are included



Nonnative gypsy moth caterpillar.



Grapevines can strangle or pull down trees or branches but their value as wildlife food may be more important if a landowner is managing to attract wildlife.



Riparian buffers are essential for improving water and habitat quality.

Maintenance includes controlling competing vegetation to ensure the survival of the new plantings until they are well established. Riparian areas often have deeper, more fertile soil than the rest of your property, so competition for growing resources will be high, especially by invasive exotic plants. See *Land Care Practices* starting on page 69 for more information.

Wetlands

Wetlands are areas that have both terrestrial and aquatic characteristics and include coastal salt marshes, forested swamps, and bogs, among many others. Some wetlands have standing water throughout the year while others have standing water for only a few weeks a year.

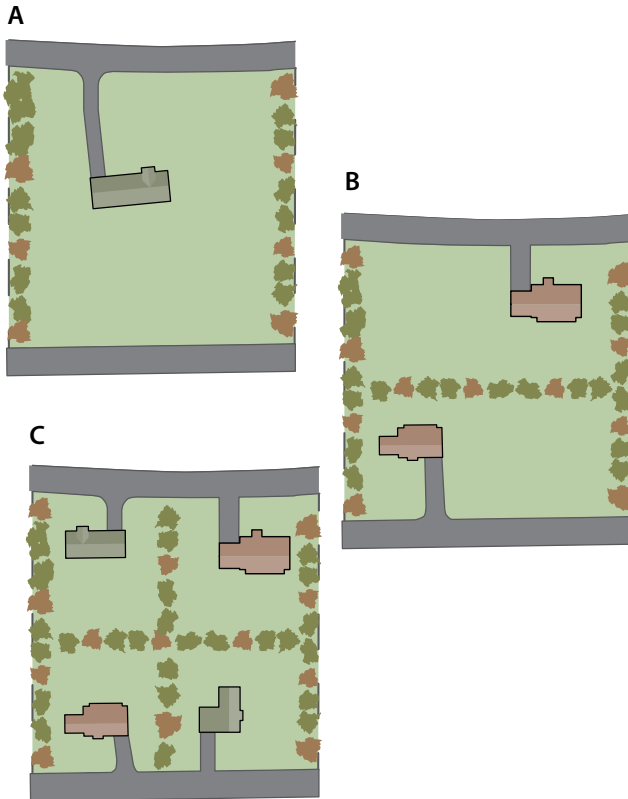
Wetlands are important for many reasons. They provide habitat for migratory waterfowl, help control flooding, act as filters for pollution, serve as important food sources for wildlife, and provide recreational opportunities. State and federal regulations often limit wetland area modification. Check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

In Activity 9 you will assess water-related resources in your natural area. Sometimes important water-related sources are not very obvious and are hard to find. You may not notice springs or seeps until you look for them. Areas that are wet most or all of the year may contain a spring or a seep—a natural source of fresh water emerging 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 water source



Dragonflies lay eggs in vernal ponds, and the adult insects are voracious hunters of mosquitoes.

Therefore, try to minimize narrow hard edge areas (those less than 50 feet deep) and maximize interior space away from the edge of a habitat type. Circular patches contain more area relative to their edge length. The drawing below provides an example of how edge length increases as the individual parcel size decreases.



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). Edge management practices affect wildlife habitat in a positive or negative way, depending on the species.

Cooperate to Achieve Shared Goals

Because animals do not 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 source, you will see greater wildlife variety than you would without water nearby. You can improve wildlife habitat by planting trees and/or shrubs to make a safe corridor between your natural area and a neighbor's habitat or water body.

Talk to neighbors about your stewardship strategy. Explain what you want to do and why. Find out if they

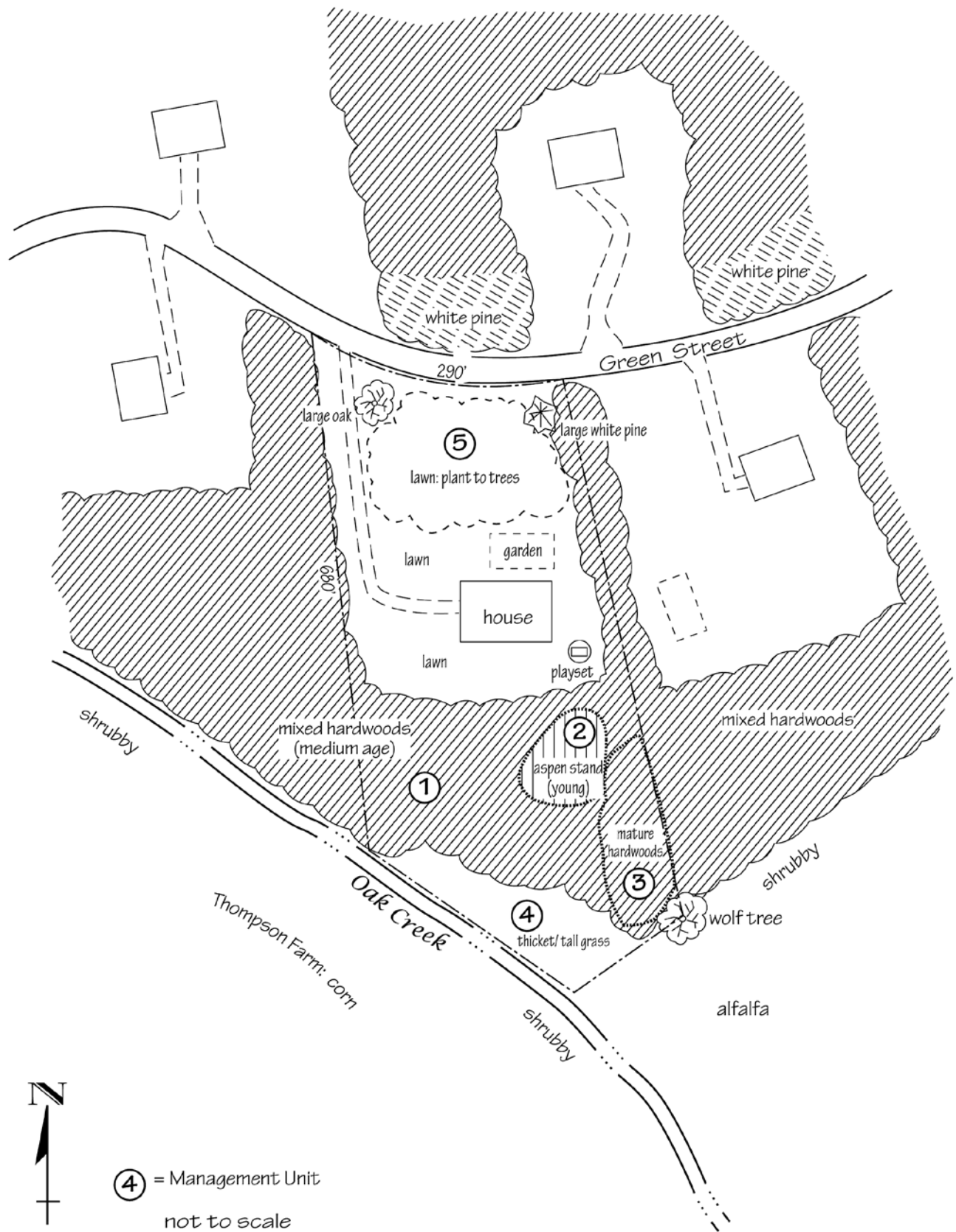
Working with Aerial Imagery

An aerial image helps you see the bigger perspective of land use around you. Aerial and satellite images give you a bird's eye view of the world and reveal landscape patterns that are difficult to discern on the ground. Traditionally aerial photos worked best on larger pieces of property (greater than 3 acres) because the photo scale was usually coarse. However, web-based satellite resources provide amazing resolution for most eastern United States landscapes. By zooming in and out, you can easily explore how habitats types vary close to your and farther away.

You can obtain a satellite image using the World Wide Web from TerraServer or from Google Maps or from your local conservation district office. Look online or in the blue pages of the phone book to find the office nearest you. Alternatively, return to Google Earth or the Forests for the Bay applications used in Chapter 1.



Aerial and satellite images provide unique perspectives.



The Nelsons' map with their neighbors' properties included.

IDENTIFYING YOUR TREES AND SHRUBS

Take a walk through your habitat units that include trees. Trees have distinguishing features. When you look closely, you will see different tree species have unique characteristics. Their bark, fruit, leaf shape, leaf edge, and leaf arrangement differ as do the buds, twigs, and growth patterns. Once you know what to look for, you can learn to identify many trees.

This section covers only tree identification basics. Printed tree keys and guides, mobile phone apps and online resources can help you distinguish between common trees. See the Resource List in the Workbook for suggestions.

Step 1 - Deciduous or Coniferous

One of the first distinctions to make is whether a tree is deciduous (broad-leaved) or coniferous (has needles). Most deciduous trees, especially in the Northeast and Mid-Atlantic United States 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, also known as hardwoods. Most conifers, also known as **softwoods** and evergreens, retain their needles throughout the year. Exceptions include cypress and larch that lose their needles each year. Conifer 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.

Identifying deciduous trees when leaves have fallen can be challenging. Do not forget to look on the ground near the tree in question for leaves and fruits to aid identifica-



Conifer needles (scale-like): Eastern red cedar.



Deciduous leaves: Black locust.



Deciduous leaves: Sugar maple.



Conifer needles: Eastern white pine.



Broad-leaved evergreen: Mountain laurel.



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

out-compete most shrubs and herbaceous plants. Unless you decide to create a patchwork design that includes one or more blocks of naturally shorter trees and shrubs, it is usually best to plant only a few shrubs and herbaceous plants amongst your trees. In some cases, native shrubs and herbaceous plants will establish themselves and out-grow those you planted. Check with your local cooperative extension office, soil and water conservation district, or state forester to verify that the trees and shrubs listed in Table 8 are suitable for your site. Appendix A starting on page 94 provides more information about the characteristics of some common trees in the Eastern United States.

Modifying or Improving Habitat

Agroforestry

Agroforestry intentionally combines agriculture and forestry practices into an integrated and sustainable land-use system. Agroforestry takes advantage of interactive benefits from combining trees and shrubs with crops and/or livestock. Since all agroforestry practices alter vegetation, they alter habitats. This can result in different wildlife species or groups being favored in the

Table 8
Suggested Plantings for the Eastern United States

Low shrubs	Tall shrubs	Small trees	Large hardwood trees	Large coniferous trees
Low bush blueberry	Viburnum species	Flowering dogwood	Shagbark Hickory	Eastern red cedar
Spiraea	Bayberry	Serviceberry	Black walnut	Eastern white pine
Black huckleberry	Red osier or silky dogwood	Redbud	Blackgum	Loblolly pine
Allegheny blackberry	Spicebush	Sassafras	Sugar maple	Red pine
American red raspberry	Winterberry holly	Staghorn or smooth sumac	Northern red oak	Northern white cedar
Eastern gooseberry	Juniper	Choke Cherry	Pin oak	White spruce
Black chokeberry	High bush blueberry	American Wild Plum	American basswood	Virginia pine
Wintergreen	American bladdernut	American Hornbeam	White oak	Red spruce
Black huckleberry	Buttonbush	American Holly	Yellow poplar	Pitch pine
Cranberry	Inkberry	Eastern Hophornbeam	Black cherry	Pond pine
New Jersey Tea	Common elderberry	Pawpaw	Aspen	Shortleaf pine
Pasture Rose	Witch Hazel	White Fringetree	American Sycamore	
Dangleberry	Smooth Alder	Alternate-leaf dogwood	Black willow	

for application with backpack sprayers. Always read and follow label directions to ensure safe and effective application. For more information on herbicides and proper application, consult the Resource List in the Workbook.

Streamside Stabilization through Planting

Streamside stabilization through planting stops or reduces stream bank erosion. Banks undercut by the stream benefit from stabilization with large rocks or logs. Seek advice from your local soil and water conservation district before beginning this work because permits may be required from one or more governmental agencies. Having a healthy riparian buffer reduces flow of polluted water and sediment into waterways. If you have lawn or mowed fields extending to the water edge, you will improve water quality if you simply stop mowing near the stream. Plant and encourage trees that will shade water. Allow tree branches to hang out over and into the water and catch floating debris. Shrubs and low vegetation provide important stream and wildlife cover. Keep trails and roads away from stream banks to reduce erosion.

Thinning

Thinning involves cutting inferior trees to make space for well-formed, superior trees. Thinning also includes cutting trees to encourage growth of crop trees. Crop trees are those you want to keep for timber, fruit, mast, cover, or any other reason. Thinning to favor these trees is called “crop tree release.” For example, fruit and nut production requires sunlight. If you want to attract wildlife with mast-producing trees, it is important to remove competing trees. As a general rule, a crop tree should have two to three sides open for about 10 feet around its canopy. The most effective time to initiate thinning is when tree trunks are 4 to 10 inches DBH. The trees left standing will respond quickly to the reduced competition. This requires good spacing between trees.

Knowing how many crop trees to release is difficult. Without the aid of a forester, try using the “diameter times two” rule of thumb. To apply this rule, estimate the average DBH in inches for those trees making it into the dominant and co-dominant crown positions. Multiply the average by two to have a guideline for the distance between crop tree trunks in feet. For example, if the trees average 5 inches in diameter, the desired spacing is 10 feet. If wildlife is a major objective, you may add 2 to 4 feet to the spacing recommendation to further open the



Steps to a successful thinning:

- 1)** Remove the trees with dark trunks because they are inferior and/or weak (forked, bent trunk, split trunk, and knobbed, respectively).
- 2)** Remove trees with the dark trunks because they are suppressed or intermediate.
- 3)** The trees with dark trunks represent a successful thinning.

office to see if they have a social media presence that allows sharing.

Periodic wildlife, plant, or habitat use surveys are useful for understanding change. What new species did you observe, and when? Work the new information into your on-going land management plan. If you do a wildlife survey, record when and where you see different wildlife. Survey at different times of day and night and in different seasons to get the best representation of wildlife diversity. All of these observations are evidence that your efforts are paying rewards. Record them in your stewardship journal!

Activity 17 provides a table for you to track your progress. Complete Activity 17, *Record Your Progress*, from the Workbook. The Nelsons' completed table can be seen below.



We must conceive of stewardship not simply as one individual's practice, but rather as the mutual and intimate relationship, extending across generations, between a human community and its place on earth.

— JOHN ELDER, "INHERITING MT. TOM"

Activity 17				
Record Your Progress				
Habitat 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 2013	\$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 2012	\$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 2012	\$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!
5-lawn	Privacy screen along edges of property	Spring 2013	\$175 vs. \$225	Completed. Cost a bit less than projected because both the seedlings and the herbicide we used were left over from other projects. Deer browsing may be a problem in winter so we plan to use deer repellent on conifers until trees are 5 feet tall. This will add to the cost.