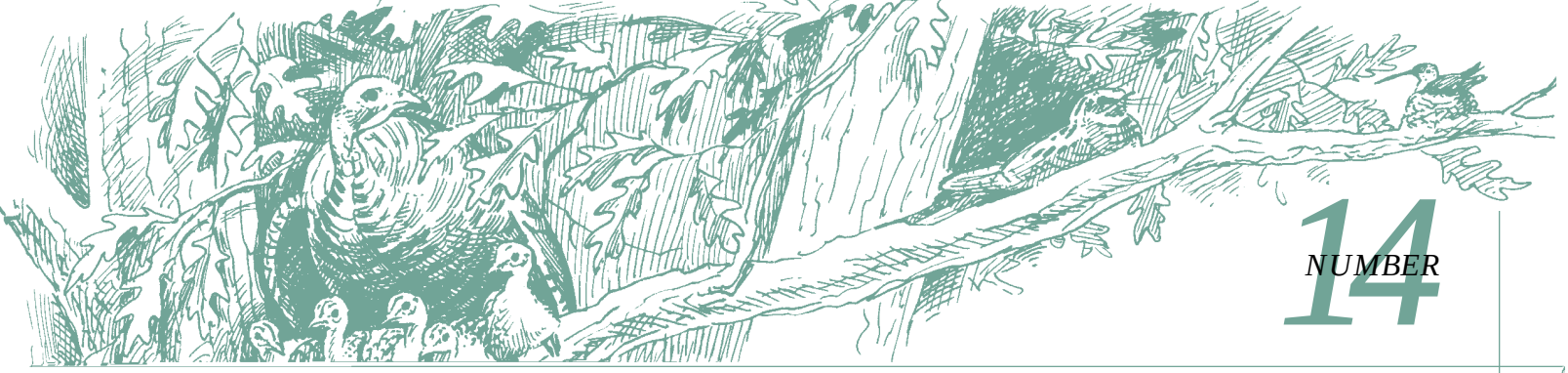


NUMBER 14

Forest Stewardship

Backyard Trees

Backyard trees provide landowners and communities with many bene ts. Trees help improve air and water quality, prevent soil erosion, and save homeowners money and energy by moderating extreme temperatures. Trees also increase property values and make neighborhoods more visually appealing. This bulletin will begin with a summary of the environmental, economic, and aesthetic values that backyard trees provide. Then, following a discussion of the basic needs of trees, we will provide tips for choosing, planting, and caring for backyard trees. Finally, we will discuss the role of professionals in helping you select, establish, and maintain healthy, valuable backyard trees.

A single, healthy young tree stores approximately 13 pounds of carbon each year. An acre of trees can store about 2.6 tons of carbon each year!

Not only do trees bene t us by absorbing and storing carbon dioxide; they also can make our air cleaner by trapping and holding dust particles. Thus, every tree in your yard can improve the quality of the air you breathe. But the environmental bene ts of trees are not restricted to improving air quality. In the next section, we will look at the value of backyard trees in sustaining healthy water supplies and soil.

Water flow, water quality, and erosion

When water moves over the earth's surface, it often takes soil particles with it; soil fertility is often compromised because valuable topsoil is stripped from the land. The soil-laden water often ends up in waterways

Visually appealing, mature landscapes are an asset to the economic stability of municipalities by helping them attract and retain progressive people and businesses. Trees and green landscapes are among a visitor's first impressions of a place; they help improve the image and reputation of neighborhoods and business districts. People are drawn to, and spend more time on, treers.

Basic Needs for Growth and Survival

Trees, like all living organisms, require certain conditions to establish, grow, and survive. These basic requirements include an appropriate amount of fertile soil, enough space for root and canopy growth, air for both roots and leaves, an appropriate amount of water, suitable sunlight and temperature conditions, and protection from disease, insects, and injury. The sections that follow explore each basic requirement in more detail.

OIL

Trees depend on soil for many things: nutrients, air, water, stability, protection from temperature extremes, and a natural recycling system. Tree roots acquire nutrients such as nitrogen, phosphorus, potassium, and calcium from the soil. For respiration (where sugars are converted to energy) to take place, tree roots must be able to acquire oxygen and get rid of carbon dioxide. A network of spaces, or pores, between soil particles allow plant roots to exchange gasses with the surrounding soil. Soil also has the capacity to store water, making it available to plants when they need it. Roots help anchor and support the entire tree, and soil is the medium that supports the root system. Soil helps moderate temperature extremes and protects roots from the severe hot or cold temperatures that can occur at the soil surface. Soil also plays a key role as a recycler of natural materials. As plants and animals die and are decomposed, soil organisms and processes convert wastes into forms that plants can use for growth.

A soil's acidity or alkalinity (pH) is a key factor in determining which

composed of small, ne particles and have small pores. Sometimes they hold too much water and too little air for trees to survive. Optimal tree growth usually takes place in "loam"—a mixture of sand, silt, and clay.

Certain human activities can inhibit tree growth and survival. Activities that apply pressure to the soil surface, such as heavy equipment operation and repeated foot traf c of humans or animals, can cause soil compaction. Paved streets, sidewalks, driveways, house foundations, and rocks can hinder root growth. Asphalt, concrete, and limestone gravel can raise the alkalinity or pH of nearby soils. Adding or removing soil around existing trees and digging trenches for underground utilities can damage trees. Certain substances, including road salt and some herbicides, can be toxic to trees.

Fertile soils are rich in organic matter from decomposing plant and animal material and microorganisms that live in the soil. Organic matter plays an important role in the formation and stabilization of soil aggregates by providing energy to sustain fungi, bacteria, and soil animals, and by yielding sticky substances upon decomposition that help maintain soil structure. Organic materials increase aeration, provide nutrients, and enhance the water-holding capacity of soils. A top-quality soil teems with life—literally billions of organisms per handful. Soil organisms such as centipedes, mites, algae, mosses, plant roots, earthworms, insects, bacteria, and fungi interact and contribute to the cycles that make life possible. Thus, it is important to retain the natural mulch under native trees and to apply mulch around planted trees.

PACE

If a tree doesn't have enough space, both above and below ground, it won't thrive. The amount of soil available for root growth is one of the most important factors in tree growth. Roots help anchor a tree in the soil, but they also are essential for absorbing nutrients and water. Roots grow like branches. That is, they grow from their tips and grow in thickness as well as length. Roots restricted by soil compaction or obstructions, such as concrete, cannot spread through enough soil to gather the food and moisture they require. As a result, tree growth will be impaired

Space is also important for the tree's upper leaves and branches, or canopy. Do not plant a potentially large tree in a con ned space. When growing under utility lines, large trees will need pruning, and incorrect or repeated pruning can be highly stressful.

AIR AND A ER

Air transports important gasses such as carbon dioxide and oxygen, but it also may contain harmful substances, such as ozone. Some trees, such as white pine, do not tolerate ozone and other air pollutants well. Avoid planting pollution-sensitive species if you live in an urban area or near a lot of traf c.

An improper amount of water, either too much or not enough, can inhibit the growth of the entire tree by limiting the roots'ability to anchor the tree and absorb nutrients. Trees can be harmed by ooding or excess watering, or by drought or underwatering. Some trees, such as willow, white cedar, red maple, river birch, and sycamore, can withstand wet soils. However, saturated soil deprives roots of oxygen and impedes root function and growth in all trees. The symptoms of overwatering are similar to those of drought: wilting, defoliation, poor growth, and branch death. In both cases, stress impairs root function and growth.

NLIGH

Sunshine provides heat and the energy that drives the process of photosynthesis. Photosynthesis provides sugars to fuel all of a tree's physiological processes, which include the maintenance of existing live tissues; bud, leaf, and wood development; water and nutrient uptake and transport; defense against decay; and ower and seed production. Some trees need full sun to grow, some do

Selecting, Planting, and Caring for Backyard Trees

If there is one thought to remember as you begin to plant and care for trees in your yard it is this: Plant the right tree in the right place. To plant the right tree in the right place, first ask yourself two questions: 1) What do I want to do? and 2) What do I have to work with? We will explain those two questions by exploring some examples.

WHAT DO I WANT TO DO?

Do you want trees to provide shade, create a windbreak, establish privacy, create wildlife habitat, or add natural beauty; or do you have other reasons to plant trees in your yard?

If you consider what you want to do first, it will be easier to proceed to the next step in the selection process

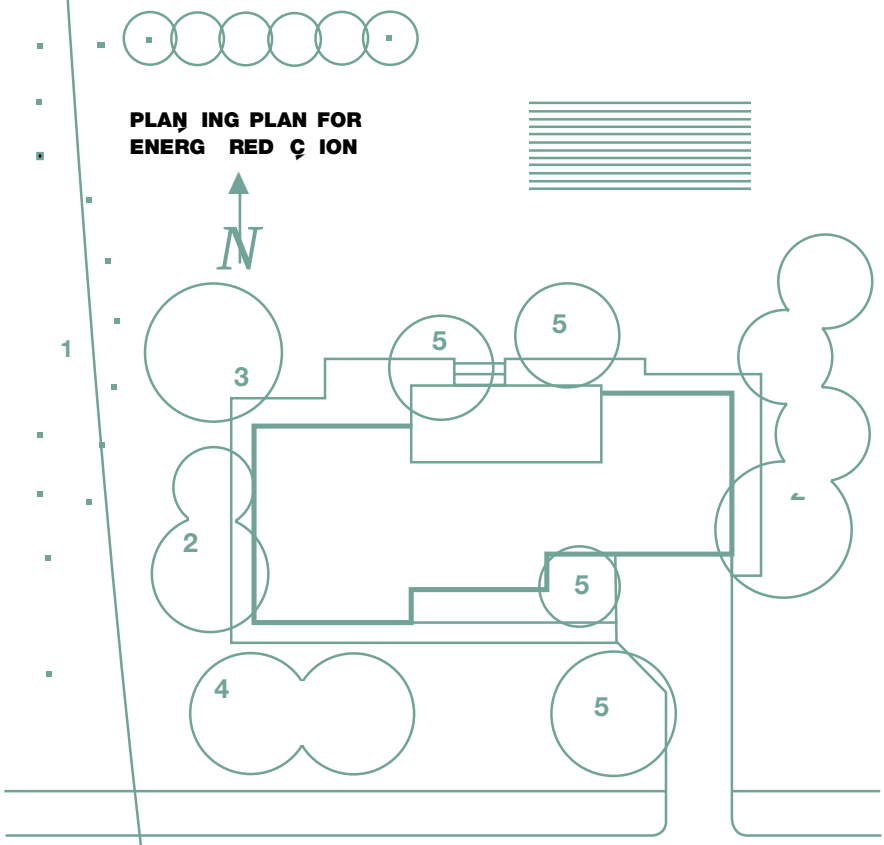
Don't do this to trees! Without a tree protection zone, trees and soils can be severely damaged by construction activities. Damage can lead to either fast decline in health or a very slow decline and eventual death.

PROTECTION FROM INJURY

The best defense a tree has against disease and insects is a good offense —that is, good health and vigor. However, you cannot simply ignore infestations, even in hardy trees. A qualified arborist can help you manage disease and insect problems. Injury, especially in backyard or residential trees, often results from human error or carelessness. "Topping" and other improper pruning practices damage and kill many trees. (We'll talk about proper pruning later in this publication.) Hitting tree trunks with your lawn mower or weed whacker can, over time, cause damage, as can gardening or construction activities near trees. Injuring a tree's roots, trunk, or limbs causes problems with both health (growth) and decay (structure). Fatal root damage is often caused by soil compaction by machinery and repeated foot traffic and pollutants from fuels and organic cleaning solvents. Such root damage often occurs in areas where lawn work and construction activities take place.

Animals can damage trees, too. Animal waste, especially urine, adds harmful compounds to the soil. Repeated animal traffic compacts soil. A host of animals, both pets and wildlife, inflict injuries on tree bark: birds peck at it, cats shred it, and rodents chew it. When tied to trees, dogs or horses can be particularly destructive; they can harm both the trees and the soils that support the trees.

Although it is not often apparent, tree roots grow near the surface, most within the first 26 inches of soil. Hence, they are particularly vulnerable to damage from surface activities such as compaction and rototilling. Sometimes you will not notice root damage until the tree visibly declines or dies back. By then, it often is too late to correct the problem.



key

1. Coniferous windbreaks to the north and west block winter winds.
2. Trees on the east and west sides provide summer shade.
3. A tree here will provide shade as the sun sets in midsummer.
4. A varity of deciduous trees to the south should grow tall and permit pruning of lower branches so that lower winter sun will strike the roof, walls, and windows uninterrupted.
5. The year-round effect of foundation and driveway planting seems never to have been measured, but they would be expected to be energy savers if they do not shade windows in the winter.

HA DO I HA E O ORK J H?

If you choose the right tree to meet your objectives, but plant it in the wrong place, you have wasted your time, energy, and money. It is important to become familiar with the available resources you have to work with.

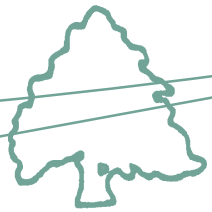
To begin, determine the orientation of your property. To provide sun in the winter, shade in the mornings and afternoons, and summer cooling, plant large deciduous trees on your home's east and west sides. Conifers, planted suf ciently close together along your property line's north and west sides, will block winter winds. Orientation also helps determine which parts of your property tend to be colder, warmer, drier, moister, sunnier, and shadier than other areas.

Other resources on your property also are extremely important. The rst, and most fundamental, is soil. The nature of the soil in the location that you intend to plant will have a signi cant effect on your trees. The more you know about the type and quality of the soil, the easier it will be to select the proper species to plant. Because soils in developed areas often are unknown mixtures, it's a good idea to have your soil tested. Check with your county Cooperative Extension of ce for details. It is important to pay attention to the pH of your soil and plant only tree species that are tolerant of your soil's characteristics.

Another important thing to keep in mind is the size and health of the planting space beneath the soil surface. Consider the amount of soil available to roots and any potential problems such as soil compaction, poor drainage, or pollution. A professional arborist or landscaper can help you identify possible insect or disease problems. In general, large trees like oak, ash, and sycamore need a lot of soil and space.

When pondering potential site problems, don't limit the search to natural causes—many potential problems, especially when it comes to planting and maintaining backyard trees, have human sources. Some human-created obstacles to growing and maintaining healthy backyard trees can be as great as natural ones. When deciding what to do, consider air pollution, neighboring landscape conditions and designs, utility clearance and other overhead space restrictions, the amount of nearby pedestrian and vehicular traf c, and the proximity of impervious surfaces (including your house's foundation).

tree shapes



Round Narrow Weeping Triangular Vase-shaped

THE RIGHT TREE PLANTED ON THE PROPER SITE LIVES LONGER, GROWS TO BE LARGER AND MORE BEAUTIFUL, AND NEEDS LESS MAINTENANCE.

Here are some examples to help you avoid making the wrong selection:

- Pin oak, red maple, black gum, and red oak cannot tolerate high pH or limestone soils and will not grow well in them. These species grow much better in acidic soils.
- The roots of large trees such as oak and tulip (yellow) poplar need large amounts of soil. If planted in restricted areas, such as near sidewalks and parking lots, these species grow poorly, never reach a normal mature size, and cause

Here are some examples to help you match the right tree to the right site and ensure its successful growth:

- White ash, sugar and red maple, and ginko offer attractive fall color. Redbud, serviceberry, dogwood, cherry, crabapple, and ornamental pears offer spring owers.
- Sycamore, urbanite green ash, honey locust, ornamental pears, crabapple, and hedge maple can withstand a variety of urban stresses—poor and compacted soils; air pollution; and poor, harsh, or otherwise unreasonable pruning.
- Smaller trees, such as hedge maple, Japanese tree lilac, and ruby red horse chestnut are suitable for planting under utility lines and in other con ned spaces.
- Native tree species are good candidates for successful planting, survival, and growth. Trees from local seed stock tend to be more tolerant of local temperature extremes and moisture conditions than non-native species. When planted on the appropriate site, native trees also tend to require less maintenance. Because they have evolved in the same area, native plants and animals are often adapted to and dependent upon one another. Consequently, native trees tend to be more useful than non-native trees for providing native wildlife species with food, shelter, and nesting sites.

Table 1. Typical Sizes and Weights of Balled-and-Burlapped Deciduous Trees

Caliper	Ball Diameter	Approximate Weight	Typical Height
1 1/2 o 1 3/4"	20"	225 lb .	10 o 12
1 3/4 o 2"	22"	260 lb .	11 o 13
2 o 2 1/2"	24"	300 lb .	12 o 14
2 1/2 o 3"	28"	600 lb .	13 o 15
3 o 3 1/2"	32"	750 lb .	14 o 16

After you select the best specimens of the tree species you want to plant in your yard, remember to move your tree from the nursery or garden center to your home gently. Pick up young trees by their burlapped root ball or container, not by the trunk. Load and unload the tree carefully. If it will be exposed to the wind on the ride home, drive slowly and cover it with a tarp. Whipping winds can cause leaves to dry out, a condition that can be fatal for a young tree.

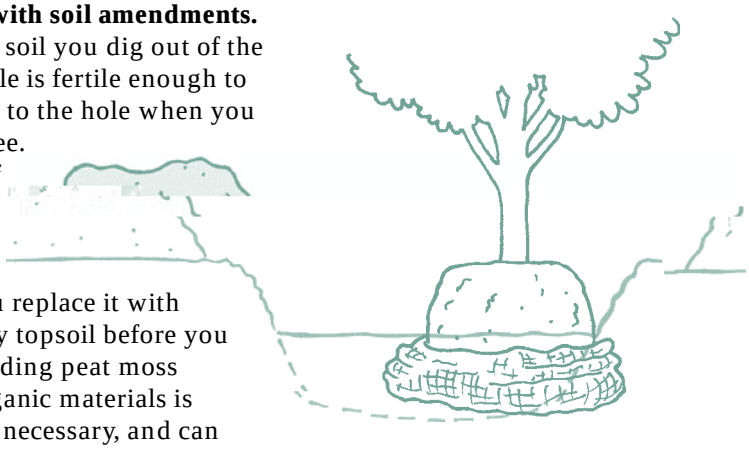
PLAN ING BACK ARD REE

Once you get them home, plant your trees as soon as possible. If you can't plant them immediately, remember to keep them in the shade and keep their root ball or containerized soil moist.

Here are 12 pointers to remember when you begin to plant trees in your yard.

1. **Give trees enough space.**
   The mature size and life span of a tree depends mainly on the volume and quality of the soil accessible to its roots. Large trees need lar[illegible] spanr[illegible].

7. Be careful with soil amendments.
Usually the soil you dig out of the planting hole is fertile enough to be returned to the hole when you plant the tree. However, if the soil is extremely poor, we suggest you replace it with high-quality topsoil before you back ll. Adding peat moss or other organic materials is usually not necessary, and can be counterproductive: peat moss acts like a sponge and can hold water in a planting hole instead of aiding drainage, especially in clay or compacted soils.



8. Back ll, mulch, and water.
Hold the tree straight while you back ll the planting hole. Pack the soil gently as you back ll around the roots. Water occasionally as you ll to help settle the soil. These steps will help eliminate major air pockets around the root system. Once you have covered the root ball with soil, rake the soil evenly over the entire planting area, and cover the area with three or four inches of composted mulch. Keep the mulch a few inches from the tree trunk, and water the entire area slowly and deeply. You should give your newly planted tree enough water to penetrate the soil to the bottom of the root ball.

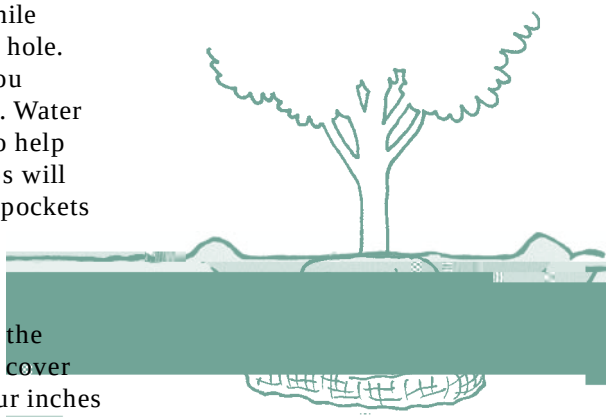


Table 2. Size and Space Guidelines

(He e a e ome gene al g deline o hel o decide hich ecie ill ell in he ace o ha e a ailable.)

Available planting space	Tree size	Height at maturity
le han 2 fee		no ad i able o lan ee
2 o 4 fee	Sho	nde 30 fee
4 o 6 fee	Medi m	be een 30 and 45 fee
mo e han 6 fee	Tall	o e 45 fee

9. You don't need fertilizer.
During the rst year, newly planted trees need, more than anything else, water. Fertilizer won't hurt, but it won't help, either. You might want to lightly fertilize your newly planted trees after the rst year in their new location.

10. Not all trees need to be staked.
Many balled-and-burlapped trees are so heavy that they don't need additional support. Use staking only if a tree is a bit imsy or needs protection against vandalism or bumping.

11. Water young trees.
Water young trees at planting and periodically during the growing season. During drought conditions in the rst three growing seasons, we recommend watering young trees weekly. Allow the soil around a newly planted tree to dry out between waterings.

12. Avoid compensatory pruning on young trees.
Some people think you should keep a tree's canopy trimmed back until its root system grows larger, but this is a destructive practice. Young trees bring their own canopies and root systems into balance without pruning. Also, young trees need as much leaf surface as possible to absorb the sunlight and carbon dioxide necessary for photosynthesis. Photosynthesis, in turn, provides the energy for additional root growth. Less ef cient leaves, twigs, and branches will die naturally as a young tree grows. Prune only broken, damaged, poorly attached, or malformed branches from newly planted trees.

Maintaining Backyard Trees

Pruning and an annual inspection for signs of stress or infestation are two ways that you can help promote and maintain healthy trees in your backyard. You can do some of the work yourself, but for certain types of work we recommend that you hire a certi ed arborist.

PR NING REE

Young trees

Pruning young trees slowly during the rst ve years is a sound investment that can decrease future tree damage and maintenance costs. Pruning young trees leads to a balanced and well-spaced branch structure while maintaining the species' typical form. Removing low branches that can interfere with people and equipment will, over a period of years, promote root growth, trunk growth, and trunk taper. Encourage a single leader, or trunk, by pruning back or removing competing leaders. During the rst year, prune only broken or dead branches. Don't remove more than 35 percent of a young tree's foliage in any one year, and prune uniformly. Don't use wound dressings; they are unnecessary and can actually cause damage.

Mature trees

Pruning mature and older trees is complicated and dangerous. We strongly recommend that you hire a quali ed arborist and ask for references. The basic guidelines are as follows:

- Always use thinning cuts, which prune a limb back to the trunk or back to a limb large enough to assume growth. Limbs should be pruned back to a limb that is at least one-third of the size of the limb being pruned.
- Don't remove more than 25 percent of a mature tree's foliage in a year.
- Don't remove more than 20 percent of the foliage or branches larger than 8 inches from older trees.
- Leave root pruning to a certi ed arborist.
- Never use stub or heading cuts to top trees. Such mistreatment induces a high level of debe c-

Forming a Tree Commission

It's a small step from backyard trees to street trees and other community trees. Many cities, towns, and townships are recognizing the many values of trees and putting tree planting and preservation high on their list of priorities. Tree commissions can use the information in this bulletin to help them select, plant, and care for public trees.

Forming a tree commission is one step that people can take to create and maintain their community forest. In fact, Pennsylvania law not only allows, but also encourages municipalities to form tree commissions. Inventorying, pruning, choosing appropriate species, and removing hazardous trees are all duties that a tree commission can oversee or in uence. Tree commissions also can help prepare street-tree ordinances and simple public-tree management plans, and help settle disputes over tree pruning and removal.

Tree commissions can have a signi cant effect on a community's appearance, image, and reputation, as well as its safety and comfort. Commissions provide long-term, stable management for a valuable, long-lived asset. By forming or supporting a tree commission in your municipality, you can improve the environment, beauty, and quality of life in your community.

Sources of Assistance

There are numerous places to get information, advice, and planting stock. We'll outline some of them for you brie y below. Because backyard trees can develop into such a bene cial asset, we recommend that you rely on the services of a certi ed arborist for technical assistance.

Additional References

Bazan, Eugene, Bill Elmendorf, and Henry Gerhold. *Fundraising for Community Tree Projects.* University Park: The Pennsylvania State University, 1997. (A 31-page book that provides information and examples about completing grants and other funding tools.)

Council of Tree and Landscape Appraisers. *Guide for Plant Appraisal.* Savoy, Ill.: International Society of Arboriculture, 1994. (Guide for appraising the value of trees and other plants.)

Dirr, M. A. *Manual of Woody Landscape Plants: Their Identi cation, Ornamental Characteristics, Culture, Propagation, and Uses*, 4thw4

NOTES

The Forest Stewardship Program is administered nationally by the USDA Forest Service and is directed in Pennsylvania by the DCNR Bureau of Forestry with assistance from a statewide steering committee. The Forest Stewardship Program assists forest landowners