



# Pennsylvania Woodlands

Penn State College of Agriculture, Cooperative Extension

## *Resource evaluation*

NUMBER 3

A woodland, even when undisturbed by people, is continuously changing. Its condition, as well as the benefits it provides, change as the woodland matures. To determine a woodland's present condition and how it may change in the future, you can conduct a resource evaluation.

Resource evaluation involves assessing the physical and biological characteristics of a woodland. It's an important step in management planning. A resource evaluation will help you determine answers to the following types of questions: Is my woodland capable of producing everything I desire? What are my options? What is the highest quality wood product my woodland can produce?

Each landowner has individual reasons for owning woodland. Therefore, when conducting a resource evaluation, you need to think about your specific objectives. You might want to know, for example, about the amount of firewood that can be harvested, or about the different types of wildlife habitat on your property, or about the potential of an area for road development.

Presenting all there is to know about resource evaluation in a few pages is difficult. This publication is a starting point. To conduct a resource evaluation, you may need further study or the help of a professional forester.

### **GETTING STARTED**

Before starting your resource evaluation, it's important that you take the time to list your ownership objectives. These objectives form the basis for your resource evaluation because they determine what to look for as you assess your woodland property. A checklist of

objectives is provided in *Pennsylvania Woodlands* Number 2: "Introduction to Woodland Management."

It's helpful to have certain information on hand before you actually go into the woods and start evaluating what you own. If you don't have a legal description of your property, it's a good idea to visit the county courthouse and get one from the deed or most recent registered survey. Property boundaries are often not clearly defined or understood by woodland owners and their neighbors. It's important for you to know the boundaries of your woodland before you begin any management activity. Boundary definition is particularly important before any harvesting takes place.

To help you put together a mental picture of your property, try to get an actual picture. Check with the Agricultural Stabilization and Conservation Service (ASCS) office in your county. The ASCS often has aerial photographs available. If you, the previous owner, or neighboring owners have been cooperators in ASCS programs in the past, the property boundaries will be drawn on these photographs.

You can also visit the Soil Conservation Service office or the county Cooperative Extension Service office and find out if the soil survey for your county has been completed. If it has, you'll be able to get a lot of information about your property from the soil maps and soil descriptions. Information about woodland soils is very useful in making management decisions. Soil type is one of the factors that influence the kind and quality of vegetation on your woodland.

Finally, get a U.S. Geological Survey map (topographic map) that includes your property. This map will show the elevation changes

(contours) and drainage patterns. It's often possible to outline your property on these maps using the information from the sources previously mentioned.

The survey or reconnaissance of your woodland will go much more smoothly if you carefully review all the information you have gathered. You're also more likely to observe all of your woodland's features by knowing ahead of time what the property looks like. Many owners admit that they have never, or at least not recently, walked over their entire property. Sound planning and management depend on knowing what you own.

You may want to start your evaluation by walking the entire boundary of your woodland. Then walk several lines through its interior, preferably using a compass so that you can note your exact position on the maps mentioned above. As you walk, make notes on the maps of various features that may be important to your management objectives. Below, we discuss in more detail what you should be observing and measuring as you walk these lines through your woodland.

### **MARKING BOUNDARIES**

When surveying your woodland property, make a special effort to visit all the known and suspected corners of your property. Note corners, fence lines, marked property lines, or other features that might show the extent of your ownership.

You might locate your boundaries by either of two methods. The first is to temporarily mark, with colored plastic flagging, what you believe to be the line. Then ask the neighboring owners to walk the lines with you. If all neighboring owners agree, permanently mark the boundary by blazing or painting selected trees. When the boundary locations cannot be determined this easily, it's necessary to hire a registered surveyor. If a boundary survey is made, be certain to have a copy recorded at the county courthouse.

Maintaining established boundaries is an important management activity. Permanent monuments (concrete columns, metal rods, or pressure treated posts, for example) should be established and witnessed at the corners. Witnesses are normally trees described by their species, distance, and compass direction from the permanent monuments. These trees are also blazed on the face toward the monument.

Trees actually on the line are referred to as "line trees" and are the property of both owners. These trees, by convention, are never cut without the consent of both owners. It's a good practice to keep them in place as boundary markers.

### **IDENTIFYING TREE SPECIES**

Woodland management for any objective involves the management of vegetation. If you're making the resource evaluation on your own, you need to be familiar with the plants in your area and on your woodland before you can get too involved in management planning.

In Pennsylvania there are about 115 commonly occurring tree species. You need not be able to recognize each of these since only 15 to 20 species have significant commercial value. You may want to start by learning the more common trees in your area of the state. Less common trees and perhaps smaller understory plants and shrubs may also be important to know for their value as wildlife habitat or for their scenic value.

You may find identifying trees and shrubs to be frustrating at first, but it doesn't need to be. Start with a few. Learn to recognize their leaves, bark, buds, and fruit. Select and identify several trees of the same species on your property. Visit them throughout the seasons and note how they look at different times of the year. Learn to recognize their general form, branch arrangement, and branch angles. A good reference book with color illustrations of plants and a general description of the types of sites you might find the plants will be very useful. Visit your local library or bookstore and see what's available. A knowledgeable friend or a resource professional are other possible sources of help.

### **IDENTIFYING MANAGEMENT UNITS**

Most owners, whether they realize it or not, think of their property as a composite of several smaller parcels. They might, for example, recognize the swamp, the orchard, or the deer woods. These identified sections are possible management units, or stands.

A stand is a group of trees sufficiently uniform in species composition, age, and condition to be distinguished from surrounding groups and managed as a single unit. This unit can be any size it needs to be to achieve your objectives. It might, for example, be a one-



acre field, a strip 100 feet wide along a road or stream, or 50 acres of sawtimber.

As you evaluate your woodland, consider how important the existing vegetation is, in terms of both species and size, to the potential use of the site. For instance, if your objective is grouse management, you'll consider an aspen stand to have much more potential than a stand made up of primarily sugar maple or ash.

You may want to consider the potential of a site for recreation or aesthetic purposes. Maples contribute color to the fall foliage. Softwoods or evergreens contrast the leafless hardwoods in the winter. Streams or hilly areas may be important to you for recreational activities. Some stands may contain trees with the potential to produce marketable wood products and you may want to manage those stands for that purpose.

**Forest Types.** Each species of tree has specific growth requirements, including light, moisture, temperature, and nutrients. All areas or sites on your woodland do not meet these requirements equally. For example, moisture can be influenced by slope position (hilltops are often drier than bottoms of hills), slope direction (sites with a southern exposure are normally drier than those with a northern exposure), soil depth, soil texture, and organic matter.

Different species may have similar site requirements and grow in close association with one another. Such an association is known as a *forest type*. Two major forest types found in Pennsylvania are the Oak/Hickory type (which covers 47 percent of the state) and the Northern Hardwoods type (which covers 40 percent of the state, mainly in the northern regions).

The better sites of the Oak/Hickory type have deep, fertile soils and tend to be dominated by red, black, and white oaks. Poorer sites with shallow, drier soils are frequently covered with chestnut oak. Red maple is often a component of both these sites. Hickory, though named in the type description, is a relatively minor species and is often found only on the better sites.

The Northern Hardwoods type is made up of sugar maple, beech, yellow birch, black cherry, and red maple. Other commonly associated species include white ash, hemlock, sweet birch, red oak, basswood, aspen, white oak, white pine, and hickory. In northcentral and northwestern Pennsylvania, a specific subtype of the Northern Hardwoods, known as

the Allegheny Hardwoods, is recognized. These forests, especially on the better sites, are made up of black cherry, white ash, and yellow poplar.

Forest type is another indicator of the potential of your woodland to meet your particular management objectives. As you walk through your woodland, make a note of forest types and where they occur.

## MEASURING TREES

Before we continue with resource evaluation procedures, it's important that we discuss how tree size is expressed by resource managers.

Diameter, perhaps the most common tree measurement, is measured at a height of 4½ feet above the ground on the uphill side of the tree (Figure 1). Diameter measured at this height is referred to as diameter at breast height (dbh). Lay people often speak of tree circumference or "inches around," but this is not the accepted convention.

You can measure tree diameters even if you don't have any of the specialized equipment used by foresters and other resource professionals. Use a steel carpenter's tape to measure the circumference of the tree at 4½ feet above the ground and then divide this measurement by 3.14 to calculate the tree diameter. In most cases, dividing by three will

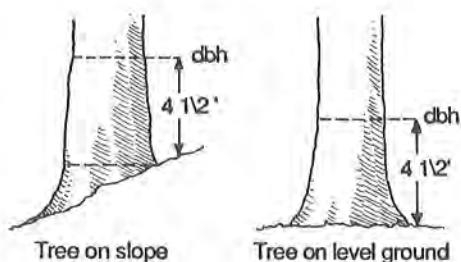


Figure 1

provide a good enough estimate since diameters of standing trees are often reported to the nearest 2-inch class.

*Saplings, poles, and sawtimber* are descriptive terms associated with tree diameter. Saplings are trees that have a dbh of 1 to 4 inches. Poles are trees 5 to 11 inches dbh and sawtimber trees have a dbh of 12 inches or more.

Height is the other measurement used to describe trees. Tree height is referred to either as total height or as merchantable height. Total height is the distance from ground level to the top of the crown. Merchantable height is the distance from stump height to the top of the merchantable material in the tree. Stump height is normally considered to be one foot above the ground (Figure 2).

Merchantable height depends on the products to be made from the tree as well as on the prevailing market situation. For hardwood sawtimber, the merchantable height of the tree stops where major branches occur or where the diameter inside bark (dib) is less than 8 inches. Standards for pulpwood normally allow for a minimum dib of 4 inches.

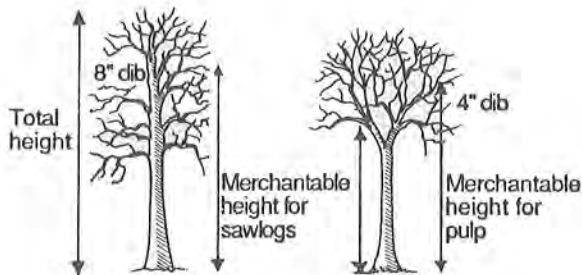


Figure 2

The basic unit of height measurement is the log, which is 16 feet in length. With a little practice, you'll be able to estimate tree height quite accurately. You may find it helpful to make a 17-foot pole marked at one foot (stump height), at 8 feet (half-log length), and at 16 feet (log length) to set against trees to train your eye.

A tree-scale stick is an inexpensive device for estimating tree diameter and height. These sticks resemble yardsticks and are available at some hardware stores and from forestry equipment suppliers. Directions are usually printed right on the stick.

Recognizing a tree's growth potential is important when managing your woodland for timber production. Diameter is not a good indicator of growth potential because diameter growth slows down when trees grow too close together. Tree height, however, is little affected by how close together trees grow. Tree height is most affected by the quality of the site.

The combined information of age and height of trees in a stand is a direct measure of the

stand's vigor and an indirect measure of the quality of the site for growing trees. A tree's age can be determined using an instrument known as an *increment borer*. You can also become familiar with external features that indicate a tree's youth or maturity.

## DESCRIBING STANDS

To describe a stand of trees, we often use words that refer to tree species and size. For example, you might have a stand of pole timber. Hearing this we know that the trees in this stand average more than 4 inches but less than 12 inches in diameter. We can refine the description further to indicate relative size. For example, a stand of large-pole timber is made up of trees approaching 12 inches dbh. Including the species adds more information to the description. A large-pole stand of red maple contains trees approaching 12 inches dbh, the most common species being red maple.

Figure 3 shows property that might be owned by one of your neighbors. Note that important features like property boundaries, streams, and roads are identified. Specific use areas like homegrounds, field, and marsh are also shown. The woodland has been divided into stands based on the dominant species and the average size of the trees. A stand of small red maple poles is found on the lower corner of the property near the marsh. A stand of large poles of the Northern Hardwood type covers the central portion. On the northwest corner is a stand of small sawtimber dominated by red oak.

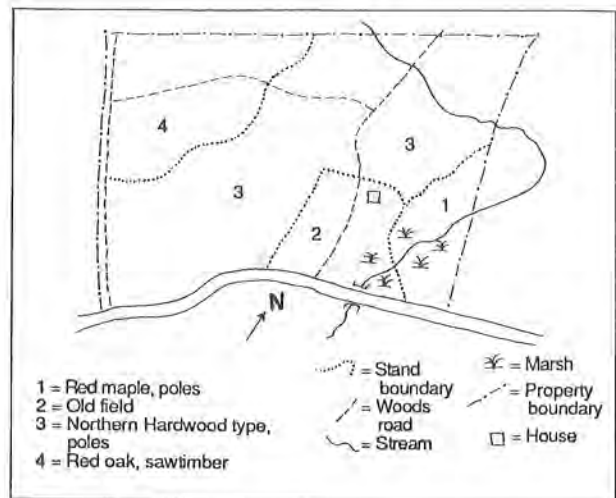


Figure 3

Think about your woodland and try to describe the stands in terms of species and tree size. Make a mental picture or mark the information on one or more of maps of your property mentioned earlier. Having a clear picture of your woodland and a list of your specific objectives should help you understand some of the management opportunities open to you. This information will also help you communicate with resource professionals you may consult during your management planning.

### CASE EXAMPLES

We now consider a few situations that you may experience as you begin to make decisions about managing your woodland resource. These examples illustrate how managing for almost any objective involves managing vegetation.

If one of your primary interests is wildlife management, evaluate the types of habitat—food, water, cover, and space—your woodland can provide. You may, for example, have a strong interest in increasing the number of ruffed grouse on your property. Small parcels of woodland can be managed for grouse if all the specific habitat requirements are met. Under the right conditions, you may be able to maintain a pair of grouse on about 10 acres.

Grouse need a mixture of age classes from tree seedlings to mature trees. If your woodland has trees that are all of one age class, you'll need to cut trees to develop the right age-class distribution for grouse habitat.

As another example, suppose you're interested in recreational activity that involves the use of a road or trail system. The activity may be horseback riding, snowmobiling, or hiking to a cabin site. Building roads and trails can be expensive. Without the proper equipment, it can also be hard work. A timber harvest that's properly planned and carried out might provide you with the roads you want and need.

As you evaluate your woodland resource, perhaps you find that you have no valuable trees to market. This need not stop you from taking action. One woodland owner in Pennsylvania was faced with a similar situation. Over a period of five years he financed the construction of more than four miles of graveled road by selling thinnings from his woodland to local residents who needed firewood.

### FOREST PRODUCTS

If one of your management objectives is to maximize profit, it will be useful for you to know about the various forest products. Even if your primary objective is to provide recreational opportunities or to improve wildlife habitat, cutting trees or harvesting wood products can still be part of your management activities. As another example, suppose your primary objective is providing for cross-country skiing. It might be nice to develop a road system throughout your woodland. To develop the system as an out-of-pocket expense may be impossible, but it could be developed as part of a harvest operation. The timber would "pay the freight."

Foresters in the Northeast generally recognize four classes of roundwood products: fuelwood, pulpwood, sawlogs, and veneer. These products differ in diameter, quality, and value. Though tree diameter is a major factor in defining these products, it should not be the only factor that determines what's harvested. As was mentioned in *Pennsylvania Woodlands* Number 2: "Introduction to Woodland Management," diameter limit cutting is often a mistake.

The following paragraphs outline the characteristics of each of the forest product groups.

**Fuelwood** is an important product of many woodlands. What you use as fuelwood will vary with your objectives. Many people consider dead and dying trees their primary source of fuelwood. Their opinion may change, however, when they consider that many bird and mammal species depend on these logs and trees for food and shelter.

Fuelwood might also be obtained from thinnings. Thinnings are improvement cuttings in which you remove trees that are in competition with others and trees of poor quality that have little potential value.

Species isn't a critical fuelwood factor since all species are considered to have the same amount of heat per pound. However, the weight of a given volume can vary considerably. For example, a cubic foot of aspen weighs 28 pounds, while the same volume of oak weighs 44 pounds.

The unit of measure for fuelwood is the standard cord, which is 8 feet long by 4 feet wide by 4 feet high. The standard cord contains 128 cubic feet of volume and between 60 and 100 cubic feet of solid wood. The



wood content of a cord varies with the diameter, length, straightness, and bark thickness of the individual sticks of wood. Fuelwood value can vary from \$2 to \$20 per cord on the stump. "On the stump" or "stumpage" refers to wood standing uncut in the woodland.

**Pulpwood** is material with a minimum dbh of 6 inches and a maximum dbh of about 20 inches. It is used in making pulp for paper. While fuelwood can be cut from topwood and small upper stem material, pulpwood cannot because restrictions limit the amount of bark permitted in the chip produced from the tree.

Pulpwood is usually sold by the cord or ton. A cord of wood contains between 1.75 to 2.5 tons of wood.

**Sawlogs** are products of trees that are 12 inches dbh and larger. In Pennsylvania, six major species of trees are highly prized for sawlog production. They are white ash, red oak, white oak, red maple, sugar maple, and black cherry. But even with these species there can be considerable variation in value depending on tree quality and market opportunities.

Quality of sawlogs is greatly influenced by log form, surface and internal defects, and to some extent, the growing site. Straight logs are more valuable because they yield more boards with the least amount of waste. High-value sawlogs have clear bark surfaces without knots or branch stubs. Quality may vary among regions. Black cherry, for example, attains its highest value on the Allegheny Plateau, whereas it's often of little value when growing in southeastern Pennsylvania.

Sawlogs are described by their potential board foot yield. A board foot is a unit of wood 1 inch thick, 12 inches long, and 12 inches wide. One board foot contains 144 cubic inches.

More than 100 different rules for estimating the board foot volume of logs have been developed over the past 200 years. For many reasons, most of these have been found unsuitable and today only three volume rules are commonly used to predict or estimate (with varying accuracy) the amount of board feet a tree will produce. The three are the Scribner, Doyle, and International log rules.

A lot of emphasis has been placed on which of these rules is to be used, but it's really of little consequence if both the buyer and seller understand the advantages and disadvantages

of each rule. As a seller, you should take the time to acquaint yourself with these log volume rules and recognize that they are different. If you want to determine the volume of trees on your woodland, find out which rule prevails in your area and use it for making your estimates.

Table 1 shows that for trees of a given height and less than 28 inches in diameter, the Doyle and Scribner rules give an estimate of volume less than that of the International rule. For trees larger than 28 inches in diameter, the Doyle rule gives the highest estimate.

Table 1 Comparison of Board Foot Log Rules for 16-Foot Logs

Log Diameter	International	Scribner	Doyle
(inches)	(board feet)		
8	40	32	16
12	95	79	64
16	180	159	144
20	290	280	256
24	425	404	400
28	585	582	576
32	770	736	784
36	980	923	1024

Source: T. Eugene Avery, *Forest Measurements*, 1967.

Some major market differences exist within Pennsylvania. For any species in any region, a range of prices is paid for stumpage. To some extent, the range is due to variation in quality. Trees with long, straight trunks free of defects bring a higher price.

Prices paid for different species and grades are reported quarterly in the *Pennsylvania Woodlands* "Timber Market Report." You can get a copy from your county Cooperative Extension Service office.

Species, size, and quality aren't the only factors affecting price. In determining the value of your resources, you need to be aware of additional factors such as access, road-building costs, number of trees per acre, and local and regional demand for the material that you may have to offer for sale. These factors are discussed in more detail in *Pennsylvania Woodlands* Number 5: "Marketing Products From Your Woodland."

**Veneer.** In terms of quality, a tree with the potential to yield veneer is considered the ultimate product. Woodland owners like to believe they have veneer-quality trees on their property. In actuality, there are relatively few such trees. To make veneer, a tree generally must have a minimum dbh of 18 inches and be free of exterior defects. This means no overgrown branches, no epicormic branches, no mechanical injuries, and so forth. The larger the tree, the more likely small external defects can be overlooked.

In Pennsylvania, the principal veneer species are red oak, white oak, and black cherry. Many people think of black walnut when veneer is mentioned but it's often of low quality in Pennsylvania and seldom in sufficient quantity.

If the production of veneer-quality trees is one of your objectives, you should be aware that the market is somewhat hit-or-miss, dependent on demand both within the United States and in foreign markets. Veneer also tends to have a seasonal market cycle that is highest during the late fall, winter, and early spring months.

## SUMMING UP

After you consider the results of your woodland resource evaluation, you may need to modify your original list of objectives. Are your objectives realistic now that you know about such factors as species composition, size, and quality of vegetation on your woodland? Does your woodland have the potential to provide what you want in the future? Do portions of your woodland have more potential than others for producing high-quality wood products?

Reviewing this publication will help you begin to evaluate your woodland resource but you may still have further questions. You may decide that the job is better done by a professional forester. *Pennsylvania Woodlands* Number 1: "Sources of Information and Guidance for Woodland Owners" tells you how to contact people who can help you plan for the use and development of your woodland.

## ADDITIONAL REFERENCES

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Prepared by James C. Finley, Forest Resources Extension, School of Forest Resources, Penn State.

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