



Pennsylvania Woodlands

Penn State College of Agriculture, Cooperative Extension

Developing a woodland management plan

Number 9

Development of a forest management plan is a good way for a woodland owner to define and organize land-use objectives. The plan is a document that describes the natural resources found on a woodland, and a program of management activities for a specific time period.

A management plan should be written with the assistance of a professional forester.¹ The landowner decides what kind of benefits are wanted from the woodland, and the forester determines whether the resource can be managed for these benefits. A management plan provides the landowner with a guide for scheduling and conducting management activities.

A management plan does not have to be a complicated document and there is no standard format for writing one. However, it is important that a number of key elements be included:

1. Management objectives
2. Maps
3. Inventory data
4. Site and stand descriptions
5. Management recommendations
6. Activity schedule

MANAGEMENT OBJECTIVES

An analysis of ownership objectives provides the foundation upon which the rest of a management plan is developed, and defines the type and extent of vegetation management that is practiced. Your ownership goals determine how much effort is allocated to the management of timber, water, wildlife, recreation, or other products and benefits.

Consideration should be given to the length of time the land will remain under its present ownership and how, or to whom, it will be disposed of when ownership is relinquished. The forester who is assisting with the plan must be made aware of these intentions so that management activities are scheduled accord-

ingly. For example, people who own land for speculation purposes probably have short-range management goals because they intend to sell the land. If land is to be inherited by a landowner's heirs, some long-range objectives are formulated now and carried out in the future. Your management objectives should be clearly stated in the plan.

The following objectives were listed by a woodland owner with a multiple-use management scheme for a 200-acre woodland:

1. Harvest an annual supply of firewood (5 cords per year) to supplement home heating.
2. Improve wildlife habitat, especially to attract deer and grouse for hunting.
3. Receive periodic revenue from commercial timber production.
4. Improve the area for cross-country skiing.

MAPS

The inclusion of maps in a management plan provides a graphic source of information in the discussion and implementation of management alternatives. Several kinds of maps can be included, but not all of them are essential to a plan. The maps do not have to be elaborate but must always have a scale and a north arrow.

First, locate your property in relation to land features and roads. For this purpose, you can outline your property on a U.S. Geological Survey topographical map. The location map allows other people who are involved with your management plan to become familiar with the property (Figure 1). For example, since the map shows the location of the property in relation to major roads, it will be easier to determine access routes for management activities.

A survey map (Figure 2), showing the location of property corners and boundary lines, is the most important map to include in a plan. Such a map can be very useful for planning management activities. The map can be drawn from deed descriptions of the property contained in the county records. With this in-

¹Pennsylvania Woodlands Number 1: "Sources of Information and Guidance for Woodland Owners."

Figure 1. A location map. The boundaries of the property are outlined on a U.S. Geological Survey topographical map.

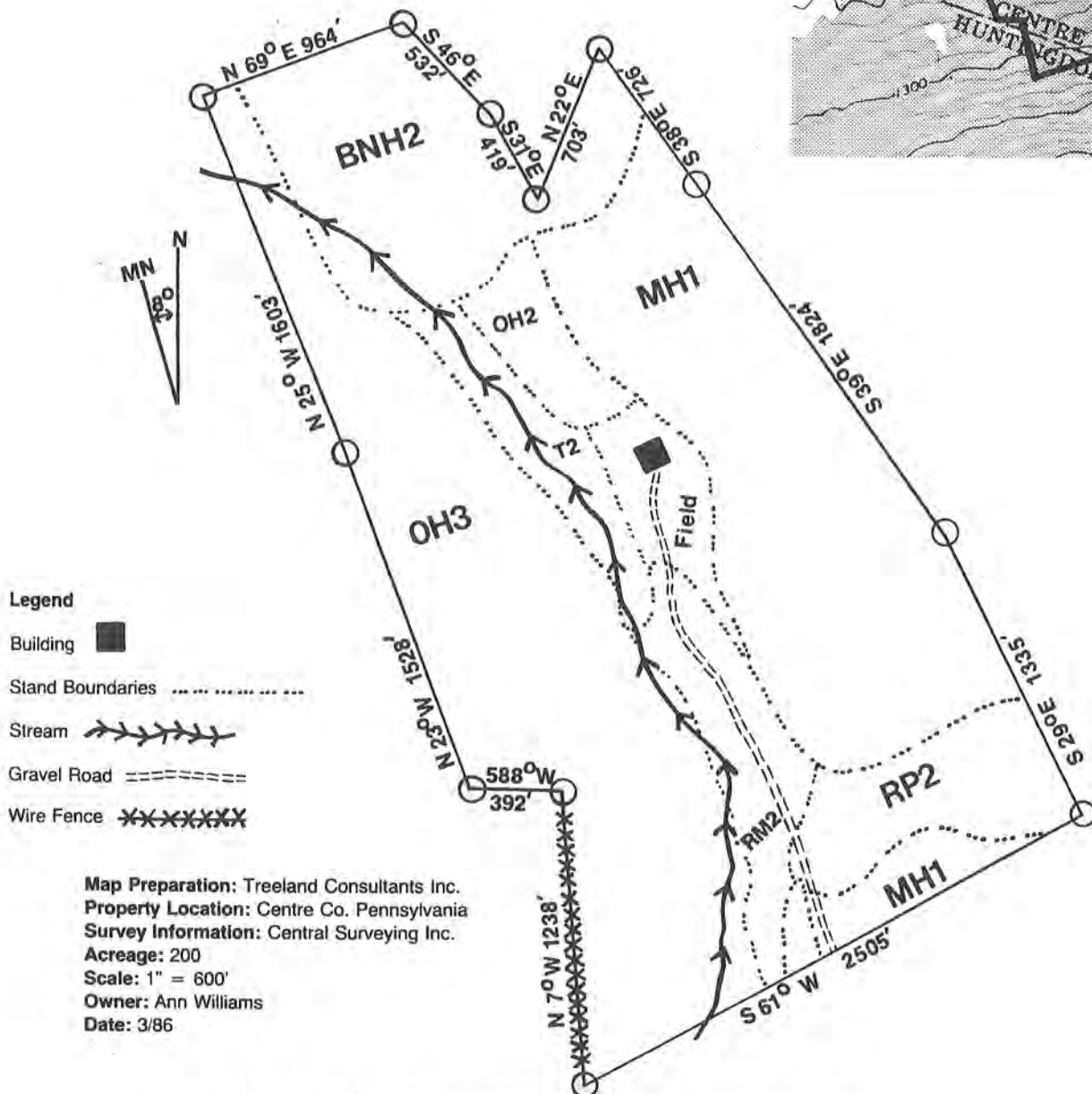
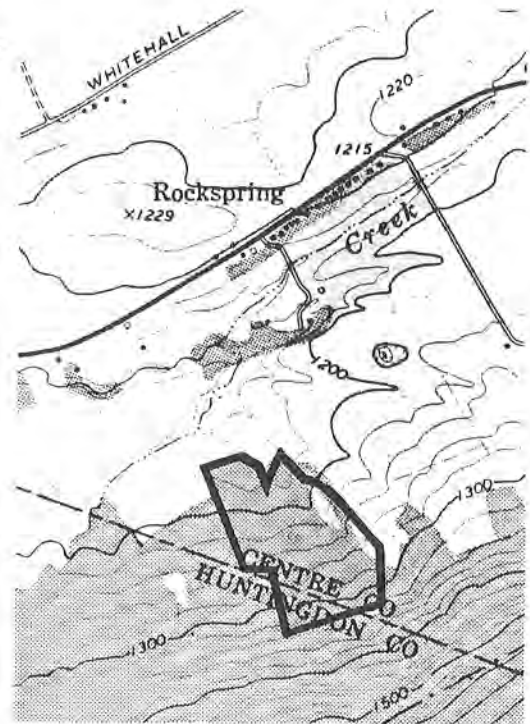


Figure 2. A survey map showing the location of property corners and boundary lines. Stands are labeled with a letter-number code that indicates vegetation type and age-class.

formation, you can verify the corners and locate some obvious boundary lines such as stone walls and old fences. However, a survey must be completed by a licensed surveyor when the maps are to be registered with the deed as a legal description of the property. The compass bearings and length of the property boundaries must be accurate and the map drawn to scale. It is easy for legal disputes to arise over boundary locations, especially during timber-harvesting operations.

Essential information concerning vegetation cover types and stand boundaries can be included on this map or on a separate map. The delineation of stand boundaries is important because each stand can be considered as a single management unit when silvicultural treatments are being prescribed.

A map showing soil types is useful when discussing site conditions for road building, timber harvesting operations, and vegetation management. Other maps (i.e., wildlife habitat) can be added if appropriate for a particular landowner's objectives.

INVENTORY DATA

An inventory of the natural resources has to be conducted before any management prescriptions can be made. The purpose of an inventory is to describe the woodland by measuring the resource. During an inventory, only portions of the resource, or samples, are usually measured; it takes too much time to measure the entire resource. Therefore, the inventory data provide only an estimate of the quantity and quality of the whole resource.

The number of measurements needed to describe the woodland depends upon the variability found within the resource. For example, in making an inventory of the vegetation found on your woodland, more data will be collected on sites with a greater variety of plant species than on sites with only a few different species. If your goal is to manage your woodland for multiple uses, measurements of the vegetation, soils, water, and wildlife can be included in the inventory. If your main interest is to harvest forest products, then the inventory should focus on the timber resource. Inventory data are used as the basis for considering the management options available to you. A forester or other qualified resource manager can collect and interpret the data and put together an appropriate plan for the resource and your objectives.

Timber inventory data are usually organized by stands in the form of stand and stock tables (Tables 1 and 2). A stand table lists the number of trees per acre according to tree species and tree diameter. Stock tables provide volume information that is reported as board feet or cubic feet per acre.

SITE AND STAND DESCRIPTIONS

The environmental factors such as climate, soils, and topography, affect the kind of vegetation found on your woodland and determine the quality of the site for growing trees. Descriptive information about the site, such as stand age and structure and insect and disease damage, can be included in a management plan.

Site index can also describe a stand. *Site index* is a measure that evaluates the quality of a site: the higher the number, the better the site and the better the quality of trees that can be grown there. A good quality site has soils that provide enough water and nutrients to grow trees faster than a site with insufficient amounts of these resources. To determine site index, the average heights of the dominant and codominant trees in a stand are compared (indexed) with their age. The taller the trees at a specific age, the higher the site index assigned to that site (Figure 3).

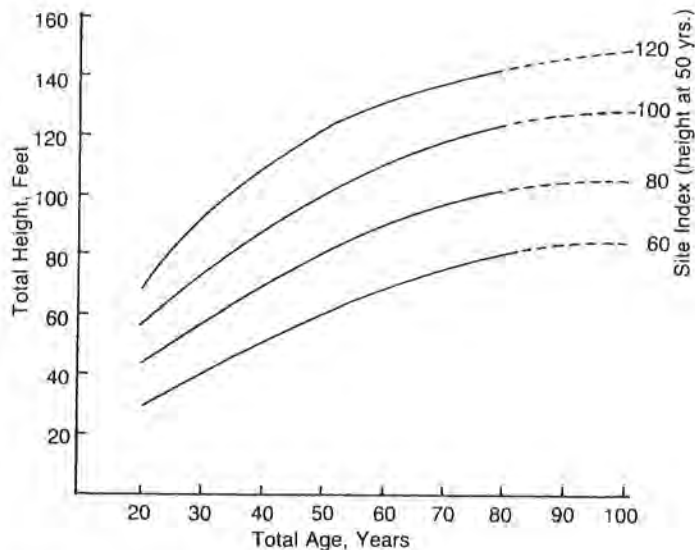


Figure 3. Site index curves developed for white pine. The age used for comparison between different sites is 50 years. For example, site index 80 on a 50-year basis means that the dominant and codominant trees reach an average height of 80 feet in 50 years. Source: U.S.F.S. Southeast. For. Exp. Sta. Res. Note no. 141.

STAND TABLE
Number of trees per acre by species and diameter class

dbh (inches)	Sugar Maple	Basswood	Ash	Red Oak	Blackgum	White Pine	Black Birch	Black Cherry	Total
2	92	0	0	0	0	0	0	0	92
4	33	11	0	0	0	0	0	0	44
6	0	5	0	0	0	0	5	0	10
8	6	11	0	0	0	0	3	6	26
10	3	7	0	0	0	0	0	2	12
12	5	7	4	0	0	0	1	1	18
14	4	9	4	0	0	0	0	0	17
16	0	11	4	3	1	1	2	0	22
18	4	11	0	1	0	1	0	0	17
20	0	1	0	0	0	0	0	0	1
22	0	1	0	1	1	0	0	0	3
24	1	0	0	0	0	0	0	0	1
Total	148	74	12	5	2	2	11	9	263

Table 1. A stand table has been developed from the inventory taken on a 200-acre woodland tract that is being evaluated for potential to produce timber, attract wildlife, and provide recreational opportunities.

STOCK TABLE
Merchantable volume of sawtimber in board feet per acre
International 1/4-inch rule

dbh (inches)	Sugar Maple	Basswood	Ash	Red Oak	Blackgum	White Pine	Black Birch	Black Cherry	Total
12	320	420	240	0	0	0	60	80	1,120
14	350	890	380	240	0	0	0	0	1,860
16	0	2,200	540	100	100	100	120	0	3,160
18	860	2,030	0	0	190	0	0	0	3,080
20	0	350	0	240	0	0	0	0	590
22	0	360	0	0	210	0	0	0	570
24	350	0	0	0	0	0	0	0	350
Total	1,880	6,250	1,160	580	310	290	180	80	10,730

Table 2. Volume data from the inventory taken on the 200-acre woodland have been combined with the stand table information to estimate the amount of sawtimber that is available for harvest.

The following is a sample of stand and site descriptions for three stands from the management plan for the 200-acre woodland mentioned previously. The descriptions were developed from the landowner's inventory. The inventory was designed to evaluate the woodland's potential to produce timber, attract grouse and deer, and provide recreational opportunities.

STAND 1: 40 acres

Type: Oak-hickory

Site: Stand 1 is located along the entire western side of the woodland (see location map). The land is gently sloping, at a grade of about 15 percent. A small stream runs along the eastern boundary. The Andover soils are derived from sandstone, and on this particular site, they are stony and surface stones are present. Seasonal wet areas also occur. The site index is 65 for oak.

Stand: The stand is dominated by black birch, white pine, red oak, chestnut oak, red maple, and hickory. This is a medium-size sawtimber stand of trees with an average diameter of 14 inches. Most of the trees are 80 to 100 years old. The growth rate of the dominant and codominant trees average 10 rings per inch (1-inch diameter growth in 5 years). Many of the oaks have been defoliated by gypsy moths during the past 5 years, and as a result some of the trees, especially in the intermediate and suppressed crown classes, have died or been weakened. There is little herbaceous vegetation, and advance regeneration of tree seedlings is scarce because of a high deer population. Hayscented fern is patchy throughout the stand, covering about 15 percent of the area. The total merchantable volume of timber per acre is 18 cords of pulpwood and 5,164 board feet² of sawtimber. Estimated value of the timber is about \$450 per acre (\$18,000 for 40 acres).

STAND 2: 25 acres

Type: Basswood-northern hardwood

Site: Stand 2 is located along the northern side of the woodland (see location map). The topography is generally flat, about 3 percent slope. The Andover soils are moderately stony, and soil drainage is adequate for forest growth. The site index is 75 for northern hardwoods.

Stand: This is a northern hardwood stand dominated by basswood, sugar maple, white ash, and red oak. Grapevine is scattered throughout the stand. Most of the stand is comprised of medium-size sawtimber with an average diameter of 15 inches and age ranging from 60 to 80 years. The average growth rate of the trees is 9 rings per inch for trees in the dominant and codominant crown classes. Advance regeneration of sugar maple is moderate but for other species is scarce. Total merchantable volume per acre is 13 cords of pulpwood and 10,730 board feet of sawtimber. Estimated value of the timber is about \$760 per acre (\$19,000 for 25 acres).

STAND 3: 50 acres

Type: Mixed-hardwood

Site: Stand 3 is located on the eastern side of the property north of the owner's house. The site has about a 10 percent slope, and the Buchannon soils are moderately well-drained and moderately stony. The site index is 65 for oak.

Stand: This is a pole-sized stand with an average diameter of 7 inches and an average age of 40 years. The principal species are red oak, white oak, red maple, and white ash. The average growth rate for the oaks is about 8 rings per inch. Gypsy moth defoliation has been moderate and no mortality is evident. Most of the stand volume is in the pulpwood-size class. Total merchantable volume per acre is 18 cords of pulpwood and 440 board feet of sawtimber. Estimated value of the timber is about \$108 per acre (\$5,400 for 50 acres).

²All sawtimber volumes are calculated according to the International 1/4-inch rule.

MANAGEMENT RECOMMENDATIONS

Management recommendations are formulated from the ownership objectives, the woodland inventory information, and site and stand descriptions. Objectives are compared with the woodland's potential to provide the desired benefits.

Cutting is the principal management tool used to alter a stand's species composition, density, size, and age. Both plants and animals respond to the changes that take place in a stand following cutting. Water yield is also affected by the removal of trees. Foresters know which cutting practices will produce certain responses in the vegetation. They are aware of the probability of outside influences, such as defoliating insects and herbivorous mammals, either prolonging or preventing the desired outcome of a treatment.

The forester assisting with your plan can recommend a silvicultural management prescription for each forest stand. The prescription defines the series of treatments that will achieve certain management goals. Management prescriptions usually have a time span of about 20 years. The prescriptions should contain a certain degree of flexibility because of the unpredictable nature of outside influences. In addition, there is always the possibility that you, the landowner, may change your original objectives.

Complementary management activities help make treatments more economical. For example, the construction of access roads constitutes an expense. To help offset this cost, road construction could be coordinated with a commercial timber harvest and in accordance with anticipated uses of the woodland.

In the woodland example used earlier, management recommendations for stands 1, 2, and 3 could contain the following treatments:

STAND 1

The number of trees in this stand is currently below the maximum that the site can support, and the growth rate of the dominant and codominant trees is excellent. Therefore, thinning the stand to provide more growing space for the better quality trees is not necessary at this time. The stand should be reexamined in 5 to 10 years to determine if a thinning operation is necessary. The stand presently requires an improvement cutting to remove dead and dying oak trees. The oaks will be harvested by the landowner for firewood—but three to five of these trees per acre that are greater than 8 inches in diameter will be left for cavity-nesting birds. Deer pressure and competing vegetation must be reduced in this stand before any future silvicultural treatments can be used to promote regeneration.

STAND 2

The number of tree stems in this stand is higher than optimal for maximum tree growth. A commercial thinning operation will be conducted to create additional growing space for the better quality trees and to provide income from the sale of sawlogs and pulpwood. Approximately 2,300 board feet of sawtimber and 5 cords of pulpwood will be removed per acre. Using current average stumpage prices of \$5 per cord and \$70 per thousand board feet, this treatment would produce a revenue of about \$186 per acre (\$4,650 for 25 acres). The existing road will have to be extended the full length of the property in order to have access to the timber. The cost of the road will be included as part of the timber sale expenses.

During the thinning operation, grapevines will be removed only if they are endangering a valuable sawtimber tree; otherwise they will be kept to provide grouse food. Immediately after completion of the thinning operation, the road and log landing will be seeded to a grass species suitable for deer and other wildlife. Seeding the road will also reduce soil erosion. The road and skid trails can serve as cross-country ski trails in the winter. Logging slash can be piled to improve wildlife habitat for small mammals.

At their present growth rate, the remaining trees will in 10 years fill the growing space created by the original thinning operation. In 10 years the total merchantable volume of sawtimber will be about 15,700 board feet per acre. A second commercial thinning can be conducted at that time, to remove 7,470 board feet per acre. The revenue produced from the second thinning would be approximately \$523 per acre (\$13,075 for 25 acres) at today's stumpage prices.

Fifteen years from now the first of two shelterwood operations can be carried out to promote regeneration. If regeneration is successful, the final harvest should take place approximately 20 years from now.

STAND 3

The major management goal for this stand is to improve wildlife habitat, primarily for grouse. In order to achieve this goal, 2 acres will be clearcut every year for the next 5 years on 10 designated acres. The herbaceous vegetation which becomes established in the clearcuts will attract insect food for grouse broods. The landings and skid trails will also serve as herbaceous openings. The clearcutting operations will remove approximately 19 cords of firewood per acre, worth \$5 per cord.

The rest of the stand (40 acres) will receive an improvement cutting to remove poorly formed trees and undesirable species. This treatment will be conducted at the same time as the 2-acre clearcut. Approximately 2.5 cords of firewood per acre will be removed, producing a revenue of about \$12.50 per acre or \$500 for the entire stand. A thinning will be needed in approximately 10 years.

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