Woodland Management

Understanding Trees and Woodlands

Forest management is working with groups of trees or forest stands to ensure abundant and high-quality forest products and services now and in the future. The Society of American Foresters defines forest management as " . . . the application of business methods and technical forestry principles to the operation of a forest property."

Woodland management consists of three general types of activities—establishment, care, and harvesting of trees to meet the objectives of the land owner. This sounds very simple, but it is not. Proper woodland management requires a great deal of knowledge and understanding from a wide variety of disciplines.

A successful woodland manager needs the understanding of a silviculturist; the long-range viewpoint of a planner; the skills of an administrator; and the alertness, flexibility, and all around resourcefulness of a successful businessperson.

The major forest types in Iowa are red oak/white oak/hickory, or the central hardwoods; silver maple/cottonwood/ash, or the bottomland hardwoods; and sugar maple/basswood, or the northern hardwoods. Specific management recommendations will differ between forest types as well as between different tracts of the same type.

Because of the complexities involved in woodland management, woodland owners should seek advice and assistance from district foresters or private professional consulting foresters. These professional foresters consult with private timber owners on all facets of woodland management.

What Makes a Good Forest

Forest land should produce as much wood or other products and services of as high a quality as possible. To do so the following aspects should be considered.

Full use of land—No forest land should be idle. Every piece of ground capable of growing trees should be growing them.

Proper spacing between trees—An acre of land will grow the most wood if trees have neither too much nor too little growing room. The optimum number changes with age and varies with quality of the land.

Fast growth—Generally, the faster trees grow, the more wood and profit a forest yields per acre. Rate of growth is much greater under proper management than in a neglected forest. In badly treated forests, the loss of wood through grazing, overcutting, and decay is often greater than the growth. Unless management is improved, such forests gradually dwindle away.

Healthy condition—Figures 1 and 2 show that protection from damage by grazing, fire, insects, and disease is particularly important.

Prompt and sufficient restocking after cutting—This is very important, but too often neglected.

To produce wood of high quality and high value the following factors are critical.

Grow valuable kinds of trees—Manage the forest in such a way that the best kinds of trees are given the best chance to grow and propagate so that all trees in the forest will be of desirable species.

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University Extension

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Trees should be of good form—Good trees with straight, evenly-tapered trunks that are clear of branches can be worked up easily and have much greater value than crooked, forked, or branchy trees.

Trees should be sound—If trees contain rot, fire scars, or other defects, their wood is unsuited for products of high quality and value. In well managed forests, the percent of defective wood is very small.

Weed out poor trees—Doing this at an early stage is desirable to produce a large quantity of good wood in the better trees.

The Tree

Some trees grow fast; others grow slowly. A forest manager should know what influences the rate of tree growth and apply this knowledge in managing a forest.

Figure 1. An ungrazed, properly managed woodlot showing an abundance of natural reproduction for future products from the stand.

Figure 2. A moderately grazed woodlot. Note the absence of reproduction in this stand.

Trees need adequate supplies of mineral food and water from soil plus light and heat from the air. Trees are inactive in winter. With the coming of spring, they absorb soil nutrients in water solution through numerous hair-like rootlets. This liquid rises through the outer part of the wood (sapwood) up the trunk and branches into the leaves. There it combines with gas (carbon dioxide), which the leaves absorb from the air, and is transformed into "tree food" through the action of the sunlight and the leaves. This process is called photosynthesis. This tree food moves in solution through the inner part of the bark into the branches and the trunk and is used to form a new layer of wood just under the bark.

A tree grows in thickness by adding a new layer of wood each growing season. These layers show as "annual rings" when the trunk is cut.

A tree grows in height only through new growth from the shoot tip. A branch that develops at a certain height above the ground remains at that point, since the trunk never moves upward.

Tree Age

The age of a tree cut close to the ground can be found by counting annual rings from the middle of the stump to the bark. If the stump is fairly high, add several years to allow for tree growth from ground level to the stump height. To find the age or rate of growth of a tree without cutting it, foresters use a thin hollow auger (increment borer). It is drilled into the tree to its pith, and the rings on the extracted cylindrical core show the age.

Rate of Growth

When favorably situated, trees in young, even aged forests (in which all trees are about the same age) grow fast in height, as if striving to avoid being overshadowed and suppressed. They normally make the best volume growth in middle age. This is not true for all aged forests (trees varying from small seedlings to mature or overmature). Here trees in the understory often grow slowly for long periods awaiting release from crowding. When this occurs through accident or cutting, they begin to make good height and diameter growth.

Upon maturity, tree growth gradually slows down. Overmature trees are less resistant to disease and insects and are therefore a poor risk. Rot frequently increases in old trees more rapidly than volume growth.

Table 1. Guide for planting forest trees.

	Recommended sites						
	Moisture			Light			
Species	Dry	Well drained	Moist	Full sun	Some shade	Growth rate	Remarks
Conifers							
Austrian pine	X	X		X		Medium	Because of disease, requires good air circulation
Jack pine	X	X		X		Fast	Hardy and adaptable
Ponderosa pine	X	X		X		Medium	Western lowa only
Red pine		X		X		Medium	Prefers cool locations
Scotch pine	X	X		X		Medium	Hardy and adaptable
White pine		X	X	X	X	Fast	Intolerant of air pollutants, adaptable
Norway spruce		X	X	X	X	Fast	Hardy and adaptable
White spruce		X	X	X		Medium	For dry sites use Black Hills variety
Eastern red cedar	X	X	X	X		Medium	Good for wildlife, native
Broadleaf							
Green ash		X	X	X		Fast	Valuable wood products, good firewood
White ash		X		X	X	Medium	Valuable wood products, good firewood
Basswood		X	X	X	X	Fast	Excellent wood for carving
Cottonwood			X	X		Fast	Bottomland sites
Hackberry		X	X	X	X	Medium	Grows best on rich soils
Hickory	X	X		X	X	Slow	Good firewood
Black locust		X	X	X		Fast	Good firewood
Silver maple		X	X	X		Fast	Bottomland sites
Sugar maple		X	X	X	X	Slow	Very tolerant of shady sites
Red oak		X		X		Medium	Valuable wood products, good firewood
White oak		X	X	X		Slow	Valuable wood products, good firewood
Sycamore		X	X	X		Fast	Very tough wood
Black walnut		X		X		Fast	Valuable wood products
Willow			X	X		Fast	May be valuable for bank stabilization

Therefore, permitting trees to become overmature may result in waste of wood and money to the owners.

The rate of growth of trees varies with species and with conditions of soil and moisture. It also depends on the way in which a forest is managed and cut. A fast-growing, vigorous forest can earn several times more revenue a year than one where growth is permitted to stagnate. Furthermore, the protection of vigorously growing forests generally requires less effort and expense than that of stagnated forests.

Light Requirements

Light is the most manageable factor of growth in the forest. Through thinning and harvesting practices, the forest manager can favor the desired species by manipulating the amount of sunlight an individual tree receives. Different tree species have different requirements for light to sustain optimal growth. This silvical characteristic is referred to as *tree tolerance*. A tolerant tree will survive and grow in the shade of other trees; an intolerant tree species needs full sunlight for survival and growth.

A knowledge of species tolerance is necessary for the management and manipulation of forest stands. For example, tolerant species can be regenerated using selection systems of harvest because their seedlings can become established in the shade. But intolerant trees must be regenerated using clearcut systems because their seedlings require full sunlight. An individual tree's response to thinning or release also is determined by its tolerance or intolerance to shade.

Suitability of Trees to the Site

Trees, especially softwoods, can grow well on much poorer soil than that needed for row crop agriculture. Yet it is important to know what site is best for certain trees and, when choice is possible, to grow them on such a site.

Table 1 gives a handy guide for matching tree species with the site. For a more complete treatment of the subject see *Silvics of U.S. Forest Trees*, Agriculture Handbook No. 271.

The Forest

To manage a forest properly, the owner must understand what it is, how it lives and grows, and what is good or bad for it. Only through such understanding can the owner get the best results with the least effort.

A forest is not merely a number of trees growing in the same location. It is a community of trees, other plants, and many creatures. Trees and other inhabitants of the forest greatly influence each other's lives.

The peaceful appearance of a forest is deceiving. A fierce though slow and silent battle is going on constantly. Plants struggle for water and food with their roots and for light and space with their foliage. Similar or different trees may be enemies or allies. When trees compete for life, the strongest win. The strongest, however, are not always the most desirable for our needs. They may be "weed trees" that cannot be used or sold. They have no place in a well managed forest.

With an understanding of this struggle and through proper cutting, a woodland owner can direct the forces of nature so the forest will continuously yield the desired products and services.

Forest Soil

The soil under a forest may differ greatly from place to place. Where the forest has not been burned or heavily grazed, however, a layer of porous material is always present. On the surface there usually is a litter of fallen leaves or needles, twigs, and decaying wood and bark. Under this is the same material but considerably decayed. Still lower is fully decayed humus merging with the mineral soil.

This covering is important. It absorbs water from rains or melting snow, storing it for plant use by slow filtering through the soil to produce a steady flow of springs and streams.

In the open, where there is no cover and the ground surface is more compact, water does not penetrate into the soil as readily. After heavy rains or rapid melting of snow, especially on steep slopes, water runs off quickly into gullies and streams. This may cause soil erosion as well as floods.

The sponginess of forest soil is aided by the forest itself in reducing rapid surface runoff of water. Where forests in a large area are destroyed, especially in hilly country, hazardous conditions may develop. Serious soil erosion may occur, floods may increase and cause more damage, droughts are intensified, and the water level in the soil is lowered so that streams and wells may dry up. Forest devastation is a threat to everyone, but particularly to people who derive their livelihood from forest products and forest industries, agricultural populations, and people who depend on the use of water.

Forest Climate

On hot days, it is much cooler in a forest than in the open; in winter, it is warmer. Air moisture in the woods is much greater, especially in summer when the soil is more damp than in the open. Within a forest, the wind has much less sweep. Such moderating influences on local climate are beneficial to forest growth, and these extend for short distances beyond the forest.

Additional Information

Other pamphlets in this Woodland Management Series provide information on various topics including protecting woodlands, harvesting forest crops, improving existing timber stands, and forestry assistance available to land owners. These pamphlets and other forestry publications are available from your county extension office.

Prepared by Paul H. Wray, extension forester, Iowa State University, and William Farris, state forester, Iowa Department of Natural Resources.

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