Aspen Management in Michigan
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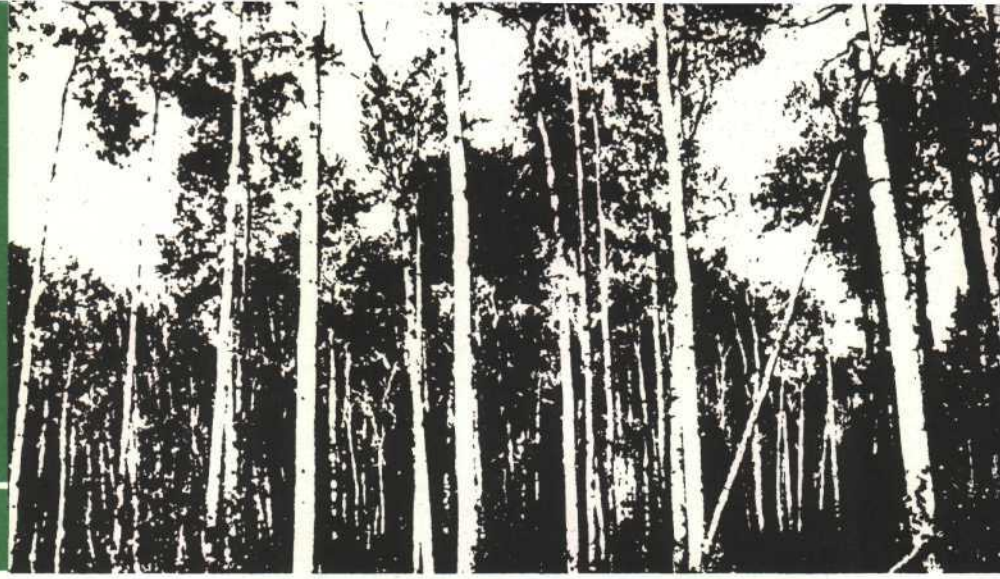

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Aspen or "popple" forest stands are widely distributed throughout Michigan, particularly in the northern portion of the lower peninsula and throughout the upper peninsula. Typically, this forest type can be identified by its prolific growth habit which results in numerous, olive-green to whitish stems growing close together. Its foliage is brilliant, golden-yellow in the fall. The most recently published forest survey reported that the aspen forest type occupies over 4 million acres or approximately 22% of the commercial forest land in the state. More than half of this acreage is located on small, non-industrial, private land.

In 1979, over 709,300 standard cords of aspen were harvested from commercial forest lands in Michigan. Assuming an average stumpage value of $4.00 per standard cord, the value of aspen harvested in 1979 was nearly $3 million. Since the total aspen resource in the state is estimated to be in excess of 30 million cords, and forecast increases in demand have been made, this valuable forest resource is worthy of intensified management and use.

Aspen forests are valuable for a number of reasons. Although the principal use of aspen is for manufacture into pulp for the production of paper products and particleboard, it is also important as a source of food and shelter for many forms of wildlife, including deer and ruffed grouse. Like other forest types, aspen influences watershed values and water quality and provides the setting for outdoor recreation and aesthetic enhancement.

THE ASPEN FOREST TYPE

Aspen is a relatively fast growing, short-lived tree that is widely distributed over a variety of soils and sites. Accordingly, growth is quite variable depending on soil fertility and moisture. On good sites, aspen reaches maximum development and is ready for harvest for pulpwood chip material in about 30 to 35 years or it may be held to a rotation of 40 to 45 years for shortwood (bolts). The actual age for harvest, however, will probably be dictated more by financial factors than by stand maturity. From a financial standpoint, once the rate of return on investment falls below an acceptable level, the stand should be harvested.

Ecological Characteristics

Aspen is an intolerant species that is unable to grow and establish properly in its own shade or in the shade of other trees. Because of this intolerance to shade, aspen usually occurs in even-aged stands (groups of trees within 10 years of age of each other) where no other tree species dominate. However, aspen will also grow vigorously in mixed, even-aged stands, providing that the aspen is initially established with the other tree species regenerating on a site. Moreover, aspen often gets started after a catastrophic event such as fire, or after cutting of a previous stand containing some aspen.

This species is considered a temporary forest type. It serves to occupy the ground temporarily for 40 to 60 years, but will usually give way to tree species that are more shade-tolerant. Succeeding species will vary, depending on the site. On heavier soils in northern Michigan, northern hardwood species such as sugar maple, American basswood, yellow birch and American beech will usually develop. In the upper peninsula, white spruce and balsam fir often succeed aspen stands. However, it is often possible to grow several aspen crops before other species take over the site. The methods used in harvesting the aspen can slow down or speed up the natural conversion to other species.

Species Components

Three species of aspen are present in Michigan. Each is usually associated with a different site condition (factors such as climate, soil, slope, etc., that

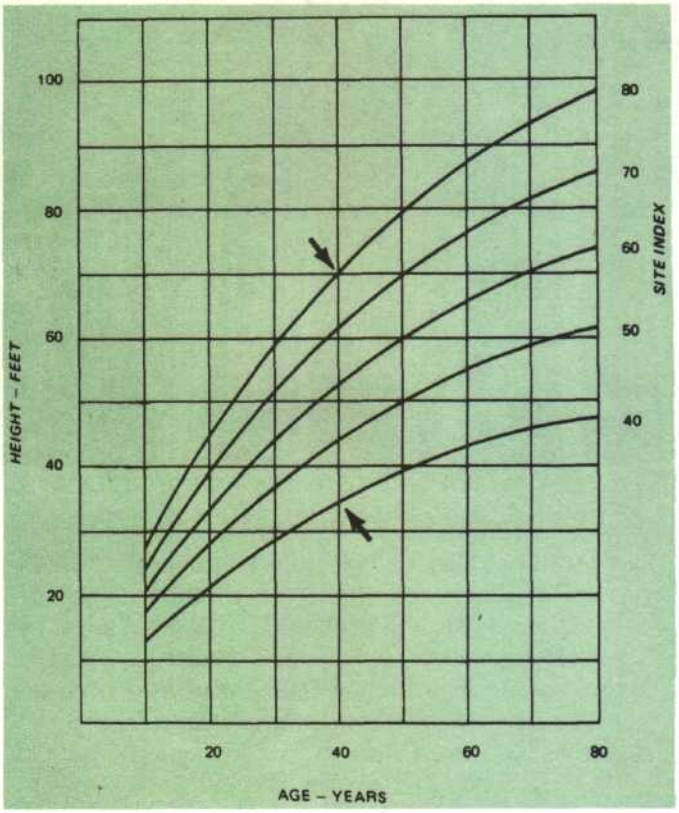

Figure 1. Site index for aspen ranges from 40 to 80, depending on the favorability of site. (Adapted from Kittredge and Gevorkiantz 1929 by Gevorkiantz 1956.)

influence tree growth on any given location). Quaking aspen *(Populus tremuloides)* is the most abundant of the three aspen species. It is adapted to a variety of soil and site conditions ranging from dry sites, such as coarse-textured sands, to wetter sites with heavy clay soils. Bigtooth aspen *(Populus grandidentata)* is also fairly abundant in Michigan; however, it is usually restricted to better sites that are not extremely dry or wet. The third species, balsam poplar or Balm-of-Gilead *(Populus balsamifera)*, is not abundant and is only found on low wet sites along streambanks or on the borders of lakes and swamps.

Stand Composition and Site Quality

Aspen most often occurs in essentially pure stands (groups of trees of the same species), but it is also found in scattered, mixed stands with other species. Most commonly associated with aspen are paper (white) birch, pin cherry and red maple; in northern areas balsam fir and white spruce are common understory species with aspen. However, other species can also be found, depending upon the stand history and quality of the site.

The potential to produce forest crops is related to the quality of the soil and site. This is often expressed on the basis of tree height in feet at 50 years of age (site index) (Fig. 1). Production will be best on those sites which have a site index of 65 and up, while a site index of 55 to 65 is considered to be medium, and a site index of less than 50 to 55 indicates a lower quality site. Early height growth is not a good indicator of site quality. Consequently, age-height relationships are not reliable indicators of site index in stands younger than 20 years of age.

Aspen site quality will vary with soil texture and depth to the water table. The best sites are those with loam or clay loam soils which have a relatively high water holding capacity. The optimum water table depth is between 4 and 6 feet. Accordingly, sites with water tables considerably below 6 feet, or above 4 feet, will be less productive.

On infertile or otherwise unsuitable sites, growth and yield of aspen will be poor. On most of these poor sites, serious defects usually develop in the trees at such an early age that many will not attain saleable size. Harvest stands that do reach merchantable size before the trees become highly defective and lose their value. Hypoxylon canker, a destructive stem disease, is common in trees growing in unsuitable locations. On such sites, consider converting the stand to pine or other suitable species to realize increased productivity and financial return.

Aspen will produce substantial yields of timber on good sites. Expect 20 to 25 cords per acre on medium sites, and 30 cords or more per acre on good sites at 50 years of age. Harvest stands for pulpwood at 40 to 45 years of age on medium sites and at 50 to 55 years of age on good sites. Often, it may be necessary to harvest at a slightly younger or older age to take advantage of favorable markets.

Units of Measurement

Most often, aspen marketed for pulpwood is sold in rough or pulpwood cord units. In Michigan, a pulpwood cord is a stack of wood 4 feet wide and 4 feet high by 100 inches in length. Pulpwood is cut by logging crews into 100-inch "pulpwood sticks" to take advantage of truck width in loading and transporting pulpwood to the mill. In some locations, however, pulpwood is bought on a weight basis at the mill (i.e.by the number of tons in a truck load). A standard cord of green aspen weighs approximately 2.3 tons.

Whole tree chipping of aspen is rapidly increasing in Michigan. Consequently, aspen chips will probably be marketed even more in the future. Higher total yield of wood per acre can be obtained through the use of this method because the limbs and tops previously left in the woods by conventional harvesting methods are now utilized. Chips are also sold by weight.

MANAGEMENT SUGGESTIONS

A principal objective of any sound forest management program is to harvest the mature crop while providing for regeneration or re-establishment of a new forest stand. Biological and ecological characteristics of those species present in the forest stand determine to a large extent what management practices to follow, particularly with respect to harvest. The intolerant nature of the aspen forest type requires periodic harvests to produce continual crops. Other factors that should be considered, include landowner objectives for non-timber products and values. The availability of markets and quality of the site will also have an impact on the intensity and timing of management operations. There are several unique aspects of aspen stands which influence management recommendations.

Reproduction-Stocking Characteristics

Aspen is unique because stands are easily reproduced by suckers (sprouts) from existing root systems. When stems are harvested, the root system responds by producing large numbers of suckers. For example, studies in the Lake States have reported that between 3,500 to 22,850 suckers per acre can be expected to develop within one year after logging. By the second year, however, when most suckering will have been completed, new stands will contain between 4,000 and 6,000 stems per acre. This number of stems will be more than enough to successfully establish a new stand.

Two important factors affect the production and development of aspen suckers: the number of trees left after logging or fire and the time of year that logging occurs. Due to the intolerant nature of the species, aspen suckers usually develop in the largest number and grow most rapidly in full sunlight. Furthermore, in mixed stands, relatively few aspens are required to produce a full stocking of suckers. If more than a few cull and otherwise unmerchantable aspen trees remain standing following harvest, they should be felled. Culls of other species should also be felled or eliminated with chemical herbicides. It may also be desirable to chemically treat the stumps of other hardwood species to prevent their sprouts from becoming a part of the new stand.

It is generally recognized that the time of year during which logging occurs influences the amount of root suckering. Dormant season harvesting usually encourages maximum production of vigorous suckers which appear the following spring. These sprouts often grow 6 feet or more the first year and usually outgrow other woody species or herbaceous growth. In contrast, summer logging may result in the production of fewer suckers than fall, winter and spring logging, although enough should still be present to successfully reproduce the stand.

Harvest Suggestions

Since aspen seedlings and root suckers are intolerant of shade, the clearcutting method is used to harvest and regenerate aspen. Clearcutting removes all trees (regardless of size) on an area at one time. When all trees are removed at the time of logging, full sunlight can penetrate to the forest floor to encourage optimum root sucker production.

Carefully consider the size and shape of the clearcut to minimize short-term visual unsightliness, erosion, and undesirable impacts on water quality. Although the initial result of a clearcut tract of land may be negative, the harsh effects on recreation, streamflow, or water quality are only temporary. Furthermore, many positive benefits to several wildlife species will also result. The undesirable effects of clearcutting can be softened by following suggested guidelines.

Clearcuts are not as visually disturbing if the size of the area harvested is not too large and if the size and shape is varied and kept in scale with natural or man-made openings that may occur in the landscape. For this reason, the area to be harvested should not exceed 25 to 40 acres. In addition, irregular, free-form shapes that follow natural land forms and soils expose smaller areas of a clearcut area to view. Avoid unnatural cutting boundaries with long, straight edges or rectangular shapes which clash with natural landscape forms or surrounding timber. When edges do contrast sharply, they can often be "feathered" to soften their effect. Thin into adjacent stands to develop an irregular, loose appearance or spacing. Leave buffer strips along streams and major highways.

Sophisticated machinery, such as tree shears, feller-bunchers and whole-tree portable chippers is being used increasingly to clearcut aspen. The relatively high volume per acre in a well-stocked, even-aged mature aspen stand make mechanized harvesting an economically feasible alternative to traditional logging methods (Fig. 2).

The use of mechanized harvesting increases labor productivity and favors year-round logging operations, conditions permitting. Although these heavy machines can cause varying degrees of site disturbance, little adverse effects on soils and watersheds have been observed. A major advantage of mechanized harvesting, if properly used, is that it can create conditions favorable for regeneration and desirable wildlife habitat. Slash can be concentrated where desired, brush can be uprooted and largely destroyed, and unmerchantable trees can be felled or broken off at low cost.

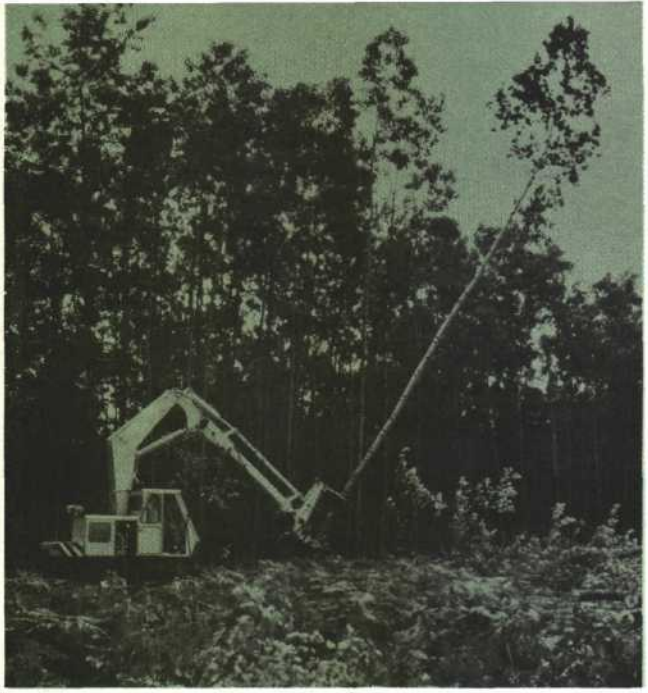

Figure 2. Mechanized harvesting is an economically feasible and desirable alternative to traditional methods.

Thinning Aspen Stands

Thinning is an improvement cutting operation often completed in immature forest stands to reduce tree density (number of tree stems per acre) and concentrate subsequent growth on fewer, higher quality trees. In Michigan, thinning is seldom recommended for aspen stands being managed for fiber production (pulpwood) because prevailing market conditions and site quality make thinning economically unfeasible. In addition, openings created in aspen stands through thinnings have increased the risk of infestation by hypoxylon canker. For these reasons, the thinning of aspen stands is only recommended on exceptionally good sites, where market conditions allow aspen to be grown and sold as sawlog and veneer bolt material.

Other Management Concerns

The objectives of producing both timber and wildlife in aspen stands are fully compatible. Clearcutting, which is necessary to reproduce aspen, results in highly desirable habitat for deer and grouse. When timber and wildlife objectives are equally important to the landowner, consider clearcutting several small, well-dispersed areas each year. This will produce vigorous aspen stands with a wide range in age. Furthermore, harvest ages

Figure 3. Excellent grouse habitat results from small clearcuts in aspen stands.

should be reduced to foster conditions favorable to wildlife. A variation of age classes is especially desirable for maximum production of grouse, because various age classes are needed to fully satisfy the habitat requirements of this game bird (Fig. 3). In addition, young sprout stands are browsed by deer throughout most of the year.

Aspen is subject to attack by a number of insect and disease pests. Occasionally, insect pests such as the forest tent caterpillar and large aspen tortrix can cause serious damage to aspen stands, but control of these insect outbreaks is rarely warranted. Hypoxylon canker and heart rot, however, are destructive diseases which cause considerable economic loss to aspen stands each year. Although no direct control measures are known for either of these diseases, management practices which keep stands healthy will help minimize their spread. The best approach is to maintain a well-stocked stand of aspen throughout the life of the stand and harvest promptly at maturity.

Additional technical information regarding aspen and its management can be obtained by consulting the following references:

- *Manager's Handbook for Aspen in the North Central States*, General Technical Report NC-36, North Central Forest Experiment Station, USDA, Forest Service, 1977.
- *Quaking Aspen: Silvics and Management in the Lake States*. Agriculture Handbook No. 486, USDA, Forest Service, December 1975.

These publications can be obtained upon request from the North Central Forest Experiment Station, 1992 Folwell Avenue, St. Paul, MN 55108.

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