CUTTING FOR THE FUTURE FOREST

The growth study made in connection with the Wisconsin Land Economic Inventory has developed a few fundamental facts relative to the present forest cover. The figures presented are for Bayfield County but they are probably fairly representative of conditions in a large part of the northern section of the state.

1. Only 15% of the area is now growing to pine of some kind as compared to possibly 75% formerly.

2. 31% of the area has some into popple, practically all of which area was formerly growing to pine, and 17% is growing to hardwoods.

3. 17 1/2% is bare and not doing anything, but is valuable potential planting land.

4. The reproduction coming in under most of these stands is of an inferior nature, or mostly hard maple to the exclusion of other species. By number of trees maple comprises 41% of the stand as compared to yellow birch composing under 4% of the stand.

In other words a large per cent of our pine area is now taken up by an inferior species of little commercial value.

The great forestry problem, therefore, is as I see it, to restore these areas by scientific forestry management to the original valuable species. This can be done partly through planting, and partly through proper methods of cutting on timber sales to encourage the most valuable species. Here the problem is to increase our yellow birch and basswood in our hardwood stands and to encourage the growth of pine in our popple and worthless brush areas as well as on pine areas.

The same problem of inferior species coming in, presented itself to us twenty years ago in the Forest Service, in the great white pine forests of northern Idaho. The reproduction under these forests was found to be of an inferior type, white fir, hemlock, etc. To encourage the reproduction of white pine, therefore, a clear cutting strip method was adopted cutting a strip 450 feet wide and leaving a strip 150' wide for seeding purposes. This clear cut strip enabled a better disposal of slash, a more systematic management and eliminated the necessity of marking the individual trees for cutting. Later on this method was modified leaving groups of seed trees instead of strips. The point was that the necessity of having light, so as not to eliminate the valuable species, (pine), which could not develop in the shade was soon recognized.

Silvicultural studies of all these species therefore are important in order that their requirements for germination and subsequent growth be ascertained. A silvicultural system of cutting that keeps the forest too dark may prove to be a method of eliminating our most valuable species from the stand and encouraging the shade endurers. On the other hand too open methods of cutting might bring in grass or induce windfall.
Cutting of timber must be justified both from the silvicultural as well as the economic viewpoint. Cutting methods which make logging unprofitable are not practical, and logging without considering the future of the forest is not forestry.

In cutting for the future of the forest one of the first things necessary to know is what species we want to favor, that is, those bringing the best price and always in demand. I believe here in Wisconsin white and Norway pine, white spruce among the soft woods, and yellow birch and basswood among the hardwoods, are our most valuable species. Assuming that they are the most valuable the object of our management should be to encourage their growth by a method of cutting which will favor them to the greatest possible extent. Studies of these species have shown that none of them are especially tolerant or shade enduring, that is, they will not grow to advantage when the stand is dark, as in the case of hard maple, hemlock, balsam, etc. These last mentioned, the tolerant shade endurers, will eventually form our climax or final forest - unless disturbed by some unnatural cause such as fire or the hand of man.

I have just recently made a study of the growth of our three leading species of conifers in Vilas County. I find that in fifty years from the stump for instance - the average volume of a white pine tree is ten cubic feet, while the maximum volume found is twenty-five cubic feet. For Norway pine the average volume of the individual tree at fifty years from the stump is thirty cubic feet, while the maximum volume is forty-eight cubic feet. Most of this difference in volume production is caused by difference in light conditions and root competition. In planted stands this is eliminated to a considerable extent by regular spacing causing maximum production.

From such a study it becomes quite apparent that unless a cutting method is determined upon that will give sufficient light for the development and subsequent growth of the seedlings of the species to be favored the forest will more and more be dominated by the weed tree, and be greatly retarded in growth.

Two methods of cutting have been in use in a rough way in Wisconsin. The first might be termed clear cutting but it has been without forestry management to provide for the future which enables the tolerant species to come in in the light open spaces, and is applicable to the even aged pine stands especially.

Clear Cutting

It must be borne in mind that clear cutting does not mean desolation as has been practiced here in this state, but it is a systematic form of forestry management producing the greatest returns.

"The popular impression is that forestry consists of thinning the forest in the manner described for the selective system. The method of cutting only the largest trees and leaving the smaller ones is applicable to stands having trees of different age classes. In handling a stand in which all or nearly all the trees are mature, the design is to remove the whole stand, and replace it with new growth in as short a time as possible. This is accomplished by the clear cutting or shelter wood systems." (Methods of Handling Woodlands by Graves)
Conditions requiring clear cutting are

1. Danger from windfall.

2. Where all the trees are large and mature

3. Where a clearing is necessary to remove trees of undesirable form or poor species in order to establish a better species artificially, or to secure good natural reproduction of a species that cannot thrive under shelter.

Shelter Wood System. I want to refer briefly to this system as a possibility here in this state in cutting second growth pine. It is a system lying between clear cutting and selection. The stand is removed in 2 - 4 cuttings.

1. Preparatory cutting to encourage seeding
   20% of volume removed
   Open up crowns.

2. Reproduction cutting
   30% volume removed.

3. Final cuttings after reproduction established.

The second is what is known as the selection method, a shelter wood system which keeps the forest more or less dark, and has generally consisted in cutting trees to a diameter limit, taking out the largest mature timber, defectives, etc. It is of course especially adapted for the uneven aged hardwood forests. The tree favored in this system is theoretically cut lightest that is to the highest diameter limit while the inferior ones should be cut to a lower diameter limit. Unfortunately, the reverse has generally been true and those trees most in demand have suffered most, at the expense of the reproduction as well. The selective method is used in mountain countries as a protective method, and is nature's method in hardwood stands of uneven age, but does not favor those species demanding light. It is not a method for even aged stands of pine, where nature's method is a form of clear cutting with seeding from the side or seed trees.

About 7% of all German Forests are selective forests. Clear cutting with artificial reproduction has displaced all others in most of the German and Swiss forests.

In the bulletin on Yellow Birch and its relation to the Adirondacks Forest the author shows the need of light as essential for its reproduction. On one area in that region where selective cutting has been employed the following statement is made:

"Reproduction is shown to be largely hard maple and beech on the hardwood type at the expense of the yellow birch, where the light cutting was not enough to open up the crowns to allow birch to succeed. This characteristic is so pronounced and important that a table is given to show reproduction under these conditions as compared to clear cutting. The table shows that on an area logged to a diameter limit by the selection method thirty years ago there are now 224 yellow birch and 3779 sugar maple seedlings and trees under 1.5 inches in diameter per acre as compared with 2530 yellow birch and 83 sugar maple seedlings and trees under 1.5 inches in diameter per
acre in a clear cut area of largest extent where all the merchantable timber was taken. This I think shows pretty conclusively the need of more light for the reproduction of yellow birch.

Most of our cuttings at the present time are in hardwoods or mixed stands and the problems of cutting in such uneven aged stands are more complicated than in even aged stands of pine. Roth says the selection method costs more to log, produces less lumber and is more difficult to manage as compared to other cutting systems.

In writing of the selection system, Mr. Graves, our former forester and Professor of Forestry at Yale, states in his "Principles of Handling Hardwoods" - "Successful reproduction depends not only on a proper distribution of seed, but also on the conditions for germination and for the development of seedlings. The problem is very simple with tolerant species, for these are able to grow in very small openings and often a good reproduction is already established where the openings are to be made.

With intolerant species on the other hand special measures often have to be taken if they are to be reproduced successfully. If such measures are not taken other more tolerant species may occupy the opening to their exclusion. The opening must be large enough not only to give the trees a start but also to allow them to make straight and thrifty growth. It is therefore sometimes desirable to enlarge an opening beyond what is necessary to remove a single mature tree. In such a case one would aim to cut several trees in a group and in so doing it would often be necessary to cut trees under the diameter limit."

Often improvement cuttings are made. The aim is to leave enough trees close enough together to protect them from windfall, and to form a basis for a second cut, and to reseed the ground with the most valuable species taking out the defective and inferior trees.

In Bayfield County an average of sixteen hardwood plots of virgin timber showed 635 trees per acre above 1" in diameter, 252 trees above 4" in diameter, 149 trees above 6" in diameter and 60 above 10" in diameter. Only 7 plots had trees over 18" in diameter, and these 7 plots averaged 8 trees per acre over 18" in diameter. Therefore cutting only to an 18" diameter in those areas could not be justified.

These young trees are now growing under suppression and releasing them to the light would accelerate tremendously this young growth. Maple particularly has the ability to recover quickly and grow rapidly after years of suppression. Thence 16 hardwood stands indicate that the age classes are well represented.

If all merchantable timber of 60 trees down to 10" were removed, after 20 years 89 trees would be left 110 years old and averaging 10" in diameter. In forty years 103 trees ninety years old would be ready to cut and in 60 years we would have 383 trees 85 years old, hardly large enough to produce merchantable material. I doubt if it would be possible to cut this timber on a twenty year cycle and get enough to justify a logging operation after the second or third cut.
Summary. I have endeavored to point out the fact that light is essential for the growth and perpetuation of our most valuable species.

(1) A study of the species is necessary before any cutting system can be adopted.

(2) The system of cutting must depend on the species wanted and the tolerance of these species.

(3) The selection method is generally used in hardwoods, but is not adapted to pine. If used in hardwoods larger openings should be made to encourage intolerants like yellow birch, as the studies in the Adirondacks have shown as well as our studies here, that yellow birch produces itself to best advantage when it has plenty of light.

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