11/26/73

An APPRAISAL of CLEARCUTTING on the MONONGAHELA NATIONAL FOREST

by
David A. Marquis

NORTHEASTERN FOREST EXPERIMENT STATION
Warren, Pennsylvania
1973

FOREST SERVICE • U.S. DEPARTMENT OF AGRICULTURE

AN APPRAISAL OF CLEARCUTTING ON THE MONONGAHELA NATIONAL FOREST

A review and evaluation of
Leon Minckler's Report by the same title

by

David A. Marquis
Northeastern Forest Experimental Station
Warren, Pennsylvania

-1973-

INTRODUCTION

On May 30, 1973, Leon S. Minckler, Adjunct Professor at the College of Environmental Sciences and Forestry at Syracuse, New York sent an "Appraisal of Clearcutting on the Monongahela National Forest" to Chief John McGuire. Minckler's report was based on observations he made during a two-day visit to the Gauley Ranger District of the Monongahela during May of 1973. His report was extremely critical of clearcutting, primarily on the basis that timber stands being clearcut were immature, with resulting large waste of timber and poor-quality sprout reproduction. Instead of clearcutting, Minckler recommended a combination of heavy improvement and group selection cutting for the Monongahela National Forest.

During his visit to the Monongahela, Minckler was guided by local people associated with the West Virginia Division of the Izaak Walton League; no Forest Service personnel were involved. Minckler's report has been read into the Congressional Record, and his recommendations are being cited as further support for the controversy over clearcutting and for the current Civil Action being taken by the Sierra Club, Izaak Walton League and others against

timber cutting on the Monongahela National Forest.

In view of the seriousness of the charges made by Minckler, their possible use in further civil actions, and their implications for management of the Monongahela and other Eastern National Forests, Regional Forester Jay Cravens asked the Northeastern and North Central Forest Experiment Stations to comment on the Minckler report. Review comments were received from eleven scientists from the two Stations. These scientists were: Carter Gibbs, Ivan Sander, Samuel Gingrich, Benjamin Roach, Kenneth Brinkman, F. Bryan Clark, Willard Carmean, Robert Phares, Richard Schlesinger, George R. Trimble, and David Marquis. In addition, it was decided that some reasonably unbiased research scientist from outside of West Virginia should make an independent evaluation of the specific timber stands cited by Minckler to determine the extent to which his charges appear valid and accurate. I was assigned that job, which I accomplished during the week of August 13-17, 1973, in West Virginia, taking stand measurements and examining data of the Gauley District of the Monongahela National Forest, and reviewing research findings from the Fernow Experimental Forest. This report describes my findings and incorporates the major comments received from the other scientists who reviewed Minckler's report.

AREA AND PROCEDURES IN QUESTION

Because Minckler did not talk with Forest Service personnel during his visit, we do not know all the timber stands he visited. However, he mentions several stands marked for clearcutting (but not yet cut) in the Music Run Timber Sale; two of these stands had previously been shown to a member of the local Izaak Walton League Chapter by Bill Wingfield, Timber Management Assistant, on the Gauley District, during a public involvement meeting. One of these two stands is the one in which Minckler tallied his 51 trees on a small transect, so I concentrated my stand measurements in these two areas, and adjacent areas in the same compartment.

The Music Run Sale was laid out in Compartment 48 of the Gauley Ranger District. The compartment area totals 2,895 acres. The entire compartment had been examined by District personnel during 1972, using their standard compartment examination procedures. Briefly, this involves the delineation from aerial photographs of small areas (timber stands) of relatively uniform condition, then on-the-ground examination of each of these stands, including collection of stand data on a minimum of five plots per stand. After examination, a prescription is prepared for each stand based on the stand condition. The prescription may call for some treatment such

as selection cutting, clearcutting, wildlife habitat improvement, etc. Or, the prescription may simply call for no treatment at this time. Treatments prescribed may be modified by conditions of, or treatments to be made in, other stands both within and adjacent to the compartment. The end product of this procedure is an Environmental Analysis Report and Compartment Management Plan describing the activities to be performed in that compartment during the next 10 year period and including analyses of the effect of the proposed activities on all of the multiple forest uses. Such a report had been completed by the District and approved by the Forest Supervisor for Compartment 48 during January of 1973.

In Compartment 48, forty-four stands were identified on the aerial photographs, and subsequent on-the-ground examinations revealed additional variability so that some of the original stands were later subdivided. The final stand delineation included 51 separate stands in a compartment totalling 2,895 acres--for an average stand size of about 57 acres.

Of the 51 stands in Compartment 48, three were found to be two-aged stands. These contained trees approximately 100 years old mixed with trees approximately

50 years old. This is a common situation resulting from a heavy cutting made many years previously in which non-merchantable trees were left uncut. All other stands in Compartment 48 were found to be of a single age class (even-aged), generally about 50 years old. This finding (based on increment cores) fits in with the known history of the compartment. During my visit, I examined maps showing the location of logging railroad lines of the Cherry River Boom & Lumber Co. One main line of this company passed directly through Compartment 48. This company logged by railroad, using steam tower (cable) skidders to bring logs to trackside. Complete clear-cutting was the practice employed in such operations, and the Cherry River Boom and Lumber Company operated throughout the area that is now the Gauley District over the period 1900 to 1940 (and into the late 1950's in some adjacent areas). Thus, Compartment 48 is composed almost entirely of even-aged stands, a result of clearcutting operations conducted 40 to 60 years ago. A few stands also contain some holdover trees from an early stand that was not clearcut as completely as most had been.

Stand condition class, as used in the National Forest system, incorporates total stocking, stocking of acceptable growing stock trees, and other factors. To be mature (by these definitions), over half of the stand basal area must be in trees above certain minimum diameters, and 75 percent of the trees must be sawtimber size. These minimum diameters vary by species and site. (See Appendix Table 1). On the good sites of Compartment 48, most species must be 22 to 24 inches in diameter to be considered mature. None of the stands in Compartment 48 were classed as mature on this basis.

The immature stand condition class is used for stands that are not yet mature, and that contain a least C[1/] level stocking in trees of acceptable quality. Of the 51 stands in Compartment 48, thirty-four stands representing 86 percent of the acreage were classified as immature on this basis.

1/ Stocking levels and criteria used here are the widely used procedures described by Gingrich (1967), and Roach and Gingrich (1968).

Low-quality and understocked condition classes are used for stands that are not yet mature and that contain less than C level stocking in trees of acceptable quality to retain as growing stock. Of the 51 stands in Compartment 48, on the basis of total stocking, none were classified as understocked, but 9 were classified as low quality because they contained less than C-level stocking of acceptable trees. Low-quality and understocked stands are candidates for clearcutting even though immature, since they do not contain minimum levels of acceptable trees.

It is the clearcutting of these low-quality stands about which Minckler objects. I believe he would agree that stands that are truly low quality should be regenerated. His objection is that the definitions used for acceptable trees have been set unrealistically high, so that stands which should be classed as immature are actually being classed low-quality and hence clearcut. Such situations have occurred occasionally in the past as a result of inexperienced personnel or perhaps over-zealousness to offer timber for sale. During my visit to West Virginia, I re-examined the proposed clearcuts of the Music Run Sale with this thought in mind, to see if the classifications had indeed been biased. I also made an

entirely different type of stand analysis--one which does not depend on the subjectivity of definitions of any kind--to determine the financial maturity of the stands in question and compare the results with those of the normal stand anlysis.

Before describing my findings, it seems pertinent to mention the final prescriptions recommended by the District for Compartment 48. Of the 51 stands in the compartment, 32 stands were to be left entirely untreated, and parts of the remaining 19 stand were to be cut in some fashion. The total area to be cut was 491 acres or 17 percent of the compartment area. Of this, 241 acres was scheduled for improvement cutting, and 135 acres was scheduled for individual tree selection cutting (all selection cutting was prescribed because the stands were located in travel- or water-influence zones--not because they were all-aged stands). Clearcutting or group selection clearcutting was to occur on 115 acres or 4 percent of the compartment. These clearcuts varied in size from 2 to 20 acres and were well distributed throughout the compartment. See Appendix Table 2, for summary of compartment examination and prescription data.

MY STAND DIAGNOSES

During my week in W. Va., I spent most of two days collecting data in four stands, as follows:

A. Stand 46, compartment 48--a 10-acre area marked for clearcutting

B. Stand 47, compartment 48--a 10-acre area marked for clearcutting

C. Stand 15, compartment 48--a 27-acre area of which 20 acres was marked for improvement cutting

D. Unnumbered stand in an adjacent compartment--stand younger than those in compartment 48 and obviously immature. Selected purposely to contrast with stands above.

I was assisted in my data collection by Bill Wingfield, Timber Management Assistant from the Gauley District, and Harvey Fleming, Silviculturist on the Timber Management staff in the Forest Supervisor's office. These fellows tallied plots using their standard procedures as I watched and checked, in particular, their definition of acceptable growing stock trees. Then they measured and graded trees for me as I collected information for the financial maturity analysis.

Standard FS Procedure

A summary of data collected during my visit, using standard FS examination procedures is included in Appendix Table 3. We took 3 or 4 plots in each stand (except for D, in which we took only 1 plot). Even 4 plots would not be an adequate sample in normal practice, but was enough to verify the District's previous results and allow me to check their use of the acceptable growing stock definitions.

I found little to question in the acceptable growing stock definitions used by Fleming and Wingfield. Well-formed trees, even if much smaller than those of the main stand were considered acceptable, particularly if they were of tolerant species. For example, well-formed 2-inch sugar maple were often considered acceptable even in predominately sawtimber stands. Criteria used appeared quite reasonable and were not set artificially high, in my opinion. The actual definitions used are included in the Appendix (table 4). A summary of the proportion of stems judged acceptable by these definitions is also included (table 5). Table 5 indicates, at least to me, that the proportion of trees being rejected as unacceptable is well within the bounds of reason.

The data in Table 3 show that stands A and B had been classified correctly as low quality stands in the initial examination. Both stands are lightly stocked. C level stocking in these stands

is approximately 60 square feet of basal area per acre, and both stands A and B are well below this when the cull, mature, and unacceptable trees are discounted. The amount of pole timber in these stands is quite low--only 10 to 16 square feet including unacceptable trees. Thus, these stands are quite near maturity--they already have well over 75 percent of their basal area in sawtimber and about 30 percent of their basal area in mature trees and culls.

Because the amount of acceptable growing stock is well below C level, these stands are not growing at full potential and will not be for many years. In fact, they might never achieve full site occupancy (of acceptable growing stock trees) in view of the small number of poles and proximity of the stands to maturity. Since prompt regeneration is virtually assured on these sites, clearcutting of stands A and B appears to be perfectly appropriate silviculture.

Actually stand C (which was classed immature and scheduled for improvement cutting rather than clearcutting) also comes very close to the same stand conditions as A and B. It does have enough additional basal area in acceptable growing stock to meet the C level, however, and was therefore classified as immature. The difference here is that stand C has enough stocking that it should fully occupy the site with acceptable trees within a few years, and therefore is

probably worth carrying for some additional period of time. But in amount of mature basal area and proportion of trees in sawtimber sizes, this stand is actually closer to maturity than stands A and B.

Stand D, an obviously immature stand located in an adjacent compartment, was sampled with just one plot for comparison with the three stands above. It is heavily stocked, has no mature trees, has less than 50 percent of the basal area in sawtimber sizes, and contains well over B level stocking in acceptable trees. This is the kind of stand I had visualized from the descriptions in Minckler's report. But the actual stands A, B, and C are far different. They contain many large trees, moderate numbers of small sawtimber-sized trees, and few small trees. They are even beginning to break up in some spots where an over-mature individual or two has died from natural causes.

Economic Analyses

To collect data for economic analyses, I inventoried trees on a 1/5 acre plot at each of the same locations used for point samples. Financial maturity calculations for all four stands are presented in Appendix Tables 6-9. These calculations were made using the procedures outlined by Grisez and Mendel (1972), and data from Trimble and Mendel (1969), Mendel and Trimble (1969), Grisez and Mendel (1972) and Mendel et al. (1973).

Overall stand interest rates for stands A, B, and C were 4.6, 3.8, and 3.9 percent respectively. Most private industries would consider any stand earning less than 5 or 6 percent as mature, and some companies insist on 8 to 10 percent. Thus, the three stands (A,B,C) are probably mature so far as the economics of timber production is concerned. The Monongahela has chosen to carry stand C for at least another decade even though its interest rate has already dropped to 3.9 percent. This is perfectly reasonable on a National Forest where timber production is but one of many goods and services obtained from the forest--provided that the stand is fully occupying the site with adequate numbers of good growing stock trees. It is also quite apparent, though, that these stands are at, or very close to, economic maturity. The decision to clearcut those few stands in this compartment that are poorly-stocked with good growing stock trees is desirable from a silvicultural standpoint.

And, it also is very desirable from the standpoint of providing wildlife with a few openings in an otherwise unbroken 2895-acre area, and to begin the job of redistributing the age classes of the compartment for purposes of forest regulation (discussed in more detail later).

Data for the immature stand in the adjacent compartment is also included for comparison with the 3 stands in Compartment 48. This stand is younger than the others, although it too contains some individual red oak approaching mature size. But most of the trees in this stand are smaller, in the large pole or small sawtimber size. They are increasing in value very rapidly--many of the individual trees in the 14 to 16 inch classes are earning 16 to 20 percent interest annually. The stand as a whole is earning 8.0 percent interest annually, and this would undoubtedly have been higher except that our plot happened to fall in a very dense patch (total basal area over 200 square feet/acre) so that many trees had small, compressed crowns and resulting low vigor class--which depresses the estimate of their rate of return. Nevertheless, this stand is obviously immature whether examined visually, by standard FS procedure, or by financial maturity procedures. This is the type of stand that I half expected to find marked for clearcutting in the Music Run Sale after reading Minckler's report. But the areas to be clearcut in Music Run are far from immature in this sense. They

do contain some individuals that are immature, but the stands are at or very near maturity.

DISCUSSION OF MINCKLER'S MAJOR CRITICISMS

Stand Maturity

I believe the preceding data show that the stands marked for clearcutting in Compartment 48 of the Gauley District (Music Run Sale) are at, or at least very near, maturity. They are not obviously immature as Minckler contends. Furthermore, the stocking of acceptable growing stock trees in those few areas marked for clearcutting is too low to warrant retention of the stands. Clearcutting is a sound silvicultural treatment in situations such as these.

It is true that many stands on the Monongahela are immature and are not ready to be clearcut. But most stands are not being clearcut. Clearcutting has been limited to those stands where it is appropriate in Compartment 48. I did not have time to look at areas marked for clearcutting anywhere except in Compartment 48, so I cannot comment on the types of stands being harvested elsewhere. But I can say that the compartment examination and prescription and resulting timber sale in Compartment 48 was silviculturally and economically sound. If this is typical, then the quality of management on the Monongahela must be high indeed.

Forest Regulation and Timber Waste

One point that Minckler completely ignores in his report is the need to regulate the forest to obtain relatively constant yields of timber on a sustained basis. I have already pointed out the fact that most of the Monongahela is even-aged with stands ranging from about 40 to 70 years of age. Unless steps are taken to break up this high acreage of one general age class, the Forest will simply perpetuate the problem of timber feast and timber famine that has marked the past hundred years. The future value to the public of having a forest of regulated age classes is very great--lack of regulation will result in waste that is just as real (although not as obvious) as the waste from cutting of immature trees.

Admittedly, there is a valid question as to how fast the regulated forest should be attained. To attempt to achieve it too quickly would indeed result in unnecessary sacrifice of growth by cutting of immature timber. So, if one strives to achieve 14 percent of a working group in each 10-year age class (thus providing a 70-year rotation), he would probably create unnecessary waste if he blindly cut 14 percent of a compartment regardless of its present condition. But there is no question that some smaller amount of cutting in truly immature stands might be desirable for regulation purposes. Many species of wildlife will also benefit from measures to insure

the creation of some minimum amount of openings, well-dispersed, and created at a regular time interval.

In Compartment 48 of the Gauley District, areas marked for clearcutting this 10-year period total only 4 percent of the compartment. The clearcuts are small (most are 5 to 10 acres, maximum 20 acres), and well-distributed throughout the compartment. None of the stands marked for clearcutting are clearly immature; depending on the criteria used, they are financially mature or very close to it. And all of the areas marked for clearcutting are areas in which the stocking of acceptable growing stock is less than that required to form a fully-stocked stand. Clearcutting of such stands is not only silviculturally sound, but will result in a minimum of waste.

It must also be pointed out that all other forms of cutting also produce waste, although it may be less obvious to inexperienced observers. Selection cutting--if it is truly selection cutting and not high grading--also results in cutting of trees throughout all diameter classes (at least throughout all sawtimber classes). To maintain any semblance of an appropriate diameter distribution, we must cut relatively more 12" trees than 20" trees. If this is waste in clearcutting, it is also waste in selection cutting.

And problems of regulation of age classes are not unique to even-aged management. These Monongahela stands are even-aged now

and there would be a long period of conversion before these stands could achieve the regulated size and age distributions needed under uneven-aged management. A period of conversion with some attendant waste of immature or overmature trees is going to be necessary regardless of what management system is used in these previously unregulated forests.

Reproduction and Sprouting

On page 3, of his report Minckler suggests that hardwood regeneration in clearcuts runs heavy to stump sprouts which characteristically make low quality trees; he also suggests that small trees sprout more profusely than large trees so that sprouting is more of a problem when immature stands are clearcut.

In the very general way, these statements are true. There is some tendency for small trees to sprout more profusely than large ones. Solomon and Blum (1967), for example, demonstrated a tendency for small sugar and red maple stumps in New England to have more sprouts than larger stumps of the same species. But two birch species did not show this relationship and even the maple correlations were weak (correlation coefficients less than .5). In a similar study in W. Va., Wendel (1972) found little, if any, relationship between parent tree size and sprouting in red oak, black cherry, or yellow poplar. With such weak or non-existant relationships, it

might be valid to suggest that clearcutting of the small trees in a 20 to 40 year old stand would produce more sprout regeneration than clearcutting of the much larger trees in 60 to 80 year old stands. But it would probably be impossible to demonstrate a difference in sprouting between 50 year-old and 60 or even 70 year old stands. Thus, delay of clearcutting by 10 or 20 years is not likely to have any measurable effect on the proportion of sprouts in the reproduction.

It may also be true that quality of stump sprouts is lower than quality of seedlings, on the average, if measured in young stands. But, most sprout clumps have 1 or 2 stems that are equal in quality to the best seedlings. Early thinnings or weedings (10 to 25 years of age) can eliminate the poor quality stems in these clumps so that sprout quality need not be a problem at all. Nature will often take care of this process too, for the better quality stems in a clump are often the faster growing ones. To verify this, one need only look around in these stands to see clumps of 2 or 3 red oak 18 to 24 inches in diameter with grade 1 butt logs in each stem. Good quality stems of sprout origin are common in most species and some, like basswood, originate almost exclusively in this way.

Dick Trimble (1972) has shown that 47 percent of the stump sprouts present 7 years after seed-tree clearcutting were good quality stems. Numerous other studies from the Fernow Experimental Forest have

shown that the quantity and quality of reproduction after clearcutting in Appalachian hardwoods is excellent (Trimble 1973). Furthermore, the Monongahela National Forest recently completed a survey of reproduction in some 62 clearcuts in all 6 districts and found excellent stocking levels (forest-wide average 7132-7761 stems/acre). I looked through the field tally sheets from these surveys and noted that almost every single milacre sample plot was stocked with an acceptable stem and most had 5 or more stems. Such reproduction stocking can only be considered as phenomenally successful. The summary sheet from this survey is attached in the Appendix (Table 10). Among other things it illustrates the great diversity of species present in the reproduction after clearcutting.

DISCUSSION OF MINCKLER'S RECOMMENDED ALTERNATIVES

Improvement cutting rather than clearcutting in Music Run Sale

It is quite correct that truly immature and previously unregulated stands such as are common on the Monongahela will benefit from one or more thinnings-improvement cuts prior to final harvest. This is being done on the Monongahela--about 3 times as much acreage received partial cutting during 1972-1973 as was clearcut, for example. Had the stocking of acceptable trees been adequate, the areas marked for clearcutting in Compartment 48 would have been marked for improvement cutting instead. But, as explained previously, it would have been unwise to carry these particular stands longer because of the low stocking levels and nearness to maturity.

However, even in stands where improvement cutting is appropriate, the specific recommendations made by Minckler on the top of page 7 of his report are not silviculturally sound. The recommended cut is too heavy and removes primarily the best trees (if you remove the largest trees in an even-aged stand, you are obviously retaining the slower growing individuals of a species and the slower-growing species). I have applied such a cut (on paper) to stands A & B in Compartment 48. Resulting

stand and basal area tables before and after this theoretical cutting are shown in Appendix Tables 11-14. As can be seen from these data, the "improvement" cut would reduce the average diameter of the stand from 10.43 to 8.28 inches and would remove over 45 percent of the basal area leaving an understocked stand. If you consider the fact that many of the 2 to 12-inch trees are not acceptable growing stock trees, the residual stocking of acceptable trees would be extremely low.

Some timber operators would appreciate such a cutting. They would get the best trees and not have to cut any small ones. A more appropriate name for such a cutting is "high-grading."

A more appropriate prescription for improvement cutting-thinning in such even-aged stands is the removal of 20 to 40 percent of the stocking (but never to reduce stocking below B level), generally by removing: (1) mature trees, (2) culls or poor risk trees in all diameters, and (3) less promising individuals from the lower half of the diameter range. Many of the 20-22 inch trees (Minckler's recommendation would remove all of these) are the best trees in the stand (the crop trees), are still increasing in value by large amounts, and should certainly be saved.

Group Selection Cutting

In his report on the Monongahela, Minckler endorses group selection cutting as the panacea for all stands in all conditions

everywhere. Experienced foresters know that a single silvicultural system is not adequate to satisfy the requirements of all species or ownership objectives.

This preoccupation with a single system (group selection) seems particularly contradictory to Minckler's own remarks--the great diversity of soils, sites, and cover types; the mixed forests of many species; and conditions mentioned in his report on page 1 and the statement on page 2 that there is not an area of even 25 acres homogenous enough to allow one overall treatment.

The regeneration aspects of group selection openings have been quite thoroughly investigated by Minckler and others on the Fernow Experimental Forest, by Jensen, Marquis, Leak, and others on the Bartlett Experimental Forest. There is almost universal agreement that small openings of 1/3 to 1 acre can be successfully used to reproduce a wide range of species. In fact, these small openings are especially favorable for some species and should be used in those special situations where reproduction of these species could be difficult to obtain in larger clearcuts.

However, openings smaller than 1 acre do not remain favorable places for shade intolerant species to grow and develop indefinitely. Unless the openings are enlarged, the more intolerant species will gradually be suppressed and the more tolerant species such as beech and maple, will begin to dominate. This is shown very

clearly in a paper by Leak & Wilson (1958). Fifteen years after cutting, they found that intolerants had virtually disappeared from patch cuttings of less than .6 acre and reproduction consisted of tolerants and intermediates in the proportion of roughly 1:2. Large clearcuttings, on the other hand, permitted retention of intolerants; reproduction in the clearcuts consisted of tolerant, intermediates, and intolerants in the ratio of 2:1:2. Agriculture Handbook 405 (Sander and Clark, 1972) shows similar advantages of clearcuts in central hardwood forests. And Trimble (1965) clearly shows the loss of intolerants and intermediates after individual tree selection cuttings.

So, even though most species can be regenerated in small openings, a system of management that relies on only small openings will not necessarily produce new stands of desired species composition. The results of Minckler's own studies on the Kaskaskia show this. I quote from Ken Brinkman's comments: "The claimed advantages of ecological silviculture in eastern mixed hardwoods were not proved by Minckler's research in Southern Illinois. Cutting "mature" trees singly or in small groups will gradually replace the faster growing species and establish a trend toward stands containing a higher proportion of such species as the slower growing white oaks and hickories. Maple and beech were never abundant in Illinois, but I suspect the

conversion to slow-growing species would be even faster in the forests of West Virginia. ---if we are to produce adequate yields of many intolerant eastern hardwood species, we will have to regenerate new stands where these species have a chance to develop. In many cases, this means clearcutting----."

A second major problem with group selection as a system of management, is the difficulty (or near impossibility) of regulation. It is impossible to keep track of and individually treat these tiny stands over long periods of time. Even using 1-acre groups means that a 100,000 acre ranger district would eventually have 100,000 individual stands to try to keep track of and manage. This is impractical; it makes area control with group selection impossible except on very small holdings. Another possibility is to forget area control and attempt to regulate on a volume basis as is done with individual tree selection. But with no means of controlling either diameter distributions or age class distributions, regulation can be achieved only in a hap-hazard, seat of the pants manner. Many highly-skilled research foresters have given up in disgust after 2 or 3 cuts under such a scheme, even on comparatively small experimental areas.

There is no scientific basis for Minckler's strong application that diversity of size and age classes on every acre is ecologically

"best." Overall diversity can be achieved easier, and with greater assurance that it can be attained and maintained, in blocks that are a feasible size for record keeping and administration. Diversity in moderate-sized blocks is every bit as "good" in terms of aesthetics, wildlife, etc. as the kind Minckler suggests--perhaps better, for there is a wider range of conditions suitable for a wider range of species of both plants and animals.

Furthermore, Minckler's view of multiple use management, in which every forest value is to be obtained from every parcel of land, is unrealistic. To attempt to do this is generally to reduce the quality and quantity of all values. Some zoning, such as the National Forest now uses, insures that certain specialized uses (such as recreation sites) can be developed fully in particular areas, while other uses receive greater attention elsewhere. Forest values such as aesthetics and recreation may therefore preclude clearcutting, (as Minckler suggests) in recreation areas, wild areas, travel-and water-influence zones. But in the general forest zone, there is no valid reason for such a restriction. Of course, aesthetic considerations do not necessarily preclude clearcutting even in travel zones; it may actually be desirable in cases to achieve diversity, open vistas, etc. Incidentally, Minckler

lumps wildlife and water values with aesthetic and recreation values as precluding clearcutting. This is erroneous--water and wildlife values seldom, if ever, preclude clearcutting. Both may actually require clearcutting.

This is not to suggest that group selection cutting has no place in eastern hardwood management. It may be possible to use it effectively on small ownerships where the distribution and arrangement of all openings to be made during an entire rotation can be planned and mapped out in advance. It may also be suitable technique in the travel-and water-influence zones of larger holdings where timber is less important, and where changes in species composition toward the tolerant species and less regular timber yields are acceptable compromises to be made in view of the other uses of these zones. The Monongahela and other National Forests are currently planning individual tree selection cutting for these zones, but group selection with openings less than 1 acre and no attempt at area control might be more desirable in many places. Nevertheless, the fact remains that group selection as a management system is impractical and undesirable on areas larger than a few hundred acres. It is not feasible for the general forest zone of a National Forest.

BRIEF COMMENTS ON MISCELLANEOUS POINTS OF MINCKLER'S REPORT

(1) Minckler's statement that there are no areas as large as 25 acres uniform enough for a single silvicultural treatment is false. There are fairly extensive areas of uniform character, particularly on plateaus, benches, or long mountain slopes. This is not surprising, since the original stands had frequently been clearcut in very large blocks, and site quality changes only gradually except in places where the terrain is strongly dissected by drainageways.

(2) On page 6, Minckler lists 4 reasons why the Forest Service uses clearcutting. But he omits the major reason, and also confuses clearcutting (a cutting method) with even-aged management (a whole system of management). The Forest Service employs even-aged management primarily to perpetuate the valuable intolerant and intermediate species efficiently and with great assurance of success, whether or not future intensive weedings, clearings, and opening enlargements can be performed. Uneven-aged management--even with group selection cutting--cannot do this. Even-aged management also provides for ease of administration, area regulation, and positive control over cutting

areas and volumes--these are very real advantages over uneven-aged management.

The remaining two items pertain more to clearcutting itself rather than even-aged management in general. Clearcutting is better adapted to use of heavy machinery than partial cutting of any kind, whether the partial cutting be thinning under even-aged management or selection cutting under uneven-aged management. And clearcutting does provide larger harvests per acre than partial cutting--this latter item is important in that it permits construction of roads to gain access to stands that it might not be economically feasible to treat if the same volume of timber were spread over a much larger area. Once constructed, these roads will serve as access for thinnings and subsequent harvests, too. But ability to use heavy equipment and the high harvest per unit area has little influence on the choice between even-aged and uneven-aged management. They are side benefits that help make it possible to construct a road system to bring previously unmanaged areas under management, and they tend to favor clearcutting over other even-aged reproduction cutting methods (such as shelterwood, strip, patch, seed tree). But they are not reasons for use of even-aged management.

(3) Minckler makes a major point of the great diversity present on the Monongahela and suggests that there are no large blocks that can receive a uniform treatment. But then he recommends group selection cutting everywhere, and he examines stands across the road from a clearcut to find out what the clearcut stand had been like before cutting. It is likely that the two were significantly different or they would have received similar prescriptions for treatment.

(4) Minckler implies that stands on the Monongahela contain many age classes in a single stand. As pointed out previously, this is incorrect; these are indeed even-aged stands. This is shown by increment cores taken in Compartment 48 and records of past logging in the area. The great range in tree size that is frequently encountered in these even-aged stands may have mislead Minckler. However, the wide range in diameters present in stands of a single age have been well documented. For example, Gibbs (1963) has shown that red oak trees in a single-aged stand ranged from 12 to 34 inches in diameter. In view of the even-aged nature of these stands, the statement on the bottom of page 7--that even-aged forests are not in harmony with the ecological nature of eastern hardwood--cannot be supported.

(5) Minckler also mentions the irrevocable nature of clear-cutting on the bottom of page 7. Since the present forests of West Virginia are the result of clearcutting, and since we seem to have the option now of using almost every conceivable silvicultural system, this statement cannot be supported.

(6) Minckler's report is seriously lacking in factual data. The only data he collected is from a single transect covering 51 trees in one 10-acre stand. Such a sample is inadequate to estimate conditions in that one 10-acre area, and provides no basis on which to draw conclusions for all of the Monongahela. Apparently the only information Minckler obtained other than his own limited data and observations, were the opinions of his escorts.

In contrast, the Forest Service examination in Compartment 48 involved 264 recorded sample plots including several thousand trees in the 51 stands there, with data on stocking by size, quantity and quality; total density; age; stand condition; site index; cultural needs; average diameter; number of trees per acre; wildlife mast, shrubs and cover; etc., etc. Minckler could have examined these data if he had talked with local Forest Service personnel, but he did not. This, and statements such as the one he makes on page 6 ("The Forest Service needs but

apparently does not have good data on these timber sales") make it obvious that Minckler had no appreciation for the inventory conducted in this compartment, nor for the relationship between those few areas marked for clearcutting and the treatments prescribed for the other stands which make up the vast majority of the compartment's acreage.

LITERATURE

Gibbs, Carter B.
1963 Tree diameter a poor indicator of age in West Virginia. U.S. For. Serv. Res. Note NE-11, 4 p.

Gingrich, Samuel F.
1967 Measuring and evaluating stocking and stand density in upland hardwood forests in the Central States Forest Science 13:38-53

Grisez, Ted, and J. Mendel.
1972 The rate of value increase for black cherry, red maple, and white ash. USDA, For. Serv. Res. Pap. NE-231, 26 p.

Leak, William B., and Robert W. Wilson Jr.
1958 Regeneration after cutting of old-growth northern hardwoods in New Hampshire NEFES Station Paper 103, 8 pp.

Mendel, Joseph J. and George R. Trimble Jr.
1969 The rate of value increase for yellow poplar and beech. USDA. For. Serv. Res. Paper NE-140, 27 pp.

Mendel, Joseph J.;Ted J. Grisez; and G. R. Trimble Jr.
1973 The rate of value increase for sugar maple. USDA For. Serv. Res. Paper NE-250, 19 pp.

Roach, Benjamin A. and Samuel F. Gingrich
1968 Even-aged silviculture for upland central hardwoods USDA, Forest Service, Ag. Handbook 355, 39 pp.

Sander, Ivan L. and F. Bryan Clark
1971 Regulation of upland hardwood forests in the Central States USDA, Forest Service, Ag. Handbook 405, 25 pp.

Solomon, Dale S. and Barton M. Blum
1967 Stump sprouting of four Northern hardwoods USDA, Forest Serv. Res. Paper NE-59, 13 pp.

Trimble, George R. Jr.
1965 Species composition changes under individual tree selection cutting in cove hardwoods USDA, Forest Service Res. Note NE-30, 6 pp.

Trimble, George R.
1968 Growth of Appalachian hardwoods as affected by site and residual stand density. US. For. Serv. Res. Pap. NE-98, 13 p.

Trimble, George R. Jr. and Joseph J. Mendel
1969 The rate of value increase for northern red oak, white oak, chestnut oak.
USDA, Forest Serv. Rev. Paper NE-129, 29 pp.

Trimble, G. R., Jr.
1972 Reproduction 7 years after seed-tree harvest cutting in Appalachian hardwoods.
USDA, For. Serv. Res. Pap. NE-223, 19 p.

Trimble, G. R. Jr.
1973 The Regeneration of Central Appalachian hardwoods with emphasis on the effects of site quality and harvesting practice.
USDA, Forest Service Research Paper NE- (In press)

Wendel, G. W.
1972 The study of stump sprouting on the Fernow Experimental Forest.
Unpublished final report.

GLOSSARY

Age-Class -- One of the intervals, commonly 10 years, into which the age range of tree crops (and sometimes other vegetation) is divided for classification or use.

All-Aged -- Of a forest, crop or stand that contains trees of all or almost all age classes.

Basal Area -- The area of the cross-section of a tree stem near its base, generally at breast height and inclusive of bark.

Clearcut -- A silvicultural system in which a stand of trees is cleared by cutting at one time.

Compartment -- The basic territorial unit of forest, averaging about 750 acres in the Eastern Region of the Forest Service, permanently defined for purposes of location, description and record.

Crop Tree -- Any tree forming or selected to form, a component of the final crop. Generally a tree selected in a young stand or plantation for carrying through to maturity.

Cull Tree -- Trees, picked out for relegation or rejection because it does not meet certain specifications, e.g., as regards usable or on-grade content.

dbh -- Diameter at breast height (4.5 feet above mean ground level).

Edge -- The more or less well-defined boundary between two or more elements of the environment, e.g., field/woodland.

Even-Aged -- Of a forest, crop or stand, composed of trees having no, or relatively small, differences in age (usually not over 10 years).

Financial Maturity -- Of a tree, crop or stand, the age beyond which value-increase is insufficient to earn a specified rate of interest.

Group Selection (System) -- A modification of the selection system in which trees are removed in small groups at a time.

Growing Stock -- All the trees growing in a forest or in a specified part of it, generally expressed in terms of number or volume.

Improvement Cut -- The elimination or suppression of less valuable in favor of more valuable tree growth, typically in mixed uneven-aged forest.

Mature -- The stage at which a tree, crop or stand, best fulfills the (main) purpose for which it was maintained, e.g., produces the best possible supply of specified products or earns a specified rate of interest.

Patch Cutting (Patch Logging) -- A modification of the clearcutting system whereby patches of 3 to 50 acres are logged, separated for as long as practicable (preferably until the regeneration is adequately shading the forest floor) by living forest, so as both to secure the optimum dispersal of seed and to avoid the high hazard of large continuous areas of slash, particularly as regards fire (Fire Hazard) and insect pests.

Regeneration -- The renewal of a tree crop, whether by natural or artifical means.

Rotation -- The planned number of years between the formation or regeneration of a crop or stand and its final cutting at a specified stage of maturity.

Saw Timber -- Trees fit to yield saw logs. In the Eastern Region National Forests, trees over 9 inches d.b.h.

Selection (System) -- An uneven-aged silvicultural system in which trees are removed individually, from a stand, here and there, each year.

Silviculture -- (1) Generally, the science and art of cultivating (i.e., growing and tending) forest crops, based on a knowledge of silvics, (2) More particularly, the theory and practice of controlling the establishment, composition, constitution, and growth of forests.

Site Class -- A measure of the relative productive capacity of a site for the crop or stand under study, based e.g., on volume or height (dominant, co-dominant) that is attained or attainable at a given age.

Stand -- An aggregation of trees or other growth occupying a specific area and sufficiently uniform in composition (species), age arrangement, and condition as to be distinguishable from the forest or other growth on adjoining areas.

Stocking -- In a forest, a more or less subjective indication of the number of trees as compared to the desirable number for best results.

Sustained Yield -- The yield that a forest can produce continuously at a given intensity of management.

Thinning -- A felling made in an immature stand in order primarily to accelerate diameter increment but also, by suitable selection, to improve the average form of the trees that remain.