# CLEARCUTTING IN UPLAND HARDWOODS:

# PANACEA OR ANATHEMA?[1/]

Charles E. McGee[2/]

Abstract.--Clearcutting, a silvicultural process described by Pinchot as "the easiest of them all to apply", is described within complex current economic, environmental, and social constraints. Economics is shown to be the major factor favoring the practice, but continued prescribed use is supported by biological, environmental, and ecological factors as well. The paper suggests that most resistance to clearcutting originates from visual and aesthetic concerns. Compromise in the use of clearcutting is foreseen as likely on some landholdings but with undesirable results if the ecological requirements of preferred species of plants and wildlife are not met.

Key words: Multiple use, forest controversy, harvest cutting methods, regeneration methods

## SETTING THE STAGE

"I will introduce legislation in the Senate to impose, by law, a two year moratorium on clearcutting."

Senator Gale McGee - 1971

"The Society of American Foresters strongly recommends that no moratorium or restriction be placed on the use of clearcutting- - -."

Kenneth P. Davis - 1971

Silvicultural clearcutting, most simply defined, is a regeneration method that results in most of the trees on a site being felled. Events of the past 25 years have elevated clearcutting from a simple cutting method to a focal point in a series of controversies that rage with varying degrees of fuss and furor over the upland hardwood landscape. The scope and intensity of these controversies has to be somewhat surprising when one considers that only a small percentage of the millions of acres of hardwoods cut in the last 25 years have been silviculturally clearcut. The arguments, thus, seem to be based more on intent or thrust rather than on actual occurrence. Nevertheless, the battle lines are drawn, the stakes are high, and the future direction of management of upland hardwoods lies in the balance.

It might be helpful if one considers the advantages and disadvantages of the clearcutting process with the realization that clearcutting has indeed become more than a silvicultural procedure. Depending upon one's point of view, clearcutting is an essential ingredient for the scientific management of upland hardwoods or is evidence of man's deliberate destructive force at its worst. Thus, the purpose of this paper is to explore a very simple forestry practice within a very complex set of sociological conditions. Why do most hardwood foresters consider clearcutting an essential and most useful harvesting method? Why do many non-foresters and some foresters consider clearcutting an unnecessary evil? Is a compromise possible? Before considering these questions and exploring the pros and cons of clearcutting, one should go back in time and consider some of the history of clearcutting.

Gifford Pinchot (1905) may have been among the first to recommend clearcutting in eastern hardwoods when he suggested coppicing chestnut stands to produce tie logs. But he may have also set the stage for our current controversy by referring to widespread destructive logging in which all the timber is cut without regard for the future. Later Frothingham (1931) recommended clearcutting as a logical way to regenerate the coves and fine hardwood stands of the Appalachians. Minckler (1969) suggested that "the way to correct the abuses of the selection

---

1/Paper presented at the Sixth Central Hardwood Forest Conference, Knoxville TN, February 24-26, 1987.

2/Principal Silviculturist, USDA Forest Service, Silviculture Laboratory, Sewanee, Tennessee, maintained by the Southern Forest Experiment Station in cooperation with the University of the South.

system was to clearcut really clean our hardwood stands and use even-aged management to start out again." Resler (1972) discussed at length some of the beneficial effects of clearcutting on wildlife. Don Morris, Forest Supervisor on the North Carolina National Forest, recognized that hardwood stands of the Southern Appalachians had not responded favorably to selection management as practiced by the USDA Forest Service. After observing the regeneration occurring on lands that had been clearcut years earlier, he, in cooperation with researchers, installed a study of intensive logging. The favorable results led Morris to promote clearcutting and even-aged management as Forest Service policy (Morris 1962).

A number of silviculturists studied even-aged management and clearcutting during the late 1950's and 1960's. Most of them recognized that regeneration per se usually posed few problems, but obtaining a specific species mix and ideal distribution following clearcutting was often difficult (Roach and Gingrich 1967, Merz and Boyce 1958, McGee and Hooper 1970).

Wildlife habitat specialists also reacted in various ways to clearcutting in the 60's. These workers were clearly opposed to clearcuts larger than 40-50 acres. However, many habitat specialists did favor small (10-25 acres), well-dispersed clearcuts as being very favorable for deer, turkey, grouse, quail, and many birds (Johnson et al. 1961, Resler 1972, Ripley and Campbell 1960). Some wildlife scientists, however, expressed great concern for lost mast potential and found adverse impacts (Crawford et al. 1975).

Clearcutting also got the attention of watershed researchers in the 1960's and 1970's. Particular concern was voiced about clearcutting on steep slopes. Pioneer research at the USDA Forest Service's Coweeta Hydrologic Laboratory in western North Carolina continued to show that cutting trees per se seldom caused erosion. The soil management problems were shown to be related to the construction and use of roads and skid trails to remove the logs (Patric 1986, Hewlett and Douglas 1968). However, some workers expressed great concern that hillsides would lose nutrients and productivity as a result of clearcutting (Bormann et al. 1968, Brooks 1971).

Landscape architects quickly recognized that clearcutting was a troublesome eyesore in the forest. Various attempts were made by landscape architects and silviculturists to improve the visual acceptability of clearcutting but with only moderate success (McGee 1970).

Many researchers and forest managers were mistaken in the 1960's because they thought that as soon as people were able to recognize the good silvicultural results from clearcutting and understood the reasons for doing it, they would no longer oppose the practice. To the contrary, resistance today is probably broader in scope and more intense than it was 20 years ago. In fact, some opponents to the practice are well versed in the advantages of clearcutting but feel that the disadvantages outweigh the advantages. One researcher was not mistaken in his assessment of public reaction to clearcutting. In 1972 Minckler said "Most private landowners will not...clear-cut their lands." Time has proven Minckler to be correct, but unfortunately most private landowners do not practice any form of management. Nevertheless, clearcutting has not been accepted by the general public, by most landowners, and least of all by environmentalists.

At this point, researchers, foresters, and others who have been through the conflicts and controversies surrounding the research, development, and application of clearcutting would probably be happy to surrender and accept alternative procedures. However, research results on selection, group selection, and shelterwood methods do not provide much optimism for finding alternatives to clearcutting that are biologically, ecologically, and economically acceptable (Della Bianca and Beck 1985, Loftis 1983, Sander 1979, Minckler et al. 1961, Minckler and Woerheide 1965). Apparently, some landholders that have been practicing even-aged management with clearcutting will be forced to accept some form of alternative management to avoid the continual harassment surrounding clearcutting. In some cases landowners that have been using even-aged methods will return to the procedure of high-grading. High-grading will probably be masqueraded as some form of selection forestry or perhaps called a shelterwood with an extended or indefinite time schedule before the final cut. If events move in the direction described above with decreased clearcutting, one can anticipate decreased public criticism of forest management activities, but one can also expect a steadily degraded forest, decreased diversity, and loss of certain types of wildlife habitat.

## PANACEA

"It often happens that a fire sweeps over second growth hardwoods and kills the trees but the roots remain alive.....When a farmer does with the axe what is often done by fire he is using the simple coppice system. Let us suppose that a farmer has a woodlot covered principally with chestnut sprouts he wants to manage for production of railroad ties. In order to insure a steady production of ties he divides the area into equal parts and cuts one part clean every

year. When the woodlot has been cut-over the parts form a series of even-aged groups..... Simple coppice is a very useful system and the easiest of all to apply."

Gifford PInchot - 1905

Perhaps the greatest utility of clearcutting is that a century of mistakes, poor management, and abuse can be corrected by the application of one clearcut. Numerous authors have pointed out that upland hardwood forests are predominated by low-quality hardwood stands. Most foresters agree that clearcutting is the most practical answer to improving many of these degraded stands.

A good illustration of the efficacy of clearcutting low-quality stands is provided by some observations on the Cumberland Plateau. A 40-acre low-quality hardwood stand was harvested by shearing trees larger than 4 inches d.b.h. and chipping them on-site. Six acres were selected for natural regeneration. Following the harvest, residual trees above 4 1/2 feet tall were injected with herbicide on 3 of the naturally regenerated 6 acres (McGee 1986).

The results suggest that Gifford Pinchot was correct in recommending clean felling for tie log production (Table 1). The results also show that oak regeneration is abundant following clearcutting on mediocre sites where large numbers of oak trees in the 2-6 inch d.b.h. classes are present. Thus, clearcutting with little or no site preparation transformed a low-quality stand that was a liability into a stand that will perform up to the limits imposed by the quality of the site.

Another great utility of clearcutting is that large quantities of high-quality logs can be efficiently and economically harvested from high-quality sites with good resultant regeneration and little or no long-term environmental damage. Five-year regeneration data taken from clearcuts on good sites in Alabama, Tennessee, and North Carolina illustrate the regeneration that can be expected when good stands are clearcut from good sites (Table 2). No appreciable soil movement occurred on these clearcut areas even though slopes were steep. However, the density of regeneration can be misleading with respect to the future composition of these stands. Oaks are present in appreciable numbers after 5 years, but few oaks are dominant. Yellow-poplar and ash will be the predominant species on these high-quality sites, although the oaks will maintain an important place in each stand.

One of the by-products of even-aged management and clearcutting is stand diversity. For example, a landowner clearcutting a 40-acre tract each year would have 10 miles of edge habitat in 10 years, but would have clearcut only 400 acres. Diversity can be achieved with other harvest systems as well, but clearcutting offers a systematic way to provide a known amount of wildlife habitat on a sustained and verifiable basis.

Table 1.--Regeneration on a mediocre Cumberland Plateau site 5 years after clearcutting.[1/]

| Species | Stems per acre | | Height | |
|---|---|---|---|---|
| | Average | Range | Average | Range |
| | - - -Number- - - | | - - - - -Feet- - - - | |
| White oak | 169 | 130-210 | 7.4 | 1-15 |
| Scarlet oak | 112 | 61-175 | 7.7 | 1-17 |
| Black oak | 54 | 27-72 | 7.2 | 2-15 |
| Yellow-poplar | 18 | 4-76 | 3.9 | 2-10 |
| Hickory | 60 | 27-103 | 5.7 | 1-11 |
| Black cherry | 10 | 4-19 | 5.8 | 2-9 |
| Other species | 11 | 0-19 | 7.4 | 1-21 |

1/ Numbers per acre and heights are based on occurrence of tallest desirable trees in 8 x 10 subplots in 6 natural regeneration plots; 15 percent of the subplots did not have a desirable stem present.

Table 2.--Regeneration on good sites 5 years after clearcutting.

| Species | Location: Alabama | North Carolina | Tennessee |
|---|---|---|---|
| | Stems per acre over 4 1/2 feet | | |
| Desirable stems | | | |
| Oaks | 806 | 239 | 441 |
| Yellow-poplar | 654 | 403 | 615 |
| Black cherry | 129 | 0 | 43 |
| Sweet birch | 0 | 1,044 | 0 |
| Black locust | 0 | 392 | 665 |
| White ash | 110 | 147 | 189 |
| Hickory | 123 | 0 | 241 |
| Total | 1,822 | 2,225 | 2,194 |
| Undesirable stems | | | |
| Red maple | 431 | 154 | 139 |
| Others | 1,870 | 649 | 2,447 |
| Total | 2,301 | 803 | 2,586 |
| Total, all species | 4,123 | 3,028 | 4,780 |

Possibly the most often overlooked attribute of clearcutting is the protection it offers the environment. Logging under any circumstance causes an impact on the land. Environmental concerns are best served when the acreage involved per unit harvested is held to a minimum. The mileage of roads and skid trails are minimized by clearcutting. Hydrologists have clearly shown that cutting trees causes little erosion, but roads and skid trails are major sources of erosion and stream sediment (Patric 1980, Stone et al. 1978). Consequently, 100 loads of logs properly removed from a 20-acre clearcut will probably cause less adverse impact on water quality than the same number of loads removed by other more dispersed methods of cutting.

The most important advantage of clearcutting for many landowners and logging operators is economics. A recent comparison in upland hardwoods revealed that road and harvest costs for 10-acre clearcuts are about twice the costs for 25- and 40-acre cuts (Moore and Funderburke 1986). Thus, concentrating the harvest, cleanup, postharvest cultural activity, postharvest protection, and roads in one area have obvious favorable impacts on costs of harvest and treatment. As Gifford Pinchot said in 1905 when referring to the selection system--"When mature trees are cut in every part of the forest everyyear the cost is high...roads and other means of transportation must be numerous and costly in proportion to the amount cut. Logging under the selection system is so expensive as to prevent its application except for cherry and black walnut." If all forest managers using even-aged management and clearcutting in upland hardwoods were polled and asked to give only one reason for using the system, most of them would probably say economy. However, included in their economic justification for using the system would be simplicity of application, ease of administration, identifiable areas for convenient record keeping, marketing advantages, no residual trees to damage, and the opportunity to use larger, more efficient equipment.

The ecological requirements of the various preferred hardwood species also suggest another advantage of silvicultural systems that open up the stand and provide full sunlight to the forest floor. Most of the important upland hardwoods grow faster in full sunlight than in partial light if they have adequate moisture, nutrients, and space to grow. There have been no definitive studies that would convince one that taller, healthier trees can be grown in less than full light. However, it is clear that when light is

diminished and competition from other plants increases, some species are better able than others to cope with and thrive under the constraints. Just as clearly, some species are better able to take advantage of the abundant light and other elements in a clearcut. For example, yellow-poplar is very aggressive in clearcuts, but white oak, sugar maple, dogwood, and hickory are relatively more adaptable to shaded areas. Minckler (1971) states that white ash, cherry, the oaks, and yellow-poplar can be regenerated by methods other than clearcutting. He suggested group selection or patches. But these species also occasionally regenerate in areas that have been high-graded or cut to a diameter limit. A great disappointment for users of clearcutting has been the lack of predictable success for regenerating and maintaining high-quality oaks on good sites. Though oaks are often present in appreciable numbers following clearcutting on very good sites, other more aggressive species tend to dominate them. The fact that oaks on good sites are proving difficult to regenerate using methods other than clearcutting does not mitigate the complaint. On very good sites, a land manager must anticipate a reduction in the dominance of oak following any kind of harvest.

## ANATHEMA

"It seems abundantly clear that a system of cutting which removes only a relatively small number of trees in a logging operation offers the best assurance of a continuous growth of timber on the area, the least deterioration of the soil, the least damage from fire, frequent cutting intervals and the possibility of gradually increasing valuable species. Mixed stands of hardwoods lend themselves to this type of cutting."

Tillitson - 1927

During the past 25 years, this author has followed with great interest the concerns of persons and groups opposed to clearcutting. Some scientists have feared that two successive clearcuts would permanently impoverish a forest. The earliest Hubbard Brook findings showed a great outflow of nutrients, especially cations, following clearcutting (Borman et al. 1968). However, "hidden" in the text was the fact that the clearcut had been heavily sprayed at least twice with herbicide following cutting. It is amazing that many hunters and biologists, who should know better, oppose any sort of disturbance of game lands. And the legal appeals of the Wilderness Society and others use clearcutting as a focal point to oppose management in general on National Forests. Moreover, some private landowners echo the thoughts and predictions of Minckler and proclaim "My lands will never be clearcut." News headlines describe with dismay and alarm the clearcutting of large areas of corporate woodlands. And many citizens find it difficult to understand how foresters can tolerate, much less recommend, clearcutting in upland hardwoods. Yet this author remains convinced that the practice has great merit but, nevertheless, attempts to objectively discuss herein the shortcomings of the clearcutting procedure.

Opposition to clearcutting can be catalogued as visual, environmental, or technical. People opposing clearcutting are almost always dedicated conservationists who love and cherish the forest. They also tend to get emotional, and their opposition to this practice usually includes all categories of adverse effects.

### Visual Problems

The visual impact of clearcutting is the major weakness of the procedure. Residual snags, logging debris, and logging roads and skid trails can provide the appearance of total devastation. Shaping, trimming, postharvest cleanup, careful timing of the cuts, and grassing roads can soften the visual impact (McGee 1970). However, there is no way to avoid the shock a clearcut has upon a person expecting to see a mature forest. Apparently, the majority of the criticisms of forest practices in general, and clearcutting in particular, are either directly or indirectly related to visual (aesthetic) impacts on forest landscapes. These complaints may be referred to as cosmetic. Thus, the public's reaction to clearcutting seems to be that anything that looks that bad can't be good. Often persons in their response to the unsightliness of clearcutting make ungrounded or exaggerated statements about other non-visual results of the practice; such as, "Surely the soil will wash away, the water will be contaminated, the wildlife will starve, and the forest will be forever destroyed."

Many complaints suggest that clearcuts are too large. Obviously, a 50-acre cut has more visual impact than a 10-acre cut; however, ten 10-acre cuts may not be visually more acceptable than five 20-acre cuts or two 50-acre cuts. The initial impact of cuts is reduced as size is reduced, but the opportunity for encounter is increased. If the practice continues, the viewing public will have to adjust to an occasional encounter with freshly clearcut areas. If the practice is curtailed, it will be largely due to visual or cosmetic reasons.

### Environmental Constraints

Any activity in the forest that disrupts the soil cover and exposes the soil to direct rainfall will increase the hazard of soil erosion and stream sedimentation (Stone et al. 1978). Clearcutting clearly provides an opportunity for significant soil movement and severe erosion.

Because of the high visibility of clearcutting and because of extreme erosion on some well-known clearcut areas, many people assume that clearcutting is synonymous with erosion, nutrient loss, and reduced water quality. The early research of Borman et al. (1968) also fed fuel to the fire. This research carefully documented the effects of clearcutting on a Hubbard Brook watershed. The authors concluded that clearcutting tends to deplete the nutrients of a forest system at levels up to 20 times as great as on undisturbed sites and that management of forest systems can contribute to eutrophication of stream water. In that study, however, 28 kilograms per hectare of Bromicil herbicide were applied after cutting, and the treatment was repeated for several years, thus creating a deforested condition. Twelve years later the watershed was reevaluated (Likens et al. 1978). Based largely on that clearcut-herbicide treatment, the authors concluded that cutting of northern hardwoods sets in motion a variety of ecological effects related to removal of living vegetation and disruption of the forest floor--streamflow is increased, transpiration is reduced, chemicals in stream water are increased several fold, and erosion and transport of particulate matter are accelerated. The sum of these factors can have a major destabilizing effect on the landscape. Those authors recommended: 1) limiting clearcutting to fertile areas and modest slopes, 2) keeping clearcuts small, 3) minimizing damage to the forest floor, 4) allowing roads and skid trails to consume minimum possible area, 5) avoiding mechanical damage to streams, and 6) giving proper weight to non-timber producing tree species. These research works were widely acclaimed and even today are used as references for environmental damage due to clearcutting. Clearly, however, the results are confounded, and it is impossible to separate the effects of the cutting of the vegetation from the effects of massive applications of herbicide. A more rational appraisal of the treatments and results is seldom cited (Horwitz 1974). However, the most recent watershed research results suggest that properly installed and administered clearcuts produce only slightly more erosion and nutrient loss than undisturbed areas (Patric 1986, Hornbeck et al. 1986). The key here is obviously the word "properly." If roads and skid trails are properly installed and grassed and put to bed after the harvest, then erosion should be within tolerable limits.

Obviously, the steeper the slope in a watershed, the greater the opportunity for soil movement. Therefore, should steepness of slope be a criterion for halting clearcutting? If the area qualifies for logging at all, then it would probably qualify for clearcutting if clearcutting were the obvious prescription except for the degree of slope. In fact, it might be argued that the higher the risk, the more important it is to mimimize the number of returns into the area. Repeated partial cuts may be riskier than a clearcut followed by expert postharvest treatment of roads and trails.

## Technical Limitations

A potpourri of complaints against clearcutting as a silvicultural process is included in this section. Clearcutting as a process has certain cultural requirements that can be a disadvantage. The procedure also produces conditions other than visual and environmental ones that can be disadvantageous. These requirements and conditions are listed below, and several of them are discussed:

Requirements of the clearcutting procedure that can be disadvantageous include:

1) The felling and poisoning and/or sacrificing of left-over unmerchantable trees; these trees often include immature growing stock.

2) The marketing of a fairly high volume of low-value trees; some of these trees if retained as crop trees would increase in volume and value.

Conditions produced by clearcutting that can be disadvantageous include:

1) No canopy cover for soil or forest floor.
2) Does not adequately regenerate oaks on good sites.
3) Does not provide regular income.
4) Diversity within clearcut areas minimal.
5) Does not provide desirable habitat for many species of wildlife. Can cause habitat fragmentation.
6) No mast production for long periods.

A major requirement of clearcutting as a silvicultural prescription is that most trees above a certain relatively small diameter be felled or poisoned. On most clearcut areas many unmerchantable left-over trees must be treated, including culls and undesirable species and also immature trees of desirable species. To complete the clearcut, the landowner is faced with an expense item. Some foresters feel that incurring the expense of cutting immature trees of desirable species is unnecessary and suggest that either another harvest system be used or the desirable immature trees be left standing. The great variability of the immature residual trees makes for good academic arguments and is fertile ground for continued research. However, the greatest disadvantage of retaining these left-over trees is that it usually requires an overt act on the part of the landowner that can be expensive. There is a great temptation on the

part of many landowners not to follow through on the control of left-over vegetation. In a worst case scenario, neglecting to control left-over trees can convert a stand that supported good mixed hardwoods into a stand dominated by low-quality species or culls.

The general trend of regeneration on clearcut areas is to favor light-seeded and intolerant species. This trend is most pronounced on good sites where yellow-poplar, white ash, black cherry, black locust, and birch often dominate the slower starting oaks and hickories. On mediocre sites, oaks and hickories might regenerate poorly following clearcutting if good sources of sprouts are not present. A major weakness of the clearcutting method is that adequate regeneration of oak cannot be consistently provided following harvest. It is not a plus for clearcutting that oak regeneration on good sites following other methods of cutting has also fared poorly. There is little consolation in knowing that where deer are present in large numbers a component of oaks might at least be left to survive in a clearcut area, whereas they may be totally eliminated in small groups or selectively cut areas. The landowner committed to featuring oak production on good sites is indeed faced with a tough dilemma without good answers.

The impact of clearcutting on wildlife habitat provides tremendous opportunity for differences of opinion. Clearcutting can be devastating to some species of wildlife and highly beneficial to others (Noble et al. 1980, Resler 1972, Pelton 1985). Consequently, wildlife habitat can be used as a powerful argument in favor of or against clearcutting. Wildlife habitat is being used as a means to an end by both those who oppose clearcutting and those who favor it. Some of the interests that oppose clearcutting have developed a strong affection for black bear, squirrel, and the wood thrush. Those who favor clearcutting can recite the exact needs of deer, grouse, turkey, and the yellow-breasted chat.

The lack of mast, den trees, cover, and internal diversity are often mentioned as reasons clearcutting provides poor habitat for some wildlife species. As the size of the clearcuts is increased, the importance of these shortcomings is magnified. The amount of edge, distance from mature trees, and sustained availability of browse and cover are clearly affected by size of cuts. Large cuts, in excess of 50-100 acres, not only limit mast and cover but also provide a feast or famine situation for browse and low cover. Many wildlife biologists favor small clearcuts but few will recommend cuts over 50 acres (Harlow and Downing 1969).

## CLOSING OUT

"The controversies that chronically arise about clearcutting and other techniques of silvicultural management involve so many different considerations that it is not easy to sort them out in analytical fashion. What may seem patently obvious to the lay public and even to foresters is sometimes the opposite of the truth. Small effects are often overemphasized and important ones overlooked. The well-intentioned pursuit of the ideal best practice easily becomes the enemy of the good."

Dave M. Smith - 1978

Smith (1978) is obviously correct in his assessment of the confusion surrounding the clearcutting controversy. However, two considerations appear to rise out of the confusion to become major components in the silvicultural and social battle over clearcutting. The major advantage of clearcutting is the economics of logging; the greatest opposition to clearcutting is based on visual or cosmetic impacts. Take away either the economic efficiencies offered by clearcutting or the visual atrocities that often accompany the practice and there is no major controversy. Other environmental and technical advantages or disadvantages are of real but limited importance. Without economic constraints, ecologists, silviculturists, and wildlife biologists would be reasonably happy with small-group or tiny patch cutting. Similarly, environmentalists are hard pressed to show any adverse non-visual effects of clearcutting when compared on a rational basis with other harvesting systems. If this author's conclusions are accepted--that the economics of logging and visual effects are the two major contributors to the controversy--then is there room for compromise? The outlook is really not very good for productive compromise. Changes in the clearcutting procedure that will make clearcut areas more acceptable visually will increase the cost of harvest. The most likely compromise is a form of partial cutting or selective logging. Selective logging, high grading, or diameter limit cutting will satisfy immediate economic requirements and be visually less obnoxious than clearcutting. Cutting the best and leaving the rest will make many loggers happy, will quiet some of the vocal critics of forest management, will impede only the long-term productivity of the forest, and will hurt the feelings of a few silviculturists. The forest will eventually recover, but the silviculturists might not.

Some workers may reject the conclusion that the economics of logging and visual impact are the key elements of the clearcutting controversy. And they might strongly contend that ecological considerations favoring clearcutting and adverse environmental effects are also important factors

in the argument. If such a conclusion is correct, is compromise more likely? Not necessarily; the ecological requirements of various species of plants and wildlife for regeneration, growth, and development cannot be readily modified. Of course, the species selected for management can be changed and thus a compromise reached by changing objectives of management. Most of the adverse environmental impacts of clearcutting are related to cutting in general. Thus, less clearcutting and more cutting using other techniques will probably not reduce adverse environmental conditions. Therefore, if adverse environmental conditions associated with clearcutting are to be reduced, then clearly, the only effective compromise is less cutting in general.

Clearcutting - Panacea or anathema? Probably neither, perhaps both. Viewed from the narrowest of perspectives as a harvest and regeneration method, the clearcutting process comes close to being a panacea. Viewed from an equally narrow perspective of pure visual impact, clearcutting comes close to being an anathema. No modern-day forest manager has the luxury of using either of these narrow perspectives; thus, an ugly battle over economics and cosmetics continues. This author believes that conservation must be more than cosmetics and that clearcutting will ultimately become an accepted, if not cherished, forest management process for central hardwoods.

## LITERATURE CITED


Borman, F .H., G. E. Likens, D. W. Fisher, and R. S. Pierce.
1968. Nutrient loss accelerated by clearcutting of a forest ecosystem. Science. 159: 844-882.

Brooks, Fred C.
1971. U.S. Senate hears clearcutting concerns. J. For. 69:299-302.

Crawford, H. S., J. B. Whelan, R. F. Harlow, and J. E. Skeen.
1975. Deer range potential in selective and clearcut stands in southwest Virginia. U.S. Dep. Agric. Res. Pap. SE-134, 12 p.

Della Bianca, Lino, and D. E. Beck
1985. Selection management in southern Appalachian hardwoods. South. J. Appl. For. 9: 191-196.

Frothingham, E. H.
1931. Timber growing and logging in the southern Appalachian region. U.S. Dep. Agric. Tech. Bull. 250.

Harlow, R. F., and R. L. Downing.
1969. The effects of size and intensity of cut on production and utilization of some deer foods in southern Appalachians. Trans. Northeast Fish and Wildl. Conf. 26: 45-55.

Hewlett, John D., and James E. Douglas.
1968. Blending forest uses. U.S. Dep. Agric. For. Serv. Res. Pap. SE-37, 15 p.

Hornbeck, J. W., C. W. Martin, R. S. Pierce, F. H. Borman, G. E. Likens, and J. S. Eaton
1986. Clearcutting northern hardwoods: Effects on hydrologic and nutrient ion budgets. For. Sci. 32: 667-685.

Horwitz, Eleanor C.
1974. Clearcutting: A view from the top. Acropolis Books Ltd. 149-155.

Johnson, F. M., J. Lindzey, and T. H. Ripley.
1961. Recent developments in needs in game and game habitat research. In proceedings Annu. Conf. Southeast Assoc. Game and Fish Comm. 15: 27-29.

Likens, G. E., F. H. Borman, R. S. Pierce, and W. A. Reiner.
1978. Recovery of a deforested ecosystem. Science. 199: 492-496.

Loftis, David L.
1983. Regenerating southern Appalachian hardwood stands with the shelterwood method. So. J. Appl. For. 7: 212-217.

McGee, C. E.
1970. Clearcutting and aesthetics in the southern Appalachians. J. For. 68: 540-544.

McGee, C. E.
1986. Regeneration after shear felling and chipping upland hardwoods. U.S. Dep. Agric. For. Serv. Res. Pap. SO-224, 14 p.

McGee, C. E., and R. M. Hooper.
1970. Regeneration after clearcutting in the southern Appalachians. U.S. Dep. Agric. For. Serv. Res. Pap. SE-70, 12 p.

Merz, Robert W., and Stephen Boyce.
1958. Reproduction of upland hardwoods in Ohio. U.S. Dep. Agric. For. Serv., Cent. States For. Exp. Stn., Tech. Pap. 155, 24 p.

Minckler, Leon S.
1969. Is silviculture necessary? J. For. 67: 880.

Minckler, Leon S.
1971. Clearcutting in eastern hardwoods. J. For. 69: 278.

Minckler, Leon S., William T. Plass, and Russell A. Ryker.
1961. Woodland management by single-tree selection: A case history. J. For. 59: 257-261.

Minckler, Leon S., and John D. Woerheide.
1965. Reproduction of hardwoods. J. For. 63: 103-107.

Moore, Dan, and Kirby P. Funderburke.
1986. Cost comparisons of various size clearcuts on the Monongahela National Forests. North. J. Appl. For. 3: 43.

Morris, Don J.
1962. Trends in timber management planning on the National Forests. J. For. 60: 301-305.

Noble, R. E., R. B. Hamilton, W. C. McComb, and S. S. Tucker.
1980. Some effects of forestry on non-game birds. Louisiana State Univ. An. For. Symp. 29: 65-78.

Patric, James H.
1980. Effects of woods products harvest on forest soil and water relations. J. Envir. Qual. 9(1): 73-80.

Patric, James H.
1986. Soil erosion in the eastern forest. Problem or provocation. The American Tree Farmer. 5(3): 11-12.

Pelton, Michael R.
1985. Habitat needs of black bears in the east. In: A Symposium: Wilderness and Natural Areas in the East - A Management Challenge. Nacogdoches, TX (In press).

Pinchot, Gifford.
1905. A primer for forestry. Part II - Practical forestry. U.S. Dep. Agric. Bull. 24: 88 p.

Resler, Rexford A.
1972. Clearcutting: Beneficial aspects for wildlife resources. J. Soil and Water Conserv. 27(6): 250-254.

Ripley, T. H., and R. A. Campbell.
1960. Browse and stand regeneration in clear and selectively cut hardwoods. Trans. North Am. Wild. and Nat. Resour. Conf. 25:407-415.

Roach, Ben, and Sam Gingrich.
1967. Even aged silviculture for upland central hardwoods. U.S. Dep. Agric. Handb. 355: 39 p.

Sander, Ivan L.
1979. Regenerating oaks with the shelterwood system. In John F. Wright For. Conf. Proceedings. Purdue Univ. West Lafayette, Ind. 54-60.

Smith, D. M.
1978. Implications for silvicultural management in the impacts of regeneration systems on soils and environment. In Forest Soils and Land Use Proc., Fifth North Am. For. Soils Conf. Cal. State Univ.

Stone, E. L., W. T. Swank, and J. W. Hornbeck.
1978. Impacts of timber harvest and regeneration on stream flow and soils. Proc. Fifth North Am. Soils Conf. Fort Collins. Ed., Chet Youngberg, 516-535.