

DEER RANGE IMPROVEMENT BY MODIFIED TIMBER HARVESTING

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An experiment has been started on the Pisgah National Game Preserve in North Carolina to determine a suitable method of timber harvesting so as to result in reasonably good deer range as well as good timber regeneration. It is generally recognized that good food conditions on white tail deer range of the east are of a temporary nature. They persist for a limited period of time during plant development from the old field stage to the mature timber stage.

After the rapid increase in deer numbers on the Pisgah Preserve from 1925 to 1938, it became evident that if suitable volume of deer forage were to be maintained, heavy opening of existing timber stands was necessary. Almost no desirable vegetation of any type was available to deer on the Pisgah Preserve by 1938. At about that time the deer herd suffered drastic reduction through a disease as yet unidentified but diagnosed as hemorrhagic septicemia. The deer herd remained at a consistently low ebb since then. Over ten years have elapsed since and the rate of increase that prevailed before the 1938 peak in deer abundance apparently no longer exists.

A combination of factors probably caused this slowing of increase. We cannot rule out the effects of illegal hunting or predation by dogs. These two factors appear to have been quite important, especially since the meat rationing days of the war and the subsequent rise in food prices. In addition to these two factors, the comparatively low carrying capacity of the range and the poorer conditions of the deer seemed to be consistently important in retarding increase of the deer herd.

The condition of the range had been carefully studied from 1930 until the present. The browsing capacity declined steadily and rapidly between 1930 and 1939. Data obtained from subsequent studies have not yet been completely analyzed but show significantly that range recuperation under a closed canopy of trees is extremely slow and may in some places be non-existent. Competition for space and light by the timber overstory is apparently enough to retard establishment of ground cover to such a degree that a very few deer can prevent production of any significant amount of forage.

The forest on the Pisgah National Game Preserve was cut over to a diameter limit under a private contract between 1916 and 1936. It was also during that time that the larger proportion of the chestnut was killed by the chestnut blight. Both the extremely heavy cutting and the effects of the disease opened the forest canopy to the extent that young vegetation of all types could occupy the exposed ground with very little competition from old trees. To this was also added the influence of intensive fire protection. These factors combined to produce an abundance of low vegetation within reach of deer. The entire 100,000 acres of the Pisgah Preserve became optimum deer range.

With this large amount of food for the deer, the protection afforded the animals by seven Game Wardens and the total exclusion of all livestock, a very

large increase in the number of deer resulted. The animals increased to the point at which they could be seen in droves.

Some attention was given to the decline in the food supply as early as 1926. No planned action was taken however until several years later. Early studies indicated that the most desirable food plants were being cropped to death and were being removed from the average ground cover composition of the area in many spots. The reduction in the desirable food plants increased as the difference between the number of deer and the amount of available food increased. Some range over-use occurred as early as 1930 and extreme over-use existed over approximately 85% of the entire Preserve by 1938. In fact, the most desirable winter food plant, the "Pink Rhododendron" (*Rhododendron maximum*) was nowhere available to deer by the winter of 1937.

Reduction activities of several types were started as far back as 1929 and 1930. Fawns were being caught, hand raised and shipped to other areas for restocking. Adult deer were being trapped for same purpose. The first public deer hunt for both sexes was held in 1932. Hunter's success in this hunt was 72%. Despite these reduction activities however, the herd continued to increase. It was found that the inaccessibility of much of the area was largely responsible for the fact that deer could not be effectively reduced by these control methods.

Essentially the deer were healthy. Their rate of increase apparently declined to a constant of 20 to 25% per year. Animals were generally in excellent condition in the fall if they had the opportunity to feed on a good mast crop. Winters were not too severe to cause actual starvation, although a large amount of malnutrition developed during the winters of 1935 to 1938.

The herd did not spread outside the Preserve as was originally hoped. A number of factors were responsible for this. Most of the area around the Pisgah Preserve was in farm land or in commercial hunting clubs.

Poaching was relatively common. Large numbers of dogs on these outside areas took their toll of young and weakened deer throughout the entire year. Finally, the white tail deer exhibits a tendency to stay within a limited radius of where it grows up. This is especially true in the mountains.

The gradual weakening of the herd culminated in the 1939 "die-off." An increasingly large number of cases of lung worm had been found during the winter previous to this catastrophe. More and more deer were found each year to have been killed by dogs. Other diseases likely lumpy jaw (*Actinomycosis*) began to make an appearance in the herd. A large number of deer carried skin tumors (*Fibrosarcomas*). Mountain laurel (*Kalmia latifolia*) appeared to be the only item of diet found in deer stomachs during the winters.

Erosion had started in several of the over-used areas by 1938. Most was of the sheet erosion type but in many places sizeable gullies had begun to develop. Low vegetation was practically non-existent on the forest floor over many areas. The humus in some areas had been compacted by trampling to the point where water was running off at an accelerated rate.

Not all the food which had existed previously had been used by deer. Enough of the desirable food plants had grown out of the reach of the deer and had established a well stocked timber stand of commercially desirable timber species. Deer had been few at the time the Preserve was cut over. Timber reproduction grew rapidly as the animals increased in numbers. They did not have a chance to eat all reproduction before enough young trees grew out of their reach. The rapid

reduction in food was a combination of two factors: 1) the normal growth of southeastern woodland types to the climax timber stand; 2) the increasing use of ground vegetation by the deer.

The Pisgah Preserve is like so many other areas of national forest land in the East in that it is a relatively young forest stand. That means that very little timber on it is old enough to be cut economically. Timber cutting on such an area is primarily designed to remove the volume of trees no longer to be kept for the final crop. The only trees that should be removed on such an area are those of low commercial value, those that are poor in quality and those that will probably not live until the next cut.

Cutting of this type is classed as either cleaning, salvage cutting or improvement cutting and has been practiced on the Preserve since the time the original stand was cut off. Most of this cutting was on a highly selective basis. A few trees were removed here and a few there. It is a type of cutting which is particularly adapted to hardwood stands of mixed species and it leaves small openings scattered throughout a large area. It is normally expected that some new timber reproduction will be established in such openings by natural seeding. These openings may vary in size from a couple of hundred square feet to a quarter of an acre. They may amount to a removal of as much as 40% of the original area of the forest crown canopy.

It was observed however that despite the sharp decline in the number of deer on the Preserve, these small holes left in the forest canopy were not regenerating in desirable tree reproduction. It is well known that species of desirable timber trees are also highly desirable deer foods. Yellow poplar, white ash, white oak and basswood are four of the most desirable hardwood timber species in the Southern Appalachians. They are also among the most highly desirable deer foods. Small seedling plants of these trees may be found during any summer in the various openings left by past cutting. Very rarely will any of these plants exist beyond the second summer however. The comparatively few deer living in the watershed apparently seek out these plants and have successfully browsed them to the ground. This practice has helped neither the deer nor the future of the timber stands.

The slow regeneration of small spots is apparently too meager to get ahead of the deer's demand for food despite the fact that the present demand is far less than it was 15 years ago. Many of the openings are now being occupied by ground cover that is classed as quite undesirable as either game food or timber production. This condition is not only developing in the small openings left by removal of trees but it is also spreading slowly in many sections over the entire forest floor. New York fern (*Aspidium noveboracense*), buckberry (*Gaylussacia baccata* and *G. ursina*) and poverty grass (*Danthonia spicata*) are three plants that are invading the forest floor, in some places extending over areas of several acres. This is apparently a natural consequence of the complete removal of other low growing plant competition by deer cropping. It will probably require special treatment to kill out such plants where they have become firmly established in order to make the ground available to more desirable plants.

It seems that this invasion of undesirable vegetation may heal up some erosion however. It is therefore a desirable invasion from this standpoint, because it is better than nothing at all on the ground.

The history of the Pisgah Preserve and the observation that similar conditions are developing elsewhere in the Southern Appalachians indicated the importance of developing some more drastic method of deer range improvement than one of establishing a few food plots. The carrying capacity of about 85,000 acres was completely destroyed. A few acres of food plots would have been a costly and very insignificant contribution to the entire management program.

It was therefore decided to try some form of timber cutting which would simulate as nearly as possible the practices responsible for establishing original deer range and still afford an adequate return in timber values. The Forest Service could not justify clear cutting and burning of the type practiced by the early lumber companies, or any other practice which would be detrimental to the sustained growth of timber of commercially desirable species. It could attempt a modification of the present system of cutting however to stimulate heavier development of low growth available to deer at a calculated reduction in timber values.

Following a number of conferences and field inspections to determine a suitable method of cutting therefore, a tract of about 70 acres was marked for saw timber and pulp wood, cut over for all merchantable material and the practically cleaned of all unmerchantable growth with the exception of an average of five seed trees of commercially desirable timber species per acre. The entire cut was governed by the following rules:

1. Cutting is directed at returning about 10% of the forest area in each compartment to the reproduction stage or youngest age class every 10 years. The youngest age class area should be broken into parcels of 1 to 50 acres. Select the oldest sawtimber stands for the regeneration or reproduction cutting. The seed tree regeneration system will be used. This means that in the oldest stands selected for regeneration all the trees merchantable for sawtimber and other products will be cut except where trees should be left for seed purposes.
2. The rotation age is established at 100 years. Sustained yield for the present will be subordinate to area allotment. Improvement cutting will be continued on all areas that are not being cut back to age class 0 - 10 years.
3. Parcels of land for the reproduction cut were limited to 1 to 50 acres so that they would serve as suitable wildlife habitat. These 1 - 50 acres parcels that are cut during the same cutting cycle should be separated from one another by an intervening strip at least $\frac{1}{2}$ as wide as the average radius of the clear cut parcel.
4. Where seed trees are necessary, they should be yellow poplar, white oak, basswood, northern red oak, chestnut oak, buckeye, white ash, white pine, hemlock, Hickory and black gum should be left to the extent of 1 per 2 acres. Dogwood, sassafras, silverbell, scarlet oak and other species of low commercial value but high wildlife value will probably be sufficiently numerous in the residual stocking after logging to insure adequate regeneration. Den trees will be left as prescribed by the manual supplement. Mast bearing trees will be removed if merchantable unless otherwise left under these provisions.
5. Essentially, each compartment is managed as a unit in itself wherein all age-classes will be developed and 10% of the area will be continuously in the 0 - 10 year age class.

An additional series of areas totalling about 250 acres have been marked for the same type of cutting. Only the seed trees were marked to be left in these areas. So far the saw timber in some of these stands has been removed already but other trees have been left pending further observations on the results of the cut on the original 70 acres.

Observations made so far on the 70 acre clear cut area indicate: 1) that too much deer forage was produced, and 2) that apparently too little desirable timber reproduction will become established.

It was observed that practically all stumps on the clear-cut area produced abundant sprouts. A reconnaissance estimate of the amount of forage produced in the form of sprouts and weeds indicates a forage capacity for deer of one animal per three acres. Such a concentration of deer is considered very undesirable from a sanitation standpoint. The surrounding area could in no way assist in supporting such a heavy concentration and it is very doubtful whether this tract of 70 acres could attract enough deer from surrounding areas to utilize this volume of forage. A smaller concentration of deer on this area will have plenty to eat for the next five years. The sprouts are growing so rapidly however that most of them will be out of reach of deer by the end of that time. They will be of no value to the deer therefore at any time.

Regeneration of desirable timber species for a future stand appears dubious because sprout competition will be so intensive that seedlings may have little chance of taking a dominant or co-dominant place in a new stand. It has been repeatedly established that trees of sprout origin in the Southern Appalachian develop early but rot and generally make undesirable stems for saw timber.

The most significant feature of this clear cut operation is the fact that we have "bracketed the target." Our previous selective cutting produced no deer food. This clear-cutting produced too much. We know that we can produce deer forage. It is next necessary to determine what modified type of cutting we may practice to get just enough deer forage and also a reasonably desirable stand for future saw timber and other forest products. It is apparent that we can well afford to make lighter cuts on smaller acreages and still probably produce abundant deer forage. It also seems desirable to treat many of the stumps left after a cutting operation with a chemical such as "ammate" in order to prevent too abundant growth of sprouts. It also seems desirable to leave small thrifty stems of desirable timber and game food producing trees rather than remove or girdle them to make room for additional ground vegetation.

The cost of treating the 70 acres of clear-cut area was estimated at approximately \$43 per acre. This cost will probably be reduced by the returns to be derived from the pulpwood sale now being made with the down timber left on the tract. Even though it is not as high as the cost of clearing and establishing game food patches this cost is still out of reason when weighed against the foreseeable benefits. It is recognized that it is still too early to evaluate the composition of the future timber stand because some seeding reproduction will probably be established each year for the next 5 years. This is being studied and a more accurate appraisal will be made in the future.

Some important modifications of the original cutting practice appear desirable. The practice is basically designed to develop both a necessary volume of forage for deer and a desirable stand of young growth for future timber values. It appears at this early stage in the experiment that a much less intensive cut is necessary to

afford the desired amount of deer forage. It is also obvious that it is not necessary to establish a rotation age at this time. It was previously thought that a rotation period of 100 years would have to be established in order that 10% of the area would at all times be in the low growth reproduction stage; that is, age class 0 - 10 years. Future experimentation will probably indicate that this amount of cut-over area is not necessary. If this is firmly established, the rotation age may well be increased to where much higher quality saw timber can be produced than is possible with 100 year old trees.

It is also apparent that various types of cutting will probably have to be applied to various types of sites, timber stands or timber types. For instance, a large percentage of ridge tops should never be clear cut. They essentially produce protection forest of commercially low value timber species. Clear cutting in these would produce little more deer food than can grow at present and would certainly not increase timber values. Upper slopes appear to require similar modification. On the other hand, some very productive sites in coves could possibly stand very heavy cutting and even extensive clear cutting over restricted areas. They would thus afford scattered patches of maximum deer forage in places where it would be available to enough deer to permit optimum use.

It will be absolutely necessary that the land managing agency be given unrestricted control over the deer herd in order that any cutting system be valuable in deer management. This would mean complete authority to hunt the animals or otherwise reduce their numbers if and when considered necessary by any means deemed desirable including doe hunting. Only with such authority will it be possible to adjust the forage capacity and the demand on this capacity at the time when such adjustment is found necessary. Without this unrestricted authority it would be necessary to delay wildlife utilization until everybody is in agreement. Even if this were possible it would cause damaging delay.

It must be remembered that the attempt to modify deer range by timber management practices is still in the initial experimental stage. It appears to be possible and can probably be worked out to where it is also economical and sound from both the wildlife and the timber management standpoint. It is not possible at this time however, to draw any further conclusions than those given.