within the area and will be remeasured annually to establish condition and trends. Tolerable browsing limits have been set and, if these limits are exceeded, hunting regulations will be relaxed by phases to encourage increasingly greater hunting pressure. The last resort would be to reopen the area to a season of conventional hunting, and thus reduce population densities. We do not expect to have to resort to such drastic action in the foreseeable future.

Both the Forest Service and the Department of Fish and Wildlife Resources count the Primitive Weapons Hunting Area as an unqualified success. Management objectives are being realized; hunter response has been enthusiastic; and primitive weapons hunting is proving to be a useful concept in game, recreation, and land use management at a time when there is increasing need to provide the hunting public with more sport per unit of game taken.

THE NEW LOOK ON SOUTHERN NATIONAL FORESTS

By

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Following purchase of the Southern National Forests, the Forest Service was faced with two major jobs: (1) protection from fire, and (2) re-establishment of a satisfactory and manageable forest cover. A vigilant presuppression program and a better informed and cooperative public have gone a long way toward bringing wild fires under control. Getting the forests in shape for management was a more difficult job. Particularly so, since watershed protection was one of the major purposes for which the forests were purchased. Much of the acreage had been high graded, burned and otherwise abused, so that many important tree species which belonged in the forests were lacking or in very short supply. Age class distribution necessary for management was badly mixed up.

To correct these conditions, silviculturalists resorted to the time-tested method of improvement cutting. This type of cutting is the accepted pioneer method for correcting conditions similar to those found on the new forests. Improvement cutting removes the "worst first" by commercial harvest followed by non-commercial release of suppressed growing stock. Improvement cutting and reforestation has been successful to the point that composition, stocking, and soils have improved. It is now time to change to silvicultural methods better adapted to regeneration and management of the southern forest types.

The new system of management has attractive opportunities for developing a high class wildlife habitat. Let's look at some of the basic reasons for the new management system and how it will tie into the wildlife program.

Most of the major commercial tree species in the South are relatively intolerant. They represent the early or intermediate stages of natural succession. It is not coincidence that those species are valuable commercially, since they are the ones most likely to lose their lower branches through natural pruning—thus furnishing clear wood products. It is also significant that they possess the ability to reproduce readily after site disturbances, such as fire, insects, disease or cutting.

Similarly, with only few minor exceptions, Southern forest game prefers subclimax tree and plant associations. This indicates that major site disturbances have been a common occurrence since time began.

Were this not so, these creatures would never have survived the ages. It follows then, that perpetuation of our native forest game requires maintaining the particular subclimax association which are their natural habitat. In primeval times, this occurred through fire, wind, and other natural phenomena. Man-designed methods of holding desired plant associations by silvicultural treatment are equally effective and much less wasteful.

To maintain subclimax forest types, silviculturalists normally manage trees in even-age stands. In this, the stand is the basic unit for which treatment is prescribed. The number of stands and area of each depends on the intensity of practice, condition of the growing stock and diversity of sites. Lesser vegetation found under the trees is an integral part of the stands and properly manipulated provides valuable food and cover for wildlife.

Therefore, silviculture and wildlife both have a common goal in keeping subclimax forest associations in vigorous condition with proper density and desirable composition. Also, the operations necessary to achieve these objectives involve application to small units or stands. This is the basic framework, but it is not all as rosy as it might seem. Managing a highly mobile resource within a quite immobile environment can present problems. Maximum yields of either one or the other are not compatible. There must be some give and take from each, if we are to get the job done. It is fortunate that the National Forests are managed under the multiple use concept, as it is in this climate, that two or more natural resources may be coordinated to the mutual advantage of each.

The measure of success in multiple-use management depends on how well the land manager harmonizes the resources for which he is responsible. Often, in making resource decisions, managers spend too much time pondering the conflicts between two or more resources. This negative attitude is time consuming and rarely yielding of sound multiple use decisions. The positive approach which develops things common to the resources in question has proven to be more fruitful. Coordination between silviculture and wildlife habitat development under even-age management can be highly successful if we use the positive approach.

We can all agree that a continuous production of a variety of food and cover, well distributed, is a major habitat objective. Let's look then at the opportunities inherent in a forest under even-age management where the objective is to develop and maintain a balanced distribution of age classes. Here are a few of the more important—

—Even-age stands provide good visibility for shooting.

—After regeneration and first thinning, the total understory is available for production of food and cover and for hunting, without affecting the timber crop.

—In suitable types, notably pine, prescribed fire can be used to manipulate understory vegetation.

—Intermediate cutting favorably influences habitat over sizeable areas.

—Stands of different age classes provide variations in food and cover.

—Measured stand carrying capacities permit more precise evaluation and intensive management of habitat.

Control of stand density and composition are the principal means by which timber and wildlife habitat needs are coordinated. To benefit wildlife, the degree of thinning and composition of growing stock species often require some modification from a strictly silvicultural approach. To better understand proper handling of these variables, let's consider for a moment habitat dynamics in an even-age stand.

Regeneration cutting, whether it be clear cut, seed tree, or shelterwood, exposes the ground to sunlight and provides ideal and instantaneous conditions for vastly improved habitat. In addition to the

new seedlings, sunlight also stimulates a bountiful number of forbs, grasses and vines. Many of these are valuable to wildlife. Food and cover is usually plentiful and normally there are ample nesting sites on the perimeter of the regenerated area. Insect life increases and is readily available for quail or grouse chicks and turkey poults, within easy reach of their nests. Shooting visibility is excellent and bird dogs can work within sight of the hunter.

Subsequently ,the seedlings grow into saplings. Low shade created by their continually expanding crowns tends to suppress desirable food plants. From this time until the first thinning, the stand becomes virtually a "biological desert." Stands in this condition have little or no attraction for wildlife. However, after the first thinning and following each subsequent intermediate cut, as the stand increases in height, more sunlight reaches the forest floor and there is an accompanying improvement in understory plants. While the stand is still in the pole timber range, trees may be too close together for good shooting, but if enough sunlight reaches the forest floor, some food will be available.

When the stand attains sawtimber size and the trees become fewer in number and are larger and farther apart, food plants and forage are plentiful and shooting conditions good. Thus, on an 80-year rotation, the first 5-10 years are good for game and the hunter, the next 10-15 years very poor for both, the remainder of the rotation fine habitat and hunting conditions.

Control of stand density through intermediate cutting is the most common and economical way of influencing understory vegetation. Understory vigor and abundance varies inversely with stand crown density. The amount of improvement in understory vegetation resulting from thinning depends on the severity of the cut. Vigor and abundance of lesser vegetation also varies with site quality in the same manner as does tree growth. Here, there is an opportunity to work out thinning guides based on site index which are mutually satisfactory for both timber production and wildlife. In the Southern National Forests, thinning guides will be used which appear to be satisfactory for both timber and food production. Based on species, stand age, and site index, these guides require thinning frequently enough to stimulate moderately abundant lesser vegetation.

Where it is possible to correlate changes in stand density with prescribed burning, there is a more rapid and lasting response to understory vegetation. Fire removes the suppressing litter which accumulated prior to thinning and, along with the additional sunlight, results in a more rapid and vigorous regrowth of desirable species. Many plant species that are high on the wildlife list occur in subclimax associations which respond well to fire.

There are two principal sources of food in forest habitat—the lesser vegetation, which furnishes food for the greater part of the year, and seed and fruits born by trees. This latter source is seasonable and less subject to short time manipulation. Nevertheless, mast from oak, blackgum, hickory and beech, for instance, is extremely important for overwintering native wildlife. For several game species, these trees may also provide living quarters. Controlling stand composition, then, is another important part of coordinating even-age management with wildlife.

In hardwood types where oaks and other mast producers are commercial components, there appears to be no significant composition problem. There are conflicts in coordinating stand composition within pine types.

To assure at least minimum wildlife needs in pine types, care must be taken to bring along the necessary hardwood components. The solution is not easy. Many soils are not presently capable of producing commercial hardwoods. Thus, the development of hardwood will frequently be at the expense of pine. Sometimes, this results in a

low grade or non-commercial product. Moreover, lack of reliable site criteria for hardwoods further compounds the problem. Many of the hardwoods now occupying the sites in question are products of past high grading, wildfire, and other abuses. They may not represent the true hardwood potential of the site. Further, a pioneer coniferous litter may be the most efficient way to protect and improve moisture in these impoverished soils.

Composition requirements may be met in these situations by either (1) developing mixed pine-hardwood stands, or (2) maintaining hardwood groups, large enough to be considered as stands, intermingled with pine stands. In the case of mixed stands, an ultimate mast producing hardwood component of not less than 5 square feet basal area per acre, or 200 square feet per 40 acres is desirable. Where hardwood stands can be found, they should, ideally, comprise not less than 15 per cent of the area. In rolling terrain where stream bottoms and lower north and east slopes make up about 25 per cent of the area, management for hardwood on these aspects will usually meet composition requirements.

In regenerated pine stands, the first cleaning, or release, is the proper time to select the method of adjusting stand composition. This is the time to retain the necessary hardwoods on the sites where they will do best. The relationship between a component of 5 square feet per acre, 200 square feet per 40 acres and 15 per cent intermingled hardwood stands, may seem inconsistent. But let's take a look at the basis for choosing the method of meeting composition requirements.

In the first place, of course, that choice depends on how the hardwood species occur on the ground. Ideally, it would be desirable for mast producing hardwoods to be distributed on each acre. There are, however, other factors which should be considered. Where fire is used to manipulate understory habitat, as in the coastal plains, there is less chance of accidental "scorch" if the hardwoods are in groups which can be plowed out—at least during the early ages. On the poorest hardwood sites, it may be difficult to find scattered, thrifty mast species; if present, they will in all probability occur in depressions and branch heads. So long as the composition requirements on these problem sites can be met within 40 acres, minimum needs have been protected. Hardwoods in these stands would rarely yield more than low grade commercial products. Their principal value would be their contribution to wildlife habitat. If there are large areas of such sites, it might be good planning to consider management preference of game species less dependent on hardwoods which, for mast production and use, must be grown in the co-dominant crown class.

Where thrifty mast producing hardwoods occur within pine types in groups large enough to be classed as stands, in most cases there has been a pronounced site change. Here, the hardwoods may have good potential to become commercial products as well as game food producers. Although their present stumpage value may be less than pine, management of these stands for dual timber-wildlife production is important in multiple use. In summary, then, the difference between the 5 square feet approach and the 15 per cent concept is an attempt to make the best of a bad situation, starting with the worst first and taking advantage of any site improvement. It is a compromise between occurrence, economics and habitat.

Coordinated standards for stand density and composition serve the purpose of making each stand contribute its share to good wildlife habitat. One of the major objectives of forest game management is to provide a variety and abundance of natural food and cover within the normal cruising range of native game species. In even-age management, this may be accomplished by coordinating stand area with game movement. For example, where game movement occurs within a square mile, as is the case of our non-migrating white-tail deer, stands ranging from 40-100 acres provide a variety of food and cover within the home

range unit. If, on the other hand, management of a short ranging species, such as quail, is to be emphasized, then smaller stands ranging from 20-40 acres are more suitable. Large stands of several hundred acres produce a monotonous habitat, lacking in variety.

The things mentioned so far, stand density, composition and stand area are variables which can be coordinated to improve forest game habitat. Since the stand is the least unit of management in an even-age forest, it follows, then, that regeneration will be done by stands, rather than single trees or groups of trees. It would seem important to the welfare of resident game that stands to be regenerated within a home range unit be limited as to time and area. Here is the reason for this—a regeneration cut drastically changes wildlife environment within a very short time. This change is felt over a greater area than that being regenerated due to daily and seasonal movements of game. The first effects of cutting are usually good, but these soon disappear and game is hard put for food. This is particularly true in the case of our white-tail deer. If too much of the herd range, say a square mile, goes into low capacity at one time, the deer will suffer as well as the undisturbed portion of the range. This situation may be overcome by limiting the total regeneration area within a square mile to about 150 acres. An exception to this, of course, would be where stands have been destroyed by fire, insects, wind or other catastrophy. This limitation on area would cover a 20-year period, since this is about the average age at which the first thinning is done, thus again releasing forage. Where hardwoods are being regenerated in areas of high deer population, protective measures are more likely to consist of fitting size of regeneration area to the deer herd, rather than drastic herd reduction by hunting. For instance, under these circumstances, regeneration should be planned and scheduled so as to have an area large enough to overwhelm the deer with forage, but not frequent enough to starve them out in their home range, when saplings grow beyond browse reach. In any event, the idea is to prescribe the area of non-productive habitat that will occur at any one period within an occupied game range.

The determination of carrying capacity for wildlife management purposes in a forest habitat has long been a difficult problem, particularly where the environment is constantly changing as a result of improvement cutting and noncommercial release. Measurements of understory are not meaningful unless they relate to the specific conditions under which they occur. In even-age stands, food conditions can be related to stand size and density. From the first thinning until rotation age, understory and mast production are continually increasing. Furthermore, those increases can be reliably predicted as the stand is a definable community and silvicultural treatment is standard for any similar set of stand conditions. Stands are delineated on the management map and thus carrying capacity becomes meaningful for any unit and the total, the weighted average of all the various stands. Using this information, managers cannot only develop habitat capacity, but probably more important, determine the wildlife species best suited to that particular set of forest conditions.

Even-age management is the new look on the Southern National Forests, and with proper attention to coordination, it will provide a highly attractive environment for wildlife and the hunter, now and in the future. These are examples of how silviculture may be used to accomplish this objective. There will undoubtedly be many more as we gain experience. Answers to forest game problems rarely fall into black or white areas, there is still a lot of gray showing through. This we do know, however, as long as wild creatures eat forage, seeds and berries which grow on or under trees, we can positively influence their production by controlling stand density and composition. There may be some "give" necessary on the part of both wildlife and timber production. For example, wildlife can sacrifice some understory production for clear boles, and silviculture can provide growing space for a com-

ponent of trees of less commercial value than the species most adaptable to the site. The important point is that both resources have more things in common than in conflict. We intend to follow this positive approach in planning the new look under our multiple use concept.

SOME ASPECT OF FISH AND WILDLIFE MANAGEMENT ON AN ARMY RESERVATION

By

EARL F. KENNAMER AND ROY T. JOHNSTON

INTRODUCTION

Long known as the largest infantry training post in the world, Fort Benning Military Reservation, established in 1918, covers 182,000 acres. Of this, 170,000 acres are in Georgia and 12,000 in Alabama. Approximately 160,000 are suitable for fish and wildlife management. Because of impact areas, however, only 140,000 acres can be hunted or fished. Yet this acreage is seldom completely open for hunting and fishing because of troop occupation, range firing, and maneuvers.

Prior to 1961 a fish and game management program for the reservation was in effect. Frequent change of personnel and lack of continuity, however, precluded establishment of a long range fish and game management program.

In January, 1961, the junior author was employed as full time civilian wildlife manager for the reservation. A complete survey of forests, fishing waters and wildlife resources was conducted. Following this, specific management plans were formulated and work was begun on a continuous fish and game management program.

Persons who can hunt and fish on the reservation are military personnel, their families, disabled veterans, retired military personnel, and civilian employees on the post.

No fee for hunting and fishing by military personnel and their dependents is required. The licensee, however, must have a current Georgia or Alabama hunting or fishing license.

Principal species of game for management and hunting include bobwhite quail *Colinus virginianus*, white-tailed deer *Odocoileus virginianus*, cottontail rabbit *Sylvilagus floridanus*, wild turkey *Meleagris gallapavo*, ducks and geese common in the area during migratory season, gray squirrel *Sciurus carolinensis*, and fox squirrel *Sciurus niger*.

RESPONSIBILITIES

Functions pertaining to fish and wildlife management activities involve many staff agencies.

Post Engineer. The Post Engineer is delegated responsibility for planning the development and management, budgetary programming and maintenance of the Fish and Wildlife Conservation Program within the Installation Natural Resources Management Program.

The Post Engineer helps maintain fire lanes, conducts controlled burning and provides seed, fertilizer and special mechanical equipment for the wildlife manager to carry out his program activities. The Post Engineer exercises jurisdiction over the wildlife manager and provides