

tion by Boy Scouts, FFA, 4-H, and other organizations active in conservation programs.

Muskrats have moved into the reservoirs as fast as they are completed. Their populations build up rapidly and trapping operations by farm boys naturally follow.

Several flood control structures have been constructed in the vicinity of good deer and turkey populations. Both deer and turkey have been attracted by the available water supply and have been observed on numerous occasions.

Critical erosion areas are planted as an essential part of a watershed program to stabilize these areas against high-frequency runoff. When bicolor lespedeza seedlings are available, in our case from the Georgia Game and Fish Commission, we have established them on the critical areas thus accomplishing two important objectives, (1) establishment of stabilizing vegetation, and (2) providing good food and cover conditions for Bobwhite quail. This program has shown remarkably good results. Within a short time after establishment of the bicolor patches, a covey of quail will begin using the area for the food and cover that is available.

An interesting addition to the common birds of an area are species of Egrets, Herons, Ibises and Swallows. Flood-retarding structures and farm ponds have attracted these birds in large numbers. The water areas being built provide feeding and resting areas for numerous water birds not normally seen in interior habitats.

Planning for wildlife on watershed projects is a new field for game and fish technicians with special problems and opportunities. Throughout the country landowners are moving into game and fish management as a business or an adjunct to farm income. A watershed program draws neighbors close together and starts them working together, sometimes for the first time. Here then may be an opportunity for a watershed association to develop the hunting and fishing potential of a relatively large area and provide better recreation for all—both the landowner and the city dweller.

FIRE AND QUAIL MANAGEMENT AT FORT CAMPBELL, KENTUCKY

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INTRODUCTION

Prescribed burning has long been recognized as a sound silvicultural practice in the pine forests of the southern coastal plain. Stoddard (1931) and Rosene (1954) found that burning was also an excellent quail management practice in the southeast. However, the use of fire as a forest and quail management practice in the hardwood region to the north has been neglected. It is the purpose of this paper to demonstrate the potentials of prescribed burning as a management tool in military land management, quail management and, to a limited degree, silvicultural usage in the establishment of pine plantations. These potentials will be demonstrated by the use of results obtained on a military reservation in this hardwood region.

DESCRIPTION OF AREA

The Fort Campbell Military Reservation consists of approximately 101,000 acres of land located in Kentucky and Tennessee. The reservation is located 16 miles south of Hopkinsville, Kentucky and 8 miles north of Clarksville, Tennessee. The topography is generally flat and rolling land except for the western portion of the post where the topography becomes more broken. Generally speaking, soils are limestone derived and consist mainly of the

following series: Hagerstown, Decatur and Baxter. These soils are among the best agricultural soils in this region. Prior to acquisition by the Army in 1940 and 1941 the land was used for the production of tobacco, corn, small grains and pasture. The total woodland acreage is approximately 27,000 acres of second growth hardwood forest, occurring mainly in small blocks 2 to 40 acres in size. These tracts are widely scattered over the entire area.

LAND MANAGEMENT NEEDS

The Army acquired the land in 1941 for the purpose of training troops for World War II. At this time the intensive agricultural usage was terminated. As is characteristic in this region, following abandonment, the fields grew up into stands of high value quail food plants, such as Korean Lespedeza, Partridge Pea, Ragweed, and Tick Trefoil. According to reports from long time residents, the quail population then increased to a very high point, perhaps reaching or surpassing one bird per acre. The first hunting on a large scale was allowed in 1945. Hunters had excellent success and soon Fort Campbell was rated as one of the best quail hunting areas in the nation. This condition continued for a few years until the natural process of plant succession replaced the valuable quail food plants with heavy accumulations of broomsedge and other plants of little food value to quail. As a result the quail population and hunter success gradually declined. During the 1953-54 hunting season only 5,000 quail were harvested. This represents a kill of one bird per 16 acres. At the same time troop training areas were becoming dense tangles of vegetation which made it almost impossible to train foot soldiers. This was a problem of grave concern to the military. Wildfires were often difficult to control due to heavy fuel accumulations in the old fields. Wildfires often occurred and reached large size, even though the military put many personnel and much equipment in the field to control them. On extremely high fire danger days it was almost impossible to control a fire due to the heavy fuel accumulations in the old fields. These large wildfires caused immeasurable damage to the forest and game resources as well as endangering expensive tactical equipment, buildings and other tangible materials. Because of these and other land use problems the first Forestry Branch was established at Fort Campbell in 1954. One of the major responsibilities assigned this branch was prescribed burning operations. After careful study a prescribed burning program was set up to accomplish the following objectives:

1. The maintenance of training areas in such a condition so as to facilitate troop training use. Troop training is the main mission for which the land area of Fort Campbell is intended and must take priority over all other activities.
2. The reduction of heavy fuel accumulations so as to limit wildfires and to make sure that wildfires were controlled when they did occur.
3. The improvement of game habitat.
4. Specialized treatment of some areas prior to reforestation.

PREPARATION OF AREAS FOR BURNING

Two general types of training areas occur on Fort Campbell; they are the maneuver areas and the impact areas. The maneuver areas are devoted to all types of training which does not involve the firing of live ammunition. The impact areas are specific areas which are set aside for the firing of all types of weapons. These areas are particularly susceptible to wildfires and are burned over each year if not prescribed burned, therefore the burning cycle on impact areas is a yearly one. Maneuver areas which make up the larger portion of the total land area on Fort Campbell are burned on a four year cycle. A shorter cycle would probably be of more benefit to game, particularly quail; however, available labor and equipment dictate a four year cycle. It may be necessary to shorten this cycle in the future. The season for burning is November 1 through April 1. The best time to burn from a game management viewpoint is probably during the month of March. Since only a few suitable days will occur in any one month a large burning program must be

spread over several months to obtain the necessary number of days when conditions are right for burning.

Since there are numerous small tracts of hardwood timber scattered over the areas, it is necessary that these stands be surrounded by plowed fire breaks. Fire even of a controlled nature cannot be allowed to enter hardwood stands. After plant growth has diminished in late summer, the preparation of selected areas begins. Fire breaks are put in by two D-7 caterpillar bulldozers with heavy bog plows, working together to make a double overlapping cut around each stand. Bush and bog plows are superior to fire plows for this type of work. Fire plows make a narrow deep furrow which rapidly fills with leaf litter and the deep cuts also cause considerable erosion.

BURNING OF AREAS

Approximately 20,000 acres are prepared and burned each year. Days to burn are selected by carefully analyzing weather forecasts and the forest fire danger readings which are derived from the fire danger station. Fire danger is predicted by measuring certain elements of the weather, such as wind, fuel moisture, rainfall, etc. Once these measurements are obtained, they are set off on a slide rule made specifically for this purpose. The readings are combined on the rule and a fire danger rating is obtained. Fire danger is expressed as a burning index. The scale on this index is 0 to 200 points, with a burning index of 0 being the time of minimum fire danger. Maximum fire danger is represented by a burning index of 200. The open type station with an 8-0 meter is used at Fort Campbell. This system of rating fire danger and burning conditions has been developed by the U. S. Forest Service and is used in one form or another over the entire country. Burning starts when the burning index is between fifteen to thirty-five points, with a burning index of about 25 being considered ideal. If burning is attempted after the burning index goes over 35, experience has taught us that the fire will become much harder to control and will, in fact, often escape the control area.

The burning is accomplished by a crew of eight men. This crew can effectively and safely burn 3,000 to 5,000 acres in an eight hour period. The actual setting of the fire is accomplished by using two D-7 tractors with mounted torches. Two tractors and two operators can fire 5,000 acres in about four hours. The cost of burning varies from \$0.25 to \$0.50 per acre depending upon the number of stands of timber in an area that require surrounding fire breaks. A prescribed burn area is usually surrounded by roads. Backfires are first set along the perimeter of the area and are allowed to burn back against the wind, at the same time a tractor backfires around all major blocks of woodland. After the backfires are set and have had time to burn out, the area is then fired and allowed to burn with the wind. Water tankers and tractors are kept on stand-by around the perimeter of the fire to be immediately available should the fire escape control.

EFFECTS OF BURNING IN RELATION TO SILVICULTURAL NEEDS

By removing excess vegetation, prescribed burning greatly aids in the establishment of pine plantations on old field sites. In areas with high rabbit and rodent populations, burning prior to planting is almost mandatory. If areas are not burned prior to planting, severe damage from rabbits and rodents may occur. The open condition of burned over fields limits the degree to which rabbits and rodents will damage the freshly planted seedlings. The removal of excess vegetation also exposes these animals to predators. Reduction of rodent populations may also be a factor of importance in quail management since food competition by these animals could be serious.

EFFECTS OF BURNING ON VEGETATION

Prescribed burning reduces heavy dense stands of plants, such as broom-sedge. Burning creates openings in these dense stands of vegetation, thereby enabling quail to move more freely and at the same time provides more edge

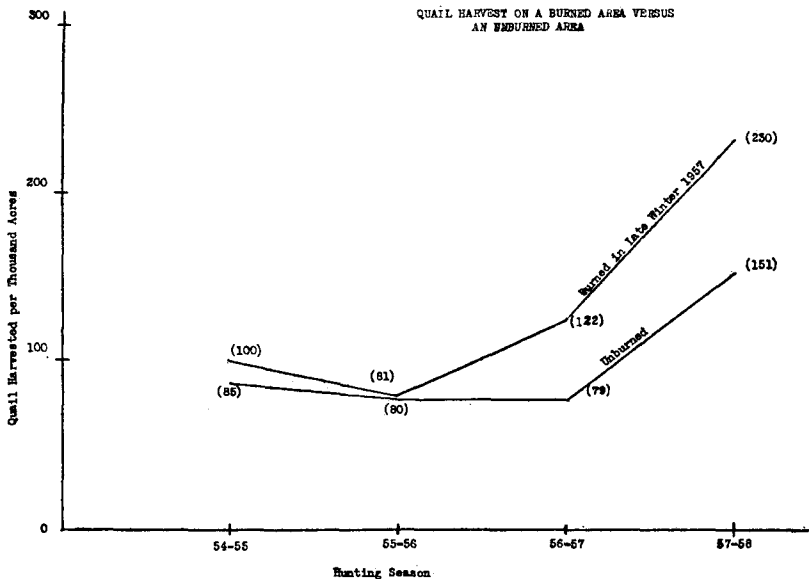
effect. Fire induced quail food plants, such as Partridge Pea, Korean Lespedeza, Tick Trefoil, Ragweed and Trailing Wild Bean, often come back in good stands following prescribed burning operations.

EFFECTS OF BURNING ON KILL AND HUNTER SUCCESS

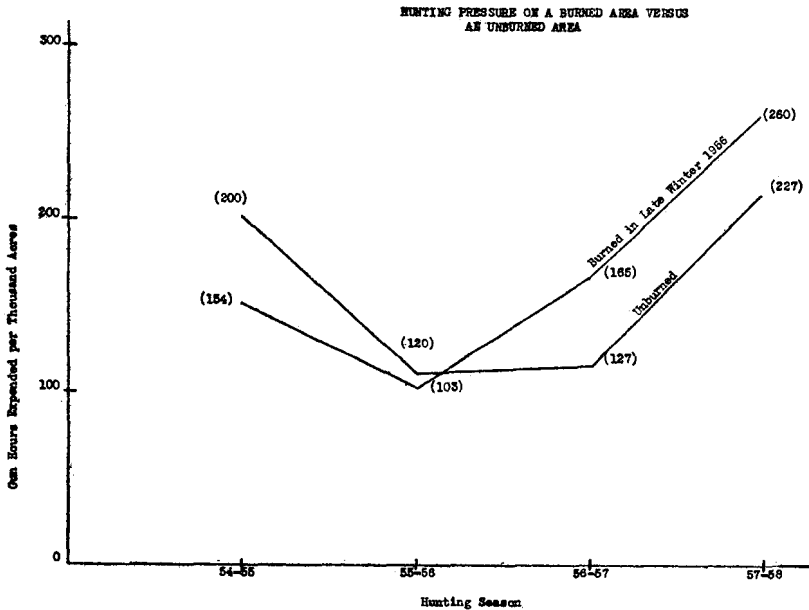
The first large scale burning on Fort Campbell was carried out in the winter of 1956. The first four-year cycle of burning will be completed in the winter of 1959. Quail kill data has been collected at Fort Campbell since the 1954-55 season, therefore we have several years' data to correlate with prescribed burning activities. The total hunting kill on Fort Campbell remained about 8,000 birds from 1954 to 1956, but nearly doubled in 1957 to 15,231 birds. Including cripples, non reported kill, etc., it is estimated that the total hunting mortality was 20,000 birds. This is a kill of 1 bird per 4 acres, and assuming hunting loss accounted for 50% of the population, indicates a possible fall population of 1 bird per 2 acres over the approximate 80,000 acres open to hunting. It is believed that this represents perhaps the highest bobwhite population and undoubtedly the highest kill ever attained over such a large area.

On the surface this impressive increase in total kill of birds during the past season would alone seem to indicate benefits from the prescribed burning practices. However, due to the fact that quail populations in the non-military region surrounding the post have also increased at a significant rate since 1954 and would nullify burning effects, a comparison must be made between burned and unburned areas on the post.

Referring to Graph No. 1 titled "Quail Harvest on a Burned Area Versus an Unburned Area", it is noted that the harvest in both of these areas was very similar until one area was burned in late winter 1957. One year later the harvest in the burned area increased by 108 birds while the harvest in the unburned area increased by 72 birds. It is doubtful if the prescribed burning one year prior could have caused an increase in population within such a short time, however, the burning did make the area burned more accessible and easier to hunt, therefore, a much better harvest was obtained.



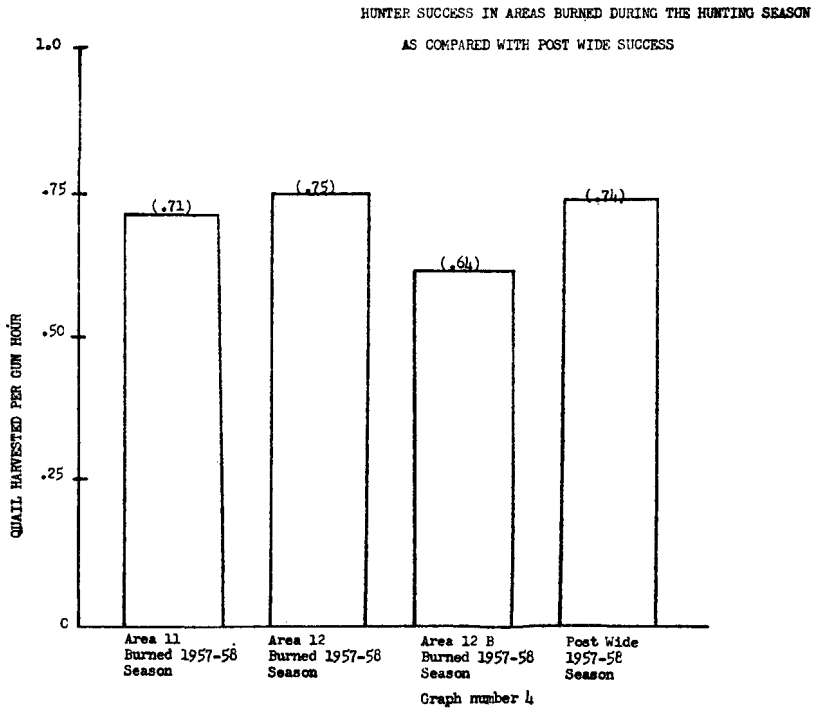
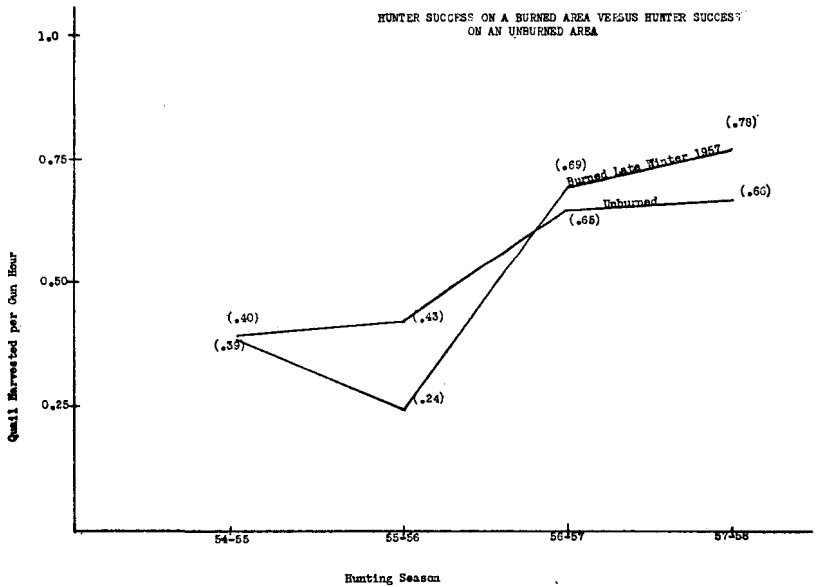
Referring to Graph No. 2 titled "Hunting Pressure on a Burned Area Versus an Unburned Area", it is apparent that the hunting pressure in both of these areas was very similar until one area was burned in late winter 1956. During the 1956-57 season the number of gun hours expended per thousand acres increased by a considerable amount in the burned area. The 1957-58 season also resulted in an increase on the burned area. The unburned area, however, showed a similar increase in number of gun hours expended in 1957-1958. It therefore appears that burning results in more hunting pressure being applied to areas burned the winter prior to the hunting season. Hunters apparently prefer these areas and expend more time in them.



Graph number 2

In referring to Graph No. 3 titled "Hunter Success on a Burned Area Versus Hunter Success on an Unburned Area", it is noted that success on both areas before burning was similar. One area was burned in late winter 1957. In the 1957-58 season the success in the burned area was .78 birds harvested per gun hour and the success in the unburned area was .66 birds per gun hour. The burned area showed an increase of .09 birds per hour one year after burning. The success on the unburned area only rose .01 birds per gun hour over the same period. Although the increase in success in the burned area over the unburned area appears small, it is important because of the fact that the number of gun hours expended in both areas during the 1957-58 season was twice the number expended during the 1956-57 season. Therefore it is apparent that success was much better in the burned area since it continued to rise despite a considerable increase in gun hours. The unburned area remained more or less stable and success did not rise appreciably with increased gun hours. It is therefore apparent that burning brought about conditions which resulted in better hunter success.

To determine the effect of burning during the hunting season on hunter success the success obtained on three areas burned during the season are compared with the post wide average in Graph No. 4. Areas 11, 12, and 12 B were burned just prior to or during the first part of the 1957-58 hunting



season. Success in these areas immediately following burning was .71 birds per gun hour, .75 birds per gun hour, and .64 birds per gun hour. The success on a post wide basis was 74 birds per gun hour. It is apparent that burning these areas prior to the hunting season did not materially affect hunter success although it is possible that success would have been higher had the areas remained unburned during the hunting season.

SUMMARY AND CONCLUSIONS

1. Prescribed burning is a practical and economical quail management tool. This technique is applicable with certain modifications to areas other than the southern coastal plain.

2. Number of quail harvested per thousand acres on a prescribed burned area was considerably higher than the harvest on a similar unburned area.

3. Hunting pressure increased considerably on a burned area one year after burning while it remained constant on a similar unburned area.

4. Hunter success increased on a burned area one year after burning despite the fact that hunter hours were doubled one year after burning. The success in a similar unburned area remained almost the same.

5. Three areas were burned just prior to and during the first part of the 1957-58 hunting season. The success in these areas remained high. It is therefore concluded that prescribed burning as described in this paper does not materially hamper quail hunters and that burning may be carried out during the hunting season without seriously affecting hunting success.

Food and cover conditions have been corrected to some extent by the use of prescribed burning. At this time it is not possible to make a definite statement as to what degree it has increased the quail population. It is possible to say that burning has increased hunter success. It can further be stated that this technique is maintaining food and cover conditions which are extremely favorable to quail on approximately 80,000 acres of land. Large acreages were burned in the winter of 1958 and large acreages will be burned in the winter of 1959. It is therefore apparent that the full impact of prescribed burning is yet to be felt.

Taking into consideration all available facts, it is believed that an annual quail harvest of 20,000 birds or more can be maintained at Fort Campbell if burning operations are continued. Approximately 80,000 acres are open for hunting at Fort Campbell, therefore a harvest of 20,000 quail would mean one quail harvested per every 4 acres.

The use of fire as a silvicultural and game management tool must be handled by the forester and the game biologist so as to insure maximum beneficial results instead of disastrous results.

ACKNOWLEDGMENT

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