



U. S. Forest Service Research Note SE - 86

February 1968

A RESUMÉ OF PRESCRIBED BURNINGS ON THE PIEDMONT NATIONAL WILDLIFE REFUGE

Abstract. --Information concerning the effects of prescribed burning on wildlife habitat in the Atlantic Piedmont is meager. Much information on this topic was in unpublished quarterly reports written by Piedmont Wildlife Refuge managers. This information has been summarized and presented chronologically.

INTRODUCTION AND HISTORY

The Piedmont National Wildlife Refuge, located in the southern Piedmont region of Georgia, occupies approximately 33,000 acres. As is typical of much of the Georgia Piedmont, streambanks and bottomlands are dominated by hardwoods while the drier hills and slopes are covered with loblolly and shortleaf pines (Brender and Davis 1959).

Pioneers settled the present holdings of the Refuge in the early 1800's. Within a short period they cleared approximately 90 percent of the original mixed pine-hardwood forest and planted cotton and corn. Poor farming methods resulted in severe erosion and decreasing fertility of the soil. This depletion, coupled with invasion by the disastrous cotton boll weevil (Anthonomus grandis Boheman), soon made farming an uneconomical operation. Accordingly, much of the land was abandoned, leaving vast areas to nature's mercy. Ecological succession was rapid and soon the land was again covered with stands of pine mixed with hardwood. Much of this second growth of timber was harvested from the Refuge holdings prior to 1930 when the area was purchased by the Federal Government under the "Resettlement Administration." The land was later turned over to the Bureau of Biological Survey, now known as the U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife; and on January 21, 1939, President Franklin D. Roosevelt issued an executive order officially establishing the Piedmont National Wildlife Refuge. The President established the Refuge to demonstrate that game populations could be restored on this and similar areas in the Piedmont by protection and proper management.

Wildlife habitat changes brought about by land clearing and farming, together with uncontrolled hunting, eliminated eastern wild turkey (Meleagris gallopavo) and white-tailed deer (Odocoileus virginianus) from the region the Refuge now serves. However, these changes in land use directly benefited several farm game species such as bobwhite quail (Colinus virginianus) and cotton-tailed rabbit (Sylvilagus floridanus).

Prior to the initiation in 1958 of a program for the development of waterfowl habitat, it was estimated that there were 8,540 use-days of the area per year by waterfowl. (A use-day is defined as the use in a 24-hour period by one individual.) By 1966 the number of use-days had increased to 411,000. The Refuge has now become an important production area for wood duck (Aix sponsa). After 27 years of management and protection, the white-tailed deer population is estimated at 1,300, of which 150 to 300 are harvested annually, resulting in approximately 19,200 man-days of recreation use per year. The wild turkey population is estimated at 450; and there are several thousand each of bobwhite quail, squirrels, rabbits, and doves using the Refuge.

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PRESCRIBED BURNING

The literature concerning fire and forest has been summarized by Williams (1938) and Cushwa (1968). Collectively, these works cite over 1,400 references. Neither contains many citations dealing with the problems of prescribed burning in the Piedmont of the Southeast, however. Barrett and Downs (1943) compared the abundance of several "climax species" of vegetation in pine stands of the Piedmont which had not burned for 10 years with their abundance in stands burned by wildfire during the past 10 years. Results obtained from the burned plots were inconsistent and were attributed to variations in fire history; these results, therefore, had limited value in calculating the effect of fire on Piedmont forests.

Studies concerning the effects of prescribed fire in the Piedmont on (a) seedbed preparation, (b) slash disposal, and (c) erosion have been underway for some time at the Hitchiti Experimental Forest near Macon, Georgia. Results from some of this work indicated that prescribed burning treatments did not significantly change the trend of ecological succession and that the silvical benefits in the form of reduced hardwood-shade cover extended through two growing seasons following treatment (Brender and Nelson 1954). Other researchers in the Experimental Forest, seeking to determine the usefulness of prescribed burning as a game-management tool, found more herbaceous vegetation suitable for game food on burned than on unburned plots (Cushwa et al. 1966). They also reported more legumes present on plots burned with strip headfires than on those burned with backfires.

The lack of published information concerning the use of prescribed burning in the Piedmont is evident. However, much information was found in unpublished quarterly reports written by Piedmont Wildlife Refuge managers. The following is a brief summary of this information from 1940 through 1966:

1940 Thirty plots, each 20 acres in size, were established on a variety of sites ranging from mature loblolly-shortleaf pine stands to open fields. The plots were burned at night during the months of February and March. On some plots fires were set along the entire perimeter and allowed to burn inward; on other plots fires were set with the wind or against it. High humidity at night increased fuel moisture and thereby limited the burning operation. Observations on the plots during the first growing season following burning indicated increases in legumes such as beggarweed (Desmodium spp.), lespedeza (Lespedeza spp.), and partridgepea (Cassia spp.). However, few legumes appeared on plots upon which broomsedge (Andropogon spp.) had predominated before the burning.

1941 A school was held to instruct Refuge personnel in prescribed burning techniques. A total of 135 acres was burned at night during February and March.

 In early May a wildfire occurred during an extremely dry period. The fire killed pine trees up to 8 inches d. b. h. and 30 feet tall. After the fire, excellent growth of leguminous plants occurred on the burned area. Plants included species of Desmodium, Cassia, Clitoria, and Galactia. None of the controlled burns had reached the intensity of this wildfire, and never before had foresters observed leguminous stands equal to those on this burned area.

1942 A total of 594 acres was burned during February and March, including a part of the area originally burned in 1941. Burning in the afternoon resulted in hotter fires than did night burns. Night burns were "spotty."

1944 From January to March, 4,523 acres were burned. The Refuge was visited by several scientists who concluded that the controlled burning program had been too cautious. They agreed that compartments should be set up so that burning could be done with the wind during the daylight hours. Wild strawberry (Fragaria spp.) increased after the burning.

- 1945 A total of 9,624 acres was burned during December, January, and February at a cost of less than 6 cents per acre. Refuge personnel found that burning with head and back fires during the daylight hours, while using barriers such as roads, trails, gullies, and streams as firebreaks, was the most economical method of burning. It was calculated that if this burning pace could be continued, the entire Refuge could be burned in 3 years.
- 1946 A total of 6,320 acres was burned during December, January, and February. On some burns, instead of making firebreaks, foresters allowed the fire to burn until it had covered the desired acreage and then extinguished it. This method worked fairly well; however, foresters had to make sure that they were prepared for unexpected changes in weather conditions. As of 1946, 27,000 acres of the Refuge had been burned at least once, while only 6,000 acres had never been burned.
- 1947 Because of unfavorable weather conditions during the period from December to March, only 2,210 acres were burned. During 1947, the Hester Fire Plow, which is employed in the construction of firelines, was used on the Refuge.
- 1948 Because of wet weather, only 540 acres were burned. All prescribed burning operations were stopped until winter of 1962. The reasons for this cessation were not stated.
- 1962 In an effort to create a more favorable wildlife habitat, particularly for wild turkey, the prescribed burning program on the Refuge was resumed. An area 780 acres in size was burned in a single fire during the winter to eliminate duff, brush, and dense, young pines. It was hoped that this elimination would make it possible for legumes and grasses to cover the forest floor. In most cases the fire did not remove the desired amount of duff, and no noticeable increase in soil movement resulted from the burn. Burning, however, did increase the number of sprouts available for deer browse. It was thought that other species of wildlife also benefited. The burning cost of 19 cents per acre was considered to be within the realm of economic feasibility; therefore, a definite prescribed burning program on the Refuge was reestablished.
- 1963 Burning began in December 1962 and continued through February 1963. A total of 4,300 acres was burned. The cost of this operation was 35 cents per acre, of which over 60 percent went to construction of firelines. Observers estimated that the 1962 burn eliminated enough ground cover to make the area more accessible to quail and turkey. Subsequently, the amount of herbaceous vegetation and deer browse in the form of sprouts increased in the burned areas, and many deer were observed feeding there.
- 1964 Burning dates were moved up to November in an attempt to increase the number of days having favorable weather for prescribed burning. Much vegetation was not "cured" by that time, however; and it was decided to postpone burning operations until the first week of December. Approximately 4,000 acres were burned at a cost of 19 cents per acre.
- 1965 A total of 4,025 acres was burned during January and February at a cost of 15 cents per acre.

The present management trend on the Piedmont Wildlife Refuge is to refine further all prescribed burning techniques and intensify efforts toward their application. Both the size and distribution patterns of burning sites will be modified to insure the proper balance between burned and unburned habitat. Areas reserved for hardwood *or* mast production will be excluded from prescribed burnings.

During the summer of 1965, the Southeastern Forest Experiment Station, U. S. Forest Service, was asked to instigate a study to determine the effect of prescribed burning on wildlife habitat. *One* hundred eighty-seven plots, each measuring one-tenth of an

acre, were located in nine different stands on the Refuge. Measurements of basal area, aspect, slope, and amount of herbaceous and woody vegetation were taken; and the site index determined for each plot. Three of the stands were burned during the winter of 1965-1966 and three during the summer of 1966. The remaining three areas, which served as control plots, were not burned. Seed and vegetative response to burning treatments was measured, as were soil movement and fire information such as rate of spread, amount of heat produced, litter reduction, etc. The Forest Service is in the process of analyzing these data and will continue to take such measurements as the study progresses.

SUMMARY

This report is limited in that at present we have little factual information concerning the effects of prescribed burning under Piedmont conditions. However, those observations which are available indicate the following:

1. Prescribed burning increases herbaceous vegetation as well as the amount of sprout growth available for deer browse.
2. The most economical method of prescribed burning is to burn over larger areas (300 to 500 acres) and to employ barriers such as roads, streams, etc. as firelines; however, as efforts toward application of burning techniques are further intensified, the cost of such burns is expected to increase.
3. Hotter fires are more effective in increasing game-bird food plants, mainly legumes, than are cooler fires.
4. Prescribed burning is an economical means of hardwood control and reduction of wildfire hazard.
5. Prescribed burning has not accelerated erosion noticeably.

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