

CONCLUSIONS

1. At present there is no way to detect small changes in state-wide quail populations. Therefore, the accuracy of a measurement technique or prediction cannot be determined.
2. Farmer questionnaires appear to give a fairly accurate estimate of quail production. Small marginal quail farms probably are best for this survey.
3. Juvenile kill per hour of hunting appears to be a better index of quail production than the adult-juvenile ratio.
4. Adult-juvenile ratios in bagged quail apparently vary from month to month.
5. Above-normal rainfall in April, May or June seemed to increase the number of quail broods hatched during the succeeding month.

RUFFED GROUSE MANAGEMENT IN NORTH CAROLINA

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INTRODUCTION

While range, numbers, and other factors will be touched on in this paper, the central theme is the harvest of existing populations. Past investigations have indicated that a relatively large grouse population and light hunting pressure do not require attempts to increase the number of birds by habitat improvement. While supplementary plantings and clearings have undoubtedly had a beneficial effect on the population, their greatest value is in concentrating the birds so that they are more available to the hunters.

HISTORY

Although little is recorded of the history of the ruffed grouse in North Carolina, they apparently occurred as far east as Person County in the middle Piedmont. Information received during a recent investigation stated that the last one was killed there in 1888. This is approximately 50 miles east of their present easternmost range. Grouse were undoubtedly present in many Piedmont counties but probably in very limited numbers. Lumbering and agriculture destroyed the Piedmont grouse habitat soon after the War Between the States. Intensive cultivation of the valleys and foothills of the mountains soon limited grouse to the higher mountains. Clearing and lumbering operations in the mountains improved the extensive forests as grouse habitat, and old time hunters speak of flushing 100 to 150 grouse a day.

PRESENT STATUS

The "mountain pheasant" as grouse are called in the southern Appalachians, is present today in one-fourth of the counties of the state. It is common to abundant in many of these counties. The grouse population in the better habitat in North Carolina compares favorably with populations found in central Pennsylvania. Table I gives a comparison of populations of the Barrens Study Area near Pennsylvania State College and the Flat Top Area in western North Carolina. The King Census Method was used on both areas.

FOOD AND COVER

In North Carolina there are two forest cover types where grouse are most numerous. The commonest is a cove type of black and yellow birch, beech, maple, tulip poplar, and hemlock making up most of the overstory. Rhododendron and mountain laurel are the principal understory plants. The other type is found at elevations of 4,000' to 6,500'. It contains black and yellow birch, beech, fire cherry, spruce, and balsam and the understory is blackberry and rhododendron. They are found in many other forest formations and associations but the above mentioned types constitute the best range.

North Carolina is geographically on the extreme southern edge of the range of the ruffed grouse. The large population is undoubtedly due to the elevations

TABLE I

Year	Season	Acres Per Bird Pennsylvania	Acres Per Bird North Carolina
1952	Fall	11.3	18.9
1953	Spring	22.0	24.9
	Fall	19.0	21.6
1954	Spring	31.0	26.0
	Fall	33.0	27.3
1955	Spring	22.8	25.7
	Fall	8.3	24.0
1956	Spring	28.1	..
	Fall	16.1	23.8
AVERAGES		21.3	24.0

of 2,000' to 6,500' where plant associations are very similar to those found in the northern states.

No food study has been made in North Carolina. From personal observations, however, it is doubtful that food is a problem at any season. Winters are severe and yet grouse prosper at higher elevations. Of over 100 January-killed grouse observed by the writer in the past eight years, approximately one-half had fed heavily on birch buds and/or mountain laurel leaves. Laurel and birch are common over all the grouse range. They apparently weather out many snows by simply staying in one spot without feeding for two and three days. Grouse concentrate in the fall in grape or red haw (*Crataegus* spp.) thickets and feed on the fruits. They utilize nearly all native fruits and feed on acorns, particularly scraps which squirrels have cut. Although they prefer these foods, they seem to do just as well without them and can exist solely on leaves and buds. It is interesting to note that a cat or dog which eats the viscera of a grouse that has fed on laurel leaves will sicken and often die.

INCREASING HUNTING PRESSURE

Several years ago it became apparent that grouse hunting was not being fully utilized by the sporting public.

It appeared that some of the reasons were (1) an absence of knowledge of the numbers of grouse, (2) ignorance of where and how to hunt, (3) that much grouse range is in very steep, brushy terrain and (4) a decline in the number of bird dogs.

It was felt that increasing this type of hunting would be beneficial, as it would (1) provide top sport for a large number of people, (2) it would probably have a favorable effect on the economy of tourist-minded mountain towns during the off-season, and (3) it would take pressure off the bobwhite.

A general publicity campaign playing up the large numbers of grouse and the availability of unposted lands was launched. Very few landowners object to grouse hunting and hundreds of thousands of acres of publicly owned lands are open. Magazine articles, pamphlets, and television programs were used to bring these facts to the attention of hunters all over the state. Hunting methods and locations were emphasized.

The open season was increased to three and one-half months and the bag limit raised to three birds per day.

All the Cooperative Wildlife Management Areas were opened for grouse hunting with lengthy seasons.

In order to encourage the older and less physically fit hunters, trails and shooting lanes were graded through the thickets. Jeep roads were constructed into inaccessible areas.

RESULTS

The grouse kill on the wildlife management areas is shown in Table II.

The large increase in 1953 on the wildlife management areas followed the clearing of over 200 acres of shooting lanes in the late winter of 1952 on several of the wildlife management areas. These were concentrated in the better grouse range.

TABLE II

<i>Year</i>	<i>Managed Area Kill</i>
1950	99
1951	96
1952	85
1953	241
1954	277
1955	214
1956	269
TOTAL	1,281

Many old logging roads were planted in ladino clover and regular use of these plantings has boosted the kill. Red haw and Japanese crabapple are being used along field borders to attract birds.

SHOOTING LANES

The most effective practice has been the creation of 365 acres of shooting lanes on the better grouse hunting areas in the past four years. These elongated clearings furnish a maximum of forest edge and provide insects and berries for young grouse. Their greatest value, though is the hunting they provide. Hunters are able to penetrate and hunt thickets that were almost impossible to hunt before. They also provide access into new areas that have not been hunted.

The lanes are cleared with hand labor. All rhododendron, laurel, and understory trees and shrubs are cut and piled on the sides. Mountain laurel stumps are painted with ammate. Rhododendron stumps are not treated, as deer usually will keep these sprouts browsed back. Trees are thinned heavily. Only the best specimens of the better timber species are left. Trees which produce favored grouse foods are left. The width is usually between 20 and 40 feet. Where grouse are the principal species concerned (some are cut for deer hunter access) 30 to 40 foot widths are preferable. While several factors enter into the choice of widths, better results are obtained where several hours of sunlight reach the forest floor.

The cost varies considerably, depending on the density of the forest. In normal second growth timber with a dense stand of rhododendron or laurel costs range from \$35.00 to \$50.00 per acre. Usually four to five man-days per acre are needed. This includes brush cutting, piling, poisoning, and travel time to the cutting area. On the higher mountains where fire cherry, yellow and black birch, and blackberry are the principal species to be cut, the cost is considerably less. Quite often only two to three man-days per acre are required. Large trees are cut with power saws; brush hooks and axes are used on smaller trees and shrubs; and short, weed-type scythes are used for briar thickets. A crew of five men and a foreman is normally used. To date, approximately 85 miles of these lanes have been cut.

Abandoned skid and logging roads are cleared in the same way. Where practical, they are seeded with grass and clover. Grouse have been observed feeding on ladino clover regularly along seeded roads and field borders.

MANAGED HUNT STATISTICS

What is good grouse hunting? Information gathered at checking stations has shown that the average hunt lasted about four and one-half hours, with an average of one flush per hour. One bird per hour apparently keeps interest high enough to sustain regular hunting. These factors vary considerably. Interviews with some of the better hunters have shown that they expect to flush a bird each 30 minutes. If it falls much below this, they are inclined to hunt another location. On the other hand, some of the amateurs without dogs are content to jump two or three birds per hunt.

Some of the kill figures are interesting. On the Pennsylvania Barrens Area in 1942, it took 8.7 hours to kill one grouse. On the Sherwood Area which produces some of the best grouse hunting in North Carolina, it took 11 hours to bag each bird.

While no records were kept, observations made at the managed hunt checking stations indicate that the most successful hunters used good, pointing-type bird dogs.

SUMMARY

Observations showed that there existed in western North Carolina a population of ruffed grouse comparable to that of good grouse range in central Pennsylvania. It showed further that these birds were underhunted and that an increase in hunting pressure was desirable. Reasons for light hunting were lack of knowledge of population, where and how to hunt, rough terrain, and a shortage of bird dogs. Remedies for these problems included publicizing grouse hunting through publications and television, increasing bag limits and season length, and cutting graded shooting lanes and trails in good grouse range. Plantings of clover and food-bearing trees were made to improve habitat and to concentrate birds. All wildlife management areas were opened to grouse hunting. The shooting lanes are considered to be the most important step taken. A heavy lane-cutting program was undertaken in the early spring of 1953 on the wildlife management areas. The grouse kill on these areas increased from 85 in 1952 to 241 in 1953. Until this program was instigated, the annual grouse kill on the management areas was always under 100 birds. Since then, it has been consistently above 200 birds.

It is felt that many sections of the Southern Appalachians contain a shootable surplus of grouse and that proper management can increase this sport in areas where it is neglected.

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EFFECTS OF CERTAIN PRESCRIBED FIRE TREATMENTS ON THE DISTRIBUTION OF SOME HERBACEOUS QUAIL FOOD PLANTS IN LOBLOLLY-SHORTLEAF PINE COMMUNITIES OF THE ALABAMA UPPER COASTAL PLAIN *

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In ecological succession, plant communities are never completely stable. They are undergoing constant change which tends finally to result in the climax association for the climate and soil conditions of the area. There are many factors that may alter the rate of change or even cause the community to revert to an earlier stage of ecological development, from which the community again tends to follow changes leading to the climax.

One of the most important problems confronting the wildlife manager is the control of plant succession. Numbers and species of wildlife on an area are largely determined by the type and distribution of the vegetation found on that area. Clearing, plowing, and planting may be practical on small areas but are too expensive, or even impossible, for the management of large areas. A practical and economical method of plant successional control is needed.

Apparently, fire was a factor in plant succession long before the appearance of man on this earth. According to Shantz (1947), a third of the natural

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