

# THE EFFECTS OF SEASON CHANGES ON HUNTING EFFORT AND GAME KILL

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Possibly the first tool to be used in managing game was the restriction of hunting (Leopold 1933). Although other management tools also are necessary under most conditions, it is likely that hunting restrictions are here to stay. Restrictions appear in many forms, including daily bag limits, possession limits, closed areas, restricted hunting hours, baiting regulations, limits on firearms and other instruments of taking and closed seasons. The effects of changes in the length of open seasons are the primary concern of this paper.

In the United States, closed seasons began in 1646, in Rhode Island, and pertained to deer (Gabrielson 1951), later spreading to other colonies and other types of game. New York had established a closed season on quail as early as 1708 (Palmer 1912). It seems significant that few studies have been made to measure the effectiveness of such an old and well established practice. Many states have shortened their open seasons during periods of game scarcity and lengthened the open seasons during periods of game abundance, assuming that total kill is more or less directly proportional to the length of the open season. Apparently there have been few attempts to measure the effects of such season changes on the hunting effort or the kill of game, possibly because of the necessity and difficulty of extending the correlation to include game population levels over the same period. Most states have a more accurate system of measuring kill than of estimating pre-hunting season game populations in terms of definite numbers. Although the kill during a given season certainly is related to the game population level, it also is heavily influenced by other factors such as weather conditions, and is not by itself a reliable index to the size of pre-hunting season populations.

It is the belief of the author that the management potentialities and limitations of season manipulation have not been adequately measured and studied. An attempt at such a measurement has been made in Kentucky since 1950.

## METHODS AND MATERIALS

No standardized records of the annual harvest of game in Kentucky were kept prior to 1949. In that year, a kill survey was initiated on a simplified basis, and since 1950 the same procedure has been used each year. Under the Kentucky plan each conservation officer is issued a supply of kill report forms immediately after the end of the hunting season. He is then required to have the first 50 hunters or hunting license holders whom he contacts at random during his regular duties, fill out a report of the total of each game species killed during the season and the number of times each species was hunted, even if none was killed. Non-licensed farmers who hunted are included in the survey as well as licensed sportsmen who did no hunting. It is readily admitted that the result is not a statistically true random sample. We believe, however, that since the same procedure is followed

the error should be quite constant from year to year. The accuracy of the daily kill averages thus obtained is attested by bag checks in the field and highway road blocks, with particularly high correlation on rabbits and ducks, the two species on which our field checks are most extensive.

Our annual game kill survey was based on 5,216 reports for 1950; 5,761 for 1951; 5,626 for 1952 and 6,582 reports for 1953. Thus, by personal contact we have sampled between two and three percent of the licensed hunters each year. From the tabulated results of the reports, the percentage of sportsmen who hunted each species, the average number of times each species was hunted and the average season kill of each species is calculated. The average daily kill also is computed but this is not affected materially by the length of the season.

The calculation of pre-hunting season game populations is less exact and deals only with trends. Each year a survey of opinion is conducted among all field employees, with special emphasis being placed on personal brood observations, highway mortality records and observations by farmers and sportsmen during the reproductive season. The results are tabulated and correlated further with data from the game biologists who have conducted roadside counts, drumming or call counts and controlled sight records on specific sample areas. This gives a very general but apparently a fairly accurate impression of statewide population trends, judging from results of the kill survey after allowing for the effects of weather during the hunting season.

During the past four years, without changing bag limits, Kentucky has made minor extensions in the quail and rabbit seasons, a major extension in the grouse season and a minor contraction in the squirrel season. The purpose of this paper is to show the effects (if any) of these changes on hunting effort and game kill.

## RESULTS

### Squirrels

According to the annual kill survey, squirrels and rabbits are the most popular game species in Kentucky, with leadership varying from year to year according to population levels and other hunting conditions. Data from the last four squirrel seasons are presented in Table 1.

Table 1. Squirrel hunting data, 1950 - 1953.

	1950	1951	1952	1953
	Aug. 20 - Nov. 5	Aug. 20 - Nov. 5	Aug. 25 - Oct. 29	Aug. 25 - Oct. 2 Oct. 27 - Nov. 5 Nov. 20 - Dec. 15
Length in days	78	78	66	75
Percent of hunters	75	70	74	75
Avg. times hunted	7.1	7.1	7.4	7.2
Avg. season kill	16.4	14.1	16.2	15.5

During 1951, a poor breeding season was experienced, with few spring litters produced and a number of late fall litters (Bertram 1952). Sportsmen reported killing many suckling females and very small squirrels that year and as a result the Commission set the 1952 season five days later. The severe drought that fall led to numerous forest fires and the 1952 season was closed on October 29 instead of November 5. In 1953, the season originally was set from August 25 - November 5. Another seige of forest fires resulted in a season of three segments on the dates indicated.

The squirrel population has remained quite stable in Central Kentucky since 1950. The statewide population apparently has not fluctuated greatly, since a poor season in one end of the state usually is balanced by a good season in the other extreme. The lowest population was in 1951 and the only year during the period studied when squirrels have been plentiful in all sections of the state was 1952. The average season kill in 1952 undoubtedly would have been much greater had not dry weather made hunting difficult. Eastern Kentucky also had a very high population in 1953, but another very dry hunting season.

In the table hunting effort is measured in two ways, viz., the percent of the total hunters who hunted squirrels and the average number of times hunting during the season. It is interesting to note that both of these indices of hunting effort rose in 1952 in response to the increase in squirrels, in spite of the shortened season. In 1953, squirrel hunters again reached a 75 percent high and the average hunter hunted slightly more than during the longer 1950 and 1951 seasons. Actually, the 1953 season was closer to 49 days than 75 days since there was very little squirrel hunting after the opening of rabbit and quail season on November 20. It seems clear that hunting effort on squirrels has been affected more by squirrel population levels than by the lengths of recent seasons.

If the extremely dry weather of 1952 and 1953 is taken into consideration, season kill averages demonstrate the same principle. Even without any allowance for weather, the average season kills for 1952 and 1953 both exceeded that of 1951 when the season was longer but squirrels were fewer. This is evidence that the kill of squirrels is not so much dependent upon season length as on population levels and hunting conditions.

In summary, the data at hand show that a reduction in the length of the squirrel season from 78 days in 1951 to 66 days in 1952 and 75 days in 1953 did not effect a decrease in either hunting effort or total kill. The greatest changes in both percentage of participation and average season kill occurred between 1950 and 1951 while the seasons remained the same.

## Rabbit

The cottontail rabbit always is the first or second most hunted game animal in Kentucky. Its distribution is statewide, although most of the mountain counties and some western counties normally have rather low populations. Data from the rabbit hunting season since 1950 are summarized in Table 2.

The rabbit population in Kentucky has increased steadily during recent years (Bruna 1952), reaching an apparent peak in 1952. The 1953 trend reversal was more in the nature of a leveling off than a true slump, however, and the statewide population remained high. When the 1952 season was set, it was extended by eight days to the maximum 60 days authorized by law.

Table 2. Rabbit hunting data, 1950 - 1953.

	1950	1951	1952	1953
	Nov. 20 - Jan. 10	Nov. 20 - Jan. 10	Nov. 20 - Jan. 18	Nov. 20 - Jan. 18
Length in days	52	52	60	60
Percent of hunters	71	70	75	77
Avg. times hunted	5.3	5.3	5.6	5.9
Avg. season killed	12.0	12.6	13.3	12.9

It will be noted that the percentage of rabbit hunters has increased generally since 1950, except for a slight, unexplained drop in 1951. The average number of times hunted also increased in 1952 and 1953, after remaining the same in 1950 and 1951. Rabbit hunting effort certainly rose in 1952 and 1953, whether because of the longer season or the rising rabbit population. Since the season extension undoubtedly helped publicize the high population existing in 1952, it is somewhat difficult to separate and evaluate the combined results. Remembering the response of the hunters to changes in squirrel population levels, the effect of the eight-day extension on rabbit hunting effort probably is minor.

The average kill of rabbits rose steadily until 1952 and dropped slightly in 1953. Thus the kill trend very closely follows the trend of the rabbit population, differing from the trend of hunting effort in 1953.

To summarize, the extension in the length of the rabbit season in 1952 was followed by an increase in the percentage of rabbit hunters and the average number of times hunted both in 1952 and 1953. The increased average season kill in 1952 was followed by a lesser decrease in 1953, conforming with the statewide population trend. While the season extension may have helped increase hunting effort, the increasing rabbit population probably was a more important factor, especially since hunting effort continued to increase the second year after the extension. This is attributed to the very successful 1952 season, which received widespread publicity.

### Quail

The bobwhite quail is easily the most popular game bird in Kentucky. The bobwhite is found in every county, with its abundance depending largely on the land use. Quail hunting data are presented in Table 3.

Table 3. Quail hunting data, 1950 - 1953.

	1950	1951	1952	1953
	Nov. 20 - Jan. 10	Nov. 20 - Jan. 10	Nov. 20 - Jan. 18	Nov. 20 - Jan. 18
Length in days	52	52	60	60
Percent of hunters	57	51	51	51
Avg. times hunted	6.3	6.5	6.9	6.6
Avg. season kill	18.1	17.3	18.6	16.7

Over the past four years, the bobwhite population was highest in 1950 and lowest in 1953. The population rose slightly in 1952 over that of 1951 and the season was extended by eight days to conform with the rabbit season.

The percentage of quail hunters has been constant since 1951, the season extension having no apparent effect on hunter participation. The average number of times hunted increased in 1952 and then dropped back in 1953, in response to the population trend. The number of times hunted in 1950 undoubtedly would have been greater than for any of the other three years except for the severe winter weather which kept bird hunters out of the field during much of late November, December, and January.

The average season kill also reflects the trend of the bobwhite population rather than the length of the season. Season kill, like times hunted, was reduced by severe weather in 1950, and therefore is not fully proportional to the population level of that year.

In substance, the data show poor correlation between season length and hunting effort or kill. On the contrary, hunting effort and season kill both are closely related to population levels and other hunting conditions, especially weather.

#### Ruffed Grouse

For several years the Division of Game has been attempting to stimulate more interest in grouse hunting, believing that this bird is probably the only underhunted game species in the state. Except for three experimental areas, grouse are confined to the mountainous eastern third of Kentucky, where bobwhite habitat is limited and rabbit population are relatively low. Grouse hunting data for recent years appear in Table 4.

Table 4. Grouse hunting data, 1950 - 1953.

	1950	1951	1952	1953
	Nov. 20 - Dec. 15	Nov. 20 - Dec. 15	Nov. 20 - Jan. 18	Nov. 20 - Jan. 18
Length in days	26	26	60	60
Percent of hunters	2	2	3	3
Avg. times hunted	2.4	3.0	3.6	3.3
Avg. season kill	1.4	1.3	1.8	1.8

There has been no significant change in the statewide grouse population since 1950, although the populations of specific areas have varied somewhat from year to year (Hardy 1952). In 1950, the season was extended by 10 days over that of the previous year and in 1952 the length of the season was more than doubled, primarily to engender more interest in grouse hunting and to give the sportsmen a better chance to reduce the surplus that was not being harvested.

In 1952, the percentage of grouse hunters increased to three percent from the two percent of 1950 and 1951. The increase was retained in 1953. Although still a small portion of the total hunters, this is a 50 percent increase in grouse hunters. The average number of hunts per grouse hunter also was greater in 1952 and 1953 than in 1950 or 1951. It should be mentioned here that the severe weather

undoubtedly was responsible for keeping the average number of hunts low in 1950. It would appear that grouse hunting effort increased slightly in 1952 and 1953 as a result of the season extension.

The average season kill of grouse also was greater in both 1952 and 1953 than in either of the two previous years, although again it should be noted that the season kill in 1950 might well have been greater except for a very heavy snowfall in late November. The lengthened season may or may not have effected the increased average season kill.

In the absence of contrary data it must be conceded that extending the open season on grouse from 26 to 60 days apparently has increased both hunting effort and the total kill to a slight extent. Considering the magnitude of the season changes, however, the effects have not been spectacular. This is not surprising when it is considered that we are dealing with a bird of limited distribution and wary habits, which makes a most difficult target and inhabits the most rugged terrain in the state. In addition, the grouse population was at a very low ebb in fairly recent times. The grouse hunter actually is in a class by himself, and few who live outside the occupied range will travel any considerable distance to participate in such a difficult and laborious sport. This is especially true when the grouse season runs concurrently with the rabbit, quail and waterfowl seasons. A sudden, tremendous increase in grouse hunting is not to be expected, but interest in the sport gradually is growing and seems likely to continue.

## SUMMARY

It has been shown that a contraction of 12 days in the squirrel season did not result in less participation, fewer hunts during the season or a smaller average season kill. On the contrary, both hunting effort and season kill were closely related to squirrel population levels, although modified by weather during the hunting season.

Similarly, increases of eight days in the length of the rabbit and quail seasons have not affected either hunting effort or season kill beyond the extent of differences which probably would have occurred within the season changes. Again, population trends seem the most important factor, always subject to variations in hunting conditions imposed by the weather.

The percentage of participating hunters, the average number of hunts and the average season kill all rose coincidentally with a 34-day extension of the grouse season. It is the belief of the author that the extension of the season was primarily responsible for the effects mentioned. The effects were not spectacular, however, considering that the length of the season was more than doubled. This is attributed to the limited grouse range and the intrinsic difficulties of grouse hunting.

Throughout the period studied the bag limits of all species under discussion have remained constant, thus the lengths of the hunting seasons have been the only important changes in legal restrictions. Opening dates have remained constant except for the squirrel season, which opened five days later in 1952 and 1953.

## CONCLUSIONS

Several conclusions have been reached which deserve thoughtful consideration by game commissions responsible for setting seasons and by biologists or game managers charged with making recommendations for season regulations:

1. A contraction of less than two weeks in a season of more than two months duration will not, per se, effect a reduction in either hunting pressure or total kill.

2. An extension of less than 10 days in a season of two month's duration will not, per se, effect an increase in hunting pressure or total kill.

3. An extension of more than one month in a season of less than one month duration is capable of increasing hunting pressure and total kill to some extent. The practice is worth while when applied to game species considered under-hunted.

4. Hunting pressure is determined largely by game population levels rather than by season lengths. Hunters react spontaneously to changes of game abundance as well as to other hunting conditions, especially weather.

5. Total kill of a game species is affected more by the population level and weather conditions than by the length of the season, within very broad limits.

6. In view of the negligible effects, minor increases or decreases in the lengths of upland game hunting seasons are not justified from a biological standpoint. On the other hand, extending a season is positive psychology while reducing a season is negative psychology. The ability of a low breeding population, under proper environmental conditions, to produce a good crop of game the following season (Errington and Hamerstrom 1936) is further argument against frequent, minor changes in seasons.

7. Assuming that a season has been established which does not hamper reproduction, the wisdom of any contraction except under conditions of a major population reduction is dubious, since a radical reduction of the season would be necessary to affect, per se, hunting pressure or total kill. In the case of a major population reduction hunting pressure and total kill would drop automatically, with or without a change in the season length.

8. Once a set of reasonable season regulations has been established, changes should be made infrequently and only when indicated necessary by substantial data. Seasons that are as constant as practicable are an aid to the hunting public and to the conservation officers responsible for their enforcement.

9. The elaborate and expensive methods used by some states to measure the annual kill of game are difficult to justify on the basis of setting subsequent upland game seasons, in view of the lack of effects achieved by season changes of the usual magnitude.

10. The conclusions of this study apply specifically to upland game in Kentucky, but the same principles probably hold true for migratory birds as well as upland game in the Southeast and elsewhere.

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