

Sharp: No.

Shorten: Once.

Clark: I had a squirrel attack and bite me when a young squirrel from a nest box was being handled by me.

Uhlig: A squirrel ran over me on a similar occasion and bit me twice on a finger.

Bakken: I have noticed a restlessness of squirrel in March and April. Females being found 200 yards or more outside of their range. Could this be due to food availability?

Shorten: I have found this and believe it is partly due to young becoming independent; but both young and adults move about, especially in June.

Bakken: I have some evidence to show that a squirrel has her first litter in a den and that the female frequently moves this litter to a leaf nest shortly after the eyes open.

Uhlig: I feel the leaf nest counts can be used to determine densities but this is open to much controversy.

Moore: My observations have been mostly on fox squirrels building nests in long leaf pines and I found that many of the oak leaf nests in the wild were made by immature squirrels and were badly made.

Lwellyn: Could it be that adults have already appropriated the dens and have their own nests?

Moore: In my study I don't think this occurred. There were plenty of dens available.

Uhlig: I don't believe that anyone has shown an inverse of leaf nest relationship to dens, except perhaps in England.

Shorten: Certainly in England.

Clark: I believe that high temperature and fleas play a part in the use of dens.

Uhlig: What about nests built in October? They are not related to temperature.

Sharp: Leaf nests are a good index to the squirrel population. Squirrel may move into a good food area and construct nests.

Uhlig: It's rough but a good index for management.

Moore: I had 6 to 8 nests per squirrel for fox squirrels in Florida so I am skeptical of their value as a fox squirrel density index.

Sharp: In ridge and valley sections of Pennsylvania, squirrels are relatively sedentary but in birch, beech maple area they move much.

SQUIRREL MANAGEMENT AND RESEARCH

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When Dr. Flyger requested me to participate in this symposium he practically provided me with an outline. The subjects he suggested that I cover included:

1. How well can we manage squirrels?
2. How is it done?
3. What needs to be known in order to better manage this species?

It is obvious that were I or anyone else able to provide adequate answers to these questions, there would be little need, except for academic interest, for continuing this symposium. However, let us put some facts and ideas together and see how we come out.

The first two points are too closely tied together to separate them. Following Leopold's definition that "game management is the art of producing sustained

crops of game for recreational use," I feel we now have sufficient knowledge to manage squirrels within reasonable limits. My "reasonable limits" are simply to provide the public with a huntable population without trying to control annual fluctuations or the so-called periodic cycles.

In fact, we can probably maintain the present status of squirrel hunting without doing anything except continuing our present regulations and recommending the usual management procedures. However, I believe we are here today as biologists to improve these procedures and increase, if possible, this one natural resource.

I do not believe we can accomplish this through the annual manipulation of regulations. If anyone doubts the small effect that regulations have on squirrel populations he should consult the works of Durward Allen (1943) on fox squirrels in Michigan; John M. Allen (1952) on fox and gray squirrels in Indiana; or Uhlig's (1955) work in West Virginia. Given reasonable protection squirrels are well able to hold their own. Daily and seasonal bag limits appear to be of little importance. Daily bag limits are self-regulatory, and seasonal limits are unenforceable. Hunter psychology, however, may be of prime importance. It appears that hunters who kill four squirrels when the bag limit is five, will go home much happier than the hunter that kills the same number when the bag limit is six. Hunters are no different than fishermen. In fact, they are often the same people. They are content if they can brag about reaching the seasonal bag limit, or even slightly exceeding it. Season length, as long as it doesn't interfere with the major part of the breeding season, is also of little importance since studies show that two-thirds to three-fourths of the squirrel take occurs during the first week. Actually there is only one regulation that I believe bears looking into and that is the opening date. It will be discussed later.

Regulations are one side of the picture, habitat maintenance or improvement the other. While we have some information as to basic food and cover requirements, detailed information along these lines is woefully short. Colin (1957) determined that in the lowland hardwoods of Alabama high populations were where there were four or five den trees per acre, and a fair population was present on another area when there were ten mast trees per acre. Specific information of this type is lacking.

Despite this lack, should a squirrel project start in a state that has not had one, it is more likely that the project would start out with research concerning bag limits, season lengths, life history, or in general, follow the pattern already set by others that have met with eye-catching success. While this "follow the leader" type of research may result in improved techniques applicable to the local situation, it more often ends in repetitious and reconfirming data, adding nothing in the way of new data or concepts. Research time is too valuable for reapplication of techniques. May I repeat, we have now sufficient knowledge to manage squirrels within reasonable limits, provided we are willing to search the literature, apply what we know, and then possibly set up research projects to determine the outcome in terms of population manipulation.

What needs to be known in order to better manage the species? While it is obvious that a general knowledge of the life history and habits of the squirrel are essential for proper management, it is also obvious when the literature is reviewed there are some shortcomings. With this third question, I am firmly put on the spot. Undoubtedly all of you have ideas as to what additional information you would like to have regarding the squirrel. Perhaps we could even make a list and assign problems to each of you present. I am sure that such a list would be a lengthy one, reaching from the presence of protozoan parasites in squirrels to more detailed woodland management measures that we might recommend. However, in order to keep such research along management lines, I believe we might subject each of these proposals to the following questions:

1. Does the problem concern an important limiting factor in squirrel management or hunter recreation?
2. Would any solution be of such an economic or practical nature that it would be widely adopted by interested parties?

Undoubtedly there are many interesting problems that would be eliminated by these two questions, but remember we are speaking now of managing squirrels, not in research that is strictly of academic interest. Rationalize all you want, a line can be drawn.

One factor that I feel needs to be known deals with regulations. I, for one, had previously concluded that the opening hunting season date was of utmost importance in managing squirrels. Because of the second litter squirrels, I had concluded that the season should open late, October 15th, when the maximum population was available. However, such states as Ohio, Kentucky, Missouri, and parts of Virginia with early seasons continue to have satisfactory harvests. Possibly their harvest may have been better had the seasons been delayed, or possibly wastage due to warble infestation, killing of lactating females, may have been less. On the other hand, studies have shown that in general, squirrels are underharvested. I, therefore, raise the question, is an early season actually harmful, is it poor management, or does it provide the hunter with additional recreation without, in the long run, harming the population?

There is a question regarding den boxes as a special management measure. While it is my belief that this is a good management tool, we have yet to determine their true effect on a population. Possibly North Carolina has the answer already.

I believe we need a great deal of information concerning squirrels' habitat, maintenance, or improvement in different forest types, in extensive forests and in small woodlots. Cooperative projects between the U. S. Forest Service and State game agencies could lead to cutting practices that would result in thousands of acres of better squirrel habitat. A girdled den tree might be of equal value to squirrels as a live tree and be more acceptable to foresters. How many mast producing trees do we need in different forest types, and of what size to maintain a squirrel population and still be consistent with good forest management?

Possibly research could point out management measures in small farm woodlots that would benefit squirrels. Whatever they are, they must be practical and economical, otherwise their acceptance would be doubtful. If they bring about a profitable return to the landowners, so much the better. There are thousands of acres of small woodlots throughout the country that will never be managed for timber production. How can such areas be managed for wildlife or for quirels in particular? The usual management measures such as the prevention of fires and over-grazing, leaving three or four den trees per acre or ten mast trees per acre may be all we have to offer.

Essentially, what I am saying is that squirrel research that will eventually lead toward practical management must be practical in itself. We need a good and practical censusing technique to aid us in the many phases of research concerning management. Other than this I would limit research by state game departments, for the most part, to squirrel food and cover requirements or management. For when these factors are met, all other factors, such as the effect of hunting, predators, and weather will fall in their proper places. When practical and economical management measures are developed agencies concerned with land management will be even more willing to use them as recommendations to the people that own the land.

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