

TERRITORY AND POPULATION IN THE GREAT HORNED OWL¹

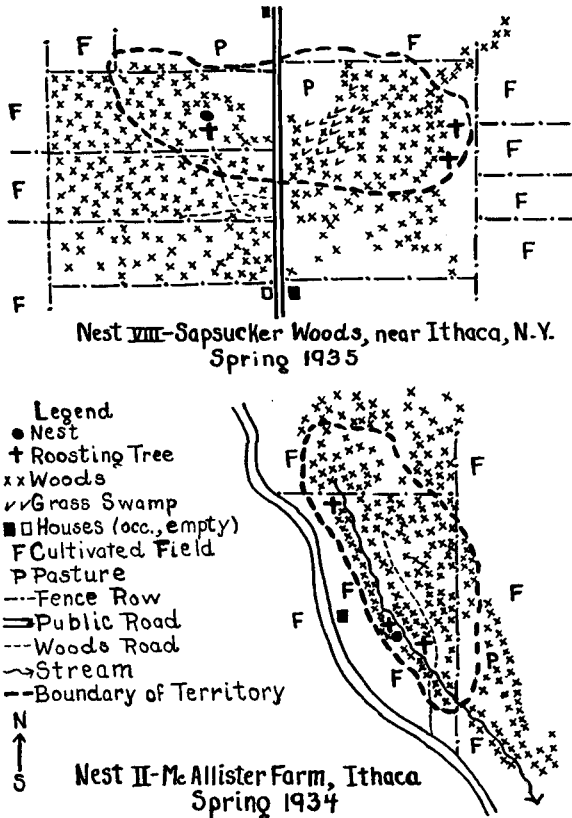
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THE distribution of most raptorial birds during the nesting season indicates that they set up relatively large territories from the limits of which all other individuals of their kind are vigorously excluded. In few species is this habit more conspicuous than in the Great Horned Owls, *Bubo virginianus*. Field studies at Lawrence, Kansas, during 1932 and the spring of 1933, and at Ithaca, New York, from the fall of 1933 to the spring of 1936 strongly suggest that this intolerance to overcrowding is an important factor in determining the density of population. All the evidence available indicates that the Great Horned Owl holds a definite territory throughout the nesting season and that in many cases the male takes up his station in this area in the late fall or winter before the period of courtship and mating begins. Certain individuals appear to roost regularly in the same place throughout the year, but since they are not always found in their usual 'hideouts' it is questionable if the territorial instinct is operative during a period of several months following the nesting season. In addition to patrolling the nest territory against all invaders the owls apparently restrict their hunting to this same area. Occasionally a bird may go on a longer foraging trip, but at nests where unhoused poultry is not available within a half mile or so such raids are rarely or never undertaken.

A number of field observers have noted the fact that Horned Owls have definite limits to their range. Ridgway (1874) states that these owls rarely go more than a mile from their nests and then only for food. Bendire (1892) quotes Denis Gale as follows: "Each pair of these birds has their particular range and no amount of harassing or robbing them of their eggs two or three times a year will induce them to leave a locality once chosen. The food supply, of course, is the chief consideration influencing their choice. In some cases half a mile of creek bottom defines the limit of their preserve or hunting ground, and occasionally it is larger A choice of location once made is never abandoned unless civilization blots out the cover or kills the birds." Miller (1930) made observations indicating that two Pacific Horned Owls had definite territories which they held in late June. Each bird appeared to patrol an irregular-shaped area with the longest diameter approximately half a mile. An attempt was made to bring the two birds together by 'hooting' from a point between their territories but the effort met with no success. Apparently both birds respected the rights of their neighbors and neither would approach closer than seventy-five yards from this boundary.

¹Part of a Doctor's thesis presented to Cornell University in August 1937.

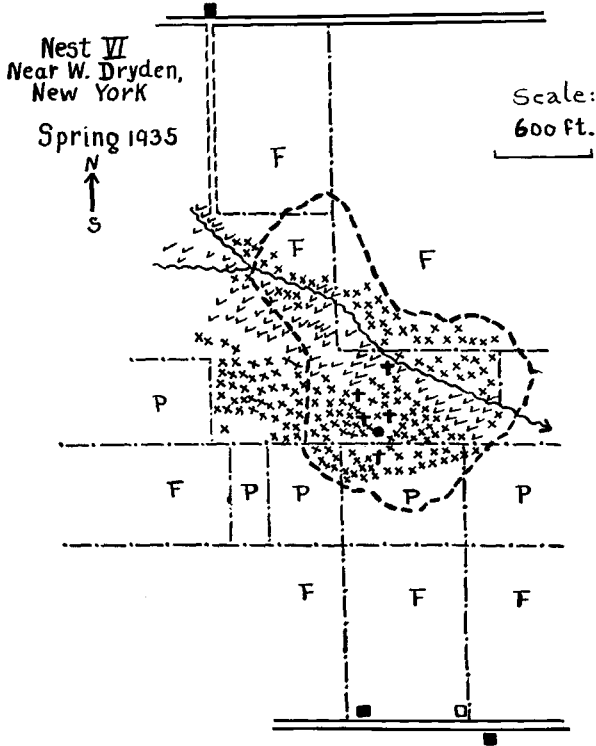
The range of both male and female birds was checked carefully at four nests near Ithaca, New York. From night observations in blinds it appeared that at dusk and again at dawn the male made a circuit about the limits of its domain, hooting from perches at several points in the territory. Furthermore, the areas patrolled by the male also served as feeding grounds



TEXT-FIG. 1.—Territories of two pairs of Great Horned Owls.

for the pair and they seldom, if ever, went beyond these limits. These areas were mapped by plotting all the sight and sound records obtained during many nights spent in blinds near the nests as well as by making a careful analysis of the possible sources of all food items that were brought to the young or were identified in pellets found beneath the roosts of the adults during this season. In no case did the size of the feeding range have a radius exceeding one-fourth of a mile in any direction from the nest, but obviously the individual characteristics of the topography and the availability of food in the immediate vicinity are important factors determining the range

of each pair. It is worthy of mention at this time that the birds were far removed from others of their kind and their movements were not affected by the activities of close neighbors. The territories have been mapped and the extent and type of environment for three may be determined from an examination of Text-figures 1 and 2.



TEXT-FIG. 2.—Territory of a third pair of great Horned Owls (legend as before).

A peculiar characteristic of Horned Owl territories is that there are normally no other species of large owls nesting or feeding extensively within the limits of *Bubo's* range. This feature was very conspicuous at Lawrence, Kansas, where the Horned Owls were generally common along creek bottoms south of the city. I noted that Barred Owls also seemed to be numerous in these regions, but that they were located along the stretches of the creeks where no Horned Owls were seen or heard. Two pairs of Barn Owls were also discovered and they, likewise, had chosen what appeared to be less favorable ranges where no *Bubos* were in evidence. Perhaps this rela-

tionship is due to the fact that the Horned Owl will at times kill and eat its smaller relatives, or it may be that the larger species drives such competitors from its feeding grounds. In either case *Bubo* apparently prefers to live alone with its mate and usually has its way in the matter.

For a period after the nesting season is over and the young have learned to take care of themselves the Great Horned Owls seem to lose their territorial instincts entirely. The juvenile birds leave the nest woods and wander away, often for considerable distances, judging from the findings of Errington (1932a) and the banding returns assembled by Lincoln (1927). The adults are apparently more sedentary, but they, too, shift about over a much wider range than during the nesting season. A limited number of observations in July and early August when the adults were still bringing food to tethered juveniles strongly suggest that the instinct of home range was waning or entirely lost. Adults were flushed from roosting sites during the day or heard at night outside of the limits of the range which they had held during the previous three or four months. This is the season when game farms and hunting preserves suddenly notice heavy losses from some form of predator and in many instances Horned Owls and other owls and hawks prove to be the agents of destruction. Lawrence, Kansas, provided a good demonstration of this post-nesting-season movement. Trapping results over a two-year period in that region revealed a marked change in local owl distribution during the period from the first of August to the end of October or mid-November. By trapping intensively during the winter and spring practically all of the resident owls had been removed in certain areas where *Bubos* were conspicuous and apparently nesting so close together that their territories were limited on one or more sides by those of their neighbors. Furthermore, I had spent many hours at night tramping over the hills and through the creek bottoms and was reasonably certain that Barred and Barn Owls were absent in the trapping areas.

Gradually a few owls appeared in my traps in August and early September, and then suddenly the region was invaded by Barred and Horned Owls. I caught approximately ten of each species during a two-week period. Field observations added further evidence that the owls were shifting about at night, moving up and down the valleys in considerable numbers. Unquestionably a large percentage were birds of the year but of the birds captured, a number gave every indication of being adults.

Mr. Frank C. Edminster, formerly with the New York Bureau of Game, has made the trapping records at the Connecticut Hill Grouse Preserve available to me, and the results are essentially similar to those outlined above. There appears, however, to be considerably more movement of the birds in winter, due probably to the invasion of birds from more northern areas. One season's record showed an appreciable catch of birds in April

at Connecticut Hill. This observation is difficult to interpret unless such birds were unsuccessful in securing mates for that season and shifted their range after nesting had started.

The question of how far resident birds range in the post-nesting-season movement can be satisfactorily answered only by data from banded adults. Unfortunately sufficient information is not yet available. Field observations at this season give very meager returns. A few sight and sound records of several pairs in the Ithaca region lead me to believe that the adults may range over several miles of cover during this period but do not normally desert the region in which they are accustomed to nest. The roosts found in the Ithaca region gave further evidence that the birds were shifting considerably, probably influenced by the availability of food. Pellet collections were small and scattered. A roost at Connecticut Hill was an exception, for it appeared that a bird or two had used the same clump of pines regularly for over a year. I have found no evidence that resident birds tend to band together after the young are shifting for themselves. This preference for solitude may be due to their natural intolerance of others of their kind or to a retention of the territorial instincts. This period of wandering apparently terminates sometime during the fall or winter. In the case of northern owls that move southward over considerable distances, the establishment of a territory does not occur until the nesting season is at hand. Certain resident birds likewise wait until the nesting season before setting up a domain.

Ridgway (1874) notes that Horned Owls may select nesting sites and build new nests or repair old ones as early as September or October. The birds, he states, roosted in the immediate vicinity until the following spring. Errington (1932a) checked seven territories where sight records or the accumulation of pellets clearly indicated that the roosts had been occupied during the fall, several months before the mating season actually started. In each case a bird (the male?) took up roosting quarters near a nest that was later occupied. However, in one case the region was not inhabited by Horned Owls until a short time before a nest was selected and incubation begun. I made a similar observation on one pair near Ithaca in the spring of 1936. A nest was under observation in Sapsucker Woods the previous spring and that winter a pair were still in the same locality. However, they apparently never roosted near the nest site until some time after the 20th of February when they took up a roost in a white pine only four hundred feet from the old nest. This pair chose a nest perhaps one hundred feet from the old situation and of the same open type in a beech tree. Incubation was in progress by the end of the first week in March, possibly earlier.

At Lawrence, Kansas, three males apparently roosted in their territories throughout two winters. I learned to distinguish between the males by

differences in their notes and do not believe that the birds left their narrow limits at all frequently, for in spite of the fact that the surrounding country was trapped intensively, these individuals were not caught and apparently found mates and nested both years. One bird in particular was flushed from a grapevine tangle during every month of the year. There were days when it was not found in this retreat, but during a period of over a year and a half it was seen there more often than not. During the late fall and winter another bird, in all probability its mate, could often be located in a nearby clump of vines and young birds were heard close by in the late spring.

The New York Bureau of Game (1937 mss.) has had returns from three Horned Owls that were released several miles from their points of capture. The January release within two weeks moved five miles back to the point where it was trapped. The bird released in February was trapped at the end of July at the original site of capture. Another owl, transported and moved ten miles in mid-December 1936, was retaken closer to the point of capture but not in a direct line between the banding and release locations. Perhaps the territorial instinct had not yet developed in this individual bird. All these observations suggest that the birds usually select territories at least several weeks before courtship and mating occur. Whether these areas have definite boundaries so characteristic of the nesting season, has not been determined.

The most satisfactory basis for an estimate of Horned Owl populations is of course the number of nests found. However, the location of hooting males and signs about roosts offer a good index to the distribution and numbers of breeding birds. No published figures on numbers of nesting Horned Owls have been found. Dr. Errington (in correspondence) has assembled a considerable amount of information about Horned Owl populations in several areas in south-central Wisconsin and central Iowa. He found the greatest density in wooded creek-bottom lands near Ames, Iowa. In these localities he estimated the population to be better than one pair of birds per two square miles.

Mr. Lee Fisher, of East Lansing, Michigan, informed me that there was approximately one Great Horned Owl per square mile over an area of ten square miles in the Pigeon River State Forest in the northern part of the Lower Peninsula of Michigan. His figures are based on field studies during the spring of 1936. A veteran trapper in the same region has plotted roughly the locations of nests on a map of the same area. Over a twenty-year period his observations indicate a similar number, approximately one pair to every two square miles. This wildland area is made up of aspen- and hardwood-covered hills with dense cedar and balsam swamps in the valleys and extensive openings that were formerly cultivated or pastured.

Mr. O. C. Furniss (in correspondence) has sent me his summary of nests

found on twenty-five quarter-sections of land near Prince Albert, Saskatchewan (*B. v. subarcticus*). He describes the region as rolling country with numerous sloughs and potholes. The land has been cleared extensively during the last twenty years and aspens are at present the chief tree species. On this area he found five nests in 1933, five in 1934, six in 1935, and four in 1936.

My own records of hooting males in a few very favorable localities south of Lawrence, Kansas, indicate a considerably higher population. On three sections of land that offered a habitat of heavily wooded creek banks bordered by small cultivated fields and pastures, there were at least three or four males to the square mile. However, in any area of five square miles the average did not exceed two males per square mile, and there was some evidence to indicate that the males did not always find mates and successfully nest. Nevertheless, I am convinced that two pairs to the square mile is a conservative estimate in the best habitat in that locality.

In the region about Ithaca, New York, due to the rugged topography and dense cover, it was difficult to locate and plot the distribution of territories of the Horned Owls and my figures may be subject to considerable error. Here there was a large rural population on small farms, numerous towns and an abundance of hunters and marksmen to whom the Horned Owls are vermin and a desirable target. These conditions are probably responsible for the relative scarcity of these birds in the areas under observation. The population over the twenty square miles with which I am familiar did not, I believe, average more than one pair to three or four square miles during the springs of 1934 and 1935. Perhaps there are larger populations in areas in the West where rodent numbers are comparatively high. An analysis of nest locations described from all parts of the species' range strengthens my own observations that Horned Owls prefer large timber bordering bodies of water and surrounded by openings in the form of grasslands, brush, or cultivated fields. A location within a few hundred yards of farm buildings is preferred, probably due to the fact that Norway rats and other rodents are attracted to such spots. In the northern part of their range these owls are usually associated with conifers which serve as winter roosting sites while in the South large hollows in trees or dense growths of shrubs or vines offer concealment during the day.

What then are the limiting factors in the density of population of the Great Horned Owl? The unusual ability of these birds to capture a majority of the land vertebrates in any area, coupled with their willingness to take what is available raises a serious doubt in my mind that lack of food is an important factor over much of their range. The young are supplied with an abundance of food throughout their nest life and apparently all of this is often obtained from a relatively small area. Nest sites are abundant and

well distributed in many localities. The Horned Owls are noted for their adaptability in finding locations in which to nest. Both the young and the adults are remarkably free from natural enemies or other natural agents of destruction. Furthermore, there is no evidence to indicate that disease or parasites are important mortality factors, although birds are occasionally found dead in the wild (Errington, 1932b). Removal of cover or molestation by man have unquestionably been the chief factors in the reduction of numbers of Horned Owls. In those areas where the birds have diminished up to the point of extirpation, civilization has so modified the habitat that it no longer conceals the birds from man and other enemies or furnishes them with an adequate food supply.

In areas where food and cover are optimum and human interference is negligible the chief limiting factor is, it appears, the definite territorial requirements of the males. At Lawrence, Kansas, it was noted during both springs that the males in the preferred creek bottoms usually hooted from perches approximately one-fourth to one-half mile apart. On moonlight nights before the nesting season began, as many as five or six males could be heard from one location. At times they approached within a much shorter distance of one another but their first challenges in the evening and their salute to the sun in the morning indicated a rather uniform distribution.

Does the male resist trespass upon his claims by fighting off the intruder? On a few occasions I heard vocal outbursts which indicated that the owls were much excited. No wilder and more blood-curdling scenes can be imagined than those suggested by these cries. On one occasion I managed to slip up within two hundred feet of such a disturbance and could hear the beating of wings amid the bedlam of hoots and screeches. I did not locate the birds themselves until my presence was noted and three or more owls drifted off into the night. Farmers in this area reported that such outbursts were not uncommon in late December. In any event the boundaries of each owl's range are apparently recognized by its neighbors and this fact appears to limit the maximum breeding population.

Since the resident Great Horned Owls have definite limits to their feeding ranges throughout most of the year, this fact is of far-reaching economic significance and should be given considerable attention in the formulation of a control policy. It means that with the exception of a few months in the late summer and fall, game farms and preserves as well as poultry raisers should be able to stop the depredations of Horned Owls by the destruction of a relatively small number of birds that maintain nearby territories. Moreover, as our knowledge of the food habits and ecology of this species increases, the conviction is growing that the Great Horned Owl plays a valuable rôle as a destroyer of harmful rodents and should not be killed except as a last resort. The wholesale extirpation of the species in large

areas is not only a waste of time and money, but is also likely to have an undesirable effect upon the populations of those objectionable animals that the Great Horned Owls hold in check. The fact that there is a southward movement of owls in the fall as well as a wandering of the young during the same period, has misled most people into believing that Horned Owls are characteristically wide-ranging forms that should be destroyed at every opportunity.

SUMMARY

1. The Great Horned Owl maintains a definite territory throughout the nesting season.
2. The male's territory is not only patrolled against all others of its species with the exception of its mate and young but also serves as the range in which both birds hunt for food.
3. In most cases resident birds are found near the nest site at all seasons of the year with the possible exception of a few months in the late summer and fall.
4. Normally no other large species of owls are found within the boundaries of the range set up by the male Horned Owl.
5. Horned Owl populations are limited chiefly by human molestation and man-made changes in their environment that result in a scarcity of cover and less frequently in a lack of nesting sites and sufficient food. In optimum range the decided territorial requirements of the males probably determine the nesting density. Populations in such areas seem to average from one to three pairs of nesting owls to the square mile. Over most of the range of the species the nesting density is much lighter.
6. The fact that resident Great Horned Owls throughout most of the year restrict their search for food to a relatively small area has an important bearing upon the economic status of this species.

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