

## TERRITORIAL BEHAVIOR OF WINTERING RED-HEADED WOODPECKERS

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TERRITORIES of Red-headed Woodpeckers (*Melanerpes erythrocephalus*) were studied near Seneca, Montgomery County, Maryland, where a winter population was attracted to pin oaks (*Quercus palustris*) growing near the Chesapeake and Ohio Canal and the Potomac River. These woodpeckers appeared in September, 1956, and left in May, 1957. Their breeding grounds were unknown. The winter territories were small, well-defined, and represented areas in which individual woodpeckers stored considerable numbers of acorns which they guarded in an aggressive fashion. This defense was well advertised. The striking colors of the Red-headed Woodpeckers, their "quirr, quirr," notes which suggest those of a watchman's rattle, and their pugnacity made them readily seen and heard. A previous communication (Kilham, 1958b) describes how these woodpeckers gather pin oak acorns, then conceal their stores from acorn-eaters, such as Blue Jays (*Cyanocitta cristata*) and Tufted Titmice (*Parus bicolor*), by sealing them in with pieces of bark and of wet, rotten wood. Two factors that enabled me to map out the storage territories in some detail were conflicts resulting from the aggressive behavior of the woodpeckers, and a particular patch of woods that offered unusual opportunities for observation. I made some initial studies in winter seasons from 1951 through 1953. More intensive observations involving all species of woodpeckers in the area, extending through 12 months of the year and including visits at dawn and at dusk, were made in 1956 and 1957.

### THE STUDY AREA

Creek Wood (Fig. 1) was a patch of woods approximately 215 yards long and 95 yards wide which extended on either side of a small creek from a dirt road on its southern border. Fields surrounded the wood in other directions. This woodland of approximately 4 acres contained the winter territories of 12 Red-headed Woodpeckers. Several features of terrain favored observations (Fig. 2). First, the fields sloped toward the creek so that one could look into the woods at mid-tree elevation and, second, pasturage of cattle in summer gave the woodland an open, park-like character, free of undergrowth and low limbs. Observations of territorial boundaries were further aided by the flashing of the black and white pattern of the Red-headed Woodpeckers against a background of grey, leafless trees. The trees were of medium height and consisted of pin oaks, ash (*Fraxinus americanus*), and black locusts (*Robinia pseudo-acacia*). Red-headed Woodpeckers used dead elms and locusts for excavation of roost holes and for storage of acorns. I made addi-

tional observations on these woodpeckers in bottomlands along the canal. In this area, however, high, tangled woods and a flat terrain made delineation of winter territories almost impossible.

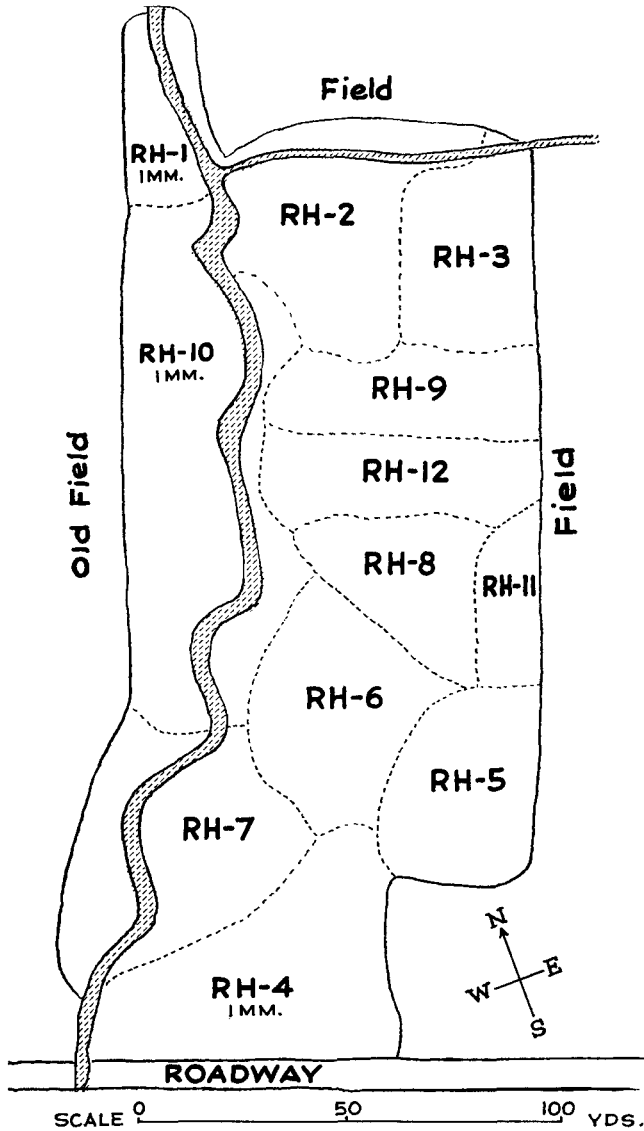


FIG. 1. Diagrammatic map of Creek Wood showing individual territories of 12 Red-headed Woodpeckers (RH = Red-headed Woodpecker; IMM. = immature bird.)

## AGGRESSIVE BEHAVIOR

Red-headed Woodpeckers are agile fliers and they were swift when attacking intruders on their territories. In between attacks they did much "bowing" and calling of "quirr" notes. The woodpeckers spread out their wings and tails and their calls became high-pitched when they were especially excited. This latter display was evoked only by intruders of their own species. Birds intruding on the woodpeckers fell into related and unrelated groups of competitors:

*Attacks on other species of woodpeckers.*—I saw Red-headed Woodpeckers attack and drive away all the other local species of woodpecker at one time or another. The Pileated (*Dryocopus pileatus*) and Hairy (*Dendrocopus villosus*) woodpeckers, and the Flicker (*Colaptes auratus*), however, were seldom present in Creek Wood. Yellow-bellied Sapsuckers (*Sphyrapicus varius*) were exceptional in being tolerated. They hardly could be classified as competitors since they didn't eat acorns and they drilled holes from which Red-headed Woodpeckers took sap when it flowed. One Red-headed Woodpecker (RH-7, Fig. 1) sometimes rested within a few feet of a sapsucker which made regular visits to a pin oak within its territory. Red-headed Woodpeckers concentrated their attacks on the two remaining species, the Downy (*Dendrocopus pubescens*) and Red-bellied (*Centurus carolinus*) woodpeckers. I never observed that Downy Woodpeckers ate acorns but they doubtless incited Red-headed Woodpeckers by moving up and down over trunks and limbs where acorns were stored. The Red-bellied Woodpeckers, on the other hand, were real competitors. They not only gathered and stored acorns from pin oaks but also occupied the same habitats as the Red-headed Woodpeckers until the latter drove them out in the fall. The Red-headed Woodpeckers seemed to go out of their way to drive off a Red-bellied Woodpecker, more so than for any other bird. On January 5, 1957, for example, I was in a field by Creek Wood when a Red-bellied Woodpecker, carrying an acorn in its bill, flew out from the territory of a Red-headed Woodpecker (RH-10). RH-10 immediately pursued the intruder well out over the field. On January 26 I watched a Red-headed Woodpecker at the Dierson Wildfowl Refuge fly over 100 yards, on two occasions, to drive a Red-bellied Woodpecker from a fringe of trees along the Potomac.

*Attacks on non-piciform birds.*—Red-headed Woodpeckers attacked Blue Jays and Tufted Titmice which, as elsewhere described (Kilham, 1958b), were their principal competitors for stored acorns. Another type of competition was for holes in trees. Each Red-headed Woodpecker had one main roost hole within its territory and, not infrequently, a number of alternates. Competition for these holes began when Starlings (*Sturnus vulgaris*) appeared

in mid-January, the male Starlings flapping their wings and giving their screechy songs. Red-headed Woodpeckers were having little rest by the end of the month. They swooped back and forth with excited "quirrs." Three or four Starlings would perch near a roost hole at one time or in relays. They were tough and persistent. A Red-headed Woodpecker might attack them again and again, occasionally hitting one with the full impact of a swoop, but the Starling involved would only shift its perch by a few inches.

Two encounters may serve to demonstrate the intensity of this competition. On January 26, 1957, a Red-headed Woodpecker struck a Starling directly and the two birds fell 40 feet to the ground as they grappled together. I heard a yelp from one of them. The woodpecker flew up straight away, but I was unable to determine what happened to the Starling. On March 17, I was searching for RH-1 at 5:00 p.m. There was no sign of this Red-headed Woodpecker in its territory. Then I heard noises and scratches coming from RH-1's roost hole which was 12 feet up, at the base of a broken branch. When I threw a log at the tree RH-1 flew out followed by the Starling. A fight had gone on within the roost hole. As spring advanced, I never encountered an instance in which Starlings succeeded in dispossessing a Red-headed Woodpecker. Red-bellied Woodpeckers did not do so well. They were paired and were excavating nest holes in early spring (Kilham, 1958c) at a time when Red-headed Woodpeckers carried on as single birds. The Red-bellied Woodpeckers fought, but all eight pairs under observation lost out in the face of Starling competition.

#### DETERMINATION OF TERRITORIAL BOUNDARIES

Creek Wood was occupied by 12 Red-headed Woodpeckers. On repeated week-end visits I observed that these woodpeckers rarely made excursions outside of the woodland, and that they remained close within individual areas. It thus became apparent that the borders of Creek Wood were natural boundaries for many of the Red-headed Woodpeckers. Accordingly I concentrated on the problem of determination of territorial boundaries lying within the woodland. Observations made for this purpose over a number of months fell into the following six categories:

(A) Recognition of individual Red-headed Woodpeckers was of immediate importance. How could one be sure that the same bird was in the same territory each week? Close observation indicated that individual Red-headed Woodpeckers may have natural markers. Three of the 12 woodpeckers, for example, were immature birds with black bars on their white primaries. The pattern of these bars varied among the individuals. Furthermore, one of these immature birds, even in the fall, had a red head and a black back whereas the other two were dull and brownish until the following April. The nine remaining woodpeckers had adult plumage but each had traits of behavior which became recognizable on prolonged observation. RH-5, for example, bowed incessantly, whereas RH-2 would swing in and out of its roost hole many times before entering at dusk. Of more general value in recognition was the fact that each Red-headed Woodpecker had certain resting places,

as well as anvils for pounding acorns, to which it would return on repeated occasions.

(B) Each Red-headed Woodpecker had a roost hole within its territory and would, with few exceptions, return to it on successive nights. I made my most prolonged observations on RH-2. This woodpecker entered its roost hole, which was 15 feet from the ground in a dead locust stub, at 5:10 p.m. on November 11, 1956. The bird remained inside as the sun set. At 4:45 p.m. on November 24 it disappeared in the same roost hole. On two other dates, December 22, 1956, and May 2, 1957, I watched RH-2 fly from its roost hole as the woods grew lighter after dawn. Thus one Red-headed Woodpecker used the same roost hole for six months.



FIG. 2. Creek Wood, as seen from south corner looking northward (Territory RH-5, Fig. 1).

(C) Observations on individual Red-headed Woodpeckers indicated that they usually flew only short distances, for such purposes as carrying an acorn from one tree and re-storing it in another or taking it to an "anvil" to break it in pieces. One could learn much concerning which trees were within the territory of any one individual by noting the extremes of such flights. Dividing lines between territories were, for the most part, sharp and definite. RH-9 not infrequently flew straight down along its northern boundary without disturbing its neighbor, RH-3, which might be only a short distance on the other side. RH-5 and RH-11 visited the same black walnut (*Juglans nigra*) to get sap from sapsucker holes. The two woodpeckers might cling to different branches only 10 feet apart, each returning, on separate occasions, to the same group of holes. This peaceful behavior was noteworthy, for any trespass of one Red-headed Woodpecker onto the territory of another usually led to considerable commotion.

(D) Territorial conflicts between Red-headed Woodpeckers were rare. When they did occur, however, one wondered if all of the Red-headed Woodpeckers in Creek Wood didn't join in with excited "quirs" even though only a few of them were immediately involved. On December 16, 1956, for example, I saw a flash of black and white as one of the woodpeckers suddenly flew the length of the wood. This Red-headed Woodpecker on the loose flew over the territories of RH-12, RH-9, and of RH-2 (Fig. 1). Each of these latter woodpeckers attacked the intruder in succession as it passed over their respective boundaries, affording in the attacks an impressive demonstration of territoriality.

(E) Conflicts between Red-headed Woodpeckers and titmice or Downy Woodpeckers were common and gave more frequent demonstrations of boundaries than the intraspecific conflicts described above. On December 16, 1956, I was standing on the boundary between territories of RH-3 and RH-9 when the latter woodpecker flew up to within 20 feet of me as it drove some titmice from its territory. The titmice now excited RH-3, which flew down from a distant perch to attack the invaders in its turn. When the titmice, continuing on their passage through the wood, crossed into RH-2's territory, they were attacked for a third time. Thus I had watched three Red-headed Woodpeckers defending their territories in an aggressive fashion. All carried their attacks on the titmice up to but not beyond their respective boundaries.

Downy Woodpeckers usually passed through Creek Wood singly and were not easily driven away. I even came to think that one of them had become adjusted to repeated attacks.

On December 22, for example, I was standing on the boundary between the territories of RH-2 and RH-9 when RH-2 swooped at the Downy Woodpecker three or four times, almost hitting it. The smaller woodpecker, however, dodged around its tree trunk and continued hammering. It finally flew to an ash tree above my head. RH-2 pursued it but, seeing me, stopped at a distance and began to "quirr." RH-9 now approached from the opposite side. I was now in between two Red-headed Woodpeckers with the Downy Woodpecker above me. The way the Red-headed Woodpeckers kept bowing their heads and clinging to awkward perches suggested that both were disturbed by the presence of the smaller woodpecker. The Red-headed Woodpeckers never paid any similar attention to my presence alone. Another episode took place two days later. The Downy Woodpecker again came to rest over my head after being chased in succession by RH-12, RH-11, and RH-5. I was standing on the edge of RH-8's territory. This Red-headed Woodpecker was obviously excited but it appeared afraid to come closer. The Downy Woodpecker now worked above me, undisturbed for 15 minutes. It was attacked immediately when it flew away. I wondered whether the Downy Woodpecker in a trial and error process had found that the area above my head afforded a temporary refuge.

(F) A fresh fall of snow in January afforded an opportunity to verify the boundaries which I had sought to establish by the various methods described above. By tramping trails around each conjectured territory I was able to convert Creek Wood into a map not unlike Figure 1. Conditions were

ideal for observation. The Red-headed Woodpeckers, with their striking color patterns and resounding "quirrs" flew back and forth in the gamut of their activities against a background of bare trees and white snow. The boundaries were much as on previous days, but I was able to map out more sectors. Some few zones where little happened were difficult to determine. Figure 1 represents the situation in a general way and shows that the Red-headed Woodpeckers were crowded together in relatively small territories. Larger territories may not have been desirable from a woodpecker's point of view for they would be more difficult to defend. Another consideration was that territories had vertical as well as horizontal dimensions, and an abundance of dead locust trees with rotted-out centers providing storage space may have been of greater importance than mere area. The three immature woodpeckers, RH-1, RH-4, and RH-10 (Fig. 1) appeared to occupy the least desirable territories. Those of RH-4 and of RH-10 were especially large as well as being relatively devoid of dead trees. One might speculate that experienced adults would occupy smaller, more defensible areas if the trees were suitable. It was of interest from this point of view that nearly all the adult Red-headed Woodpeckers in Creek Wood were bunched in territories east of the creek where the dead locusts were located. Locations of roost holes gave corroborative evidence of this situation. All the Red-headed Woodpeckers, for example, which inhabited the easternmost territories, roosted in locust stubs (RH-2, RH-3, RH-5, RH-8, RH-9, RH-11, and RH-12; Fig. 1). The remaining five woodpeckers, of which three were immature birds, occupied the western portion of Creek Wood. Here four roosted in dead elms and the fifth in a black walnut.

#### EXCEPTIONAL TERRITORIAL BEHAVIOR

A remarkable feature of the Red-headed Woodpeckers in Creek Wood was that they almost never left its borders while in residence. RH-1 and RH-10, both immature, would make occasional sorties to catch insects in an adjacent field in favorable weather. RH-4, also an immature bird, was the most exceptional of the Red-headed Woodpeckers in regard to wandering, as I first discovered on November 24, 1956, when I could not find it in its territory by the roadside. The woodpecker was still missing a week later. A constant succession of birds of various species were coming to plunder the stores of acorns which RH-4 had hammered into crevices of a dead elm. The elm came to resemble a large feeding tray. Titmice were the most frequent visitors but, to my surprise, White-throated Sparrows (*Zonotrichia albicollis*) came up at dusk to feed on bits of acorn. Two Red-bellied Woodpeckers made repeated visits to remove acorns, occasionally encountering a Red-headed Woodpecker, RH-7, which would drive them away. RH-7 also took acorns but showed no

disposition to take over any of the vacated, neighboring territory. This was an example of the conservatism of the Red-headed Woodpeckers, none of which, as far as I could observe, ever changed its boundaries once these had become established. RH-4, the wanderer, suddenly reappeared after an absence of two weeks. It remained in Creek Wood until early spring, apparently compensating for its lost acorn stores by flying out after insects whenever possible.

#### SPRING AND DEPARTURE

The Red-headed Woodpeckers showed few signs of a breeding urge until the season was well advanced. Whereas Red-bellied Woodpeckers were drumming, calling, and forming pairs by the end of January (Kilham, 1958c), March 24, 1957, was the first day on which I saw a Red-headed Woodpecker drumming. The drumming came in bursts of about one second's duration and was repeated two or three times. Many of the Red-headed Woodpeckers seemed never to drum and I presumed these were the females, since female Red-bellied Woodpeckers are known to drum rarely. Conversely, other individual Red-headed Woodpeckers, presumably males, drummed with increasing frequency.

On April 20 I heard a new note which I had not heard previously. This was a sharp "quee-ark." The calling of "quee-ark" and the drumming now became common. At the same time one observed that one woodpecker might fly into the territory of another and be tolerated. RH-6 did much calling and drumming. Since other woodpeckers seemed to come to his territory, rather than *vice versa*, I wondered if he were not a male and the visitors females. All the immature Red-headed Woodpeckers had assumed adult plumage by the latter part of April. With these various developments I began to wonder whether some of the Red-headed Woodpeckers might not stay to nest in Creek Wood. In spite of their new activities, however, the Red-headed Woodpeckers were still spending most of their time within their own territories, and even at the end of April continued to feed on their stored acorns. Their departure from Creek Wood came rather abruptly. On May 2 I could find only three Red-headed Woodpeckers and on May 5 I saw the last one. On that final day RH-6, still aggressive, drove away a Red-bellied Woodpecker.

#### SUMMER

Creek Wood seemed deserted after the departure of the Red-headed Woodpeckers. Toward the end of May, 1957, a pair of Red-bellied Woodpeckers had moved in and were obviously preparing to nest. I was away in June, but through July and August I made repeated visits to observe the Red-bellied Woodpeckers and the three young ones which they had raised. No Red-headed Woodpeckers were seen in these months, either in the wood or along



the canal. There was none on August 31, when I again searched through Creek Wood. On the following day, however, I caught a glint of sunlight on white. A Red-headed Woodpecker had returned. It appeared to be quiet and subdued and in following it about I observed an episode contrary to expected winter behavior. The Red-headed Woodpecker was clinging to a tree trunk when it suddenly flattened against the bark with its bill pointed straight forward. I then noticed that a Downy Woodpecker had alighted two feet above it. The Red-headed Woodpecker remained "frozen." There was no attack and no "quirrs." I wondered whether it failed to act aggressively because, having just arrived, it had no established territory and no stored acorns.

#### FLUCTUATIONS OF RED-HEADED WOODPECKER POPULATIONS

A severe drought afflicted the Seneca area in the summer of 1957. The swamp became hard and dry and Creek Wood had a withered appearance. During September I saw a few Red-headed Woodpeckers by the canal but only the one came to Creek Wood and none remained elsewhere in places where I had found many the year before. The reasons why Red-headed Woodpeckers appeared, then moved on, can only be conjectured. Three explanations suggested themselves. First, Creek Wood and the swamp had no water and I had observed that the woodpeckers of previous seasons came down to drink not infrequently. Second, there was a scarcity of insect life during the drought. A possible indication of this, apart from direct observation, was that the fall warbler migration in the area was unusually poor. Finally, the pin oak acorn crop was minimal. One could see this by scanning the trees or by noting that far fewer Blue Jays came for acorns than in the previous year. The winter season of 1953-54 offered an interesting comparison. The entire pin oak acorn crop failed in 1953 and not a single Red-headed Woodpecker wintered in the Seneca area as far as I could determine.

#### A LONE WINTERING RED-HEADED WOODPECKER

During the winter of 1957-58 I knew of only one Red-headed Woodpecker in bottomlands along the Potomac. This lone woodpecker lived in the center of Creek Wood. It gathered acorns while such were available and I watched it seal in its stores with slivers of damp, rotten wood, usually taken from dead limbs of adjacent live pin oaks. The winter was unusually cold, with much snow. There seemed to be no warm days with insects flying about. How could the lone Red-headed Woodpecker survive under such adverse circumstances? The bird was not at a loss. From November to March I watched it make repeated flights to a cornfield 400 yards away. It would devour some kernels by pounding them on trees adjacent to the field but it carried

others in its bill when, with a direct and undulating flight, it flew back to Creek Wood.

The behavior of this single Red-headed Woodpecker differed in several respects from what I had observed the year before when numbers of the same species had lived in a community. For one thing I almost never heard the single woodpecker call "quirr." Secondly, the area occupied by the Red-headed Woodpecker could not be called a territory, by one interpretation of the word, for, in the absence of close competitors of its own species, the lone woodpecker seemed to recognize no definite boundaries to its movements. It did, nonetheless, spend most of its time within a small circle of trees. The lone Red-headed Woodpecker would occasionally drive away a Red-bellied Woodpecker and less frequently a Downy Woodpecker or a Tufted Titmouse.

#### DISCUSSION

The term territory is used in this report in reference to relatively small areas with well-defined boundaries, which included stores of large numbers of acorns and were defended by the notably aggressive behavior of their owners, the Red-headed Woodpeckers. I have not read of any closely similar type of territory, based on food storage, among other birds. I have, however, observed two situations where mammals established individual territories in late summer in a manner not unlike that described above for Red-headed Woodpeckers.

In one case Red Squirrels (*Tamiasciurus hudsonicus*) were harvesting pine cones (*Pinus strobus*) in Tamworth, New Hampshire (Kilham, 1954), in a section of pine woods clear of undergrowth. Repeated observations made early in September indicated that an individual squirrel had a definite territory and would sometimes run around its actual boundary. The animal was transporting cones to caches near the center of its domain. It appeared to warn off neighboring squirrels, engaged in similar activities, by means of its loud, chattery song, and conflicts between squirrels, in which the defending animal was dominant, were not infrequent.

In a second situation, Pikas (*Ochotona princeps*) inhabiting an open rock slide in mountains in Montana were observed over a period of four weeks (Kilham, 1958a) harvesting sprigs of vegetation which they accumulated in piles above and under the rocks. Each Pika maintained a definite territory which it would defend against neighboring Pikas and advertise with a frequently uttered "caack." These animals live on stored food while active under the snow in winter.

The Red-headed Woodpeckers, Red Squirrels, and Pikas had some features of strategy in common. All had small, readily defended territories surrounded by similar territories of others of their own species. Furthermore all three species were noisy. Their calls may have been warnings which served to diminish interspecific conflicts. In one sense the Pikas differed from the other two species for they stored miscellaneous types of vegetation that would have been available almost any year. The Red-headed Woodpeckers with

their acorns and the Red Squirrels with the pine cones, on the other hand, were taking advantage of bumper crops, such as might be entirely absent in other years. One might think of the last two species as being mobile opportunists.

Winter territories have been described for other birds. Lack (1943) states that the British Robin (*Erithacus rubecula*) may establish an individual territory in the autumn which it uses as a foraging area. Unrelated food competitors are not driven away. The situation observed among the Red-headed Woodpeckers was different in that they might collect acorns outside of their territories if they had no suitable pin oaks within them (Kilham, 1958b). The woodpeckers drove away all avian competitors, related or not. A Mockingbird (*Mimus polyglottos*) exhibited a somewhat parallel behavior when it took to defending a group of persimmon trees opposite Creek Wood. On November 25, 1956, it drove away a Yellow-bellied Sapsucker, then a Downy Woodpecker, which had come to feed on persimmons.

The Greater Spotted Woodpecker (*Dendrocopos major*) is reported by Pynnönen (1939) to live mainly on pine and spruce seeds in Finland in winter. Individuals hold territories with distinct boundaries, although food apparently is not stored within them in significant amounts. These territories, apparently ranging from 2½ to 8 acres in extent, were large in comparison to those described above for Red-headed Woodpeckers.

Swanberg (1956) describes food storage as one of the main functions of territories held the year around by Thick-billed Nutcrackers (*Nucifraga caryocatactes*) in Sweden, the winter stores of nuts being used to feed the young in spring. Such territories averaged over 30 acres in extent. The Red-headed Woodpeckers described above, on the contrary, were migratory and had settled down into small winter territories where food supplies were optimal. Here they competed directly with Red-bellied Woodpeckers, both for food and habitat.

#### SUMMARY

Twelve Red-headed Woodpeckers wintering in Maryland were observed to maintain small, individual territories over eight months in 1956 and 1957. The Red-headed Woodpeckers defended their stores of pin oak acorns against other birds, both related and unrelated, and appeared to be the most aggressive of the local species of woodpeckers. Conflicts with such birds as Tufted Titmice enabled one to mark the boundaries of the woodpeckers' territories with some precision. Each Red-headed Woodpecker had a roost hole within its territory. Calls and drumming expressive of a breeding urge did not become prominent until April. The woodpeckers had all departed by the first week in May. The pin oak crop was minimal in the fall of 1957, and

under these circumstances only a single Red-headed Woodpecker returned to winter. This bird subsisted largely on corn from an adjacent field. Although it spent most of its time within a small circle of trees the lone woodpecker had no discernible territorial boundaries in the absence of neighbors of its own species.

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