

# RED-COCKADED WOODPECKER FALL MOVEMENTS IN A FLORIDA FLATWOODS COMMUNITY

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**ABSTRACT.**—Four Red-cockaded Woodpeckers from three clans were radio tracked for 128 hours from October to December 1975 in a pine flatwood community in central Florida. Radio telemetry equipment proved valuable for obtaining data on daily movements, behavior, and range size over a complete dawn to dusk tracking period. The average range of 69.8 ha (172.3 acres) was larger than most previously reported ranges. Foraging was most frequent in pine flatwoods habitat; longleaf and slashed pine were the main species utilized. The roosting area itself was used as a foraging site only during rainy weather. Based on this study a minimum of 58–91 ha of suitable foraging habitat are necessary to support clans of 3–4 Red-cockaded Woodpeckers during fall in a pine flatwoods community.—*Florida Game and Fresh Water Fish Commission, Wildlife Management Laboratory, 4005 S. Main Street, Gainesville, Florida 32601.* Accepted 13 October 1976.

Survival of the Red-cockaded Woodpecker (*Picoides borealis*) within its natural range, the pine woods of the southeastern United States, is uncertain under present day commercial forestry practices. Concern for the future of the species is evident from the “endangered” status given it by the U.S. Fish and Wildlife Service (U.S. Department of the Interior, 1973).

This study to determine critical habitat requirements for the woodpecker in central Florida was undertaken as part of an overall assessment of the impact on wildlife of the proposed Cross Florida Barge Canal. The use of radio telemetry equipment was authorized under interim authority granted by the Office of Endangered Species, U.S. Department of Interior pending final disposition of the applications. When initiated, the intention was to carry out the study more fully than reported here. Final approval for the use of radio telemetry equipment was denied and restrictions were placed on the number of birds that could be color marked. As a consequence, the study was curtailed.

To our knowledge this is the first study to employ radio telemetry techniques to study the Red-cockaded Woodpecker. For this reason and because any new information on a species as sensitive as this woodpecker would be important in making sound management decisions related to the species, it seems appropriate to present the results of this study here.

## STUDY AREA AND METHODS

Three “clans” (Jackson and Thompson 1971) of the Red-cockaded Woodpeckers were studied during the fall of 1975 in Marion County, Florida, about 7 km south of Eureka and 1 km west of the Oklawaha River.

The habitat of the area consisted of longleaf pine (*Pinus palustris*) flatwoods on the higher sites, characterized by an overstory, principally longleaf pine between 50 and 80 years old and 21–25 m tall. This habitat graded to slash pine (*Pinus elliottii*) or pond pine (*Pinus serotina*) flatwoods on the lower, wetter sites. Bayheads occurred on the lowest, wettest sites and long streams with an overstory of loblolly bay (*Gordonia lasianthus*), sweet bay (*Magnolia virginiana*), red maple (*Acer rubrum*), and black gum (*Nyssa sylvatica*). Scattered throughout the area were several intermittent “flatwoods ponds” bordered by bay and pond cypress (*Taxodium ascendens*). Also within the study area were improved pastures, four recent timber clear cuts, and a 10–15-year-old slash pine plantation with an open understory of wire grass (*Aristida stricta*) and gallberry (*Ilex glabra*). Figure 1 is a general habitat map of the three ranges.

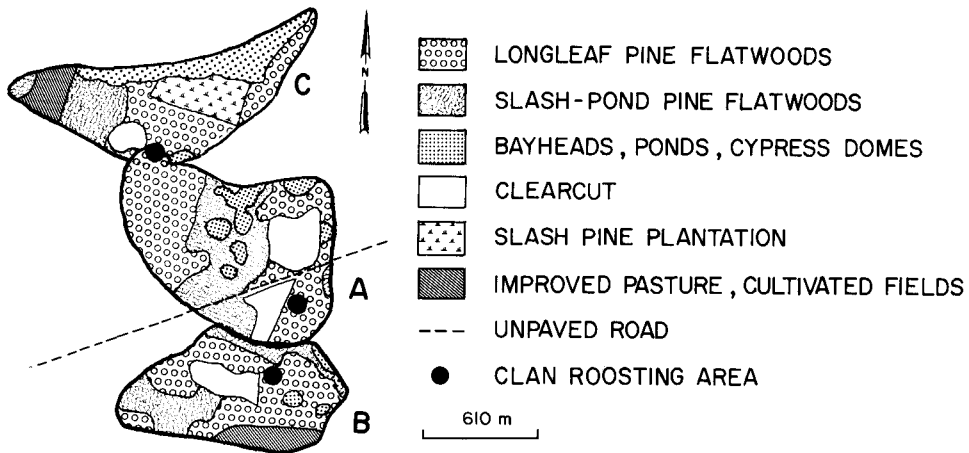


Fig. 1. Habitats and general configuration of range of three Red-cockaded Woodpecker clans.

Birds were captured in a 4-cm mesh mist net bag suspended from a 50-cm-diameter dip net frame attached to a pole. To minimize post-release disorientation, all captures were made in the morning before birds left the roost cavity. Nets were held in front of the roost holes and the birds were driven from the cavities by pounding on the trees or by playing taped Red-cockaded Woodpecker calls. The birds were banded with the U. S. Fish and Wildlife Service leg bands. All captured birds were color marked with red and/or green Chick Dye (Edwards Colored Chick Dye, Marshall, Texas) on the breast, back, and/or tail to distinguish them individually in the field. Some birds were also marked with colored plastic leg bands (National Band and Tag Co., 721 York St., Newport, Kentucky). Birds were held less than 30 min and except in one instance, were released on the roost tree. The remainder of the clan were often still in the vicinity at the time of release. If other clan members could not be heard, they were lured back to the roosting area by playing taped calls before the bird was released.

Previous investigations of Red-cockaded Woodpecker home range (Crosby 1971 and Baker 1971) involved visual observations of color-marked individuals. This study employed miniature radio transmitters (AVM Instrument Company, 810 Dennison Drive, Champaign, Illinois). Signals were received over a portable 24-channel crystal controlled receiver and a hand-held four element Yagi antenna (Wildlife Materials, Inc., Carbondale, Illinois). The transmitters were powered by 1.35 volt mercury hearing-aid type batteries. The signal was broadcast via an 18-cm wire "fishing leader" antenna extending from the rear of the transmitter. The transmitter package was waterproofed with silicone adhesive (Dow Chemical Corp., Midland, Michigan). An effort was made to maintain a low package profile. The entire package weighed approximately 3.6 g (3.47–3.71) and measured 30 by 25 mm excluding the antenna. The radio was attached as described by Arlo J. Raim (pers. comm.) using a small piece of cotton fabric glued to the back of the transmitter to provide a suitable backing for gluing the transmitter to the bird. The transmitter was glued to the woodpecker's back feathers between the scapulars using cosmetic eyelash cement. Instrumented birds were usually followed from dawn to dusk for 2 or more consecutive days during October, November, or December. Care was taken to avoid disturbing a bird while it was being tracked. The clan's activities and movements were recorded as to time of day and habitat type and plotted on 1–24,000 scale maps of the area. A planimeter was used to determine approximate home range hectareage of each woodpecker clan, and hectareage of the seven general habitat types available within their ranges.

*Equipment performance.*—Maximum range of the transmitters was about 1 km. We encountered no difficulty in maintaining radio contact with an instrumented bird throughout the day. Signals were still received after birds had entered the roost cavity though the range was somewhat reduced. An advantage of using telemetry techniques over visual observation alone was the ability of maintaining continuous contact with individual clans and the quick reestablishment of contact following foraging movement or other interruptions. Battery life was rated at 26 days, however, 5–14 days was the maximum used in this study.

The color marking system proved adequate for identifying individuals throughout the study, and the dye was easily discernible the third month after application. Capture efficiency of about one bird for every

two attempts might have been improved using nets of slightly smaller mesh size and a smaller diameter net throat elongated to conform better to tree contour.

## RESULTS

Between October and November nine birds were captured and color marked. Four birds, 3 males and 1 female, were instrumented with miniature radio transmitters and followed for 12 full days and parts of 3 others for a total of 128 hours of observation. Birds were watched after release to determine if they behaved normally. Sustained flight and the ability to forage with other members of the clan were used to determine normalized behavior. Three of the four birds appeared to exhibit normal behavior within 2 hours of release. The instrumented member of clan A made a sustained flight of  $\frac{1}{2}$  km within a few minutes of release. The behavior of one individual, a male from clan B, never become satisfactorily normal. This individual, though able to keep up with the other members of the clan, never managed extended flight, but flew from tree to tree. As this bird was not leading, but following the other members of the clan, data from this bird were used to represent the movements of the whole clan. The day after instrumentation this bird was recaptured and the transmitter removed. Disfunction was apparently caused by a heavier than necessary transmitter package resulting from too much silicone adhesive and feathers matted by excess eyelash cement. After removal of the transmitter and freeing of the matted feathers, the bird appeared normal on three subsequent observations during the next few days. Transmitters fell off the other 3 woodpeckers 5–14 days after instrumentation. No instrumented bird exhibited difficulty entering or exiting roost cavities, and behavior was presumably normal once the bird had entered the cavity.

*Movement.*—It was apparent from the onset of the tracking study that the clan moved and fed together throughout the day making it necessary to instrument only one clan member to obtain movement data on the entire clan. The habitats used by the three clans, A, B, and C, are shown in Fig. 1. They were derived by connecting the outside points of the daily movements for each of the three clans.

Clan A consisted of three birds (2 males, 1 female) that roosted together and a fourth bird, a male, that roosted with clan B but traveled and foraged with clan A during the day. Clan B consisted of 4 birds (2 males and 2 females) that roosted together, 3 of which foraged together. Clan C consisted of 3 birds (1 male, 1 female, 1 uncaptured) that roosted and foraged together. At the beginning of the study, two of the birds in clan C roosted in separate holes in the same cavity of a recently dead tree. For most of the tracking period, one of these birds roosted in another unknown place.

Table 1 presents the daily movement parameters for the three clans. Clan A had the largest recorded range during a 3-day tracking period, approximately 91.4 ha (225.8 acres). Clans B and C had smaller ranges of approximately 58.4 ha (144.2 acres) and 59.5 ha (146.9 acres) during 5- and 4-day tracking periods respectively. The average range size for the three clans was 69.8 ha (172.3 acres) during the study period.

Daily movements from A.M. to P.M. roosting were fairly consistent throughout the tracking period for all three clans. Upon emerging from the roost cavity, the birds spent 10–20 min in the immediate roosting area. Behavior during this period typically consisted of excited vocalization and much activity. No actual feeding was noted near the roosting site during this time. After this “assemblage” period, the clan began moving and feeding. The average linear distance traveled by a clan during a normal day was 1.92 km. They moved most frequently in the morning. During late

TABLE 1  
TERRITORY SIZE AND DAILY MOVEMENT<sup>1</sup> OF RED-COCKADED WOODPECKERS

Tracking date	Sex	Hours observed	Total daily distance traveled (km)	Max. distance from roost tree (km)	Time of day when maximum distance reached (EST)
Clan A: approximate range: 91.4 ha (225.8 acres)					
22 Oct.	M	9 h 45 min	2.02	0.50	1430
23 Oct.	M	10 h 5 min	3.13	1.12	1500
24 Oct.	M	11 h 5 min	2.05	0.60	1130
26 Oct.	M	4 h 45 min			
Average			2.40	0.74	1406
Clan B: approximate range: 58.4 ha (144.2 acres)					
6 Nov.	M	11 h 30 min	1.58	0.40	1245
7 Nov. <sup>2</sup>	M	10 h 20 min	0.86	0.44	1625
13 Nov.	F	8 h 15 min	0.94	0.39	1400
14 Nov.	F	9 h 16 min	1.79	0.86	1425
17 Nov.	F	9 h 40 min	1.38	0.31	1005
Average			1.31	0.48	1348
Clan C: approximate range: 59.5 ha (146.9 acres)					
4 Dec.	M	10 h 15 min	2.16	0.99	1320
5 Dec.	M	9 h 51 min	2.21	0.98	1000
7 Dec.	M	1 h			
8 Dec.	M	8 h	2.36	1.09	1040
9 Dec.	M	7 h 50 min	1.48	0.71	1350
10 Dec.	M	6 h 25 min			
Average			2.05	0.94	1228
Average for 3 clans: approximate range: 69.8 ha (172.3 acres)					
			1.92	0.72	1327

<sup>1</sup> Based on full days observation.

<sup>2</sup> Rained all day.

morning or early afternoon, the clan usually reached its farthest distance from the roosting site, which averaged 0.72 km at the average time of 1327 h EST. During the later half of the day the birds moved less frequently, at times spending up to 4 hours in one place, often a single tree that had died recently. In later afternoon, the clan began moving back to the roost site from the feeding location, sometimes in one direct flight.

On 7 November clan B was tracked during a day of drizzle, with intermittent heavy rain. Movements that day were quite restricted with more time than usual spent in the colony area. Total straight line distances traveled was only 0.86 km and a maximum distance from roost of 0.44 km was reached at 1625 h. During the periods of heavy rain, birds found shelter under large limbs or on the lee side of the trees they were feeding on. Other days during brief periods of rainy weather, the birds often returned to the roost area. Poor weather conditions also caused early roosting as noted by Beckett (1971) and others.

*Agnostic behavior.*—A territorial dispute lasting 27 min was seen on 24 October at the common boundary shared by clan A and B. The dispute was marked by excited vocalization, drumming, and the “wing out” displays described by Ligon (1970). Another territorial dispute took place on 5 November when the male bird that normally roosted with clan B, but foraged with clan A, was released among the members of clan B as they foraged. This bird was not radio instrumented and had been banded and dyed previously so no change was made in the general appearance at this time. Nonetheless clan B members vigorously drove this bird off. The bird may have been shifting its clan affiliation, which could explain the ambivalent behavior of

TABLE 2  
TOTAL HECTARES (ACRES) OF SEVEN HABITATS WITHIN THE RANGE OF AND THEIR USE BY  
RED-COCKADED WOODPECKERS

	Clan A	Clan B	Clan C	Total	% total foraging time by the three clans combined
Longleaf pine flatwoods	50.6 (125.0)	34.1 (84.2)	23.8 (58.9)	108.5 (268.1)	38.2
% of total range	55.4	58.4	40.1	51.9	
Pond-slash pine flatwoods	18.7 (46.2)	10.9 (27.0)	9.3 (22.9)	38.9 (96.1)	43.8
%	20.5	18.7	15.6	18.6	
Bayhead-ponds borders					
Cypress dome etc.	7.7 (19.0)	2.8 (7.0)	11.3 (27.9)	21.8 (53.9)	6.5
%	8.4	4.9	19.0	10.4	
Clearcut	11.6 (28.6)	4.1 (10.0)	2.2 (5.5)	17.8 (44.1)	0
%	12.7	6.9	3.7	8.5	
Slash pine plantation	0 (0)	0 (0)	7.0 (17.2)	7.0 (17.2)	9.4
%	0	0	11.7	3.3	
Improved pasture and fields	0 (0)	4.9 (12.0)	4.7 (11.5)	9.5 (23.5)	0
%	0	8.3	7.8	4.5	
Roosting area	2.8 (7.0)	1.6 (4.0)	1.2 (3.0)	5.7 (14.0)	2.2
%	3.1	2.8	2.0	2.7	
Total range	91.4 (225.8)	58.4 (144.2)	59.4 (146.9)	209.2 (516.9)	

the members of clan B towards it, tolerating it in the roosting area, but not as a foraging member of the clan.

In the course of this investigation Red-cockaded Woodpeckers were seen feeding in close proximity, sometimes less than 1 m, to Downy Woodpeckers (*Picoides pubescens*), Hairy Woodpeckers (*Picoides villosus*), Red-bellied Woodpeckers (*Melanerpes carolinus*), Yellow-bellied Sapsuckers (*Sphyrapicus varius*), and Pileated Woodpeckers (*Dryocopus pileatus*), but no agnostic displays were seen.

*Habitat use.*—All roost cavities located were in longleaf pine with average diameter breast height of 0.331 m (13.04 in). This is less than the average of 0.404 m (15.93 in) reported by Hopkins and Lynn (1971) for longleaf pine roost trees in South Carolina. This smaller size probably resulted from a combination of poor soil and the effects of turpentine, evidence of which was present on all active roost trees. These turpentine scars may provide an avenue for infection by red-heart fungus (*Fomes pini*), usually associated with Red-cockaded Woodpecker roost trees.

Table 2 shows the percentage of seven habitat types within the range of the three clans and the percentages of foraging time spent in each type during the tracking period. The roosting site was considered separately because it was utilized at a different rate than other areas of longleaf pine flatwoods. The pine flatwoods was the habitat type most frequently used, with 82% of the foraging time spent in these habitats. Within the flatwoods habitat longleaf pine flatwoods was utilized most at 38.2%; slash and pondpine flatwoods were used 24.2% and 19.6% of the time respectively. Slash pine plantations and borders of flatwoods ponds were used to a much lower extent at 9.4 and 2.2% respectively. Extensive feeding in the colony area was observed only during periods of adverse weather such as on 7 November. Of 76 specific foraging encounters recorded, 22 (29.0%) were in living longleaf pines, 19

(25.0%) were in dying or dead longleaf pines, 22 (29.0%) were in living slash pines, 8 (10.5%) were in pond pines, and 1 (1.3%) was a bird feeding on wax myrtle (*Myrica cerifera*) berries.

#### DISCUSSION

Previous range size estimates of Red-cockaded Woodpecker have varied with season of study. Crosby (1971) reported a range of 17.2 ha for a clan of two birds studied for 4 days between March and June in a longleaf pine flatwoods community. During a July and September study of an 8-bird clan (5 adults and 3 juveniles) in mixed habitat, Baker (1971) detected a maximum range of 65.6 ha. Skorupa and McFarlane (1976) showed an average summer-to-winter increase in maximum foraging range of 54.5%, from 26.8 to 57.1 ha for 2 clans, 1 of 2 adults and a second clan consisting of 2 adults and 2 juveniles (juveniles were not present during winter period). The average fall range size determined by this study was 69.8 ha or 20.6 ha per bird. Though this is larger than the clan range reported from Crosby's spring study and Baker's summer-early fall study, it is smaller than the maximum, per bird winter range reported by Skrouper and McFarlane. Aside from seasonal variation, some discrepancies in range are no doubt the result of range conditions, survey technique, and individual clan variation.

Range and habitat utilization estimates for this study were based primarily on complete dawn-to-dusk tracking. Many previous investigations have relied on partial days of observation. While it is not proved that whole day observations are more informative than parts of several days, plainly if partial observations do not include the period when birds reach their farthest point from the roost (mid-morning to early afternoon) range and habitat needs will be more difficult to predict accurately.

Though avoidable difficulties were encountered with the instrumented male woodpecker from clan B, radio equipment otherwise provided a successful tool for studying the behavior of Red-cockaded Woodpeckers. The presence of the radio on a female might deter copulation, but otherwise this equipment could be used to study these birds year round. In this study the equipment was used to investigate the more orthodox parameters of woodpecker life history. Future studies with similar equipment using a more manipulative approach could investigate the behavior of a clan after the roost area had been clear cut or the response of Red-cockaded Woodpeckers to being relocated.

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