

BROAD-WINGED HAWK NESTING AND FOOD HABITS

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COMPARED to the literature on other species of raptors, relatively little has been published on the Broad-winged Hawk (*Buteo platypterus*). Although clutch size (Burns, 1911) and food habits (May, 1935, and others) are well-documented in this species, little information is available on fledging rates and nesting densities. Similarly, reports on Broad-wing ecology in the northern part of their breeding range are scarce. This paper describes the nesting density, productivity, and food habits of a breeding population of Broad-winged Hawks near Rochester, Alberta.

Central Alberta, the locale of this study, is on the northwestern fringe of the Broad-winged Hawk range in North America (Burns, 1911; May, 1935; Bent, 1937). Reptiles and amphibians, which are important components of this hawk's diet in more southern latitudes, are scarce in central Alberta. We were especially interested in the incidence of these prey items in the Broad-wing diet in our area, and in evaluating the possibility that their scarcity limits the northern distribution of this raptor.

STUDY AREAS

We studied Broad-winged Hawks on a 36-square-mile tract (the Town Area, Figure 1) surrounding the town of Rochester, during a population study of Great Horned Owls (*Bubo virginianus*) (Rusch et al., 1972) and Red-tailed Hawks (*Buteo jamaicensis*) (Luttich et al., 1970). In addition we conducted intensive searches for Broad-wing nests on three smaller tracts within the larger one. Numbers of nests found on these three areas, totaling 2,750 acres in size, we used to estimate the species' nesting density.

The topography of the Town Area is flat to gently rolling, except for the valleys of the Tawatinaw River and Stoney Creek to the east. About 28 percent is cultivated; the remainder is mostly aspen-dominated deciduous forest (41 percent), and scattered brushy areas, bogs, marshes, lakes, and ponds. For more detailed description of the area see Luttich et al. (1970).

METHODS

The searches for Broad-wing nests on the three small tracts were conducted in May and early June of each year, and employed two to six men who systematically traversed the areas at intervals of 100 feet or less. Also personnel associated with intensive population studies of snowshoe hares (*Lepus americanus*) and Ruffed Grouse (*Bonasa umbellus*) visited these tracts almost daily and reported sightings of raptors to us.

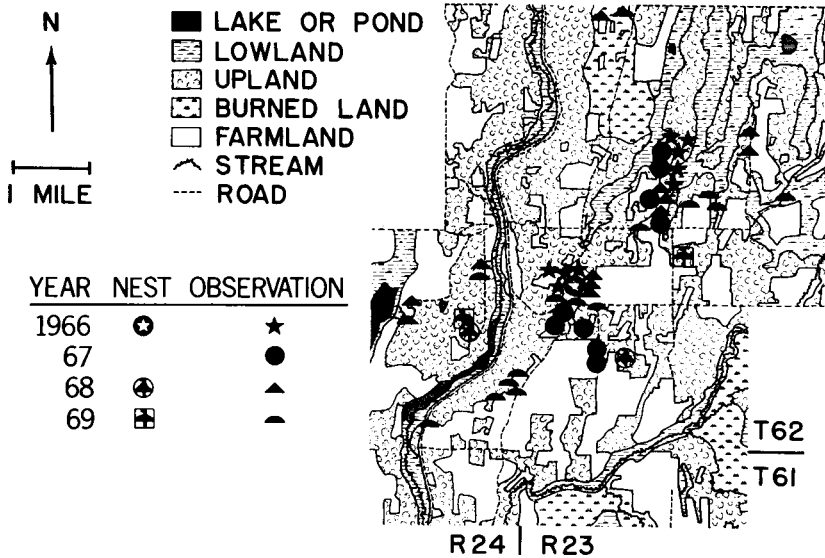


Figure 1. Locations of sightings and nests of Broad-winged Hawks on the 36-square-mile Town Area.

The remainder of the Town Area was not systematically searched from the ground, but we traversed most of the forested sections several times on foot. In addition six systematic searches from helicopters in the winters of 1966-68 located most of the large raptor nests used by Great Horned Owls and Red-tailed Hawks (Luttich et al., 1970) and many smaller nests suitable for use by Broad-winged Hawks. We checked all nests for nesting activity of raptors each spring.

We recorded all sightings of Broad-wings on the Town Area. We climbed to active nests every 1 or 2 weeks. Our estimates of clutch size are the maximum numbers of eggs observed. We estimated hatching dates by presence of pipping eggs or backdating from approximate ages of recently hatched young. Approximate ages of young Broad-winged Hawks were determined from weight curves for two young we obtained in 1968.

Food habits data were obtained by tethering four 3- to 4-week-old Broad-winged Hawks at the base of two nest trees, in the manner described by Errington (1932). We visited tethered hawks once or twice each day for 17-30 days. At each visit we weighed the young, collected regurgitated pellets and remains of prey, and recorded and weighed fresh prey items present.

Errington and Breckenridge (1938) and others have discussed the techniques and difficulties of analysis of pellets from *Buteo* hawks. Fortunately 117 of the 190 prey items fed to the tethered young Broad-wings were identified from fresh carcasses or remains left at the tethering site. Only 73 prey were identified from hair, bones, or feathers found in 111 pellets. As the species composition of these prey was essentially the same as that determined from the carcasses or remains of prey, we combined the two sets of data. Prey numbers are minimum, as we took special care to avoid counting an item in remains and again in a pellet.

TABLE 1
 NUMBERS AND PRODUCTIVITY OF BROAD-WINGED HAWKS ON
 A 36-SQUARE-MILE AREA NEAR ROCHESTER, ALBERTA

Year	Number			
	Estimated number of resident pairs ¹	Known active nests	Eggs per nest	4-week-old young per nest
1966	2	1	2.0	2.0
1967	2	0	—	—
1968	4	2	3.0	2.5
1969	4	2	2.0	2.0

¹ Estimated numbers of pairs are derived from distribution of sightings and nests plotted in Figure 1.

We calculated relative percentage frequency of each species in the diet of young Broad-wings on the basis of total numbers of prey identified. Relative percentage biomass was calculated from total weights of all prey. We used actual weights of fresh prey or averages of weights from various published records or other studies at Rochester.

RESULTS

We located one pair of Broad-winged Hawks nesting on the three small study tracts in 1966 and 1968, and two pairs in 1969. In addition, in 1968 we found one pair of Broad-wings nesting outside the small areas, but within the larger Town Area (Figure 1). We found no nests in 1967.

The observations plotted in Figure 1 suggest that some Broad-winged Hawks on the Town Area did not nest or that the nests were not found. As approximately one-eighth of the Town Area was searched intensively, the actual number of Broad-wing pairs present on the area could have been about eight times the number of nests found. On the basis of the sightings plotted in Figure 1, we suspect that the number of pairs was four or less in any one year (Table 1). We also observed raptors and searched for nests on an adjacent 26-square-mile area southwest of Rochester. About 64 percent of this area was in farmland and no Broad-wings were recorded there. Within the more heavily forested Town Area (28 percent farmland), most Broad-wings were sighted in or adjacent to large blocks of forest cover (Figure 1).

Of the five nests we examined, three contained two eggs each and two contained three eggs each. All 12 eggs hatched and all but one of the young hawks, from a clutch of three eggs, survived to 4 weeks of age. Of these 11 young Broad-wings 10 also survived to fledging, in-

TABLE 2
FOOD HABITS OF NESTLING BROAD-WINGED HAWKS

Prey species ¹	Percent frequency			Percent biomass		
	1966	1968	Total	1966	1968	Total
Mammals						
Snowshoe hare	3	7	5	23	24	24
Red squirrel	1	0	1	5	0	2
Least chipmunk	2	0	1	4	0	1
Meadow vole	18	20	19	18	10	12
Red-backed vole	36	12	24	28	5	12
Jumping mouse	6	2	4	3	1	2
Deer mouse	1	12	6	1	4	3
Cinerous shrew	5	0	2	tr ²	0	tr
TOTAL MAMMALS	72	53	62	82	44	56
Birds						
Ruffed Grouse	0	8	4	0	42	28
Blue Jay	1	0	1	1	0	tr
Rose-breasted Grosbeak	1	0	1	1	0	tr
Fox Sparrow	1	0	1	1	0	tr
White-throated Sparrow	2	1	2	1	tr	tr
Ovenbird	1	0	1	1	0	tr
Warblers	3	0	2	1	0	tr
Unidentified small birds	15	16	15	13	7	9
TOTAL BIRDS	24	25	27	19	49	38
Amphibians						
Leopard frog	1	0	1	tr	0	tr
Wood frog	1	4	2	tr	tr	tr
Toad	0	13	6	0	7	4
TOTAL AMPHIBIANS	2	17	9	1	7	5
Insects						
Grasshopper	0	4	2	0	tr	tr
Sample ³	87	83	190	2923	5611	8534

¹ Scientific names not mentioned in the text are *Tamiasciurus hudsonicus*, *Eutamias minimus*, *Zapus hudsonius*, *Cyanocitta cristata*, *Phenicticus ludovicianus*, *Passerella iliaca*, *Zonotrichia albicollis*, *Sciurus aurocapillus*, *Rana* spp., and *Bufo cognatus*.

² tr = trace; 0.5 percent or less.

³ Total numbers of prey individuals and total grams of biomass.

cluding the 4 that were tethered. The mean hatching date for these five nests was 2 July.

Table 2 summarizes the foods of four young hawks tethered at two nests. On the average, Ruffed Grouse formed the largest component of the Broad-wing diet, though no grouse were found among the prey taken in 1966. Six of the seven grouse were juveniles averaging 300 g in weight and less than 9 weeks of age. Snowshoe hare ranked second in the young hawks' diet, constituting 23 percent of the diet biomass in 1966 and 24 percent in 1968. All nine of the hares identified among the prey were juveniles, averaging approximately 18 days in age.

Red-backed voles (*Clethrionomys gapperi*) and meadow voles (*Microtus*

pennsylvanicus) were the most numerous species in the diet, but ranked third and fourth in biomass provided to young hawks. We found no reptiles in the Broad-winged Hawk diets, and only 5 percent of the total diet biomass was amphibians.

DISCUSSION AND CONCLUSIONS

Broad-winged Hawks were less common at Rochester than Red-tailed Hawks (Luttich et al., 1970) or Great Horned Owls (Rusch et al., 1972). Broad-wing Hawks were probably the third or fourth most common raptor in the Rochester area, but their densities were low and they appeared to be minor components of the predator community. Our estimates of nesting density of Broad-wings at Rochester (2-4 pairs per township) are considerably lower than those mentioned by Burns (1911: 176-177) for some eastern states (18 pairs per township) in more typical Broad-wing habitat. The low density of Broad-wings at Rochester is probably not due to reduced production of young because survival rates of young were very high in our small samples, being approximately double those of young Red-tails (Luttich et al., 1970: 199) and Great Horned Owls (Rusch et al., 1972) on the same area. The distribution of our sightings of Broad-wings at Rochester, and their diets as well, support the general contention that this is primarily a forest species.

Burns (1911) gives the mean completion date of 37 clutches of Broad-winged Hawks collected in the "Canadian Zone" as 25 May. Clutch completion dates at Rochester, which is on the extreme north-west fringe of the reported range for this raptor, averaged 13 days later.

The high incidence of Ruffed Grouse in the diet of young Broad-wings at Rochester is surprising since Burns (1911), May (1935), McAtee (1935), and Errington and Breckenridge (1938) report few birds of any kind, and no gallinaceous birds, in stomachs of these raptors.

Information on age ratios of hares and species ratios of mice in raptor diets suggests a minimum of competition for food resources among the various species of raptors at Rochester. Broad-winged Hawks preyed on young hares only. On the other hand Red-tailed Hawks took hares in approximately the same age ratios as existed in the hare populations (Luttich et al., 1970), and Great Horned Owls preyed almost exclusively on adult hares in spring and summer (Rusch et al., 1972). Red-backed voles were the mice we most commonly trapped near Rochester (Rusch et al., 1972), and Broad-wings took a greater number of these than either of the other two species of mice. Conversely, meadow voles and deer mice (*Peromyscus maniculatus*) were more frequently found in diets of Great Horned Owls, while meadow voles occurred more often in Red-tail diets.

Although stomachs of Broad-wings from lower latitudes contained high proportions of reptilian and amphibian prey, these formed a minor part of this hawk's diet at Rochester, and their low incidence in the diet probably reflects their scarcity in the Rochester area. In 4 years of field work at Rochester we have seen no reptiles and only a few amphibians. The food habits of Broad-winged Hawks near Rochester suggest that predation by these hawks is largely opportunistic in nature and that they are capable of utilizing a wide variety of prey forms. We suggest, therefore, that the species composition of prey does not limit the northern distribution of Broad-winged Hawks.

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SUMMARY

The number of nesting Broad-winged Hawks was between zero and two pairs on 2,750 acres near Rochester, Alberta, in the years 1966-69, and the number of resident pairs on a 36-square-mile area was probably between two and four. The 5 nests found contained a total of 12 eggs, all of which subsequently hatched. All but one of the young Broad-wings survived up to 4 weeks of age and 10 young survived to fledging. The average hatching date was 2 July.

The foods of four young Broad-winged Hawks at two nests were primarily Ruffed Grouse (28 percent biomass), young snowshoe hares (24 percent), red-backed voles (12 percent) and meadow voles (12 percent). Although reptiles and amphibians are important components of this hawk's diet in the United States, they are scarce in central Alberta and they formed a minor part (5 percent) of the Broad-wing's diet there.

The Broad-winged Hawk appears to be an opportunistic feeder near Rochester, and we suggest that its northern distribution is probably not limited by composition of the prey base or scarcity of any particular prey forms.

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