

FOOD HABITS OF RED-TAILED HAWKS IN BOULDER COUNTY, COLORADO

DANIEL T. BLUMSTEIN

The Red-tailed Hawk (*Buteo jamaicensis*) is a common raptor in Colorado, yet nothing is known about its food habits there. The objective of this study was to qualitatively document nesting season food-habits of Red-tailed Hawks in Boulder County, Colorado. Boulder County is located on the eastern slope of the Front Range of the Rocky Mountains in north central Colorado. The county contains 5 major ecosystem types defined along an altitudinal gradient: Plains Grassland, ≤ 1707 m; Lower Montane Forest, 1829-2348 m; Upper Montane Forest, 2439-2744 m; Subalpine Forest, 2835-3354 m; and Alpine Tundra, ≥ 3445 m (Marr 1964).

Nests were located early in 1985 by visiting areas where Red-tailed Hawks and their nests were historically known to occur. After a nest fledged young or was abandoned, pellets and other prey remains (e.g., carcasses, body parts, etc.) found in its "white-wash" zone were collected during a 1 hr search. One nest tree was climbed and pellets and other remains were removed. Skulls and other identifiable body parts were identified whenever found. From nests having ≤ 20 pellets, all pellets were analyzed for mammalian and avian prey; 20 randomly selected pellets were analyzed from nests with > 20 pellets. Five percent of the pellets that contained hair were re-analyzed to obtain a measure of precision (N consistently reidentified/ N reidentified); 82% of the prey items in these were re-identified consistently. No attempts were made to identify scales or chitinous remains in this study despite their presence in pellets.

Ten nests were located (including 1 nest used in 1984

but not in 1985) in 3 ecosystem types (Plains Grassland, 6 nests; Lower Montane Forest, 2 nests; Upper Montane Forest, 1 nest) and 1 nest in the ecotone between Plains Grassland and Lower Montane Forest. Pellets and remains were collected beneath 7 nests and within 1 nest. Of 380 pellets collected from 8 of the nests (range 2-147), 112 (29%) were analyzed for content. Pellets from all habitats with nests were represented in the analysis.

Twenty-six mammalian and 6 avian species were identified, including 6 species that, to my knowledge, had previously not been reported to be consumed by Red-tailed Hawks (Table 1). Prey species were those expected to be found near respective nests based on known mammalian and avian distributions in Colorado (Armstrong 1972; Kingery and Graul 1978). Hawks from Plains Grassland consumed 17 different species (14 mammals, 3 birds), ecotone hawks, 7 species (4 mammals, 3 birds), Lower Montane Forest hawks, 12 species (11 mammals, 1 bird), and Upper Montane Forest hawks, 9 species (8 mammals, 1 bird). However, these discrepancies may be an artifact of the numbers of nests studied in each ecosystem. Preferences of individual hawks and availability and vulnerability of prey around a given nest influence what individual Red-tailed Hawks consume (Errington and Breckenridge 1938; Beebe 1974; Adamcik et al. 1979).

ACKNOWLEDGMENTS

I thank D. M. Armstrong for advice, criticism, and encouragement while conducting this project. M. Figgs, S. Jones, N. Lederer, and many members of the Boulder

Table 1. Mammalian^a and avian^b species consumed by Red-tailed Hawks^{c,d} in Boulder County, Colorado.^e Species marked with an asterisk had never previously been reported to be consumed by Red-tailed Hawks.^f

SPECIES	HABITAT	N NESTS
Mammals		
Unidentified Shrews, <i>Sorex</i> spp.	UM	1
Black-tailed Jackrabbit, <i>Lepus californicus</i>	PG	1
Pika, <i>Ochotona princeps</i> *	LM, UM	2
Desert Cottontail, <i>Sylvilagus audubonii</i> ^c	PG	1
Nuttall's Cottontail, <i>Sylvilagus nuttallii</i>	PG	2
Unidentified rabbits, <i>Sylvilagus</i> spp.	PG	2
Beaver, <i>Castor canadensis</i> *	LM, UM	2
Black-tailed Prairie Dog, <i>Cynomys ludovicianus</i>	PG	3
Plains Pocket Gopher, <i>Geomys bursarius</i> *	PG	3
Yellow-bellied Marmot, <i>Marmota flaviventris</i>	E, LM, UM	3
Long-tailed Vole, <i>Microtus longicaudus</i> * ^c	LM	1
Prairie Vole, <i>Microtus ochrogaster</i> ^c	PG	2
Meadow Vole, <i>Microtus pennsylvanicus</i>	PG, E, LM, UM	6
Unidentified voles, <i>Microtus</i> spp.	PG, UM	3
Muskrat, <i>Ondatra zibethicus</i>	PG	2
Deer Mouse, <i>Peromyscus maniculatus</i>	PG	3
Unidentified mice, <i>Peromyscus</i> spp.	PG	1
Western Harvest Mouse, <i>Reithrodontomys megalotis</i>	PG	1
Plains Harvest Mouse, <i>Reithrodontomys montanus</i> *	PG	1
Abert's Squirrel, <i>Sciurus aberti</i>	E, LM	2
Fox Squirrel, <i>Sciurus niger</i>	PG	1
Unidentified squirrels, <i>Sciurus</i> spp.	E	1
Golden-mantled Ground Squirrel, <i>Spermophilus lateralis</i>	LM	1
Thirteen-lined Ground Squirrel, <i>Spermophilus tridecemlineatus</i>	PG	1
Least Chipmunk, <i>Tamias minimus</i>	UM	1
Uinta Chipmunk, <i>Tamias umbrinus</i> *	UM	1
Unidentified chipmunks, <i>Tamias</i> spp.	UM	1
Red Squirrel, <i>Tamiasciurus hudsonicus</i>	LM, UM	3
Northern Pocket Gopher, <i>Thomomys talpoides</i>	E, LM, UM	3
Western Jumping Mouse, <i>Zapus princeps</i>	LM	1
Striped Skunk, <i>Mephitis mephitis</i>	LM	1
Raccoon, <i>Procyon lotor</i>	PG	1
Birds		
Northern Flicker, <i>Colaptes auratus</i>	PG, LM, UM	3
Steller's Jay, <i>Cyanocitta stelleri</i>	E	1
Black-billed Magpie, <i>Pica pica</i>	E	1
Western Tanager, <i>Piranga ludoviciana</i>	PG	1
European Starling, <i>Sturnus vulgaris</i>	PG	3
American Robin, <i>Turdus migratorius</i>	E	1

^a Mammal names follow Jones et al. 1982.

^b Bird names follow American Ornithologists' Union 1983.

^c Identified by skeletal remains only.

^d Six mammals were identified to genera only, and 5 of these (*Sylvilagus*, *Microtus*, *Peromyscus*, *Sciurus*, and *Tamias*) may overlap items identified to species.

^e Nest area habitats include the following major ecosystem types: Plains Grassland (PG); Plains Grassland-Lower Montane Forest ecotone (E); Lower Montane Forest (LM); Upper Montane Forest (UM).

^f Blumstein, unpubl. ms.

County Audubon Society and Boulder County Nature Association helped me locate nests. The City of Boulder Open Space and Mountain Park Rangers, and G. Craig of the Colorado Division of Wildlife, provided helpful information. R. Weiser and the Getmans allowed me access to their land and Red-tailed Hawk nests. R. Adams, B. Gilbert, S. Pederson, and J. Strauch helped identify pellet contents. D. M. Armstrong, D. L. Evans, B. Jakob, M. R. Lein, R. K. Murphy, and J. R. Parrish helped improve previous versions of this paper. I was supported by a UCD Graduate Fellowship during manuscript preparation.

LITERATURE CITED

- ADAMCIK, R. S., A. W. TODD AND L. B. KEITH. 1979. Demographic and dietary responses of Red-tailed Hawks during a snowshoe hare fluctuation. *Can. Field-Nat.* 93:16-27.
- AMERICAN ORNITHOLOGISTS' UNION. 1983. Check-list of North American birds, sixth ed. American Ornithologists' Union. 877 pp.
- ARMSTRONG, D. M. 1972. Distribution of mammals in Colorado. *Univ. Kansas Mus. Nat. Hist. Monogr. No. 3.* 415 pp.
- BEEBE, F. L. 1974. Field studies of the Falconiformes of British Columbia. *British Columbia Prov. Mus. Occas. Pap. No. 17.* 163 pp.
- ERRINGTON, P. L. AND W. J. BRECKENRIDGE. 1938. Food habits of buteo hawks in north-central United States. *Wilson Bull.* 50:113-121.
- JONES, J. K., JR., D. C. CARTER, H. H. GENOWAYS, R. S. HOFFMANN AND D. W. RICE. 1982. Revised checklist of North American mammals north of Mexico, 1982. *Texas Tech Univ. Occas. Papers No. 80.* 22 pp.
- KINGERY, H. E. AND W. D. GRAUL. 1978. Colorado bird distribution latilong study. Colorado Div. Wildl. 58 pp.
- MARR, J. W. 1964. The vegetation of the Boulder area. Pages 34-42. In H. G. Rodeck, ED. Natural history of the Boulder area. *Univ. of Colorado Mus. Leaflet No. 13.* 100 pp.
- Department of Environmental, Population, and Organismic Biology, University of Colorado, Boulder, CO 80309. Present address: Animal Behavior Graduate Group, % Department of Zoology, University of California, Davis, CA 95616.**

Received 18 October 1987; accepted 6 March 1989