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Robert B. Brua
1501 Wyatt Ave.
Stevens Point, WI 54481
715-341-8876

TERRITORY SIZE OF URBAN CHICKADEES

ROBERT B. BRUA, College of Natural Resources, University of Wisconsin - Stevens Point, Stevens Point, WI 54481.

Abstract: I determined the territory size of urban black-capped chickadees (Parus atricapillus) on Schmeeckle Reserve, Stevens Point, Wisconsin. During spring 1988 and 1989, 34 chickadees were color marked. Seven territories were mapped in 1988 and 5 in 1989. Territory size ranged from 0.78 - 1.3 hectares (ha), and averaged 1.0 ha in the former and 1.0 - 1.8 ha in the latter. Urban territory size was significantly smaller ($t = -13.99$, $p < 0.05$) than rural chickadee territory size.

The rapid growth of the human population and the resultant urbanization has destroyed wildlife habitat. Gavareski (1976) stated that it is imperative to understand the relationship between bird life and urban habitats due to the rapid expansion of urban and suburban development.

Studies have shown that as urbanization increases, bird species diversity decreases, but density increases (Batten 1972, Emlen 1974, Hohtola and Jarvinen 1977, Hohtola 1978, Taylor et al. 1987). House sparrow (Passer domesticus), rock dove (Columba livia), and European starling (Sturnus vulgaris) densities accounted for the largest proportional increases. In contrast, Gavareski (1976) reported that bird density and diversity declined as park sizes decreased and as vegetation

was modified due to urbanization.

Studies showing the effect of urbanization on bird life are in need (DeGraaf and Thomas 1973, Hohtola and Jarvinen 1977). Most studies have looked at bird communities, and there is a paucity of data on the effects of urbanization on territories of individual bird species. Beer et al. (1956) studied the minimum territory sizes of birds on various sized islands. They reported that as island size decreased the territory size also decreased. It is possible that urban developments may simulate islands where similar reductions in size of territories occur. In urban settings, Cauley (1973) reported reductions in territory size of cardinals (Cardinalis cardinalis) and blue jays (Cyanocitta cristata) and Howard (1973) reported similar results in robins (Turdus migratorius).

No information has been published on the territory size of urban black-capped chickadees. In this paper, I will report the results of a 2 year study on black-capped chickadee territoriality. My objectives were to: 1) determine the territory size of black-capped chickadees in an urban environment; 2) compare the territory size between urban and rural chickadees; and 3) compare the degree of territory overlap between years. I thank J. Hardin for his assistance in this study and R. Zimmerman for allowing me to use Schmeeckle Reserve for a study area.

STUDY AREA

The study was conducted on Schmeeckle Reserve within the city limits of Stevens Point, Wisconsin (Fig. 1). The Reserve is

unique in that it consists of approximately 76 ha of natural area surrounded by urban development. The Reserve serves as a storm water catchment basin (Szewczykowski 1988). It is bounded on the north by a large building complex and a golf course. Along the south border there are residence halls, parking lots, athletic fields, apartment buildings, and areas of active urban development. Along the west border are numerous businesses. Undeveloped land and private residences occur along the east border. Michigan Avenue transects the reserve and lies 150 m west of the banding station. For a more detailed description see UWCA (1977) and Szewczykowski (1988).

METHODS

Chickadees were captured using mist nets placed at bird feeders concentrated next to the visitor center. Three colored plastic leg bands and a numbered Fish and Wildlife Service aluminum band were placed on each chickadee in unique color combinations. Chickadees were sexed by wing chord (Glase 1973).

Locations of individuals were determined each year in April and May by using playback recordings while walking throughout the Reserve. The area or territories over which a pair would respond to a playback of song on a tape recorder (Dhondt 1966) were mapped using locations plotted on aerial photos and maps of the study area. This gave the most precise and rapid measure of territory size (Krebs 1971), but not all birds would respond to the tape recorder. Methods for determining the degree of overlap are described by Picman (1987).

Territory size for urban chickadees was determined by connecting the outermost locations in response to playback recordings and boundary disputes between chickadees. A dot grid method to compute area was used. Mean territory sizes of rural chickadees are based on Schroeder (1983). Mean values for territory sizes were compared statistically using a t-test (0.05 level) (Dietrich and Kearns 1983).

RESULTS AND DISCUSSION

During the study I color marked 34 chickadees. Nineteen of the 34 chickadees were recaptured or seen again. Seven territories were mapped in 1988 and territory size ranged from 0.78 - 1.3 ha and averaged 1.0 ha (Fig. 2 , Table 1). In 1989, 5 territories were mapped and territory size ranged from 1.0 - 1.8 ha and averaged 1.4 ha (Fig. 3, Table 2). When territory sizes were pooled between the 2 years the average was 1.2 ha. No territory holders from 1988 returned so territory tenacity and overlap could not be determined for those birds. Two marked birds that held territories in 1989 overlapped territories from the previous year. Chickadee Y/W overlapped 4 territories from 1988 and chickadee B/G overlapped 2 territories from the previous year.

Schroeder (1983) reported that rural chickadees required 2.4 ha for territory size in his HSI model. I compared this size with the mean territory size I determined for urban chickadees. In my study the pooled mean urban chickadee territory size of 1.2 ha was significantly smaller ($t = -13.99$, $p > 0.05$) than that of rural chickadees. This difference in territory size was surprising since

the study area is large and primarily forested. Gavareski (1976) compared a large urban forest with little or no vegetative modification (such as Schmeeckle Reserve in the last decade) and a control area (native forest) and found no differences between bird diversity and density. Such a situation may exist at Schmeeckle Reserve.

Cauley (1973) and Howard (1973) found similar differences in territory sizes of the species they studied. Cauley (1973) concluded that the reductions in territory size were due to an abundance of water and supplemental food. Burr and Jones (1968) determined that the decrease in breeding bird diversity was a result of parkland management coupled with heavy human use. These factors might influence territory size because there is an abundance of water from natural seeps, ponds, and the university lake and food at feeders placed at the Reserve visitor center. Human activity is probably not a factor, because chickadees are quite adaptable to human activity (J. Hardin pers. comm.). Stefanski (1967) found that territory size varied with reproductive state; prenesting, nest-building, egg-laying, incubation, nestling, and fledgling periods. Since most of these territories were mapped during egg-laying, I compared the pooled mean territory size I determined with the territory size (0.97 ha) Stefanski determined for chickadees during egg-laying. In my study the territory size of 1.2 ha was slightly larger ($t = 2.28$, $p < 0.05$) than found by Stefanski. The cause in the difference of territory size in this study is probably due to the timing of territory mapping.

LITERATURE CITED

Batten, L. A. 1972. Breeding bird species diversity in relation to increasing urbanization. Bird Study 19:157-166.

Beer, J. R., L. D. Frenzel, and N. Hansen. 1952. Minimum space requirements of some nesting passerine birds. Wilson Bull. 68:200-209.

Burr, R. M., and R. E. Jones. 1968. The influence of parkland habitat management on birds in Delaware. Trans. N. Am. Wildl. Nat. Res. Conf. 33:209-306.

Cauley, D. L. 1973. Urban habitat requirements of four wildlife species. Pages 143-147 in J. H. Noyes and D. R. Progulske eds. Wildlife in an urbanizing environment. Univ. Massachusetts, Amherst.

DeGraaf, R. M., and J. W. Thomas. 1973. A strategy for wildlife research in urban areas. Pages 53-56 in J. H. Noyes and D. R. Porgulske eds. Wildlife in an urbanizing environment. Univ. Massachusetts, Amherst.

Dhondt, A. A. 1966. A method to establish the boudaries of bird territories. Le Gerfault 56:404-408.

Dietrich II, F. H., and T. J. Kearns. 1983. Basic statistics: an inferential approach. Dellen Publ. Co. San Fransisco and Santa Clara, California. 731pp.

Emlen, J. T. 1974. An urban bird community in Tuscon, Arizona: derivation, structure, regulation. Condor 76:184-197.

Gavareski, C. A. 1976. Relation of park size and vegetation to urban bird populations in Seattle, Washington. Condor 78:375-382.

Glase, J. C. 1973. Ecology and social organization in the Black-capped Chickadee. Living Bird 14:235-267.

Hohtola, E. 1978. Different changes in bird community structure with urbanisation: a study in Central Finland. Ornis. Scand. 9:94-99.

_____., and O. Jarvinen. 1977. Quantitative composition of the urban bird community in Tornio, Northen Finland. Bird Study 24:179-185.

Howard, D. V. 1973. Urban robins: a population study. Pages 67-75 in J. H. Noyes and D. R. Progulske eds. Wildlife in an urbanizing environment. Univ. Massachusetts, Amherst.

Krebs, J. R. 1971. Territory and breeding density in the great tit, (Parus major). Ecology 52:2-22.

Picman, J. 1987. Territory establishment, size, and tenacity by male red-winged blackbirds. Auk 104:405-412.

Stefanski, R. 1967. utilization of breeding territory in the Black-capped Chickadee. Condor 69:259-267.

Szewczykowski, P. M. 1988. Urban impacts on ground water quality and flow characteristics in Schmeekle Reserve. M.S. Thesis, Univ. Wisconsin - Stevens Point, Stevens Point. 106pp.

Taylor, K., J. H. Marchant, and R. A. Morgan. 1987. The breeding bird communities of woodlands in a new city. Acta OEcol. OEcol. Genera. 8:293-299.

University of Wisconsin Central Administration. 1977. Schmeeckle Reserve, Environmental Assessment 650.1.3. Univ. Wisconsin - Stevens Point, Stevens Point. 44pp.

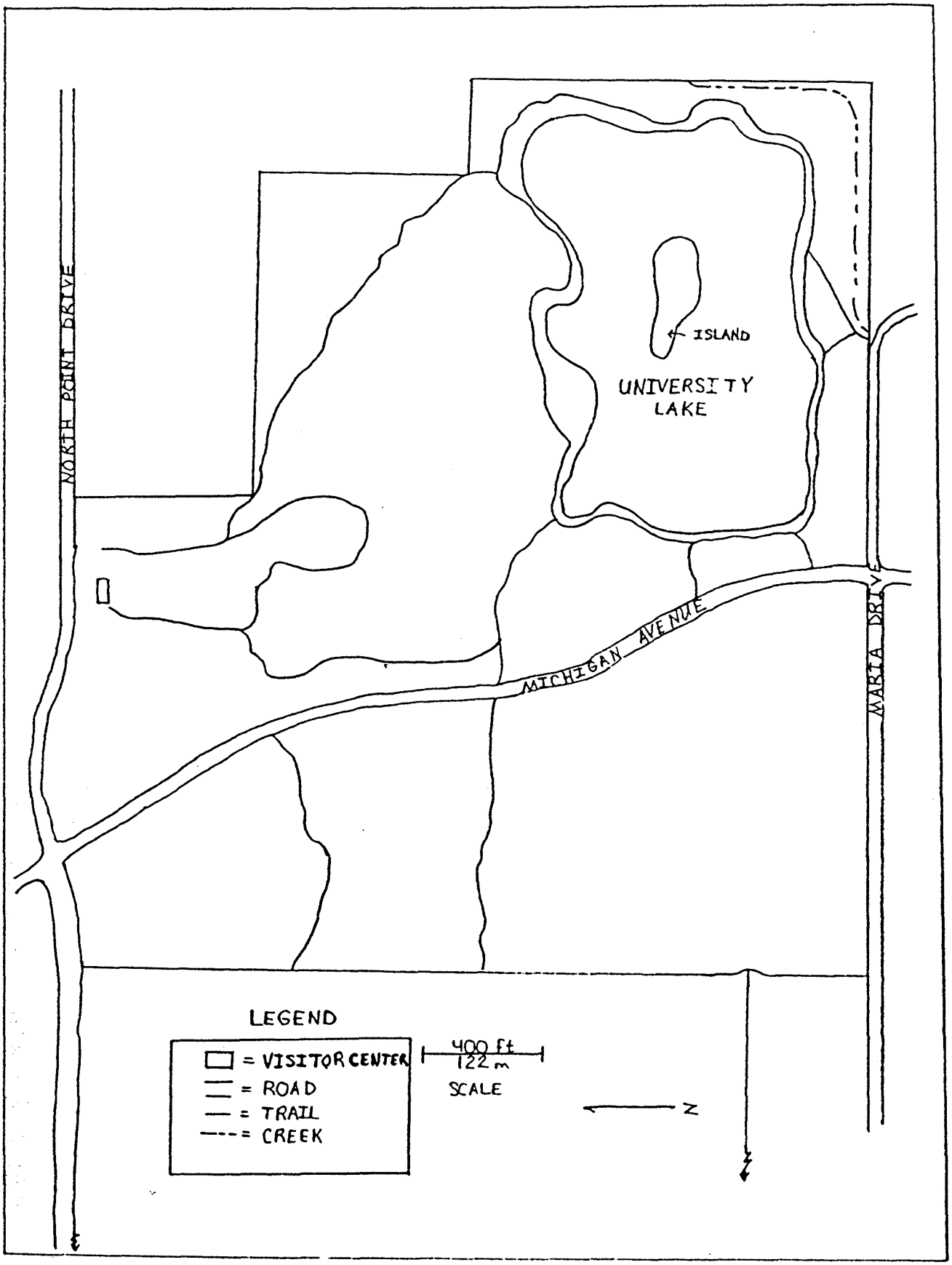

Fig. 1. Map of the Schmeeckle Reserve study area on the campus of the University of Wisconsin - Stevens Point, Stevens Point, WI.

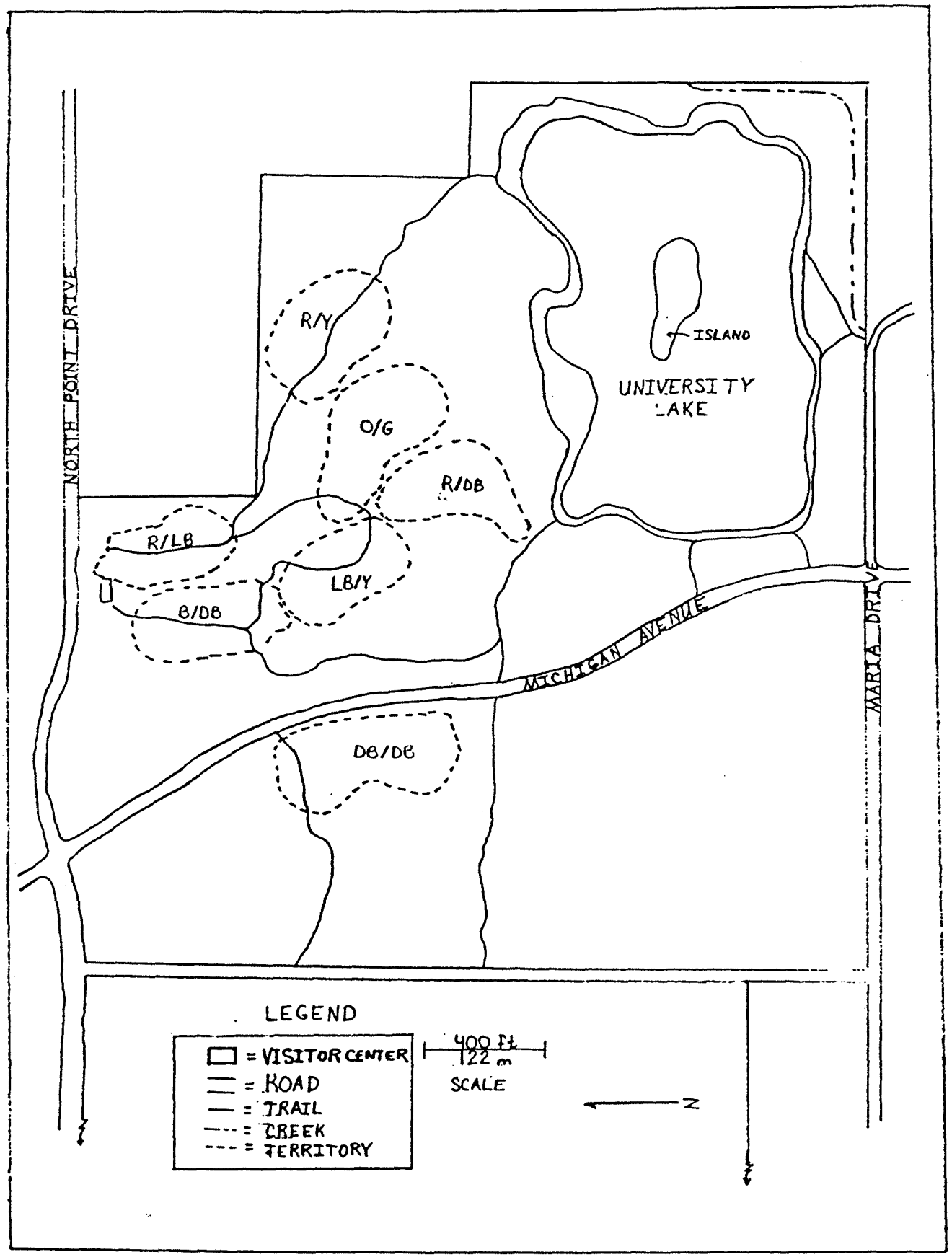

Fig. 2. Territories of 7 chickadees in 1988.

Table 1. Territory size of individual chickadees in 1988.

Chickadee	Territory Size (ha)	Sex
O/G a	1.14	M
R/Y	1.06	F
R/DB	0.94	M
LB/Y	0.90	F
R/LB	0.78	M
B/DB	0.98	M
DB/DB	1.31	M
Mean	1.00	

a. See appendix 1 for description of color combinations.

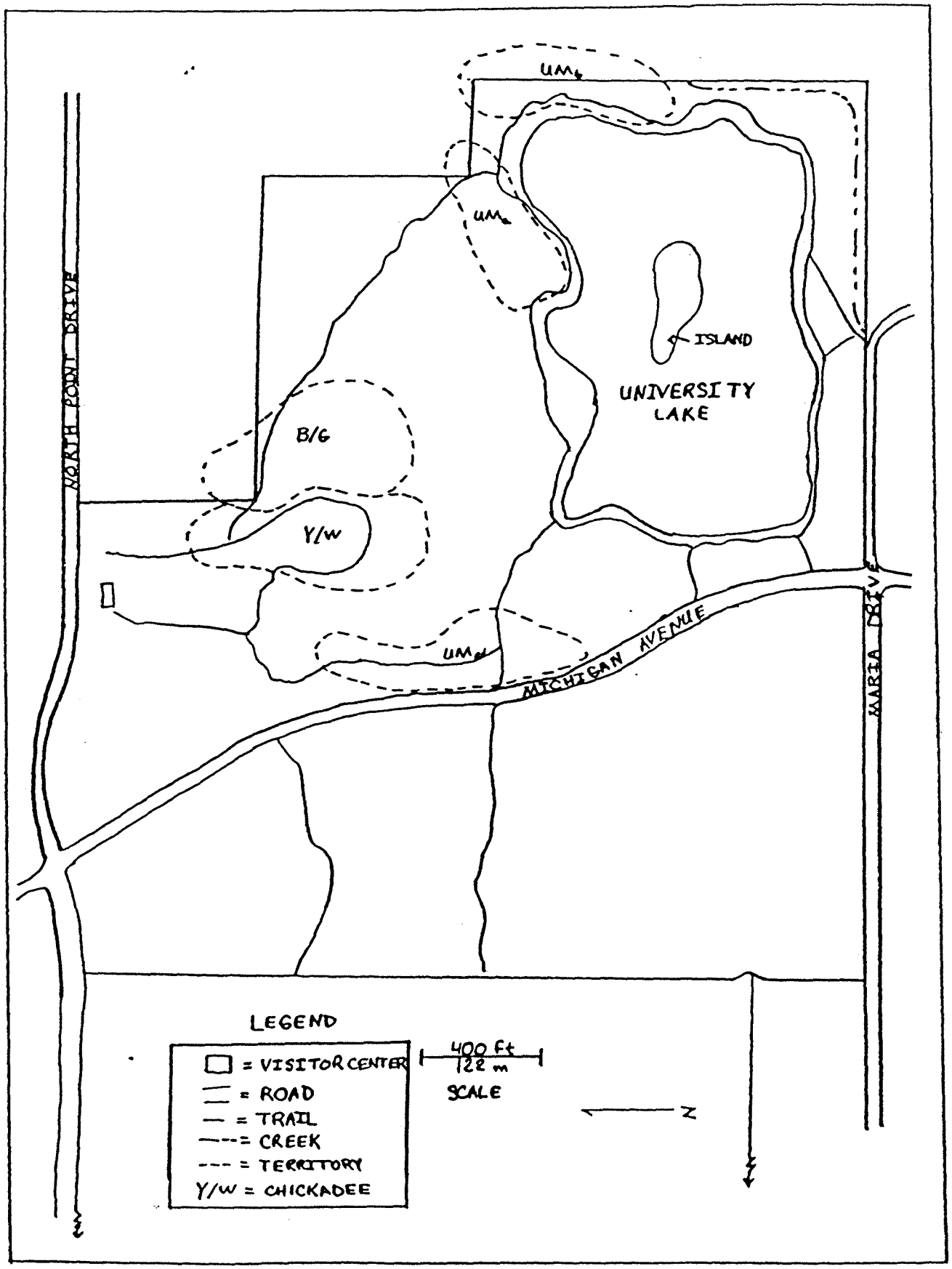

Fig. 3. Territories of 5 chickadees in 1989.

Table 2. Territory size of individual chickadees in 1989.

Chickadee	Territory size (ha)	Sex
Y/W	1.67	M
B/G	1.79	F
UM (RD) a	1.26	U
UM (A) b	1.02	U
UM (B) c	1.22	U
Mean	1.39	

a. Unmarked chickadee along Michigan Avenue (see fig. 3).
b. Unmarked chickadee A (see fig. 3).
c. Unmarked chickadee B (see fig. 3).

Appendix 1. Description of abbreviated color band combinations.

R	=	RED
O	=	ORANGE
G	=	GREEN
B	=	BLACK
W	=	WHITE
Y	=	YELLOW
DB	=	DARK BLUE
LB	=	LIGHT BLUE