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# Using Two Survey Methods to Determine a Suburban Bird Population

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## INTRODUCTION

Meyers and Johnson (1978), in addressing the impact of land use and bird habitat, suggest that rapid human population growth in the south is causing large increases in neighborhood subdivisions and corresponding loss of forest bird habitat. Few studies have been completed on the effects of subdivisions on summer and winter bird communities in the south. Using bird banding, a year-round survey of the bird population in a Virginia piedmont suburban habitat was started in April 1986. Objectives included determination of the occurrence of bird species, determination of the seasonal behavior of these species, and examination of Freer's (1973) suggestion that subspecies of the American Robin move into and away from the local area (i.e., exhibit movement) during the changing seasons.

## STUDY SITE AND OPERATION

### Station Location

The banding station is located on the western edge of the Virginia piedmont in Campbell County, 1¼ miles from the intersection of Route 460 and State Route 622.

### Station Description

Mist nets are placed in the back of a 75' x 125' lot. A row of eastern white pine (*Pinus strobus*) is on the north side of the lot. A sweetgum (*Liquidambar styraciflua*), several red maple (*Acer rubrum*), an eastern redbud (*Cercis canadensis*), and two flowering dogwood (*Cornus florida*) are located on the lot, with ornamental bushes near the house and along the sides of the lot. The trees and bushes were placed after 1965. During the fall, winter, and spring seasons, bird feeders containing sunflower, mixed wildbird, and thistle seeds are erected on the north side of the lot. Directly behind the lot is a field with a shopping center on its northeast corner. A two-acre horse farm and a church border the east side. The remainder of the field is bordered with houses on the west, northwest, and south sides. The grassy portions of the field are mowed randomly when the grass reaches approximately three feet or more in height.

### Station Operation

Strong winds, extreme temperatures, precipitation, in addition to work and family responsibilities prevented the mist nets from being opened on a regular schedule. Station operation averaged 6.8 banding days/month and banding operations averaged 48.4 hours/month over sixty months. Mist nets were opened and closed randomly between dawn and dusk but were not opened at night. Generally, only one net was opened, but occasionally four were used. Each 12-meter, 1-1¼" mesh nylon mist net had four trammels. Nets were checked for captures every 15 to 30 minutes. After the netted bird was banded, the "unflattened" chord was measured to the nearest millimeter using a rule fitted with an end-stop. The bird was also aged and sexed before release.

There was a large population of Gray Squirrels (*Sciurus carolinensis*). A live trap was used to capture the squirrels, which were later released unharmed. Trapped birds were banded on 56 days. The hours the live trap was opened and closed were not recorded. Any calculation of indices based upon net hours is complicated by the trapped birds that were banded.

## RESULTS

Table 1 lists 60 months of station data. Table 2 lists only the bird species detected by both survey methods. Table 3 lists birds detected only by a mist net survey method. Table 4 lists birds detected only by an informal field observation survey method (discussed below).

## DISCUSSION

### Strengths and weaknesses of the mist net survey method

Karr (1981) listed the following advantages for using mist nets to survey bird populations:

1. to reduce variability in data (when compared to procedures which depend on extensive experience with sight and sound identification or judgment in compilation and analysis of field data);

2. to collect a wealth of data quickly;

3. to use between seasons and also to use among years to determine patterns in avian population; and

4. to differentiate how a bird species uses subtly different habitat types in small geographic areas.

Karr cited two problem areas:

1. variability of data by placement of mist nets, and

2. the reduced value of the mist net method due to inclement weather (periods of rain and high wind).

He cautioned that capture rate (number of captured birds/100 net hours) do not equal a measure of absolute density of population. Karr mentions that the mist net procedure is being used more and more widely as an ornithological tool on a year-round basis. Robbins (1978) noted that :

1. the capture/recapture method permits counts of females and young in addition to singing males;

2. permits comparisons with both the mapping and point count methods of survey;

3. is extremely useful during migration periods; and

4. can be used to give additional information about daily range and habitat use by an individual bird.

He suggested that use of mist nets is neither an efficient nor highly accurate way of measuring entire breeding bird populations in forest habitat.

#### ***Factors affecting mist net capture of birds at station***

1. Mourning Doves, American Robins, Sharp-shinned Hawks, Common Grackles, European Starlings, and Brown Thrashers exhibited strong wing activity and often escaped from a shelf, lowering the number of captures.

2. Neighborhood pets created problems. Dogs ran through the nets leaving holes. Cats killed netted birds. Free roaming pets required continuous monitoring to protect captives. Sudden appearances of pets drove birds away from or into a mist net, affecting capture rates.

3. On two occasions, Sharp-shinned Hawks were captured in the net and banded. Hawks escaped from the nets on three occasions. Hawks reduced the local bird community by predation and influenced capture rates by either driving birds into or away from the net.

4. Flocking and irruptions of birds occurred at the station. Hansrote and Hansrote (1990) documented a major irruption of Pine Siskins. The effect of large numbers of one bird species at the station made interpretation of annual population indices impossible without correcting for these large anomalies.

5. Karr's (1981) statement that net placement is critical for capturing birds was supported by our experience. Captures declined after three consecutive days of banding. Nets were moved or banding temporarily stopped to overcome a lower rate of capture.

The mist net survey method contributed bird population data for suburban habitat in spite of the above unexpected influences on the rate of capture.

#### ***Annual rate of detection of new species of birds***

Forty-seven bird species were banded in 60 months. As shown below, the capture rate of new species declined from 28 in 1986 to zero in 1991, the years during which the banding station was in operation.

Years	1986	1987	1988	1989	1990	1991
New Species	28	4	7	6	2	0

In a suburban habitat, the majority (96%) of the bird species banded were detected within four years. The decrease in the number of new species captured suggests mist net use is limited as a survey method for a suburban bird community.

#### **EFFECTIVENESS OF MIST NETS AS A SURVEY METHOD**

##### ***Comparison with an informal survey method***

To date, no other long-term bird population study has been conducted in Campbell County, Virginia. Fortunately, an informal field observations survey method was being used by M. Hansrote to monitor bird species within the yard. This method uses sight and sound to identify birds in a volume of space from the ground to a height as far as 10 X 40 binoculars can aid the user. Observations were made at random times throughout the day. Since this was an informal study, hours were not recorded for the daily observations. In spite of these limitations, this informal field observation survey method was used for a comparison because it was carried out at the banding station site over part of the time when the mist net survey method was in operation. In 791 days, 76 bird species were identified

during the period 1 April 1986 to 30 April 1989 using the field observation survey method.

### ***Effectiveness of detection of total number of bird species***

The informal field observation census method (76 bird species seen in three years) was more effective than the mist net method (47 bird species banded in five years).

### ***Effectiveness of detection of permanent resident bird species***

The same 40 species (Table 2) were detected by both methods. In addition, the Ruby-throated Hummingbird was detected by both methods but not banded. Twenty of these species fit Freer's (1973) classification as permanent residents for this geographic location. An additional seven bird species (Table 3) detected by mist net capture included no permanent resident. The informal field observation survey method detected 35 additional bird species including 11 permanent residents (Table 4). The informal field observation survey method (31 species) was more effective than the mist net method (20 species) for detection of permanent resident birds.

### ***Explanation for lower mist net detection of permanent resident bird species***

Mist net captures are limited by the dimensions of the nets and their placement. These limitations can be seen if the additional 35 bird species detected during the field observation survey are examined. These species can be separated into types (see Table 4) based upon bird behavior and characteristics which do not lend themselves to capture with a mist net. This principle is illustrated as follows: birds flying too high to encounter a net; birds heard and seen that never came into the net area; birds that miss the net; birds that forage too high to be captured; and birds heard when the nets were not opened at night.

### ***Results of the comparison***

A total of 83 bird species found in a Virginia piedmont suburban habitat was compiled by combining results from two survey methods (sum of Tables 2, 3, and 4, plus the Ruby-throated Hummingbird). Forty bird species were found common to both survey methods.

## **CONCLUSIONS AND SUMMARY**

1. A list of 83 bird species found in a Virginia piedmont suburban habitat was compiled by combining the results from two survey methods.

2. Comparison of two methods of survey show an informal field observation survey method detected more bird species (76) than the mist net method (47). More permanent resident bird species (31 versus 20) were determined using the informal field observation survey method.

3. Mist net captures were used successfully as one survey method to aid in the compilation of a list of bird species found in a Virginia piedmont suburban habitat. There were 47 species banded; 20 of them are permanent resident bird species for this geographic location.

4. Use of the mist net survey method is more time consuming than the informal field census method.

5. Insufficient numbers of American Robins were captured to permit analysis of Freer's suggestion of seasonal movement.

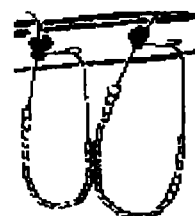
6. Future work will involve (a) examination of seasonal behavior of birds in a suburban habitat; and (b) completion of evaluation of recapture data for presence of migratory species, longevity, and male/female ratios for particular species of the banded birds.

## **ACKNOWLEDGMENT**

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**Table 1.** Banding station data, Campbell County, VA, April 1986 to April 1991.

	1986 <sup>1</sup>	1987 <sup>2</sup>	1988 <sup>2</sup>	1989 <sup>2</sup>	1990 <sup>2</sup>	1991 <sup>3</sup>	Total
Individuals Banded	352	483	1741	515	959	128	4178
Bird Species Banded	28	29	32	30	27	15	47 <sup>6</sup>
Net Hours	408	596	521	627	598	196	2946
Number of Net Days <sup>4</sup>	62	97	106	67	68	17	417
Number of Trap Days <sup>5</sup>	31	20	3	1	1	0	56

1. For 1986 = 6 April to 31 December.

2. For 1987, 1988, 1989, and 1990 = January to December.

3. For 1991 = 1 January through 4 April.

4. A "net day" is defined as any day or part of a day the banding station is open. It does not depend upon the number of nets open.

5. A "trap day" is defined as any day a bird is accidentally caught (and banded) in the live trap for squirrels.

6. Total species detected for 60 months.

**Table 2.** Forty (40) bird species detected by both survey methods.

Sharp-shinned Hawk* ( <i>Accipiter striatus</i> )	Gray Catbird ( <i>Dumetella carolinensis</i> )	Dark-eyed Junco ( <i>Junco hyemalis</i> )
Mourning Dove* ( <i>Zenaidura macroura</i> )	Northern Mockingbird* ( <i>Mimus polyglottos</i> )	Red-winged Blackbird* ( <i>Agelaius phoeniceus</i> )
Red-bellied Woodpecker* ( <i>Melanerpes carolinus</i> )	Brown Thrasher ( <i>Toxostoma rufum</i> )	Common Grackle* ( <i>Quiscalus quiscula</i> )
Yellow-bellied Sapsucker ( <i>Sphyrapicus varius</i> )	European Starling* ( <i>Sturnus vulgaris</i> )	Brown-headed Cowbird*+ ( <i>Molothrus ater</i> )
Downy Woodpecker* ( <i>Picoides pubescens</i> )	Cape May Warbler ( <i>Dendroica tigrina</i> )	Purple Finch ( <i>Carpodacus purpureus</i> )
Northern Flicker* ( <i>Colaptes auratus</i> )	Palm Warbler ( <i>Dendroica palmarum</i> )	House Finch ( <i>Carpodacus mexicanus</i> )
Blue Jay* ( <i>Cyanocitta cristata</i> )	Common Yellowthroat ( <i>Geothlypis trichas</i> )	Pine Siskin ( <i>Carduelis pinus</i> )
Carolina Chickadee* ( <i>Parus carolinensis</i> )	Northern Cardinal* ( <i>Cardinalis cardinalis</i> )	American Goldfinch*+ ( <i>Carduelis tristis</i> )
Tufted Titmouse* ( <i>Parus bicolor</i> )	Rufous-sided Towhee ( <i>Pipilo erythrophthalmus</i> )	Evening Grosbeak ( <i>Coccothraustes vespertinus</i> )
White-breasted Nuthatch* ( <i>Sitta carolinensis</i> )	Chipping Sparrow ( <i>Spizella passerina</i> )	House Sparrow* ( <i>Passer domesticus</i> )
Carolina Wren* ( <i>Thryothorus ludovicianus</i> )	Field Sparrow* ( <i>Spizella pusilla</i> )	
House Wren ( <i>Troglodytes aedon</i> )	Fox Sparrow ( <i>Passerella iliaca</i> )	Ruby-throated Hummingbird ( <i>Archilochus colubris</i> ) captured in net but not banded.
Golden-crowned Kinglet ( <i>Regulus satrapa</i> )	Song Sparrow*+ ( <i>Melospiza melodia</i> )	
Ruby-crowned Kinglet ( <i>Regulus calendula</i> )	White-throated Sparrow ( <i>Zonotrichia albicollis</i> )	* Any species Freer labelled permanent resident.
American Robin ( <i>Turdus migratorius</i> )	White-crowned Sparrow ( <i>Zonotrichia leucophrys</i> )	+ Any species Freer labelled a transient.

**Table 3.** Seven bird species detected only by mist net method.

Brown Creeper ( <i>Certhia americana</i> )	Tennessee Warbler ( <i>Vermivora peregrina</i> )
Winter Wren ( <i>Troglodytes troglodytes</i> )	Savannah Sparrow ( <i>Passerculus sandwichensis</i> )
Wood Thrush ( <i>Hylocichla mustelina</i> )	Lincoln's Sparrow ( <i>Melospiza lincolnii</i> )
	Swamp Sparrow ( <i>Melospiza georgiana</i> )

**Table 4.** Thirty Five (35) bird species detected only by field observation method.

**A. Birds Flying Over:**

Great Blue Heron  
(*Ardea herodias*)  
Green-backed Heron  
(*Butorides straitus*)  
Black Vulture\*  
(*Coragyps atratus*)  
Turkey Vulture\*  
(*Cathartes aura*)  
Osprey  
(*Pandion haliaetus*)  
Cooper's Hawk\*  
(*Accipiter cooperii*)  
Broad-winged Hawk  
(*Buteo platypterus*)  
Red-tailed Hawk\*  
(*Buteo jamaicensis*)  
Common Nighthawk  
(*Chordeiles minor*)  
Chimney Swift  
(*Chaetura pelagica*)  
Barn Swallow  
(*Hirundo rustica*)  
American Crow\*  
(*Corvus brachyrhynchos*)  
Cedar Waxwing  
(*Bombycilla cedrorum*)

**B. Field Birds:**

Northern Bobwhite\*  
(*Colinus virginianus*)  
Killdeer\*  
(*Charadrius vociferus*)  
Eastern Bluebird\*  
(*Sialia sialis*)  
Eastern Meadowlark\*  
(*Sturnella magna*)

**C. Migrants:**

Eastern Wood-Pewee  
(*Contopus virens*)  
Eastern Phoebe  
(*Sayornis phoebe*)  
Eastern Kingbird  
(*Tyrannus tyrannus*)  
Blue-gray Gnatcatcher  
(*Poliophtila caerulea*)  
White-eyed Vireo  
(*Vireo griseus*)  
Yellow-throated Vireo  
(*Vireo flavifrons*)  
Yellow Warbler  
(*Dendroica petechia*)  
Yellow-rumped Warbler  
(*Dendroica coronata*)  
Black-and-white Warbler  
(*Mniotilta varia*)  
Blackpoll Warbler  
(*Dendroica striata*)  
Indigo Bunting  
(*Passerina cyanea*)

**D. Ground Birds:**

Hermit Thrush  
(*Catharus guttatus*)  
Rusty Blackbird  
(*Euphagus carolinus*)



**E. Tree Birds:**

Hairy Woodpecker\*  
(*Picoides villosus*)  
Pileated Woodpecker  
(*Dryocopus pileatus*)  
Orchard Oriole  
(*Icterus spurius*)

**F. Night Birds:**

Barn Owl  
(*Tyto alba*)  
Great Horned Owl\*  
(*Bubo virginianus*)

Ruby-throated Hummingbird  
(*Archilochus colubris*) captured in net but not banded.

\* Any species Freer labelled permanent resident.

+ Any species Freer labelled a transient.

