BLUEBIRD NEST-BOX TRAILS IN ONTARIO AND THEIR USEFULNESS FOR BIOEFFECTS MONITORING OF AGRICULTURAL CHEMICALS

Martin K. McNicholl
William F. Read
D.V. (Chip) Weseloh

TECHNICAL REPORT SERIES No. 202
Ontario Region 1994
Canadian Wildlife Service

CANADA'S GREEN PLAN
LE PLAN VERT DU CANADA

TECHNICAL REPORT SERIES
CANADIAN WILDLIFE SERVICE

This series of reports, established in 1986, contains technical and scientific information from projects of the Canadian Wildilfe Service. The reports are intended to make available material that either is of interes to a limited audience or is too extensive to be accommodated in scientific journals or in existing CWS series.

Demand for these Technical Reports is usually confined to specialists in the fields concerned. Consequently, they are produced regionally and in small quantities; they can be obtained only from the address given on the back of the title page.

Technical Reports are available in CWS libraries and are listed with the DOBIS system in major scientific libraries accross Canada. They are printed in the official language chosen by the author to meet the language preference of the likely audience. **To determine whether there is significant demand for making the report available in the second official language, CWS invites users to specify their official language preference. Requests for Technical Reports in the second official language should be sent to the address on the back of the title page.**

SÉRIE DE RAPPORTS TECHNIQUES
DU SERVICE CANADIEN DE LA FAUNE

Cette série de rapports donnant des informations scientifiques et techniques sur les projets du Service canadien de la faune (SCF) a démarré en 1986. L'objet de ces rapports est de promouvoir la diffusion d'études s'adressant à un public restreint ou trop volumineuses pour paraître dans une revue scientique ou l'une des séries du SCF.

Ordinairmant, seuls les spécialistes des sujets traités demandent ces rapports techniques. Ces documents ne sont donc produits qu'à l'échelon régional et en quantités limitées; ils ne peuvent être obtenus qu'à l'adresse figurant au dos de la page titre. Cependant, leur numérotage est effectué à l'échelle nationale. La citation recommandée apparaît à la page titre.

Ces rapports se trouvent dans les bibliothèques du SCF et figurent aussi dans les listes du système de référence DOBIS utilisé dans les principales bibliothèques scientifiques du Canada. Ils sont publiés dans la langue officielle choisie par l'auteur en fonction du public visé. **En vue de déterminer si la demande est suffisamment inportante pour produire ces rapports dans la deuxième langue officielle, le SCF invite les usagers à lui indiquer leur langue officielle préférée. Il faut envoyer les demandes de rapports techniques dans la deuxième langue officielle à l'adresse indiquée au verso de la page titre.**

Published by Authority of the
Minister of Environment
Canadian Wildlife Service

Catalogue No. CW69-5/202E
ISBN No. 0-662-22151-6

Copies may be obtained from:
Canadian Wildlife Service
867 Lakeshore Road
Box 5050
Burlington Ontario L7R 4A6
Canada

BLUEBIRD NEST-BOX TRAILS IN ONTARIO AND THEIR USEFULNESS FOR BIOEFFECTS MONITORING OF AGRICULTURAL CHEMICALS

By Martin K. McNicholl[1], William F. Read[2], and D.V. (Chip) Weseloh[3].

[1] 4735 Canada Way, Burnaby, British Columbia V5G 1L3
[2] 2-165 Green Valley Drive, Kitchener, Ontario N2P 1K3
[3] Canadian Wildlife Service, Box 5050, Burlington, Ontario L7R 4A6

Introduction

L'aménagement de sites de nidification artificiels pour les oiseaux nichant dans des cavités, pour les merles-bleus (Sialia spp.) particulièrement, est depuis longtemps un passe-temps populaire, non seulement pour les naturalistes sérieux mais aussi pour de nombreux ornithologues amateurs occasionnels (Zeleny 1978, 1983). En Ontario, on offre aux oiseaux des nichoirs depuis au moins 1771, année où Humphrey Marten en a installés pour les Hirondelles bicolores (Iridoprocne bicolor) à Fort Albany et dans les environs, à la baie James (Baillie 1946; Allen 1951). On a maintes fois préconisé l'installation de nichoirs à titre d'activité de conservation (voir par exemple Hewitt 1914; Saunders 1914; Taverner 1919; Woodford 1957; Carrick 1960; Kelly 1967).

D'importantes recherches relatives à la conception de nichoirs adaptés à différentes espèces sont menées en Ontario (Carrick 1960; Lumsden 1986) et dans toute l'Amérique du Nord (Zeleny 1978, 1983). Ces dernières années, l'intérêt pour les projets d'aménagement de sites artificiels de nidification s'est rapidement accru, d'où la création de la North American Bluebird Society. Cet organisme se voue entièrement à des activités de conservation des oiseaux nichant dans des cavités (Zeleny 1983).

Par suite de l'évaluation réalisée par Risley (1981), le CSEMDC (Comité sur le statut des espèces menacées de disparition au Canada) a donné au Merle-bleu de l'Est (Sialia sialis) le statut d'espèce rare au Canada (Keith 1984). À l'échelle du continent, l'état de la population de Merles-bleus de l'Est est considéré «spécialement préoccupant» (Tate 1986). Les données du Recensement des oiseaux de Noël montrent que la population de cet oiseau a culminé dans les années 1940, pour ensuite décliner dans les années 1960 et 1970, durant lesquelles elle a connue des fluctuations occasionnelles (Andrews et Bock 1979). Par ailleurs, les données du Relevé des oiseaux nicheurs indiquent qu'il y a eu un déclin constant depuis les années 1960 (Robbins et al. 1986). En Ontario, on a signalé l'existence de déclins dès les années 1880 (Woodford 1957) ainsi que dans les années 1890 (Saunders 1891) et au début des années 1900 (Cooke 1913; Hewitt 1914; Taverner 1922), avec des fluctuations évidentes même à ces époques, tant en Ontario qu'ailleurs (Forbush 1905 ; Cooke 1913; Taverner 1922; Krug 1941; Devitt 1967; Dupree 1982). Selon Tate (1986), la population de Merles-bleus de l'Est est très faible en Ontario, mais certains indices récents laissent entendre qu'elle est en train de s'y rétablir (Foster 1987; Risley 1987; voir aussi la section sur les tendances des populations).

Bien que les prédateurs et les parasites aient sans nul doute contribué à réduire les effectifs localement (Woodford 1957; Zeleny 1970; Risley 1981, 1984; Roberts 1981; Jackson 1985; Foster 1987), les fluctuations naturelles semblent être plutôt liées aux forts taux de mortalité durant les hivers rigoureux (Cooke 1913; Taverner 1922; Musselman 1939; Pitts 1978, 1981, 1984; Andrews et Bock 1979; Anonyme 1979; Pinkowski 1979; Risley 1981, 1984). Des travaux visant à concevoir des abris qui pourraient réduire la mortalité hivernale ont été récemment menés (Tuttle 1987).

Les déclins à long terme des effectifs du Merle-bleu de l'Est ont largement été attribués aux activités humaines ou aux changements environnementaux qu'elles entraînent. Bien qu'en certains endroits de nombreux oiseaux peuvent avoir été tués directement (Taverner 1922), l'altération des habitats (Hewitt 1914; Woodford 1957; Prescott 1980; Pitts 1984; Lougheed et Lougheed 1986) et la concurrence d'espèces introduites nichant elles aussi dans des cavités (Woodford 1957; Prescott 1980; Zeleny 1978, 1983; Risley 1981) ont eu des effets plus étendus sur les populations de merles-bleus. Les nombreux circuits de nichoirs établis sur tout le continent visent à soustraire les oiseaux à ces facteurs, du moins partiellement.

On a aussi avancé que les contaminants chimiques pouvaient être une cause de ces déclins (Prescott 1980; Pitts 1984; Krueger 1988). De faibles concentrations de DDT et d'un de ses de métabolites, le DDE, ont été détectées dans les oeufs et dans les corps entiers de Merles-bleus azurés (Sialia currocoides). Ces concentrations étaient dans certains cas très faibles, comme celle de 0,06 partie par million (ppm; poids sec ou poids humide non spécifié) de DDE mesurée dans des oeufs trouvés au Colorado (Den 1985) et celle de 0,18 ppm dans des corps entiers d'oiseaux du Dakota du Sud (DeWeese in Den 1985). Dans une autre étude, on a mesuré une concentration moyenne de 5,29 ppm de DDT total avec ses métabolites un an après une application de ce produit dans le nord-est de l'Oregon et le nord de l'Idaho (Henry et al. 1977), alors que la concentration moyenne était de 1,67 ppm à 16 à 50 milles (80 kilomètres) de l'aire d'étude. Il semble que la plus forte concentration signalée dans des Merles-bleus azurés ait été de 7,83 ppm de DDE dans des corps entiers en Oregon, trois ans après l'application du produit (DeWeese in Den 1985). Dans l'État de New York, parmi 39 oiseaux morts par intoxication aux organochlorés, selon les examens post-mortem, il y avait un Merle-bleu azuré adulte femelle qui a été trouvé mort dans un verger de pommiers (Stone et Okoniewski 1988). Le cerveau de cet oiseau contenait des concentrations de 228 ppm de DDE, 31,4 ppm de DDT et 3,51 ppm de dieldrine.

Peu d'études visant à comparer le succès de nidification avant et après l'application des programmes de pulvérisation ont été réalisées (Bednarek et Davidson 1967). Des études visant à comparer le succès de la reproduction des merles-bleus dans des secteurs exposés à des pulvérisations à celui existant dans des secteurs témoins n'ont pu démontrer d'effets définis (Jaco et Hulse 1963; Thomas et McCluskey 1974; McCluskey et al. 1977). Dans une étude comparant le succès de l'éclosion et la proportion de jeunes ayant atteint l'âge de l'envol chez quatre espèces d'oiseaux nichant dans des cavités avant et après la pulvérisation de carbaryl au Massachusetts, Bednarek et Davidson (1967) n'ont observé aucune différence dans le succès de la nidification d'un petit échantillon de Merles-bleus de l'Est; cependant, de jeunes Hirondelles bicolores pourraient avoir été intoxiqués. Par ailleurs, Krueger (1988) a signalé au Texas plusieurs cas de mortalité de jeunes au nid qui ont coïncidé avec la pulvérisation de carbaryl à proximité. Dans le cadre d'un relevé d'un petit nombre de nichoirs en Alabama, Jaco et Hulse (1963) ont observé qu'un plus grand nombre de nichoirs étaient occupés par des Merles-bleus de l'Est dans une région où aucune pulvérisation n'avait été effectuée que dans une région semblable où divers produits chimiques avaient été pulvérisés; cependant, aucune différence dans le succès de nidification entre les deux régions n'a pu être établie avec certitude. Thomas et McCluskey (1974) et McCluskey et al. (1977) ont mesuré le nombre d'oeufs pondus, d'oeufs éclos et de jeunes ayant atteint l'âge de l'envol chez le Merle-bleu de l'Ouest, le Merle-bleu azuré et le Troglodyte familier (Troglodytes aedon) dans une région de l'Oregon où des pulvérisations de DDT avaient été effectuées et dans une région similaire où aucune pulvérisation n'avait été effectuée. En comparant les résultats des deux régions, ils n'ont observé dans les succès de la reproduction aucune différence qui aurait pu être attribuée au produit chimique.

Le Service canadien de la faune effectue depuis plusieurs années la surveillance d'une vaste gamme de contaminants chimiques dans la faune, surtout celle des écosystèmes aquatiques (recension dans Price 1977; Peakall et Bart 1983; Mineau et al. 1986; Noble et Elliott 1986; Norstrom 1986; Wren 1986). L'intérêt récent pour les pesticides et autres contaminants présents dans les écosystèmes terrestres a suscité la recherche d'une ou plusieurs espèces indicatrices appropriées. Les espèces d'oiseaux qui nichent dans des nichoirs pourraient être envisagées : elles sont relativement faciles à étudier et à manipuler et elles permettraient une participation aisée des bénévoles. En outre, plusieurs de ces espèces sont largement répandues dans la province.

Le présent rapport brosse un tableau des activités connues relatives aux circuits de nichoirs à merles-bleus en Ontario. Il présente aussi les résultats d'un relevé ontarien réalisé en 1987 sur l'utilisation des nichoirs par les merles-bleus. Enfin, on y examine la possibilité d'utiliser les nichoirs de merles-bleus dans la surveillance des effets des produits chimiques agricoles sur les composantes naturelles des écosystèmes modifiés par l'agriculture en Ontario.

Table of Contents

Introduction....3
Methods....5
Overview of Bluebird Nest-box Trails in Ontario....5
Geographic Survey....8
  Western Ontario....8
  Central Ontario....9
  Southern Ontario....10
Biological Parameters Concerning Eastern Bluebirds in Ontario....21
  Clutch Size....21
  Nesting Success in Ontario in 1987....21
  Causes of Nest loss....23
  Population Trends....24
Use of Boxes by Other Species....25
Usefulness of Bluebird Survey in Bioeffects Monitoring....25
Acknowledgements....27
Literature Cited....48
Appendix 1: 1987 Questionnaire Distributed by W. F. Read....62
Appendix 2: Summary of Next-box Trail Results Reported to William F. Read....64
Appendix 3: Addresses of Respondents to Bill Read's 1987 Survey....77
Appendix 4: Ontario Members of the North American Bluebird Society Who Were Not Participants in Read's Survey....82

List of Tables

1. Distribution and Objectives of Read's 1987 Ontario Nest-box Survey 28
2. Ontario data on First Brood Summary of North American Bluebird Society 28
3. Midwest (1980-1983) and Central (1984 ff.) Figures from North American Bluebird Society Nest-box Reports.....29
4. Number of Nests of Eastern Bluebirds Reported to the Ontario Nest Records Scheme.....30
5. Numbers of Eastern Bluebirds Banded in Ontario.....31
6. Numbers of Nest-box Trails Reported on Read Survey.....32
7. Results of Bluebird Trail at Chesley, Ontario 1936-1939 (Krug 1941)..32
8. Results from Trail of Leo A. Smith, Dufferin to Durham Counties.....33
9. Results of Winona, Ontario Bluebird Trail.....34
10. Results of Purpleville Nest-box Project.....34
11. Results of Bluebird Nest-box Project in the Oshawa-Lake Scugog Area..35
12. Early Results of Bluebird Nest-box Trail at Pike Lake, Victoria County.....35
13. Bluebird Project Results of Willow Beach Field Naturalists.....36
14. Trail Size in Comparison with Proportion of Trails Fledging Bluebirds.....37
15. Bluebird Fledging Rate in Comparison with Trail Size,1987.....37
16. Numbers of Bluebirds Fledged in Comparison with Number of Years of Trail Operation as of the End of the 1987 Season.....38
17. Bluebird Nesting Success in 1987 on Ontario Trails Reported to W. F. Read.....39
18. Causes of Nest Loss Reported on Read's Survey.....44
19. Reported Impressions of Bluebird Population Trends.....44

List of Figures

1A. Map of Ontario Bluebird Trails Reported to W. F. Read 1987 Survey: Northwestern Ontario.....45
1B. Map of Ontario Bluebird Trails Reported to W. F. Read 1987 Survey: Southwestern Ontario.....46
1C. Map of Ontario Bluebird Trails Reported to W. F. Read 1987 Survey: Eastern Ontario.....47

Introduction

The provision of artificial nest sites for hole-nesting birds, especially bluebirds (Sialia spp.) has long been a popular pastime, not only with serious naturalists, but also with large numbers of casual observers (Zeleny 1978, 1983). In Ontario nest boxes have been provided since at least 1771, when Humphrey Marten had them erected for Tree Swallows (Iridoprocne bicolor) both inside and outside of Fort Albany on James Bay (Baillie 1946; Allen 1951). Provision of such boxes has often been advocated as a conservation activity (e.g. Hewitt 1914; Saunders 1914; Taverner 1919; Woodford 1957; Carrick 1960; Kelly 1967).

Research on nest box design for particular species is extensive and ongoing in Ontario (Carrick 1960; Lumsden 1986) and throughout North America (Zeleny 1978, 1983). In recent years, interest in artificial nesting projects has grown rapidly and has resulted in the formation of the North American Bluebird Society. This organization is devoted entirely to conservation activities that favour hole-nesting birds (Zeleny 1983).

After a review by Risley (1981), the Eastern Bluebird (Sialia sialis) was classified as Rare in Canada by COSEWIC (the Committee on the Status of Endangered Wildlife in Canada) (Keith 1984). On a continental scale, the Eastern Bluebird is considered of "special concern" (Tate 1986). Christmas bird count data indicate a population peak in the 1940s, followed by a decline in the 1960s and 1970s, with occasional fluctuations during these years (Andrews and Bock 1979). Breeding Bird Survey data indicate a continuing decline since the 1960s (Robbins et al. 1986). In Ontario declines were reported as early as the 1880s (Woodford 1957), 1890s (Saunders 1891) and early 1900s (Cooke 1913; Hewitt 1914; Taverner 1922), with some fluctuations evident even then, both in Ontario and elsewhere (Forbush 1905; Cooke 1913; Taverner 1922; Krug 1941; Devitt 1967; Dupree 1982). Although Tate (1986) reported the Eastern Bluebird population as "greatly down" in Ontario, there are recent indications of a recovery in the province (Foster 1987; Risley 1987; and see Population Trends below).

Although predators and parasites have undoubtedly affected bluebird numbers locally (Woodford 1957; Zeleny 1970; Risley 1981, Roberts 1981; Jackson 1985; Foster 1987), natural fluctuations appear to result from high mortality rates during harsh winters (Cooke 1913; Taverner 1922; Musselman 1939; Pitts 1978, 1981, 1984; Andrews and Bock 1979; Anonymous 1979; Pinkowski 1979; Risley 1981, 1984). There have been recent efforts to design winter roost boxes that may reduce such mortality (Tuttle 1987).

Prolonged declines in Eastern Bluebird numbers have largely been attributed to humans or human-induced changes. While direct killing of birds may have been locally significant (Taverner 1922), changes in habitat (Hewitt 1914; Woodford 1957; Prescott 1980; Pitts 1984; Lougheed and Lougheed 1986) and competition from introduced hole-nesting species (Woodford 1957; Prescott 1980; Zeleny 1978, 1983; Risley 1981) have had more widespread effects on bluebird numbers. The many nest box trails established around the continent are designed to counteract these factors.

Chemical contaminants have also been suggested as causes of declines (Prescott 1980; Pitts 1984; Krueger 1988). Low levels of DDT and its metabolite DDE have been found in eggs and whole bodies of Mountain Bluebirds (Sialia currucoides). These levels ranged from as low as 0.06 parts per million (ppm: wet or dry weight not stated) DDE from eggs found in Colorado (Den 1985) and 0.18 ppm in whole bodies found in South Dakota (DeWeese in Den 1985) to an average of 5.29 ppm total DDT and its metabolites one year after treatment in northeastern Oregon and northern Idaho (Henny et al. 1977),with an average of 1.67 ppm 16 to 50 miles (80 kilometres) away from the study area. The highest level recorded in Mountain Bluebirds appears to have been 7.83 ppm DDE in whole bodies in Oregon three years after treatment (DeWeese in Den 1985). Of 39 birds diagnosed as having died from organochlorine poisoning during post-mortem examinations in New York, one was an adult female Eastern Bluebird found dead in an apple orchard (Stone and Okoniewski 1988). This bird's brain contained levels of 228 ppm DDE, 31.4 ppm DDT, and 3.51 ppm dieldrin.

There have been few studies conducted comparing nest success of bluebirds before and after spray programs (Bednarek and Davidson 1967). Studies comparing the reproductive success of bluebirds on sprayed areas with that of control areas have not shown definite effects (Jaco and Hulse 1963; Thomas and McCluskey 1974; McCluskey et al. 1977). In a comparison of hatching and fledging success of four species of hole-nesting birds before and after carbaryl spraying in Massachusetts, Bednarek and Davidson (1967) found that there was no difference in nesting success of a small sample of Eastern Bluebirds. However, they did note the possible poisoning of young Tree Swallows. On the other hand, Krueger (1988) documented several circumstantial cases in Texas where the deaths of nestlings coincided with the nearby spraying of carbaryl. In a small sample of nest boxes in Alabama, Jaco and Hulse (1963) found more boxes occupied by Eastern Bluebirds on an unsprayed area than on a similar area sprayed with a variety of chemicals. However, they had no conclusive evidence of differences in nesting success between the areas. Thomas and McCluskey (1974) and McCluskey et al. (1977) compared the number of eggs laid, eggs hatched and young fledged of the two western bluebird species and House Wrens (Troglodytes aedon) in an area in Oregon sprayed with DDT with these parameters on a similar unsprayed area. They found no differences in nesting success between the two areas that could be attributed to the chemical.

The Canadian Wildlife Service has been monitoring a wide variety of chemical contaminants in wildlife. This monitoring has been ongoing for several years, and is primarily from aquatic ecosystems (reviewed in Price 1977; Peakall and Bart 1983; Mineau et al. 1984; Grue et al. 1986; Noble and Elliott 1986; Norstrom 1986; Wren 1986). Recent interest in pesticides and other contaminants in terrestrial ecosystems has prompted a search for one or more appropriate monitor species. Bird species which breed in nest boxes are relatively easy to study and manipulate. They also lend themselves well to volunteer participation. In addition, several such species are distributed widely throughout the province.

This paper summarizes known bluebird trail activity in Ontario. It presents details of a 1987 survey of bluebird utilization of nest-box trails in Ontario. Finally, the paper assesses the feasibility of using bluebird trails to assist in monitoring the effects of agricultural chemicals on natural components of agriculturally-modified ecosystems in Ontario.

Methods

Initially, the intention of McNicholl and Weseloh was to attempt to locate as many current bluebird nest-box trail operators in Ontario as possible, and to ask these operators for information on the history of their trails, and on the use of their boxes by bluebirds and Tree Swallows. The operators would also be invited to participate in ongoing biomonitoring studies.

Coincidently, however, in the fall of 1987 Read sent out survey forms requesting similar information (Appendix 1). Read wanted to assess possible interest in forming a bluebird organization in Ontario. Read's forms were distributed to organizations and individuals indicated in Table 1, where his specific objectives are also listed.

Although the motivating objectives of Read's survey were somewhat different from those of the planned Canadian Wildlife Service survey, we felt that a combined effort would be more productive to both groups. This would avoid any resentment that may have been felt by trail operators who would have received two similar data requests in the same year. Thus, this report combines the historical record of bluebird nest-box trails in Ontario with the results of Read's 1987 survey to assess the level of interest in such trails in Ontario. The 1987 data were then compared with those of earlier publications to assess current nesting success and population trends in the province. This survey and the published record were then used to consider the potential value of using such surveys to monitor the bioeffects of agricultural chemicals in Ontario.

Overview of Bluebird Nest-box Trails in Ontario

Eastern Bluebirds nest throughout southern Ontario in suitable habitat (Speirs 1985; Peck and James 1987; Risley 1987). They breed sporadically in locations as far north as about the fiftieth parallel (Peck and James 1987; Risley 1987), such as near Sioux Lookout and the Cochrane District.

Some indication of nest-box trail activity in Ontario overall can be gleaned from three province-wide sources:
1) The number of first broods, boxes used and young fledged as reported by the North American Bluebird Society, 2) The number of nests reported to the Ontario Nest Records Scheme, and 3) The number of birds banded. For reasons outlined below, none of these sources are comprehensive in themselves. The survey which was initiated by William F. Read in 1987 is directed specifically at nest-box trail operators. Although this survey will undoubtedly fail to discover several smaller trails, it should provide the best source of province-wide data if maintained routinely on

an annual basis.

The North American Bluebird Society initiated a "first brood summary" in 1979. This summary uses the number of boxes occupied by bluebirds for first broods in comparison with the number occupied the previous year as a measure of survival from the previous winter (Anonymous 1979). These summaries were conducted until 1981 (Table 2), but then discontinued. As only two to three Ontario trails were reported, they do not provide a province-wide overview, and as the society does not keep its survey forms for further analysis, it is not known from which part(s) of Ontario the reports came.

A second survey by the North American Bluebird Society has been conducted annually since 1980 (Pinkowski et al. 1981, 1982; Dupree 1983, 1984, 1985, 1986, 1987; Dupree and Wright 1988, 1989, 1990). These figures present general trends in populations and box use. Ontario is included only within a broad geographical area (Table 3) labelled "Midwest" from 1980 to 1983 and "Central" since 1984. This region encompasses Ontario in the north and 19 U.S. states south of Ontario from Minnesota, Nebraska, Kansas and Texas in the west to Ohio, West Virginia, Kentucky, Tennessee and Alabama in the east. As no record is kept of the original survey forms for further analysis (D. C. Dupree pers. comm. 1987), the Ontario contribution to the survey cannot be tabulated.

The Ontario Nest Records Scheme provides a major source of data on nests, incubation periods and egg data. There were 3507 records of about 3799 bluebird nests representing 46 provincial regions reported in approximately the first twenty years(Peck and James 1987). These data do not provide information on nest-box trails per se, but do offer a wealth of data on the nests themselves. A report summarizing the first eight years (Giles 1963) was followed by a series of annual reports until 1981 (Table 4). This annual series was followed by less frequent reports, the most recent of which covered up to the end of 1983 (Peck 1984). Minimum figures are provided on the numbers of bluebirds nesting in the province in any given year. As some nests are not reported until a year or more after the year of nesting, the numbers of nests for a given year are sometimes revised upwards in subsequent reports. Table 4 lists the number of nests reported each year, using the most recent figure for any given year as the correct total if figures differ among reports.

Unlike North American Bluebird Society surveys and Ontario Nest Records Scheme totals, annual banding totals have the advantage of being more complete, because the reporting of all bandings is compulsory. This, however, does not give an index of nest-box activity. Unsuccessful nesting would preclude banding, at least of the young. In addition, many nest-box operators do not band birds, and some bluebirds are banded during migration or while wintering. As Eastern Bluebirds sometimes winter in southern Ontario (Brooman 1954; Kelley 1978; Broker 1981; Risley 1981; Speirs 1985; Bird 1986a), some may be banded in the province during that season. Table 5 provides Ontario's bluebird banding totals as compiled by members of the Ontario Bird Banding Association from Canadian Wildlife Service files (1960-1971) and by Canadian Wildlife Service personnel

(1977-1982). Figures included for 1984 and subsequently as compiled by the Ontario Bird Banding Association are only partial. Totals for these years have not yet been published by the banding office. Recent Ontario Bird Banding Association figures are based on a volunteer survey form which may not include the complete totals banded during those two years.

There are summer records of Eastern Bluebirds in Ontario from as far north as Favourable Lake and Moosonee (Peck and James 1987). However, nests have not been reported farther north than the southern boundary of northern Ontario as outlined by Snyder (1939), (i.e. south of a line drawn from the angle of the Manitoba-Ontario border to the northern shore of Lake Nipigon and south of a line drawn from the northern shore of Lake Nipigon to the northern shore of Lake Abitibi). Atlas records do not extend the possible breeding range any further north than the known mapped nesting records (Peck and James 1987 cf. Risley 1987). Although localized within western and central Ontario, the scattered nesting records in that area (Peck and James 1987; Risley 1987) suggest that the species nests more commonly than the "extremely rare to non-existent" status assigned to this area by Dupree (1982).

Although Risley (1981) surveyed bluebird observers who were known to him, Read's survey was the first attempt to assess both the level of activity of bluebird nest-box trail operators and the success of bluebird nesting attempts throughout Ontario. Appendix 2 summarizes the general results of the 100 responses covering 101 trails. Most of these were returned on questionnaires which had been filled out by the operators. Two responses covered the same trail (that of the Pembroke & Area Bird Club), while Rob Swainson's response covered three trails (each located in a different county). A few operators sent more general letters or supplied information over the phone. Thus, some details tend to be lacking from some of the returns. In a few cases such details have been filled in from information published elsewhere.

In Appendix 2, details are included on the number of years each trail has been in operation, the specific years for which the respondent has supplied data on use of the boxes by Eastern Bluebirds and Tree Swallows, the number of boxes on each trail during the years reported, and habitat along the trail. Specific details on nesting success in 1987 are given in more depth later in the report, as are details on use of the boxes by other species and causes of nest loss. Appendix 2 and the following geographic survey are arranged by county (or equivalent jurisdiction) progressing from west to east. Trail numbers correspond to those mapped on Figure 1.

Although nest-box trails have been popular in Ontario for many years (e.g. Saunders 1914), the results reported to Read suggest a recent increase in their popularity. Table 6 indicates the number of nest-box trails reported to be in operation on the survey each year since 1972 and the number of operators who reported that they were active prior to that time. These figures suggest that 72 of the trails reported have been established since 1980, with an increase of 53% in the number of trails in the last five years. These figures are somewhat biased in favour of

recent years since currently active participants are more likely to respond to the survey than former operators who have since suspended operations. However, we believe that the figures suggest a true trend. There are several factors which are probably influential in promoting this increased interest: 1) the general increase in concern for the environment, 2) numerous "popular" articles on the plight of bluebirds and/or the work by specific individuals on nest box trails (e.g. Zeleny 1977; McDougall 1981; Wainio 1981; Walton 1987), 3) the formation of the North American Bluebird Society in 1976, 4) the designation of the Eastern Bluebird as Rare in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 5) heightened awareness of breeding birds through participation in field work for the Ontario Breeding Bird Atlas, and 6) the availability since 1985 of Community Wildlife Improvement Program (CWIP) grants from the Ontario Ministry of Natural Resources.

Geographic Survey

Western Ontario

Kenora District

Although no data appear to have been published on nest-boxes in the Kenora District, three trails were reported to Read from the Dryden area, and one was reported from near Oxdrift (Appendix 2). In 1937, T.M. Shortt found a nest at Wabigoon, which is near Dryden (Baille and Harrington 1936-1937). There are also nesting records from west of Kenora and near Sioux Lookout (Peck and James 1987). No bluebirds were reported on Breeding Bird Survey routes in the district from 1968 through 1977 (Speirs 1985). However, in 1983 two were reported on one route in that area (D. C. Dupree pers. comm. 1987).

Rainy River District

Read did not receive any returns from Rainy River District. However, there are nesting records between Lake-of-the-Woods and Fort Frances (Peck and James 1987). Eastern Bluebirds averaged 1.3 individuals per 50 stops on the Fort Frances Breeding Bird Survey route from 1968 to 1977 and 0.2 per 50 stops on the Atikokan route (Speirs 1985).

Thunder Bay District

In the Thunder Bay District the species averaged 0.1 per 50 stops on the Nipigon Breeding Bird Survey route between 1968 and 1977 (Speirs 1985). One bird was reported on the Suomi route in both 1983 and 1984 (D. C. Dupree pers. comm. 1987). L. S. Dear reported two nests at Thunder Bay in 1928 (Baillie and Harrington 1936-1937). There are also scattered nesting records in southern parts of the district (Peck and James 1987).

In 1953 junior naturalists Bill and Peter Addison, Jr. constructed three nest boxes according to specifications published in the

Intermediate Naturalist (Anonymous 1953). One of these attracted bluebirds, but the eggs were later found broken. In 1972 the Thunder Bay Field Naturalists Club and local Wolf Club groups placed "over 35" nest boxes in areas near Thunder Bay previously known to attract bluebirds (Hearn 1972). A more recent project involving approximately 400 boxes was organized by Mrs. Jean Lister. This project was described by Don Baughman (1987) in a newspaper column which was sent to Read (Appendix 2).

Central Ontario

General Area and Cochrane District

Dupree (1982) considered Eastern Bluebirds as "extremely rare to non-existent" in the Closed Boreal Forest. This region corresponds approximately to the districts encompassed by Snyder's (1939) Central Ontario. However, nest records are scattered throughout the area (Peck and James 1987) and atlas results indicate probable or confirmed breeding except in portions of Algoma and Timiskaming Districts (Risley 1987).

Read did not have any questionnaires returned from Cochrane District and the only Breeding Bird Survey routes on which bluebirds have been reported in the district are Hearst, where the birds averaged 0.1 per 50 stops between 1968 and 1977, and Kapuskasing, where the average was 0.3 birds per stop during the same period (Speirs 1985). Both reports coincide with nest records (Peck and James 1987), which have also been reported south of Lake Abitibi. A pair observed feeding young at Moosonee in July 1974 (Goodwin 1975) represents the northernmost indication of nesting.

Algoma District

The only bluebirds registering on Breeding Bird Surveys in Algoma District have been on the Thessalon route, where they averaged 0.1 birds per 50 stops from 1968 through 1977 (Speirs 1985). Nest records are restricted to Agawa Meadows and the Sault Ste. Marie and Wawa areas (Baxter 1985; Peck and James 1987). Read's only survey reporter from this district indicated that bluebirds have not yet used his nest box at Blind River (Appendix 2).

Sudbury District

Read's only return from Sudbury District consisted of a manuscript by McIlveen (1984). McIlveen's report described a project of the Sudbury Ornithological Society, which in 1984 established a trail of 70 boxes north of Sudbury (Appendix 2). Three of the 58 boxes checked that season were occupied by bluebirds, and 26 were used by Tree Swallows (McIlveen 1984). There is also a nest record at Chapleau (Baillie and Harrington 1936-1937), where they are uncommon summer residents (Nicholson 1974).

Manitoulin Island District

On the two Manitoulin Island Breeding Bird Survey routes, bluebirds

averaged 0.4 and 1.8 birds per 50 stops from 1968 to 1977 (Speirs 1985). More recently, they have still been reported on both routes (D. C. Dupree pers. comm. 1987). Nicholson (1972) considered the species a regular summer resident on the island, where the estimated population was about 35 pairs in the early 1970s. Numbers have dropped "alarmingly" since 1976 (Nicholson 1981), with only one substantiated nesting in each of 1979 and 1980 (Nicholson 1981).

Timiskaming District

Bluebirds have not been recorded on Breeding Bird Surveys in the Timiskaming District. However, there are confirmed nest records from this region (Peck and James 1987; Risley 1987). Lloyd Taman has a successful nest box trail in the district (Appendix 2). His trail consisted of 5 boxes until 1983, and expanded to 15 by 1985, 72 by 1986 and 153 by 1987. Of the 72 boxes available in 1986, 65 were of the size used by bluebirds and swallows (Taman 1986). In 1986, bluebirds laid eggs in six of these boxes and Tree Swallows in 12 (Taman 1986). In 1987, 73 boxes were used by swallows and 20 by bluebirds (Taman 1987).In 1988, Taman(1988) had about 250 boxes of all types. He had occupancy information on 128,119 of which were used by Tree Swallows and 63 by bluebirds.

Nipissing District

One six-year old trail reported to Read from Nipissing District has so far lacked any bluebirds (Appendix 2). Another operated by Bob Swainson in 1984 and 1985 attracted two to three pairs per year. There are also other nest records from the district (Peck and James 1987; Risley 1987). Three of the Breeding Bird Survey routes in that district averaged 0.1 to 0.8 birds per 50 stops between 1968 and 1977 (Speirs 1985). Bluebirds have also been recorded on all three of these routes more recently (D. C. Dupree pers. comm. 1987).

Southern Ontario

Eastern Bluebirds were considered "very rare" in the Great Lakes Plain and in all of the St. Lawrence River Plain except the "Kawartha Lakes area from Belleville west to Victoria Harbour" and a small area near Ottawa by Dupree (1982). He considered them as simply "rare" in those two areas. Peck and James (1987) show nest records for all counties and districts in southern Ontario except Essex, Grenville, Dundas, Stormont and Prescott. Bluebirds have been registered on all but five or six Breeding Bird Survey routes in southern Ontario (Speirs 1985). Atlas data show bluebirds as widespread in southern Ontario during the breeding season, though considerable gaps remain in their distribution there (Risley 1987).

Essex County

Atlas data show confirmed nesting of Eastern Bluebirds in Essex County (Risley 1987), where Peck and James (1987) did not have nesting records. The Essex Region Conservation Authority has had a program of supplying nest boxes to volunteers for four years (Appendix 2). However, they have

not kept records of resulting nestings (information supplied to W. F. Read 1987). Risley (1981) reported a breeding pair on Pelee Island in 1980. Kelley (1978) considered Eastern Bluebirds as less common in the county than they had been formerly, with a marked decline after severe spring weather in 1957 (Kelley 1972).

Lambton County

Bluebirds have not been attracted to the only trail reported to Read from Lambton County (Appendix 2).

Kent County

The Lower Thames Conservation Authority gave out 250 nest boxes in each of 1984 and 1986 to both landowners and scouts. They distributed another 300 boxes in 1987. The Authority did not keep records of the use by birds of these boxes (information supplied to W. F. Read 1987). The only other project reported to Read from Kent County was that of 80 boxes at Wallaceburg. In its first year, it did not attract bluebirds (Appendix 2). A six-box trail of Frederick R. Bickel at an unspecified location was not used by bluebirds in 1984 (Byers and Bickel 1985). A pair of bluebirds was reported nesting in the Wheatley area in 1980 (Risley 1981).

Bruce County

In Bruce County Howard H. Krug (1941) started a trail at Chesley in 1936, with considerable success (Table 7). Krug reported to Read that he started placing nest boxes out in 1922, and his current trail has been in operation for about ten years (Appendix 2). In 1962, the Grey-Bruce Naturalists initiated a nest-box project in Bruce and Grey Counties (primarily in the vicinity of the base of the Bruce Peninsula) (Burton 1962; Kirk 1963). Burton (1962) reported that they set out 533 boxes in 1962, with 56 (10.5%) being occupied by bluebirds. However, Kirk (1963) indicated that 683 boxes were set out that year, with 58 (11%) having been used by bluebirds. Additional boxes were set out in 1963, when 37 of the 378 boxes checked were occupied by bluebirds (Kirk 1963).

In 1965 Barry (1966) found 28 nesting pairs on an 8.5 square mile portion of this trail near Hepworth Village. The removal of Tree Swallows from parts of this trail increased bluebird occupancy to 31%, with swallows previously occupying 80% of a sample of 71 boxes. Habitat in the area is primarily pasture land and hay fields interspersed with wood lots and river valley (Kirk 1963; Barry 1966). More recently, Robert J. Byers' trail of 12 boxes at Allenford fledged six bluebirds and five Tree Swallows in 1984 (Byers and Bickel 1985). A nest box trail of up to 23 boxes at Port Elgin has had one box occupied by bluebirds every year since 1985 (Appendix 2). This trail consisted of two boxes until 1982, five from 1982 to 1986, and 23 in 1987. MacRae and MacRae (1987) have had Tree Swallows occupy bluebird houses for a few years at Petrel Point on Red Bay, while Eastern Bluebirds nested for the first time in 1987, using a martin house. Dennis Lewington of Stoney Creek started a trail with eight boxes at Sauble Falls in 1986, expanding to 23 boxes in 1987. Both

bluebirds and swallows nested in these boxes in both 1986 and 1987 (Appendix 2). Another trail of 50 boxes managed by Ken Maynard at Lion's Head attracted six pairs of bluebirds in 1987 (Appendix 2). A new trail of six boxes established by Martin Parker at Port Elgin in 1987 attracted three pairs of swallows, but not any bluebirds (Appendix 2).

Huron County

Nest records in Huron County date back to 1935 (Baillie and Harrington (1936-1937). William A. Henderson has a successful nest-box trail near Lucknow, although when newly established in 1980 its 211 boxes attracted only three bluebird nestings (Anonymous 1990). In 1987, 50 of 285 boxes available were used by bluebirds (17.5%) and 47 (15.7%) of 300 were used by bluebirds in 1986. This trail had been in operation for 9 years at the time of the survey (Appendix 2), and has continued to attract bluebirds since, with 110 nestings among 300 boxes in 1989 (Anonymous 1990). Another trail in operation for six years at Clinton has grown from eight boxes in 1982 to 30 in 1987 (Appendix 2). This trail does not attract bluebirds every year, and when they are attracted, only one or two pairs nest. A new trail of 20 boxes was established by the Huron Fringe Field Naturalists in 1985. Geoffrey Walker reported that this trail was expanded 200 boxes in 1987 when it was used for the first time by two pairs of bluebirds (Appendix 2). Tree Swallow occupancy increased from 15 pairs in 1985 to 190 pairs in 1987.

Middlesex County

Nesting records in Middlesex County date back to at least 1893 (Saunders and Dale 1933). The McIlwraith Field Naturalists of London started a project in 1959 (Morris 1964). In 1963, R. W. Morris (1964) and Gord Cummings put out 30 boxes, two of which were used by bluebirds. Fifty more boxes were placed out in 1964, 13 of the total being used by bluebirds and 12 by Tree Swallows (Morris 1964,1965). More boxes were planned for 1965. The club established another trail of 38 boxes along the Thames River near Delaware in 1977 (Anonymous 1977). Bluebirds did not nest on that trail in 1977, but six boxes were used by Tree Swallows (McLeod 1978).

More recently Carl E. Hearn has had a trail near Dorchester for 10 years (Appendix 2). Although he had up to 75 boxes in one year (1982), bluebirds have used his boxes during only two years since 1982 (1983 and 1987), and only one pair was present in each of these two years.

Elgin County

Brooman (1954) considered Eastern Bluebirds to be a fairly common species in Elgin County in the summer. However, he also noted that there had been a recent reduction in numbers there. An adult carrying food to a nest along the Kettle Creek Valley in 1948 provided him with positive evidence of breeding in the county. Twenty-five boxes placed near Tyrconnell by members of the St. Thomas Field Naturalists in 1957 were used by wrens and flying squirrels, but they were not used by bluebirds,

and appear not to have been used by swallows (Lemon 1957). Better success was achieved by George Leverton. Six of his 17 boxes erected in Yarmouth Township in 1971 were occupied by bluebirds and other boxes were occupied by a variety of other species, including Tree Swallows (Leverton 1972). Another project by Joe Hurst at Port Stanley has been in operation for 16 years (Appendix 2). Hurst reported that two to nine of 20 to 30 boxes were used by bluebirds each year. A more recent project by Robert Hubert at St. Thomas (Appendix 2) has attracted one to five pairs of bluebirds to the 11 to 20 boxes available each year.

Perth County

Although bluebird nesting has been reported in Perth County (Peck and James 1987), Read's survey results did not include any returns from this county. In addition, we did not find any published accounts of trails there.

Oxford County

Read had four reports from Oxford County (Appendix 2). Two boxes have been used by bluebirds on a four or five-year old trail near Tillsonburg, while two small trails were started at Bright in 1987. Each Bright trail hosted a pair of bluebirds in its first year of operation. J. W. Lambe has had boxes out on his farm near Embro for five years, but bluebirds have not yet been attracted to them (Appendix 2).

Grey County

Grey County is rich in nest-box activity. In addition to the Grey-Bruce Field Naturalists' project reported under Bruce County above, John C. Clarke has operated a trail of about 50 boxes on the Meaford Tank Range for 25 years (Appendix 2). Twenty of his boxes were used by bluebirds in 1987. Clarke (1982) has experimented with aluminum press plates to thwart Raccoon predation. He has also used bluebird boxes in educational displays (Anonymous 1985b).

Another trail in the Meaford area operated by Dale Glover for seven years (Appendix 2) was occupied by bluebirds in 1986 and 1987, when two pairs nested in both years. Malcolm Kirk, initiator of the Grey-Bruce project, has more recently operated a trail with Lynne Richardson near Thornbury. They had over 30 boxes occupied in both 1986 and 1987 (Appendix 2). At Owen Sound, Lorne Smith placed 250 boxes out in 1983 (Newman 1989). Forty more were added in 1985 and 226 in 1986 (Appendix 2). No bluebirds used his boxes in 1982, but numbers gradually increased from two pairs in 1983 to nine in 1985. In 1986 and 1987, numbers increased markedly with 39 in 1986 and 79 in 1987. A Community Wildlife Improvement Project grant in the winter of 1987-1988, allowed him to expand his trail to over 1400 boxes (Newman 1989). A second grant the following year allowed even further expansion (Newman 1989). Twelve boxes erected by the Grey Sauble Conservation Authority (Appendix 2) have not been monitored for success.

Wellington County

Brewer (1977) noted that most recent bluebird nesting records in Wellington County came from Puslinch Township. These nestings occur in moraine areas with occupancy by only one to ten pairs in a trail of 200 boxes. The two substantial trails of David Lamble and Brian Wyatt were reported in Read's survey to have a similar low occupancy rate (Appendix 2).

Waterloo County

Read had four reports of trails in addition to his own from Waterloo County (Appendix 2) all of which concerned small trails. One trail has been operated by Norman Shantz at Ayr for over 30 years. Nine of his 38 boxes were occupied by bluebirds in 1987. In 1986, Read established his own trail in the Flamborough area (MacNamara 1988). In 1987 his trail of 160 boxes attracted 30 pairs of bluebirds and 50 of Tree Swallows (Appendix 2).

Brant County

Read did not have any reports from Brant County. We are not aware of published accounts of trails in the county, though nesting has been reported there (Peck and James 1987).

Regional Municipality of Haldimand-Norfolk

In the Regional Municipality of Haldimand-Norfolk, the Norfolk Field Naturalists were offering bluebird houses to interested members in 1963 (Anonymous 1963). However, there did not appear to have been any organized effort at establishing bluebird trails or monitoring the houses at that time. Bluebirds nest only irregularly on Long Point (McCracken et al. 1981), but there are several recent breeding records on the nearby mainland (McCracken 1987). A ten-year old nest-box trail at Taquanyah Nature Centre near Cayuga has not hosted any nesting bluebirds since at least 1982 (Appendix 2). However, Dorothy Armstrong had a pair use her only box in nearby Cayuga in 1987. William Fletcher established a trail of 16 boxes at Fisherville in 1986. His trail attracted one pair of bluebirds that year and three pairs in 1987, when he expanded his trail to 24 boxes (Appendix 2).

Dufferin County

Read had his first five years of experience with bluebird boxes in Dufferin County. Two trails near Orangeville have successfully hosted bluebirds for several years (Appendix 2). The Boyne River Natural Science School's five-year old trail at Shelburne had bluebirds nesting in several boxes in 1987 (Appendix 2).

The best known bluebird trail in Ontario is that of Leo A. Smith. His trail extends through eleven townships (Caledon, Albion, Mono, Mulmur, Osprey, Tosoronto, King, Uxbridge, Reach, Cartwright, and Darlington) in

Dufferin, Simcoe, Peel, York and Durham Counties (Smith 1978b; McDougall 1981; Wainio 1981). Table 8 documents the success of this trail as far as can be ascertained from the published literature and the data included in Read's survey (Appendix 2). Figures in different sources sometimes vary, and numbers are generally approximations rather than exact counts. Smith started his trail in 1966 (Smith 1982a) or in 1968 (McDougall 1981; Wainio 1981), with first nesting by bluebirds in 1970 (Smith 1982a). He has continously experimented on methods of reducing predation, parasitism, vandalism, and competition with other hole-nesting species (Anonymous 1984a,b; Smith 1975, 1978a,b, 1982a,b,c, 1985a; Wainio 1981).

Simcoe County

In Simcoe County nests were reported as early as 1905 at Barrie and in 1924 at Wasaga Beach (Baillie and Harrington 1936-1937). There are several more recent nest records of bluebirds in the county (Devitt 1967). Eastern Bluebirds were among the species which used Lumsden's (1986) experimental boxes in abandoned fields at Anten Mills from 1975 to 1983. Brian Fleming has had a trail of 30 (1982) to 160 (1987) boxes at Hawkestone for seven years, with about 30 used by bluebirds in 1987 (Appendix 2). Glen Best's trail of eight boxes present at Glen Huron for several years has attracted a pair of bluebirds annually since at least 1982 (Appendix 2). At Orillia Ray Kiff attracted a pair of bluebirds to his first box, which was placed out in 1984. In 1987, there were 27 nestings in his 60 boxes (Appendix 2). David Hibbard started a small new trail at Coldwater in 1987. As previously mentioned, Leo Smith's trail discussed under the Dufferin County section, also extends through Simcoe County.

Peel County

Other than the portion of Leo Smith's trail extending through Peel County, Read received no reports from this county. About 65 nesting boxes were established in the Pelgrave Conservation Area in the winter of 1965, with at least three used by bluebirds and "many others by Tree Swallows" in 1966 (Anonymous 1966). Iden (1967) stated that "several pairs" of bluebirds nest in these boxes every year.

Halton County

Read's only report from Halton County was of a trail at Campbellville that consists of five nest boxes. Though this trail has been in operation since 1982, it has not yet attracted nesting bluebirds (Appendix 2).

Hamilton-Wentworth Region

In Hamilton-Wentworth a friend of Saunders (1914) was successful in attracting bluebirds to a nest box at least as early as 1913. At least one pair used one of an unspecified number of boxes erected in the Dundas Marsh area in 1957 (Anonymous 1958). The best known trail is that of George Coker, Ray Hughes and Sam Tabone at Winona (Table 9). This trail passes through vineyards and orchards, as described each year in reports published in the Wood Duck. A more recent trail established at

Millgrove had its first nestings (two pairs) in 1987 (Appendix 2), while after four years of operation, two boxes at Mount Hope have yet to attract either bluebirds or swallows (Appendix 2).

Niagara Peninsula

In the Niagara Peninsula, the local conservation authority has attracted bluebirds to a small seven-year old trail at Allenburg (Appendix 2). The Fonthill office of the Ontario Ministry of Natural Resources worked with the Fonthill Boy Scouts to place out 40 nest boxes in 1985 (Beane 1985), but the results of their efforts were not documented. At Ridgeway, in 1987 Bob Eberly attracted one pair of bluebirds and 45 pairs of Tree Swallows to an unspecified number of boxes in a two-year old trail (Appendix 2). The Port Colborne & District Conservation Club managed to attract one pair of bluebirds and many Tree Swallows to a new trail of 96 boxes in 1987 (Appendix 2). Although (Sheppard 1970) considered bluebirds to have declined in the Niagara area, local naturalists feel that these birds have increased there in the last few years (J. and M. Cooper pers. comm. 1987). Bluebirds were certainly common in the vicinity of Niagara Peninsular orchards in August 1987 (McNicholl, pers. obs.) Baillie and Harrington (1936-1937) listed historical nest records for this region at Beamsville in 1918 and at Rosedene in 1933.

Parry Sound District

Bluebirds were apparently more common in Parry Sound District earlier in the century than at present (Mills 1981). Mills (1981) listed a number of known nesting localities, including Ahmic Lake, Doe Lake, Fish Bay on Lake Nipissing, Katrine, Nobel, Pickeral Lake, Sand Lake and Sundridge. Ray Hughes of Winona started a trail at Lake Manitouwabing in 1987. His trail attracted one pair of bluebirds and seven pairs of swallows to his nine boxes (Appendix 2).

Muskoka District

Read had only one return from Muskoka District. This was a report of a new 19-box trail established at Bracebridge by local Girl Guides (Appendix 2). They did not have bluebirds, but they did attract 16 pairs of Tree Swallows. Although bluebirds have declined from numbers present earlier this century (Mills 1981), they continue to nest in Muskoka District annually. Baillie and Harrington (1936-1937) reported a 1919 nest record at Port Sydney and another from 1923 at Robinsdale. Mills (1981) reported several other nest localities, including Fawn Lake near Bracebridge, Lake of Bays, Mactier, Ravenscliffe, and Tingley Camp near Gravenhurst.

York Municipality

Besides Leo Smith's current trail (previously discussed under Dufferin County), which extends through York Municipality, there was also another project for several years at Purpleville near Maple (Table 10). This project was started in 1952 by the Intermediate Naturalists of the Toronto Field Biologists (Woodford 1952; Burton 1961; Anonymous 1966), but was

discontinued in 1965 or 1966 because of the gradual decline in use of the boxes by bluebirds (Anonymous 1966). Other records in the area include a 1915 nest at Toronto and a 1928 nest at Pottageville (Baillie and Harrington 1936-1937). A record of a bluebird pair using a nest box in this municipality in 1921 has been cited as the first for the province (Peck and James 1987), though as mentioned previously, Saunders (1914) reported a 1913 record of bluebirds using a nest box in the Hamilton-Wentworth Region. Bluebirds also nested at Roy Ivor's bird sanctuary at Erindale (Halliday 1954). In addition, one box of four has been occupied by bluebirds in three of the first four years of a trail at Unionville (Appendix 2). A six-year old trail of 31 boxes at Kleinburg attracted a pair of bluebirds in both 1986 and 1987, when there were also four to six pairs of swallows present (Appendix 2).

Durham County

In addition to the eastern extreme of Leo Smith's trail discussed under Dufferin County above, Read had one other return from Durham County. This report was from Lionel A. Parker, who documented two unsuccessful nestings by bluebirds in 1987 in a 16-box trail established in 1983 at Bowmanville (Appendix 2). Also, Carrick's (1960) comparative study was based on 30 boxes at Uxbridge, with both bluebirds and Tree Swallows being among the species using them. In 1978, the Pickering Naturalist Club erected about 65 boxes in North Pickering, Uxbridge and Whitby Townships (Nisbet 1979a). That year, "less than five" of about 40 boxes (i.e. about 10%) housed Eastern Bluebirds in Pickering, while another group of boxes (number not stated) in Uxbridge Township achieved a similar success rate of "about 10%" (Nisbet 1979a). Of 34 of these boxes checked regularly by Peter Lockhart in 1979, 19 were used by Tree Swallows and five by Eastern Bluebirds (Nisbet 1979b). Another project was initiated in the Oshawa-Lake Scugog area by James Richards in the fall of 1966 (Barry 1970). This trail was continued by Dennis Barry (Table 11). Speirs (1975) noted a steady decline in the western part of the county (former Ontario County) from his initial observations in 1948 through to the 1960s. There was some indication of a slight increase in the early 1970s.

Victoria County

Read's only report from Victoria County was that of Dave Calvert's 75-box trail near Kirkfield. His trail was used by 24 bluebird pairs in 1987 (Appendix 2). In addition, Robert O. Braley has had a nest-box trail at Pike Lake since 1982 (Anonymous 1983b). Results from this trail are tabulated in Table 12. In addition, Rob (presumably Robert C.) Braley reported that he had started a new trail in Emily Township in 1984 or 1985 (Anonymous 1985c).

Haliburton District

Read's only report from Haliburton was that of a 25-box trail set up near Minden by Dennis Barry (Appendix 2). Bluebirds used ten of his boxes in 1987. There are also previous reports of bluebirds nesting in other parts of the district (Peck and James 1987).

Peterborough County

In Peterborough County, Sadler (1983) reported that a trail is run by Nan Luscombe for the Peterborough Field Naturalists and another is run by Don Gunter at Chandes Lake. Sadler (1983) did not include details of trail size or numbers of bluebirds using the boxes. A trail established by Don Porter at Millrock did not attract any bluebirds in 1985, but hosted eight pairs of bluebirds and 14 of Tree Swallows in 1987 (Appendix 2). There were also two new trails in 1987, both of which attracted bluebirds (6 and 30 pairs: Appendix 2).

Northumberland County

In Northumberland County, two observations of flocks of bluebirds in October of 1966 stimulated Hazel Bird to suggest a nest-box project (Bird 1966). In 1968, the Willow Beach Field Naturalists Club and local school children built 25 boxes and started to put them up in the Harwood area under Bird's supervision (Wilson 1968). Fifteen boxes were erected on the first trip (Bird 1968a) and 19 (Bird 1968a) or 21 (Bird 1969a; McLeod 1969) were established in time for nesting the same year. The project has been in operation at least at a maintenance level continuously for about 20 years (Bird 1988). It has grown continuously since 1968 (Bird 1988), with major renovations and relocations by Bird and her helpers in the 1980s (Bird 1982b, 1983a, b, c, d, 1984a, b, 1985, 1986b, 1988). Reports were not published every year, but data available are summarized in Table 13. Like Leo Smith, Bird does considerable experimentation on her trail in attempts to overcome predation and other problems (McLeod 1969; Walton 1987). The Willow Beach Field Naturalists also disseminate information on bluebirds. For example, its members answered 513 letters in response to a single newspaper column report in 1972 (Bird 1972; Bluebird Committee 1972). In 1990, Hazel Bird was awarded the John and Norah Lane Award of the North American Bluebird Society for her work on this project (Anonymous 1991).

Another trail, which was established by R. Martin Bird at Brighton in 1983, attracted its first three pairs in 1985, with 11 boxes used in 1987 (Appendix 2). McRae (n.d.) mentions local nesting in this area and a nest record just outside Presqu'ile Provincial Park in 1978. Baillie and Harrington (1936-1937) reported a nest at Wooler in 1925.

Hastings County

Read's only two reports from Hastings County were both from Tweed (Appendix 2). One report involved a 12-box trail established by Rob Swainson after moving from Whitney in 1986. Six boxes were stolen before the bluebirds arrived. The remaining boxes managed to attract one pair of bluebirds and four pairs of Tree Swallows. Swainson then moved on to Sharbot Lake, but Gerald O'Hearn set up another new three-box trail. This new trail hosted two successful nestings of bluebirds in one box and Tree Swallows in another during its first year (Appendix 2).

Prince Edward County

Read did not have any reports from Prince Edward County. Sprague and Weir (1984) reported that the few boxes placed out in this county in recent years have been hardly used by bluebirds. Sprague and Weir (1984) stated that after having ceased nesting in the county by the 1950s, bluebirds began to nest in natural cavities in the county again in the 1970s.

Renfrew County

Renfrew County has considerable trail activity. The McNamara Field Naturalists Club at Arnprior has had an active program for 20 years (Appendix 2). They expanded gradually from 24 boxes in 1982 to 35 in 1985, and then markedly to 244 in 1986 and 359 in 1987 (Appendix 2). Thirteen to eighteen bluebird pairs used the boxes until 1985, while 141(57.8%)and 165 (46.0%) boxes were used by bluebirds in the last two years (Appendix 2). Tree Swallows also use these boxes. The two four-year old trails at Pembroke (Appendix 2) have also expanded annually, with corresponding increases in both bluebirds and swallows. In addition, Albert Lambert reported to Read that he has sent out 2250 boxes to other people in the county since 1985. Lambert estimates that there are at least 4000 boxes in Renfew County.

Lennox & Addington County

Read had two reports of long-term trails in Lennox and Addington County (Appendix 2). J. E. Hughes has operated a trail for 22 years at Centreville with 200 boxes since at least 1982. Warren (1975) reported that of 70 of these boxes checked in 1975, at least 17 were occupied in 1975. D. Keeling has operated a small trail at Enterprise for a decade. Both reported results for 1987 only, a year in which both Hughes and Keeling had successful nestings by both bluebirds and swallows (Appendix 2). Warren (1975) reported another trail of 40 boxes put up by Jack Bell near Moscow. Fourteen boxes were occupied by bluebirds when Warren visited in 1975, but the presence of several fledged young in the vicinity suggested an even higher occupancy. Another five-year project reported to Read (Appendix 2) involved a single box at Flinton from 1983 to 1986, followed by an expansion to three boxes in 1987. Bluebirds have nested in the Flinton project since 1985, and Tree Swallows annually since the original box was put out in 1983, both species using the same box in 1985 and 1986.

Frontenac County

In Frontenac County, Quilliam (1965) considered bluebirds as uncommon summer residents, commenting that they were formerly more common. E. Beaupre reported a nest as early as 1902 at Portsmouth (Baillie and Harrington 1936-1937). Four trails initiated in 1987 (Appendix 2) were all successful in attracting bluebirds, but the nesting at Mountain Grove did not result in fledged young.

Lanark County

Read had four reports from Lanark County (Appendix 2). The oldest of these has been in operation for 20 years at Almonte, with 54 boxes attracting three pairs of bluebirds and 28 pairs of Tree Swallows in 1987. The other three trails are all at Perth, where Carson Thompson has run a trail for nine years, R. C. Braley has had one for six years, and Bob Mount established a new trail in 1986 (Appendix 2). Thompson's trail attracted 20 pairs of bluebirds and eight pairs of Tree Swallows to 65 boxes in 1987, when Braley hosted 74 pairs of bluebirds and 57 of swallows in his 300 boxes. Mount's two-box trail has so far attracted only swallows (Appendix 2). In addition to these trails reported on the survey, Rob Braley established a trail of 25 boxes in this county in 1980 (Anonymous 1985c). By the time he left the area in 1984, he had expanded this trail to 446 boxes (Anonymous 1985c).

Leeds/Grenville County

Art Briggs-Jude (1986), of Westport in Leeds/Grenville County, promotes the placement of bluebird houses in rural church yards and mentions placing over 2000 nest-boxes in various parts of Ontario during a period of 30 years. In an article dated 20 March 1986 from Lark Outdoors which Briggs-Jude sent to Read, he mentions "upwards of 20 nesting pairs" using 100 nest-boxes locally since 1956. In 1987 20 pairs of bluebirds were attracted to 120 boxes on this trail. Two twenty-year old trails in the Merrickville area have each attracted one pair of bluebirds annually since at least 1982 (Appendix 2). A larger number of Tree Swallows has been attracted to this trail each year (Appendix 2). Another 10-year old trail at Gananoque (Appendix 2) has attracted seven to 15 pairs of bluebirds and two to four pairs of swallows since 1982 (Appendix 2). A more recent six-year trail at Merrickville has attracted one to three pairs of bluebirds each year since 1984 (Appendix 2). A newer trail of five boxes in 1986 and 20 pairs in 1987 in the St. Lawrence Islands National Park headquarters area at Mallorytown has not to date attracted any bluebirds. However, this trail has been adopted by Tree Swallows (Appendix 2).

Ottawa-Carleton Region

In the Ottawa-Carleton area MacNay (1983) reported that in 1982, bluebirds used 34 of his boxes on a trail at Dunrobin. He also removed 37 nests of Tree Swallows from this trail that year (MacNay 1983). His trail has been in operation for at least 19 years, and consisted of 75 boxes in which 280 bluebird eggs were laid in 1987 (Appendix 2). The Ottawa Field Naturalists' Club presented him with its 1987 conservation award for his nest box trail efforts (Brunton 1988). At Stittsville Cecil Jessiman has had a trail in operation for 15 years (Appendix 2). In 1987, his 70 boxes attracted 32 bluebird pairs and 15 pairs of Tree Swallows (Appendix 2). Walter Hopewell has run a trail of slightly over 50 boxes at Nepean for eight years, and in some (but not all) years has attracted one to two pairs of bluebirds (Appendix 2). Read received four reports of more recent trails in the area (Appendix 2). In 1987, these trails ranged from six to 31 boxes, and one to five pairs of bluebirds used the boxes offered, as well

on box use by Eastern Bluebirds in 1987. Of these 95 trails, 81 (85%) had one or more boxes used by bluebirds in at least one nesting attempt, while 14 had no known use by bluebirds that year. At least one young bluebird fledged from 73 (77%) of the trails on which bluebirds attempted nesting.

Of the 95 reports that included data on nest-box use by bluebirds, 94 either provided figures on both numbers of boxes available and numbers of young fledged or sufficient information from which such figures could be approximated (Table 14). Of these trails, approximately 35% consisted of more than 50 boxes. These longer trails accounted for about 40% of the trails on which bluebirds were raised successfully in at least one box and only for about 14% of the trails that reported no success in raising bluebirds. In contrast, the approximately 65% of trails with fewer than 50 boxes accounted for only 60% of the trails that were successful in raising one or more young and about 86% of the trails that failed to raise any young bluebirds. Thus, although many small trails are successful in raising bluebirds (35% of trails of 1-20 boxes), these figures show that larger trails are disproportionately more likely to produce fledglings from at least one of their boxes than are smaller trails.

Fledging rates per trail on which at least one young was raised ranged from 0.02 to 6.0 young per available box (Table 15). Mean fledging rate/ available box on trails raising bluebirds was highest on trails of 1-20 boxes (1.37). This was probably in part because the use by bluebirds on very small trails having only one, two or three boxes may distort the rate. The second greatest mean fledging rate on trails raising bluebirds was on trails of 51-100 boxes (1.13), while the lowest was on trails of 101-200 boxes (0.53). Larger trails may be expected to be somewhat lower in the productivity rate of bluebirds, because such trails would be expected to attract larger numbers of other species and may have received less "hands-on" management. On the other hand, large trails are often handled by organized groups of people. Success in terms of bluebirds will also depend on the degree to which a particular trail is managed specifically for bluebirds. Some operators, for example, remove and/or discourage such "pest" species, as House Sparrow (Passer domesticus) and Eurasian Starling (Sturnus vulgaris), while others prefer to "let nature take its course." Some operators have been known to remove other protected, native species, such as Tree Swallow and House Wren, while many others are also interested in attracting these species. Of the approximately 4910 young bluebirds reported fledged in 1987, more than half came from the nine largest trails (Table 15). While trails of 50 boxes or less comprised about 65% of all reporting trails (Table 14), they fledged only 14.7% of the known successful young. Thus, larger trails accounted for most of the young raised. The total fledging rate per box available on trails fledging one or more young (4910 young/7503 boxes) was 0.7 young per box. If the 640 boxes from 22 trails not raising bluebird young are included in this total, the fledging rate per box available where nesting outcome is known would be (4910 young/8143 boxes) 0.6 young per box. An additional 420 boxes which were distributed by three conservation authorities and one Ontario Ministry of Natural Resources office were not followed for results, and are therefore excluded from these totals.

A total of 90 questionnaires returned included both 1987 data on bluebird use or non-use of trails and information on the number of years of operation of the trail (Table 16). Twenty-one trails (23%) were new in 1987, while 55 (61%) were five or fewer years in operation (Table 16). On the other hand, 15 (17%) of the trails reported have been in existence at least 15 years. These 15 trails produced 2018 young in the available 1768 boxes, representing a fledging rate of 1.14 young per available box (Table 16). These figures are almost double the rate on newer trails (0.11 to 0.64) and close to ten times the 0.15 young per available box fledged from brand new trails. Overall fledging rate on these trails was 0.52 young bluebirds per available box (Table 16). There was little difference in the fledging rate between trails which were one to five years old (0.11-0.59) and those six to ten years old (0.26-0.64). While some new trails are operated by veteran trail operators who have moved, these results are at least partially a reflection of experience of trail operators. Even veteran operators may need a few years at a new site before they are able to operate their trails at full productivity.

Bluebird nesting success in 1987 for the 101 trails listed in Appendix 2 is documented by trail in Table 17. Known numbers of boxes, successful bluebird nestings, young fledged and unsuccessful nesting attempts are also summarized by trail in Table 17, where trails are grouped by jurisdiction (county, district or regional municipality). Where numbers of known successful nestings and numbers of young fledged were both available, numbers of young per successful nesting were also calculated and listed. Where numbers of successful nestings were known, but numbers of fledglings were not available, an estimate was made on the basis of four fledglings per nest. Estimates are indicated by "?" in the table. Thus, the number of 74 young fledged on trail #5 is a known number, whereas that of the 20 young reported for trail #57 is an estimate. Numbers of young that do not total four times the number of boxes used successfully that are also labelled "?" in the table indicate either an estimate by the observer or some ambiguity on the form. The values for numbers of fledglings per successful nesting attempt ranged from 0.5 to 5.5, values which correspond well with the clutch size of 1 to 8 eggs and average clutch range of 4 to 5 eggs recorded in the Ontario Nest Records Scheme (Peck and James 1987). Barry (1974) recorded average numbers of young per nesting attempt in the Lake Scugog-Oshawa area of from 2.69 to 3.28 per year from 1967 to 1971 and (Barry 1970) average number of young fledged per brood from 2.69 to 3.29 per year from 1967 to 1969. Six-egg clutches in Ontario have been noted in Durham (Barry 1970, 1974; Speirs 1975) and Northumberland (Bird 1986b, 1988) Counties.

Causes of Nest Loss

Respondents to Read's survey attributed losses of Eastern Bluebird eggs or young to fifteen possible principal causes (Table 18). In addition, mites, earwigs and blackbirds were suspected agents of nest loss on one trail each. One respondent thought that raptors may prey on some adult bluebirds in the vicinity of his trail. Larvae of blowflies (Protocalliphora spp. or Apaulina spp.) are frequently found in nests of birds (Hicks 1959), and have been of particular concern to

operators of nest-box trails (Lloyd 1927; Johnson 1932; Mason 1944; Pinkowski 1977; Roberts 1981; Campbell 1982; Chow et al.1983; Zeleny 1986; Foster 1987). The recent article by Foster (1987), published in a magazine popular with naturalists in Ontario, may have alerted many trail operators to their presence. At any rate, blowflies were the cause of nest loss reported on the largest number of trails. In addition, blowflies were the cause ranked as the single most important nest-loss factor by the most respondents (Table 18). In a system of points devised by Read giving the most important nest loss factor on a given trail 8 points, and others fewer points in descending order, blowflies also scored the highest rank.

House Wrens were considered the most important cause of nest loss in nearly as many cases as blowflies (Table 18). They are frequently considered a problem when boxes are placed close to shrubby areas, and much has been written on placing boxes to avoid use and/or predation by wrens (e.g. Zeleny 1976; references in Gutzke 1985).

House Sparrows (Passer domesticus) were the third most frequently listed cause of nest failure (Table 18) and also ranked third on Read's scoring method. This introduced species is often cited as a cause of bluebird population declines. Consequently, trail operators are often asked to prevent them from nesting in their boxes (Zeleny 1970,1976; Risley 1981; and others listed by Gutzke 1985). Evidently, most Ontario operators agree with this recommendation, since 59 of Reid's respondents stated that they did not allow House Sparrows to nest in their boxes, while only 27 respondents stated that they allowed House Sparrows to proceed with nesting.

The fourth most important cause of nest loss was thought to be from Raccoons (Procyon lotor), a species that has inspired considerable experimentation into thwarting its efforts (e.g. Wainio 1981; Clarke 1982; Walton 1987). Other factors reported included weather (usually cold and/or wet weather), competition with swallows, and human interference, including traffic in two cases. These and the several other predators listed in Table 18 are all problems which are well documented elsewhere (see Zeleny 1976; the bibliography of Gutzke 1985; and recent issues of Sialia).

Population Trends

As indicated in Table 19, most of the respondents (73%) to the question of whether they believed bluebird populations locally to be increasing or decreasing indicated increases. Respondents in the Great Lakes-St. Lawrence forest region between Carolinean Canada and the southern extent of the Great Canadian Shield noted substantial increases. Increases were also widely reported in Kenora District and north of Ottawa along the Ottawa River. Two of the three reported decreases were near the southern end of Lake Huron at Sarnia in Lambton County and Clinton in Huron County (in the western extreme of far southern Ontario), where bluebirds are generally scarce (see survey above, as well as Peck and James 1987; Risley 1987). Bluebirds commonly nest north of Clinton, as exemplified by Henderson's successful trail at Lucknow on the Huron-Bruce County border, and the long history of successful trails in Bruce and Grey Counties. One other

reported decrease, at Perth in Lanark County, was attributed to weather, and could thus be a short-term trend. A decrease in 1987 at Thornbury was attributed to road construction and blowflies. Kirk and Richardson considered the population there to be steady over a longer term. This general impression of a population increase in southern Ontario is in contrast to marked declines in the decades preceding the early 1980s (Risley 1981; Robbins et al. 1986). However, it corresponds well to the more recent recovery suggested by Risley (1987) and reported in various jurisdictions in the geographic survey above.

Use of boxes by other species

Read's questionnaire asked the respondents to indicate the numbers of Tree Swallows, House Wrens, and Black-capped Chickadees (Parus atricapillus) using the boxes. Sixty-nine co-operators reported nesting by 1953 to 1955 pairs of Tree Swallows in 1987, and 13 more indicated nesting by this species without providing totals. Forty-four respondents reported nesting by 186 House Wrens in 1987, while seven others reported nestings but did not include numbers. Two of the latter commented that they had removed the nests. Eight respondents reported 1987 nestings by 17 pairs of Black-capped Chickadees, while others reported that no chickadees nested on their trails in 1987, but that they did nest in 1982 (1 trail), 1984 (2 trails), 1985 (4 trails) and/or 1986 (4 trails). Three respondents also reported eight nestings by House Sparrows, but as indicated by the 20 who reported this species as a cause of nest loss (Table 18), many more undoubtedly had in fact nested. Two respondents reported nestings by Great Crested Flycatchers (Myiarchus crinitus), another hole-nesting species occasionally known to nest in nest boxes in southern Ontario (Peck and James 1987). Ian and Elinor McRae reported nesting by 51 Purple Martins (Progne subis) on a trail at Almonte in Lanark County. This species also commonly nests in boxes in southern Ontario (Peck and James 1987), but it usually nests in colonies in boxes built to accommodate several pairs. Of particular interest was the nesting of a pair of House Finches (Carpodacus mexicanus) in a box of Rob Eberly at Ridgeway. Although this species does not usually nest in nest-boxes (Peck and James 1987), there are previous reports of such nestings (Hill 1988), and Ridgeway is in the Niagara Peninsula, where the population of this species is very high (pers. obs. M. K. McNicholl) after a spectacular recent arrival and increase (Foley 1983; Kozlovic 1987, 1994). This increase is one component of an ongoing colonization of eastern North America following a release in New York in 1940 (Mundinger and Hope 1982). One respondent also reported three boxes used by squirrels and two respondents reported occupancy by mice.

Usefulness of Bluebird Survey in Bioeffects Monitoring

Tucker and Leitzke (1979) grouped field tests for toxicity in wildlife into two categories: 1) those that place caged animals in their natural habitat for monitoring, and 2) those that attempt to follow marked free-ranging animals. Each has certain advantages and disadvantages. Birds nesting in nest-boxes remove the disadvantages associated with caging animals by essentially selecting their own "caged" area where they can be

predictably found by the observer. At the same time, they remain free-ranging individuals, acting "naturally" within the environment. Thus, they are ideal species for monitoring.

This survey indicates considerable interest in bluebirds and conservation of hole-nesting birds throughout a wide area of Ontario, especially in southern portions of the province. Active trails range throughout a wide variety of land uses and crops. Thus, they provide considerable opportunity for comparative studies among areas subjected to different levels and/or types of chemical use as well as other land-use variables. The survey initiated by Read offers an opportunity to channel the efforts of large numbers of amateur observers over a variety of habitats and land uses by monitoring population trends of bluebirds, swallows, or other species in comparison with particular crops, local spray usage and other factors. Such an effort requires that co-operators pay careful attention to details on the questionnaire. The questionnaire does require some revision to avoid confusions identified through responses to this initial effort. An annual newsletter or report would help maintain the interest of co-operators. Such a newsletter could outline nesting success for the year in question and perhaps each year provide an article or two on some specific aspect(s) of bluebird biology and/or management. This would help to show respondents how their efforts were contributing to biomonitoring.

Responses to Read's survey suggested that interest in such a project would be high. Of 84 respondents indicating whether or not they would be interested in joining an Ontario bluebird organization, 74 (88%) responded affirmatively, four more indicated possible interest, and only six (7%) were not interested.

In reading through the responses to Read's questionnaire, McNicholl noted a wide variety in 1) quantity of information supplied, 2) understanding of the questions asked, and 3) willingness to provide details. This sort of variability in quality of response is common in biological surveys using volunteer help (e.g. McNicholl 1987). However, even the partially answered questionnaires provide some data, such as the location of bluebird trails. Volunteers willing to visit their boxes at a few critical points during the nesting cycle can supply basic information on rates of use of nest-boxes in particular areas, approximate nest success, and visible causes of nest-loss (predation, parasites, vandalism, etc.) This type of basic nesting information provides the basic biological background against which more specific questions can be asked. Many volunteers are not likely able to provide information on agricultural chemicals applied to crops in the vicinity of their trails. Nevertheless, some may be able to obtain such information, and researchers could obtain data on chemical use in some areas from local, provincial or federal agricultural officials. Volunteers could be encouraged to seek such information and/or submit (or make available) specimens of dead young they felt may have been affected by chemicals.

Some volunteers might also be willing to participate in more intensive studies. For example, the fate of nests along particular trails could be used to compare nesting success between trails located along different

crops within the same area or along trails in areas known to be subjected to different chemical applications. While some information can be gleaned from the habitat section of the questionnaire, data on location of specific crops in relation to trails would probably require specifically targeted and more detailed questions. These could perhaps be sent to trail operators in a specific area, or to those who tend to provide more details. The data analyzed above suggest that trails of 50 or more boxes would be required to provide sufficient sample sizes for most such studies. Also, trails used for comparative purposes should be comparable in as many respects as possible, such as style of nest boxes used, distances nest boxes are placed from cover, and other features that may influence nesting success.

The use of a survey in biomonitoring should be conducted in conjunction with more intensive and rigorous on-site research of the type described by Bunyan et al. (1981). The survey itself could not be expected to provide highly detailed sets of data that require detailed field study. In conclusion, the interest of large numbers of amateur observers provides an opportunity to gather certain types of data in much larger samples than thos that could be gathered by professional biologists. These data sets can be used as background information from which more detailed and specific questions can be tested.

Acknowledgements

The respondents to Read's survey listed in Appendix 3 provided much of the information on which this report is based. McNicholl was able to survey the extensive literature on Ontario trails with the co-operation of librarians and other staff of the Long Point Bird Observatory, Royal Ontario Museum, and Universities of Guelph, Toronto and Western Ontario. D. C. Dupree kindly answered an enquiry concerning the North American Bluebird Society surveys. He also supplied both a print-out of Ontario records of Eastern Bluebirds on Breeding Bird Surveys and a list of Ontario members of the society. Lucy Metras supplied a list of banders who have banded bluebirds in recent years within the province. John and Margaret Cooper's comments on bluebirds in the Fonthill area helped provide perspective in the Niagara Peninsula. Janet Hinshaw of the Van Tyne Memorial Library of the Wilson Ornithological Society provided two references that McNicholl was not able to locate elsewhere. Suggestions by Joe Carreiro and Christopher J. Risley were considered in revising the manuscript. Donna Stewart and Tammara Boughen commented on the text. Graham van der Slagt assisted in the final preparation of the manuscript.

Table 1
Distribution and Objectives of Read's 1987 Ontario Nest-box Survey

Survey forms were sent to the following groups:

1. Conservation directors of all Ontario naturalist organizations affiliated with the Federation of Ontario Naturalists
2. Wildlife biologists with all conservation authorities in Ontario
3. All Ontario Ministry of Natural Resources offices
4. All bluebird trail operators known personally to Read
5. All grantees of Ontario Ministry of Natural Resources Community Wildlife Improvement Program (CWIP) grants for Eastern Bluebird trails
6. The compiler of the Ontario Nest Records Scheme
7. Long Point Bird Observatory

Objectives of Survey:

1. To determine the number of successful nestings and fledglings of Eastern Bluebirds on nest-box trails in Ontario in 1987
2. To determine the number of Eastern Bluebirds banded along nest-box trails in Ontario in 1987
3. To compile a list of current bluebird box trail operators in Ontario
4. To determine whether or not there is sufficient interest to form an Ontario bluebird society

Table 2
Ontario Data on First Brood Summary of North American Bluebird Society

Year	No. trails	No. boxes	No. used for first broods	Source
1979	3	615	5	Zeleny 1981
1980	3	630	9	Zeleny 1981
1981	2	90	2	Zeleny 1982

Table 3
Midwest (1980-1983) and Central (1984 ff.) Figures from North American Bluebird Society Nest-box Reports

No. Year	No. Respondents	No. Boxes	Boxes Used by Bluebirds No.	%	Young Fledged No.	No./Box	Source*
1980	94	2351	762	32.4	2068	2.7	1
1981	51	1195	705	60.0	2343	3.3	2
1982	79	8452	3143	37.2	14497	4.6	3
1983	361	12730	4793	37.7	20164	4.2	4
1984	508	19268	6277	32.6	25106	4.0	5
1985	618	20988	7547	36.0	32840	4.4	6
1986	638	27420	10365	37.8	46559	4.5	7
1987	715	14953	6671	44.6	31135	4.7	8
1988	667	12825	4574	35.7	20066	4.3	9
1989	700	18921	7416	39.2	32931	4.4	10

*Source: 1 = Pinkowski et al. 1981; 2 = Pinkowski et al. 1982; 3 = Dupree 1983; 4 = Dupree 1984;5 = Dupree 1985;6 = Dupree 1986;7 =Dupree 1987; 8 = Dupree and Wright 1988; 9 =Dupree and Wright 1989; 10 =Dupree and Wright 1990

Table 4
Number of Nests of Eastern Bluebirds Reported to the Ontario Nest Records Scheme

Year	Number of Bluebird Nests Reported*	Source**
pre-1956	23	Giles 1963
1956	1	Giles 1963
1957	8	Giles 1963
1958	5	Giles 1963
1959	4	Giles 1963
1960	1	Giles 1963
1961	4	Giles 1963
1962	2	Giles 1963
1963	2	Peck 1968
1964	13	Peck 1968
1965	27	Peck 1968
1966	63	Peck 1970
1967	100	Peck 1970
1968	200	Peck 1970
1969	253	Peck 1971
1970	165	Peck 1972
1971	38	Peck 1973
1972	67	Peck 1974
1973	65	Peck 1974
1974	149	Peck 1976
1975	228	Peck 1977
1976	249	Peck 1978
1977	179	Peck 1978
1978	127	Peck 1981
1979	66	Peck 1981
1980	147	Peck 1981
1981	128	Peck 1984
1982	212	Peck 1984
1983	320	Peck 1984

* Some cards may include two nestings in one box.
** Where numbers for a given year vary, the most recent figure is used. Additional sources used in compiling the table were Peck (1967,1969,1975, 1979, 1982).

Table 5
Numbers of Eastern Bluebirds Banded in Ontario

Year	Number Banded	Source
1960-1964	49	Baldwin 1968
1965	123	Brewer and Salvadori 1978
1966	72	Brewer and Salvadori 1978
1967	9	Brewer and Salvadori 1978
1968	40	Brewer and Salvadori 1978
1969	348	Brewer and Salvadori 1978
1970	261	Brewer and Salvadori 1978
1971	169	Brewer and Salvadori 1975
1977	120	Poulin *et al.* 1979
1978	23	Hyslop and Poulin 1980
1979	83	Hyslop and Poulin 1981
1980	33	Hyslop and Demers 1983
1981	102	Hyslop and Demers 1984
1982	204	Wendt *et al.* 1986
1984*	79	Anonymous 1985a
1985*	137	Duncan and Shepherd 1986
1986*	64	Shepherd 1987
1987*	107	McIlveen 1989a
1988*	162	McIlveen 1989b
1989*	671	McIlveen 1990

* Figures reported to the Ontario Bird Banding Association; these are not necessarily complete.

Table 6
Numbers of Nest-box Trails Reported on Read Survey

Year	No. Reported Trails	Increase	% Increase from Previous Year
1987	97	26	26
1986	71	6	8
1985	65	5	8
1984	60	9	15
1983	51	13	25
1982	38	8	21
1981	30	5	17
1980	25	1	4
1979	24	4	17
1978	20	5	25
1977	15	0	0
1976	15	1	7
1975	14	0	0
1974	14	0	0
1973	14	1	7
1972	13	--	--
pre-1972	14	--	--

Table 7
Results of Bluebird Trail at Chesley Ontario 1936-1939 (Krug 1941)

		Use by Bluebirds			
		First Nesting		Second Nesting	
Year	No. Boxes	No.	%	No.	%
1936	24	16	66.7	14	58.3
1937	52	46	88.5	25	48.1
1938	52	43	82.7	25	48.1
1939	45	30	66.7	17	37.8

Table 8
Results from Trail of Leo A. Smith, Dufferin to Durham Counties

Year	No. Boxes	No. Used by Bluebirds	Other Details	Source(s)
1975	?	106+		Smith 1975
1976	500	170 (34.0%)	140 "good nestings"	Smith 1978a, b,1982a
1977	500	100 (20.0%)		Smith 1982a
1978	?	?	90 "good nestings"	Smith 1979
1979	?	?	80"good nestings"	Smith 1979
1980	500			Wainio 1981
1982	500	100 or 126 (20.0 or 25.2%)	400 fledged young	Smith 1982b, c;Appendix 2
1983	488 or 500	100 or 114 (20.0 or 23.4%)	81 "good nestings" on first brood; 112 "good nestings" 114 fledged young	Anonymous 1983a,1984a; Smith 1983, 1984; Anonymous 1985b; Appendix 2
1984	500	100 or 116 (20.0 or 23.2%)		Anonymous 1984b;Smith 1985a,b; Appendix 2
1985	500	100 (20.0%)		Appendix 2
1986	500	110 (22.0%)		Appendix 2
1987	500	100, 160 or 164 (20.0, 32.0 or 32.8%)	620 fledged young	Anonymous 1987b,1988b; Appendix 2

Table 9
Results of Winona, Ontario Bluebird Trail

Year	No. Boxes	Use by Bluebirds		Young Fledged		Source(s)*
		No. Boxes	%	No.	No./Box Used	
1982	60	8	13.3	27	3.4	Read files
1983	75	11	14.6	33	3.0	Anonymous 1983c
1984	81	12	14.8	51	4.3	Anonymous 1985d
1985	102	24	23.5	80	3.3	Anonymous 1986
1986	102	25	24.5	47	1.9	Anonymous 1987a
1987	125	13(16 nests)	10.4	55	4.2	Read files; Anonymous 1988a

* no discrepencies were found between published accounts and details supplied to Read as summarized in Appendix 2 except that the published report for 1987 lists number of nests, rather than number of boxes.

Table 10
Results of Purpleville Nest-box Project

Year	No. of Boxes	No. Used by Bluebirds	No. Used by Tree Swallows	Source(s)
1952	25	10(12 nests)	not stated	Woodford 1952
1953	23	15	5	Woodford 1953
1954	20	12	6	Woodford 1955
1955	30	9	8	Woodford 1956
1956	9	4	1	Burton 1957
1957	10	3	3	Burton 1958
1958	42	3	10	Burton 1959
1959	40	4	4	Burton 1960
1960	40	1	8	Burton 1960
1961	47	5	11	Burton 1961
1962	47	2	12	Burton 1962
1963	41	1	14	Burton 1963
1964	37	1	16	Burton 1964

Table 11
Results of Bluebird Nest-box Project in the Oshawa-Lake Scugog Area

Year	No. boxes Available	No. of Broods/ No. of Nesting Attempts*	Source(s)
1967	90	24/37	Barry 1970/1974
1968	240	106/106	Barry 1970/1974
1969	330	133/133	Barry 1970/1974
1970	258	140	Barry 1974
1971	167	75	Barry 1974

* Nesting attempts of Eastern Bluebirds only.

Table 12
Early Results of Bluebird Nest-box Trail at Pike Lake, Victoria County

Year	No. of Boxes	No. Used by Bluebirds	Bluebirds Fledged	Tree Swallows Fledged	Source(s)
1982	75	?	25	?	Anonymous 1983b
1983	217/354*	104	247/400*	420/535*	Anonymous 1983b/ J.L.Baillie Fund files 1983
1984	446	148	472	622	J.L.Baillie Fund files 1984

* Where these figures differ, the first is that published in Anonymous (1983b), the second from Braley's report to the James L. Baillie Fund for Bird Research and Preservation.

Table 13
Bluebird Project Results of Willow Beach Field Naturalists

Year	No. Boxes	No. Used by Blue-birds	No. Blue-bird Nests*	No.** Success-ful Nest-ings	No. Young fledge-ged	No. Used by Tree Sw.	Source(s)
1968	19-21		9-10	4-6		11	Bird 1968b, 1969a; McLeod 1969
1969	200		90	24-37	153	72	Bird 1969b; McLeod 1969
1970	225-228	115	154	88	400	"many"	Bird 1970a,b
1971	325+		(49 in June)			"many"	Bird 1971a,b
1972	?:#350 mentioned		?: some				Bluebird Committee 1972
1973	"just under 400"		?: some				Bird 1973a,b
1974	?		(33 on 1st check)			"many"	Bird 1974
1977	(311+)	(11+)	(11+)			some	Marsh 1977
1978		several				high	Bird 1978
1980	323		41			"explosion"	Bird 1980
1982	324						Bird 1982a
1983	269		103	69 app.272		"many"	Bird 1984a,c
1984	255		119	42-43 (77 lost to cold, wet weather, & predation		(500 eggs lost to cold, 37 ads. to predation	Bird 1984a, 1985, 1986a
1985	173			81			Bird 1986a, Walton 1987
1986			107	71		many	Bird 1986b
1987	175		138	81-85		present	Appendix 2; Bird 1988

*Full numbers include second nestings; bracketed numbers are preliminary figures for years in which final figures were not reported
** "Presumed" or known number of successful nestings.

Table 14
Trail Size in Comparison with Proportion of Trails Fledging Bluebirds

No. boxes/trail	1-20	21-50	51-100	101-200	201 Or +	Total
No. trails with successful bluebird nestings	25	18	11	9	9	72
% of successful trails	35	25	15	12.5	12.5	100
No. trails without successful bluebird nestings	12	7	2	0	1	22
% of trails with no successful nestings	54.5	32	9	0	4.5	100
Total trails	37	25	13	9	10	94
% of total trails	39	26.5	14	9.5	11	100

Table 15
Bluebird Fledging Rate in Comparison with Trail Size, 1987

Trail Size	Trails Fledging Bluebirds No.	%	Boxes No.	%	Fledglings No.	%	No. Not Fledging Bluebirds	No. Boxes
1-20 boxes	25	35	211	2.8	266 (0.1-6.0/ box, mean 1.37)	5.4	12	84
21-50 boxes	18	25	600	8.0	455 (0.05-2.3/ box, mean 0.87)	9.3	7	201
51-100 boxes	11	15	713	9.5	845 (0.02-2.6/ box, mean 1.13)	17.2	2	135
101-200 boxes	9	12.5	1431	19.1	693 (0.04-1.9/ box, mean 0.53)	14.1	0	0
201 or + boxes	9	12.5	4548	60.6	2651 (0.2-1.9/ box, mean 0.68)	54.0	1	220
Total	72	100	7503	100	4910	100	22	640

Table 16
Numbers of Bluebirds Fledged in Comparison with Number of Years of Trail Operation as of the End of the 1987 Season

Years	Trails	% of Total	No. Young Fledged	No. Boxes Available	No. Fledged Young/ Boxes Available
1	21	23	168	1087	0.15
2	8	9	182	307	0.59
3	6	7	39	343	0.11
4	9	10	775	1655	0.47
5	8	9	181	366	0.49
1-5	55	61	1345	3758	0.36
6	8	9	714	1404	0.51
7	4	4	86	330	0.26
8	1	1	0	55	0.00
9	3	3	237	373	0.64
10	6	7	113	237	0.48
6-10	22	24	1150	2399	0.48
12	1	1	3	8	0.38
15 or +	15	17	2018	1768	1.14
Total	90	100	4163	7925	0.52

Table 17
Bluebird Nesting Success in 1987 on Ontario Trails Reported to W. F. Read

Jurisdiction	Trail No.*	No. Boxes	No. used successfully by bluebirds**	No. young fledged	Young per nesting	Unsuccessful nesting attempts	No. years of trail
Kenora	1	3	1	0	0	3	1
	2	3	1	4	4	0	1
	3	32	2	11	5.5	0	5
	4	5	1	4	4	0	28 or +
District Total		43	4	19	4.5	3	
Thunder Bay	5	400	30	74	?	?	2
Algoma	6	1	0	0	0	0	1
Sudbury	7	no 1987 data					
Timiskaming	8	153	10	36	3.6	5	25
Nipissing	9	30	0	0	0	0	6
	10	no 1987 data					
District Total		30	0	0		0	
Essex	11	68	?	?	?	?	4
Lambton	12	25	0	0	0	0	3
Kent	13	300	?	?	?	?	
	14	80	0	0	0	0	1
County Total		380	?	?		?	
Bruce	15	15	10 (13 nestings)	46	3.5	3	10
	16	50	6 (9 nestings)	32	3.6	0	?
	17	23	0	0	0	1	9

Table 17(cont.)

Jurisdiction	Trail No.*	No. Boxes	No. Used successfully by bluebirds**	No. young fledged	Young per nesting	Unsuccessful nesting attempts	No. years of trail
Bruce (cont.) County total	18	6	0	0	0	0	1
	19	32	8	34	4.3	2	2
		126	24 (30 nestings)	112	3.8	6	
Huron	20	30	0	0	0	1	6
	21	200	2	8	4	0	3
	22	285	50	157	3.1	3	9
County Total		515	52	165	3.6	4	
Middlesex	23	45	1	4	4	1	10
Elgin	24	30	9 (15 nestings)	70	4.7	5	16
	25	20	4	16	4	0	5
County Total		50	13 (19 nestings)	86	4.4	5	
Oxford	26	12	1	4	4	0	1
	27	8	1	4	4	0	1
	28	40	0	0	0	0	5
	29	6	2	12	6	0	4
County Total		66	4	20	4.7	0	
Grey	30	12	?	?	?	?	1
	31	50	20	75	3.8	7	25
	32	22	2	1	0.5	1	7
	33	875	79	316	4.0	?	6
	34	187	24 (34 nestings)	90	2.7	10	5
County Total		1146	125 (135 nestings)	482	2.8	18	
Wellington	35	220	0	0	0	2	7
	36	111	2	7	3.5	3	10
County Total		331	2	7	3.5	5	
Waterloo	37	1	1 (2 nestings)	6	3	0	2
	38	38	9 (10 nestings)	44	4.4	4	30+
	39	8	1	1	1	0	1

Table 17(cont.)

Jurisdiction	Trail No.*	No. Boxes	No. used successfully by bluebirds**	No. young fledged	Young per nesting	Unsuccessful nesting attempts	No. years of trail
Waterloo (cont.) County Total	40	28	0	0	0	0	1
	41	160	30	105	3.5	11	2
		235	41 (43 nestings)	156	3.0	15	
Haldimand - Norfolk Municipality Total	42	1	1 (2 nestings)	2	1	0	1
	43	24	3	16?	5.3?	0	2
	44	25	0	0	0	1	10
		50	4 (5 nestings)	18	3.2	1	
Dufferin County Total	45	8	2	3	1.5	4	12
	46	30	8 (9 nestings)	31	3.4	0	26
	47	21	6	8	1.3	0	5
		59+Smith***	16 (17 nestings)	42	2.1	4	
Dufferin, Simcoe, Peel, York & Durham	48	500	160	620	3.9	30	21
Simcoe County Total	49	4	0	0	0	0	1
	50	8	1	4	4	1	6+?
	51	60	30	65	2.2	?	7
	52	60	27 (36 nestings)	116	3.2	2-3	4
		132+Smith***	58(67 nestings)	185	3.1	3-4	
Peel	portion of Smith***						
Halton	53	5	0	0	0	0	6
Hamilton-Wentworth Municipality Total	54	51	2	8	4	0	3
	55	2	0	0	0	0	4
	56	125	13	55	4.2	8	6
		178	15	63	4.1	8	
Niagara	57	28	5	20?	4?	1	7
	58	no 1987 data					
	59	96	1	3	3	0	1
	60	56+?	1	1?	1?	1	2

Table 17(cont.)

Jurisdiction	Trail No.*	No. Boxes	No. used successfully by bluebirds**	No. young fledged	Young per nesting	Unsuccessful nesting attempts	No. years of trail
Niagara (cont.) Region Total		180	7	24	2.7	1	
Parry Sound	61	9	1	5	5	1	1
Muskoka	62	19	0	0	0	0	1
York	63	31	1	3	3	0	6
	64	4	0	0	0	3	4
Municipality Total		35+Smith***	1	3	3	3	
Durham County Total	65	16	0	0	0	2	3
		16+Smith***	1	3		5	
Victoria	66	75	24	183?	7.6?	0	?
Haliburton	67	25	10 (15 nestings)	53	3.5	0	?
Peterborough	68	45	5	19	3.8	3	3
	69	350	20	35	1.8	10?	1
	70	12	4 (6 nestings)	25	4.2	0	1
District Total		407	29 (31 nestings)	79	3.3	13?	
Northumberland	71	51	11	43	3.9	0	5
	72	175	85	340?	4?	?	20
County Total		226	96	383	4.0		
Hastings	73	3	1 (2 nestings)	3	1.5	1	1
County	74	no 1987 data					
Total		3	1 (2 nestings)	3	1.5	1	
Renfrew	75	359	?	165	?	0	20
	76	550	63	222	3.5	29	4
	77	929	93	394	4.2	?	4
County Total		1838	156	781	3.9	29	

Table 17(cont.)

Jurisdiction	Trail No.*	No. Boxes	No. used successfully by bluebirds**	No. young fledged	Young per nesting	Unsuccessful nesting attempts	No. years of trail
Lennox & Addington	78	200+	55(70 nestings)	280?	4?	0	22
	79	15	3 (4 nestings)	16?	4?	1	10
	80	3	2	8	4	1	5
County Total		218+	60 (76 nestings)	304?	4	2	
Frontenac	81	2	0	0	0	1	1
	82	2	1	4	4	1	1
	83	40	2	4	2	2	1
	84	5	5	20?	4?	0	1
County Total		49	8	24?	3.3	4	
Lanark	85	54	3 (8 nestings)	23	2.9	1	20
	86	300	74 (81 nestings)	328	4.1	28	6
	87	2	0	0	0	0	2
	88	65	20	80	4	6	9
County Total		421	97 (109 (nestings)	431	3.7	35	
Leeds-Grenville	89	26	8	40	5	2	10
	90	20	0	0	0	0	2
	91	15	1	4	4	1	20
	92	14	1	2	2	1	20
	93	8	3 (4-5 nestings)	12	2.4-3	1	6
	94	120	20 (25-28 nestings)	112	4-4.5	10	?
County Total		203	33 (39-43 nestings)	170	3.6	15	
Ottawa-Carleton	95	12	1 (2 nestings)	5	2.5	0	5
	96	6	1	4?	4?	0	3
	97	55	0	0	0	3	8
	98	75	?	196?		0	19+
	99	12	4	20	5	0	2
	100	31	5	21	4.2	2	4
	101	70	32	128	4	4	15
District Total		261	43 (44 nestings)	374	3.9	9	

*Trail Nos. correspond to those in Appendix 2
** =No. of nestings except where otherwise noted
*** Trail of Leo Smith, 500 boxes extending through five counties (Dufferin, Simcoe, Peel, York, and Durham).

Table 18
Causes of Nest Loss Reported on Read's Survey

Cause	No. Reports	No.#1 Rankings	Importance Score*
Blowflies	26	9	152
House Wren	25	8	143
House Sparrow	20	6	113
Raccoon	19	6	111
Humans	16	1	87
Squirrels	15	2	69
Biocides	14	1	72
Weather	10	7	74
Tree Swallows	9	6	67
Mice	2	0	5
Crows	1	1	8
Snakes	1	0	7
Cat	1	0	7
Ants	1	0	6
Weasel	1	0	5

*Scored by point system, ranking most important factor as 8, others in descending order of importance.

Table 19
Reported Impressions of Bluebird Population Trends

Response	No.	% of Responses
Increased	63	73
Decreased	3	4
Stable	11	12
Uncertain	9	11
Total	86	100

Figure 1A: Map of Ontario Bluebird Trails Reported to W. F. Read 1987 Survey: Northwestern Ontario

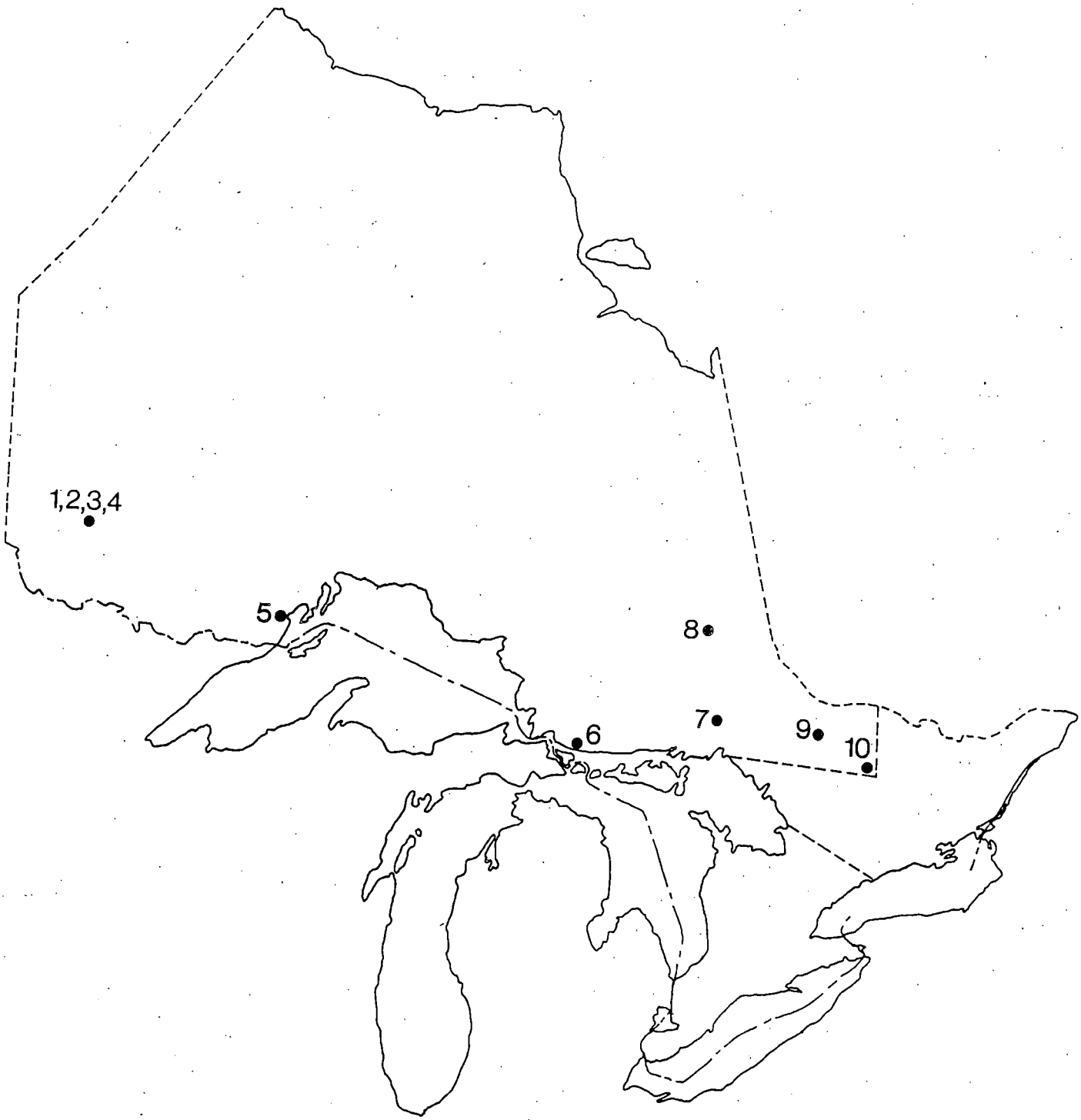


Figure 1B: Map of Ontario Bluebird Trails Reported to W. F. Read 1987 Survey: Southwestern Ontario

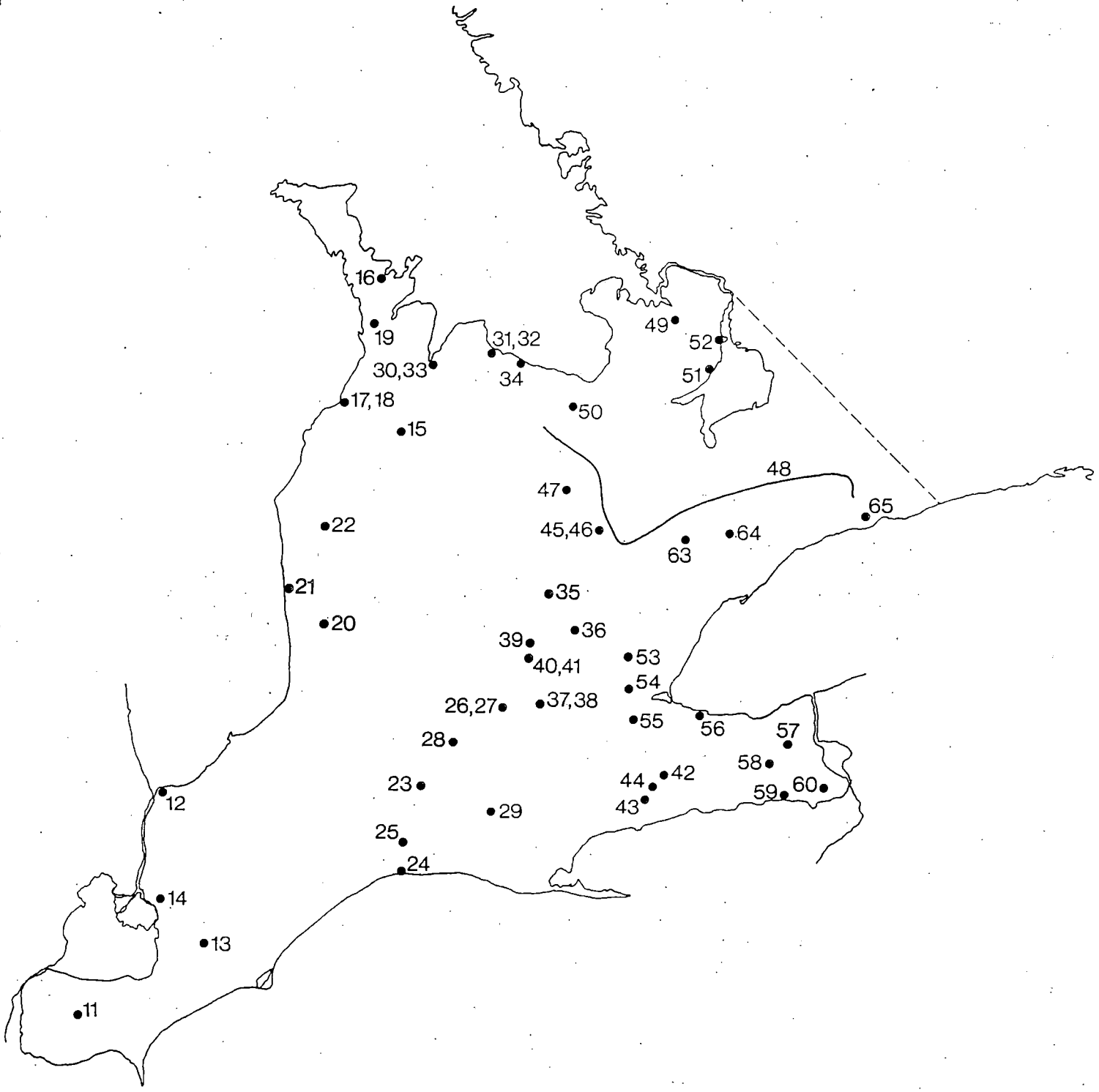
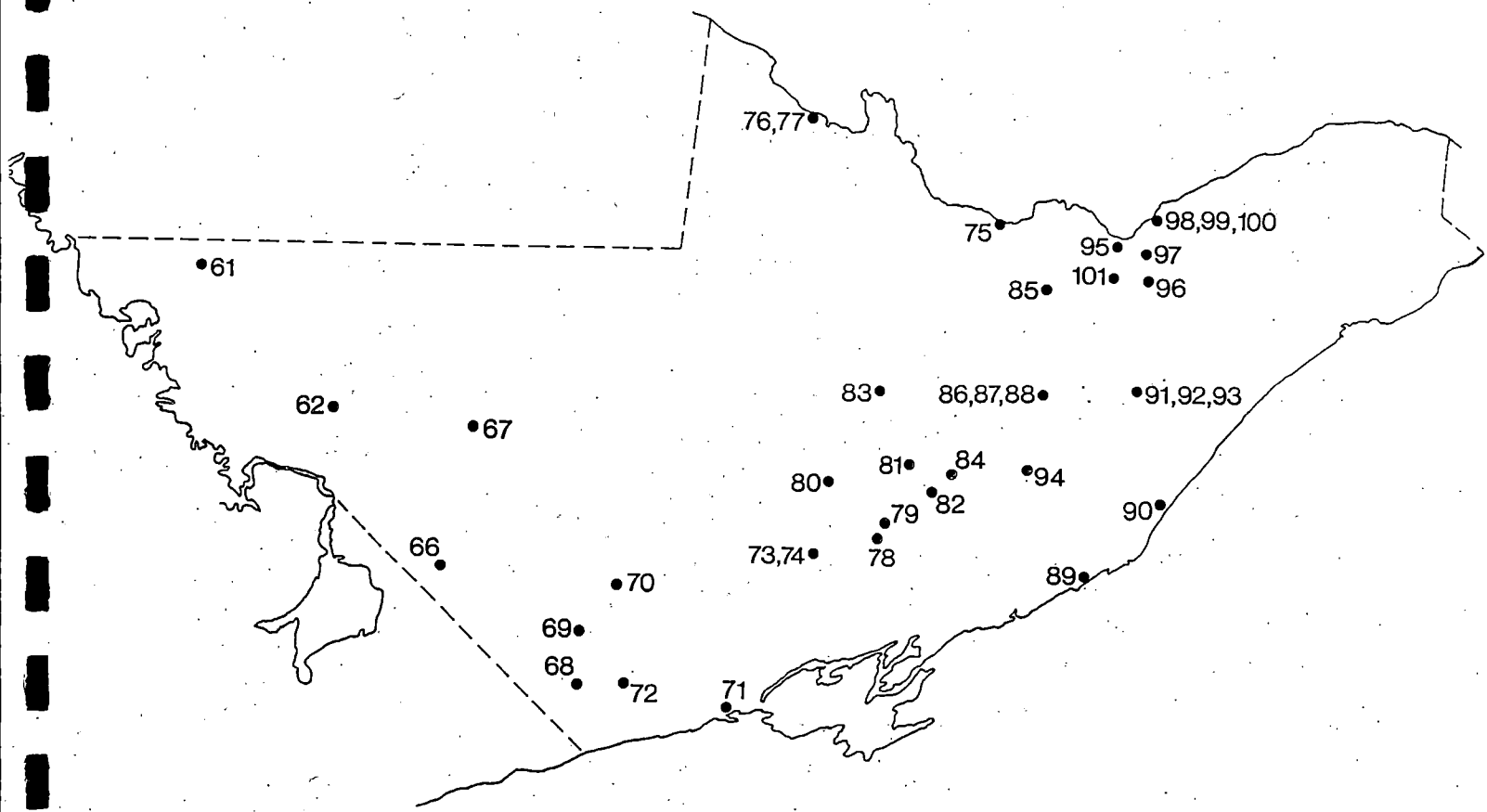


Figure 1C: Map of Ontario Bluebird Trails Reported to W. F. Read 1987 Survey: Eastern Ontario



Literature Cited:

Allen, E. G. 1951. The History of American Ornithology Before Audubon. Trans. Amer. Phil. Soc. 41:387-591.

Andrews, R. W.; C. E. Bock. 1979. A Christmas Bird Count Analysis of Bluebird Abundance Patterns and Population Trends. Sialia 1:10-14.

Anonymous. 1953. Our Bluebird Report. Newsletter Thunder Bay Field Nat. Club 7(5):29-30.

Anonymous. 1958. Are Bluebirds Becoming Fewer in Number? Wood Duck 11:104-105.

Anonymous. 1963. Bluebirds Again. Lotus 1963:5.

Anonymous. 1966. A Note on the Bluebird Project. Ont. Field Biol. 20:43.

Anonymous. 1977. Bluebird House Project. Cardinal 89:33.

Anonymous. 1979. First Brood Summary -1979/an Indication of Winter Survival. Sialia 1:141-143.

Anonymous. 1983a. Bluebirds Find Refuge. Seasons 23(3):11.

Anonymous. 1983b. On the Trail. Sialia 5:99.

Anonymous. 1983c. Eastern Bluebird Nest Box Scheme -1983 Report. Wood Duck 37:57.

Anonymous. 1984a. On the Trail. Sialia 6:19.

Anonymous. 1984b. On the Trail. Sialia 6:134.

Anonymous. 1985a. Banding in Ontario: 1984. Ont. Bird Banding 18:4-11.

Anonymous. 1985b. On the Trail. Sialia 7:63.

Anonymous. 1985c. On the Trail. Sialia 7:102.

Anonymous. 1985d. Eastern Bluebird Nest Box Scheme -1984 Report. Wood Duck 38:111.

Anonymous. 1986. Eastern Bluebird Nest Box Scheme -1985 Report. Wood Duck 39:143.

Anonymous. 1987a. Eastern Bluebird Nest Box Scheme 1986 Report. Wood Duck 40:102.

Anonymous. 1987b. (Untitled Report of L. A. Smith Trail Results for 1987.) Ont. Field Ornithol. Newsletter 13:3.

Anonymous. 1988a. Eastern Bluebird Nest Box Scheme Report 1987. Wood Duck 41:112.

Anonymous. 1988b. On the Trail. Sialia 10:59.

Anonymous. 1990. The Bluebirds of Lucknow. Sialia 12:148.

Anonymous. 1991. Hazel Bird. Curlew 36(2):6.

Baillie, J. L., Jr. 1946. Naturalists on Hudson Bay. Beaver 227(3):36-39.

Baillie, J. L., Jr.; P. Harrington. 1936-1937. The Distribution of Breeding Birds in Ontario. Trans. Royal Can. Inst. 21:1-50 & 199-283.

Baldwin, D. H. 1968. Bird Banding in Ontario: an Analysis of Five Years' Records, 1960-64. Ont. Bird-Banding 4:89-132.

Barry, D. 1966. Observations on Bluebird Nesting. Ont. Nat. 4(1):13-14.

Barry, D. 1970. The Eastern Bluebird in the Oshawa-Scugog Area. Ont. Bird Banding 6(2):39-51.

Barry, D. 1974. Eastern Bluebird Nest-box Project. Appendix F,pp. 347-354 in R. G. Tozer; J. M. Richards. Birds of the Oshawa-Lake Scugog Region. Alger Press, Oshawa.

Baughman, D. 1987. Bush Beat. Thunder Bay Chronicle-Journal 24 Nov. 1987:3.

Baxter, T. S. H. 1985. The Birding Handbook/Eastern Lake Superior. Superior Lore, Wawa.

Beane, M. 1985. Bluebird Habitat Enhancement Project Niagara district. Ont. Ministry Nat. Resources, Fonthill.

Bednarek, R.; C. S. Davidson. 1967. Influence of Spraying with Carbaryl on Nesting Success in a Sample of Birdboxes on Cape Cod in 1965. Bird-Banding 38:66-72.

Bird, H. 1966. Our Bluebirds Have Not Vanished.....Yet. Curlew 11(8): 2-3.

Bird, H. 1968a. Bluebird Project. Curlew 13(6):5-6.

Bird, H. 1968b. Bluebird Project -Part Two. Curlew 13(8):5-6.

Bird, H. 1969a. Bluebird Project, 1969. Curlew 14(6):4-5.

Bird, H. 1969b. Bluebird Project -Part 2 -1969. Curlew 14(8):4-5.

Bird, H. 1970a. Bluebird Project -1970 (Third Year of Operation) Mid-season Report. Curlew 15(6):2.

Bird, H. 1970b. Bluebird Project -1970 (part 2). Curlew 15(8):2.

Bird, H. 1971a. Bluebird Report -June, 1971. Curlew 16(6):2.

Bird, H. 1971b. Bluebird Report, 1971. Curlew 16(8):3.

Bird, H. 1972. Bluebird Report -October 1972. Curlew 17(8):2.

Bird, H. 1973a. Early Bluebird Report, 1973. Curlew 18(5):2.

Bird, H. 1973b. Fall Bluebird Report -1973. Curlew 18(9):2.

Bird, H. 1974. Bluebird Report. Curlew 19(6):2.

Bird, H. 1978. First Bluebird Report -1978. Curlew 23(6):7-8.

Bird, H. 1980. 1980 Bluebird Box Report. Curlew 25(6):3-4.

Bird, H. 1982a. 1982 Bluebird Report -Operation Renovation. Curlew 27(8): 4.

Bird, H. 1982b. Keeping You Posted -Operation Renovation. Curlew 27(9): 3-4.

Bird, H. 1983a. Operation Renovation -Bluebird Update #3. Curlew 28(1):3.

Bird, H. 1983b. Bluebird Update #4. Curlew 28(2):3.

Bird, H. 1983c. Bluebird Update #5; March 4, 1983. Curlew 28(3):2.

Bird, H. 1983d. Bluebird Update #6 -May 14, 1983. Curlew 28(5):2.

Bird, H. 1984a. WBFN Bluebird Report -Update #7. Curlew 29(3):4-5.

Bird, H. 1984b. Bluebird Update No. 8 -April 24/84. Curlew 29(5):4.

Bird, H. 1984c. Bluebird Update #9 (Part 1) -Nov. 29, 1984. Curlew 29 (10):2-3.

Bird, H. 1985. Bluebird Update #9 (Part 2) Jan. 3, 1985. Curlew 30(1): 2-3.

Bird, H. 1986a. Bluebird Update #10 -Feb. 2, 1986. Curlew 31(2):3-4.

Bird, H. 1986b. Bluebird Update #11.-Nov. 29, 1986. Curlew 31(9):2-5.

Bird, H. 1988. Bluebird Report -Update #12 -Jan. 19, 1988. Curlew 33(2): 3-6.

Bluebird Committee. 1972. Bluebirds -Final Report -1972. Curlew 17(9):2.

Brewer, A. D. 1977. The Birds of Wellington County. Guelph Field Nat. Spec. Publ., Guelph.

Brewer, A. D.; A. Salvadori. 1975. First Annual Report of Non-game Bird Banding in Ontario, 1971. Ont. Bird Banding 10:52-96.

Brewer, A. D.; A. Salvadori. 1978. Second Annual Report of Non-game Bird Banding in Ontario 1965-1970. Ont. Bird Banding 11:30-99.

Briggs-Jude, A. 1986. Blue Bells. A Bluebird Appreciation Program. Bull. Richmond Hill Nat. 280:4-8.

Broker, H. 1981. Hermit Thrush, Robins and Bluebirds - on January 17? Wood Duck 34:112.

Brooman, R. C. 1954. Birds of Elgin County, Ontario. Gilbert Press, St. Thomas.

Brunton, D. F. 1988. 1987 Honorary Membership and OFNC Awards. Trail & Landscape 22:102-106.

Bunyan, P. J.; M. J. Van den Heuvel; P. I. Stanley; E. N. Wright. 1981. An Intensive Field Trial and Multi-site Surveillance Exercise in the Use of Aldicarb to Investigate Methods for the Assessment of Possible Environmental Hazards Presented by New Pesticides. Agro-Ecosystems 7:239-262.

Burton, D. E. 1957. The Bluebird Project - 1956 Report. Ont. Field Biol. 11:21.

Burton, D. E. 1958. The Bluebird Project - 1957 Report. Ont. Field Biol. 12:27.

Burton, D. E. 1959. The Bluebird Project -1958 Report. Ont. Field Biol. 13:32.

Burton, D. E. 1960. The Bluebird Project -1959 and 1960 Reports. Ont. Field Biol. 14:29-30.

Burton, D. E. 1961. The Bluebird Project -1961 Report. Ont. Field Biol. 15:29-30.

Burton, D. E. 1962. The Bluebird Project -1962 Report. Ont. Field Biol. 16:31-32.

Burton, D. E. 1963. The Bluebird Project -1963 Report. Ont. Field Biol. 17:34.

Burton, D. E. 1964. The Bluebird Project -1964 Report. Ont. Field Biol. 18:23-24.

Byers, R. J.; F. R. Bickel. 1985. Ontario Trails. Sialia 7:104.

Campbell, I. L. 1982. Experimental Nesting Box Designed to Reduce Blowfly Parasitism. Sialia 4:49-51.

Carrick, W. H. 1960. Nest Boxes for Birds. Can. Audubon 22:42-45.

Chow, W.; E. H. Burtt, Jr.; D. E. Johnston. 1983. Invertebrate Fauna of Eastern Bluebird Nests. Sialia 5:53-57.

Clarke, J. C. 1982. Bluebird Express. Sialia 4:37.

Cooke, W. W. 1913. Local Decrease in Bluebirds. Bird-Lore 15:9-10.

Den, S. E. 1985. Pesticide Contamination and Eggshell Characteristics for Mountain Bluebirds in Colorado. North Amer. Bird Bander 10:119-121.

Devitt, O. E. 1967. The Birds of Simcoe County, Ontario. 2nd ed. Brereton Field Nat. Club, Barrie.

Duncan, B. W.; D. Shepherd. 1986. Banding in Ontario: 1985. Ont. Bird Banding 18:4-11.

Dupree, D. C. 1982. Eastern Bluebird Population Density in the North Central Portion of its Breeding Range. Sialia 4:52-59.

Dupree, D. C. 1983. 1982 Nesting Box Report. Sialia 5:62-64.

Dupree, D. C. 1984. 1983 Nesting Box Report. Sialia 6:51-53.

Dupree, D. C. 1985. 1984 Nesting Box Report. Sialia 7:51-54.

Dupree, D. C. 1986. 1985 Nesting Box Report. Sialia 8:53-56.

Dupree, D. C. 1987. 1986 Nesting Box Report. Sialia 9:51-55.

Dupree, D. C.; M. Wright. 1988. 1987 Nesting Box Report. Sialia 10:43-50.

Dupree, D. C.; M. Wright. 1989. 1988 Nesting Box Report. Sialia 11:65-70.

Dupree, D. C.; M. Wright. 1990. 1989 Nesting Box Report. Sialia 12:47-55.

Foley, M. E. 1983. Large Numbers of House Finches in St. Catharines, Ontario. Ont. Birds 1:56-60.

Forbush, E. H. 1905. The Decrease of Certain Birds in New England. Auk 22:24-25.

Foster, J. 1987. Welcoming the Bluebird. Seasons 27(1):16-19.

Giles, W. 1963. Ontario Nest Records Scheme -Report on the First Eight Years. Royal Ont. Mus., Toronto.

Goodwin, C. E. 1975. The Fall Migration August 1 - November 30, 1974. Ontario Region. Amer. Birds 29:48-53.

Grue, C. E.; L. R. DeWeese; P. Mineau; G. A. Swanson; J. R. Foster; P. M. Arnold; J. N. Huckins; P. J. Sheehan; W. K. Marshall; A. P. Ludden. 1986. Potential Impacts of Agricultural Chemicals on Waterfowl and Other Wildlife Inhabiting Prairie Wetlands: an Evaluation of Research Needs and Approches. Trans. North Amer. Wildl. & Nat. Resources Conf. 51:357-383.

Gutzke, T. W. 1985. A Bibliography on the Technical Literature of the Bluebird Genus Sialia. North Amer. Bluebird Soc., Silver Springs, Maryland.

Halliday, H. M. 1954. Wildlife Friends. Thomas Allen, Toronto.

Hanrahan, C.; M. Elder. 1987. Recent Bird Sightings. Trail & Landscape 21:202-213.

Harrison, C. 1978. A Field Guide to the Nests, Eggs and Nestlings of North American Birds. Collins, Glasgow.

Harrison, H. H. 1975. A Field Guide to Birds' Nests of 285 Species Found Breeding in the United States East of the Mississippi River. Houghton Mifflin, Boston.

Hearn, D. 1972. Bluebird Project Underway. Newsletter Thunder Bay Field Nat. Club 26(2):23.

Henny, C. J.; R. A. Olson; D. L. Meeker. 1977. Residues in Common Flicker and Mountain Bluebird Eggs One Year After a DDT Application. Environ. Contam. and Toxicol. 18:115-122.

Hewitt, C. G. 1914. The Protection of Birds In and Around Ottawa. Ottawa Nat. 27:161-171.

Hicks,E. A. 1959. Check-list and Bibliography on the Occurrence of Insects in Birds' Nests. Iowa State College Press, Ames.

Hill,J. R. III. 1988. The Eastern House Finch Nesting in Purple Martin Houses and Gourds. Amer. Birds 42:36-38.

Hyslop, C.; A. M. Demers. 1983. Annual Report to Banders -Summary of Bird Banding in Canada in 1980. Can. Wildl. Serv. Progress Rept. No. 135.

Hyslop, C.; A. M. Demers. 1984. Annual Report to Banders -Summary of Bird Banding in Canada in 1981. Can. Wildl. Serv. Progress Rept. No. 145.

Hyslop, C.; R. M. Poulin. 1980. Annual Report to Banders -Summary of Bird Banding in Canada in 1978. Can. Wildl. Serv. Progress Notes No. 117.

Hyslop, C.; R. M. Poulin. 1981. Annual Report to Banders -Summary of Bird Banding in Canada in 1979. Can. Wildl. Serv. Progress Notes No. 125.

Iden, P. 1967. Toronto Birdfinding guide. Toronto Field Nat. Club, Toronto.

Jackson, J. A. 1985. On the Control of Parasites in Nest Boxes and the Use of Pesticides Near Boxes. Sialia 7:17-25.

Jaco,B.D.; D. C. Hulse. 1963. Insecticides as a Factor in Bluebird Nesting Success. Alabama Birdlife 11:43-44.

Johnson, C. W. 1932. Notes on Protocalliphora During the Summer of 1931. Bird-Banding 3:26-29.

Keith, J. A. 1984. Committee on the Status of Endangered Wildlife in Canada. Trans. Fed.-Prov. Wildl. Conf. 48:175-180.

Kelley, A. H. 1972. Historical Notes on the Bird Records of the Detroit-Windsor Area. Jack-Pine Warbler 50:44-47.

Kelley, A. H. 1978. Birds of Southeastern Michigan and Southwestern Ontario. Cranbrook Inst. Sci., Bloomfield Hills, Mich.

Kelly, M. 1967. Bird Houses for Bluebirds and Other Desirable Species. Ont. Nat. 5(1):21-22.

Kirk, M. D. 1963. Restoring the Bluebird. Can. Audubon 25:142-143.

Kozlovic, D. R. 1987 . House Finch Roselin Familier Carpodacus mexicanus. pp. 492-493 in M. D. Cadman, P. F. J. Eagles and F. M. Helleiner (Eds.). Atlas of the Breeding Birds of Ontario. Univ. Waterloo Press, Waterloo.

Kozlovic, D. R. 1994. The House Finch in Ontario. pp. 298-306 in M. K. McNicholl and J. L. Cranmer-Byng (Eds.). Ornithology in Ontario. Ontario Field Ornithologists. Special Publication #1, Hawk Owl Publishing, Whitby.

Krueger, H. 1988. A Carbaryl Pesticide Suspected in Death of Nestling Eastern Bluebirds. Sialia 10:93.

Krug, H. H. 1941. Bluebird Banding at Chesley, Ontario. Bird-Banding 12: 23-26.

Lemon, J. 1957. Bluebird Boxes. Cardinal 22:17.

Leverton, G. 1972. Eastern Bluebird Elgin County. Cardinal 73:3-5.

Lloyd, H. 1927. Identification of Flies Found Infesting Bluebirds. Can. Field-Nat. 41:111.

Lougheed, S.C.; E. C. Lougheed. 1986. Man's Influence on Bluebird Habitat. Wood Duck 39:111-113.

Lumsden, H. G. 1986. Choice of Nest Boxes by Tree Swallows, Tachycineta bicolor, House Wrens, Troglodytes aedon, Eastern Bluebirds, Sialia sialis and European Starlings, Sturnus vulgaris. Can. Field-Nat. 100:343-349.

MacNamara, K. 1988. Home of the Bluebird. Wood Duck 41:126-127.

MacNay, C. G. 1983. Bluebird Trail * 1982. Trail & Landscape 17:99.

MacRae, J.; J. MacRae. 1987. Purple Martins or Eastern Bluebirds. Wood Duck 40:24.

Marsh, M. 1977. Bluebird Project Updated to May 8, 1977. Curlew 22(5): 2-3.

Mason, E. A. 1944. Parasitism by Protocalliphora and Management of Cavity-nesting Birds. J. Wildl. Manage. 8:232-247.

McCluskey, D. C.; J. W. Thomas ; E. C. Meslow. 1977. Effects of Aerial Application of DDT on Reproduction in House Wrens and Mountain and Western Bluebirds. USDA Forest Serv. Res. Paper PNW-228.

McCracken, J. D. 1987. Annotated Checklist to the Birds of Haldimand-Norfolk. Part 5 in The Natural Areas Inventory of the Regional Municipality of Haldimand-Norfolk. Vol. 2: Annotated Checklists. Norfolk Field Nat., Simcoe.

McCracken, J. D.; M. S. W. Bradstreet; G. L. Holroyd. 1981. Breeding Birds of Long Point, Lake Erie. Can. Wildl. Serv. Rept. Ser. No. 44.

McDougall, M. M. 1981. Bluebirds and Leo Smith. Seasons 21(3): 14-17.

McIlveen, W. D. 1984. Report on the Bluebird Nestbox Program of the Sudbury Ornithological Society. Typescript.

McIlveen, W. D. 1989a. Banding in Ontario: 1987. Ont. Bird Banding 20/21: 2-10.

McIlveen, W. D. 1989b. Banding in Ontario: 1988. Ont. Bird Banding 20/21: 12-19.

McIlveen, W. D. 1990. Banding in Ontario: 1989. Ont. Bird Banding 22:1-8.

McLeod, D. 1978. Bluebird Trail. Cardinal 92:2.

McLeod, V. 1969. Bluebird Territory. Curlew 14(10):2-4.

McNicholl, M. K. 1987. Ontario Lakes Loon Survey Progress Report No. 4: 1984-1986. Long Point Bird Observ., Port Rowan, Ont.

McRae, R. D. n.d. [1982]. Birds of Presqu'ile, Ontario. Ont. Ministry of Nat. Resources, 74 pp.

Mills, A. 1981. A Cottager's Guide to the Birds of Muskoka and Parry Sound. Privately Published.

Mineau, P.; G. A. Fox; R. J. Norstrom; D. V. Weseloh; D. J. Hallett; J. A. Ellerton. 1984. Using the Herring Gull to Monitor Levels and Effects of Organochlorine Contamination in the Canadian Great Lakes. Chapter 19, pp. 426-452 in J. O. Nriagu; M. S. Simmons (Eds.). Toxic Contaminants in the Great Lakes. Wiley, New York.

Morris, R. W. 1964. Bluebirds of Happiness. Cardinal 50:4-7.

Morris, R. W. 1965. Bluebirds of Happiness II. Cardinal 51:8-9.

Mundinger, P. C.; S. Hope. 1982. Expansion of the Winter Range of the House Finch: 1947-79. Amer. Birds 36:347-353.

Musselman, T. E. 1939. The Effect of Cold Snaps Upon the Nesting of the Eastern Bluebird (Sialia sialis sialis). Bird-Banding 10:33-35.

Newman, J. 1989. Speaker of the Quarter. Lorne Smith. Sialia 11:108-109.

Nicholson, J. C. 1972. The Birds of Manitoulin Island - a Species Accounts Summary. Privately Published, Sudbury.

Nicholson, J. C. 1974. Birds of the Sudbury District -a Species Accounts Summary. Privately Published, Sudbury.

Nicholson, J. C. 1981. The Birds of Manitoulin Island and Adjacent Islands Within Manitoulin District. 2nd ed. Privately Published, Sudbury.

Nisbet, R. 1979a. Pickering Naturalist Club Bluebird Nest Box Project. Pickering Nat. 4:24-25.

Nisbet, R. 1979b. Pickering Naturalist Club Eastern Bluebird Nest Box Program, 1979 Report. Pickering Nat. 4:122.

Noble, D. G.; J. E. Elliott. 1986. Environmental Contaminants in Eastern Seabirds 1968-1985: Trend and Effects. Can. Wildl. Serv. Headquarters Tech. Rept. Ser. No. 13, Ottawa.

Norstrom, R. J. 1986. Patterns and Trends of PCB Contamination in Canadian Wildlife. IEEE Montech 86, Conference on PCBs and Replacement Fluids:1-9.

Parker, B. D. 1983. A Survey of Ontario Bird Literature -Part 15. Thrushes to Shrikes. Toronto Field Nat. 354:37-38.

Peakall, D. B. and J. R. Bart. 1983. Impacts of Aerial Application of Insecticides on Forest Birds. CRC Critical Rev. Environ. Control 13:117-165.

Peck, G. K. 1967. Ontario Nest Records Scheme Third Report (1956-1966). Royal Ont. Mus., Toronto.

Peck, G. K. 1968. Ontario Nest Records Scheme Fourth Report (1956-1967). Royal Ont. Mus., Toronto.

Peck, G. K. 1969. Ontario Nest Records Scheme Fifth Report (1956-1968). Royal Ont. Mus., Toronto.

Peck, G. K. 1970. Ontario Nest Records Scheme Sixth Report (1956-1969). Royal Ont. Mus., Toronto.

Peck, G. K. 1971. Ontario Nest Records Scheme Seventh Report (1956-1970). Royal Ont. Mus., Toronto.

Peck, G. K. 1972. Ontario Nest Records Scheme Eighth Report (1956-1971). Royal Ont. Mus., Toronto.

Peck, G. K. 1973. Ontario Nest Records Scheme Ninth Report (1956-1972). Royal Ont. Mus., Toronto.

Peck, G. K. 1974. Ontario Nest Records Scheme Tenth Report (1956-1973). Royal Ont. Mus., Toronto.

Peck, G. K. 1975. Ontario Nest Records Scheme Eleventh Report (1956-1974). Royal Ont. Mus., Toronto.

Peck, G. K. 1976. Ontario Nest Records Scheme Twelfth Report (1956-1976 [sic:1975]). Royal Ont. Mus., Toronto.

Peck, G. K. 1977. Ontario Nest Records Scheme Thirteenth Report (1956-1976). Royal Ont. Mus., Toronto.

Peck, G. K. 1978. Ontario Nest Records Scheme Fourteenth Report (1956-1977). Royal Ont. Mus., Toronto.

Peck, G. K. 1979. Ontario Nest Records Scheme Fifteenth Report (1956-1978). Royal Ont. Mus, Toronto.

Peck, G. K. 1981. Ontario Nest Records Scheme Sixteenth Report (1956-1980). Royal Ont. Mus., Toronto.

Peck, G. K. 1982. Ontario Nest Records Scheme Seventeeth Report (1956-1981). Royal Ont. Mus., Toronto.

Peck, G. K. 1984. Ontario Nest Records Scheme Eighteenth Report (1956-1984). Royal Ont. Mus., Toronto.

Peck, G. K.; R. D. James. 1987. Breeding Birds of Ontario. Nidiology and Distribution. Vol. 2: Passerines. Royal Ont. Mus. Life Sci. Misc. Publ., Toronto.

Pinkowski, B. C. 1977. Blowfly Parasitism of Eastern Bluebirds in Natural and Artificial Nest Sites. J. Wildl. Manage. 41:272-276.

Pinkowski, B. C. 1979. Effects of a Severe Winter on a Breeding Population of Eastern Bluebirds. Jack-Pine Warbler 57:8-12.

Pinkowski, B.; R. Adams; P. Jung. 1981. 1980 Bluebird Nest Box Report. Sialia 3:52-53.

Pinkowski, B.; R. Adams; P. Jung. 1982. 1981 Bluebird Nest Box Report. Sialia 4:70-71.

Pitts, T. D. 1978. Eastern Bluebird Mortality at Winter Roosts in Tennessee. Bird-Banding 49:77-78.

Pitts, T. D. 1981. Eastern Bluebird Population Fluctuations in Tennessee During 1970-1979. Migrant 52:29-37.

Pitts, T. D. 1984. Historical Population Changes of Eastern Bluebirds in Northwest Tennessee. Sialia 6:43-47.

Poulin, R. M.; K. L. Newell; S. J. O'Donnell; S. Wendt. 1979. Annual Report to Banders: Summary of Birds Banded in Canada in 1977. Can. Wildl. Serv. Progress Notes No. 102.

Prescott, H. W. 1980. Causes of Decline of the Western Bluebird in Oregon's Willamette Valley. Sialia 2:131-135.

Price, I. M. 1977. Environmental Contaminants in Relation to Wildlife. Trans. North Amer. Wildl. Conf. 42:382-396.

Quilliam, H. R. 1965. The History of the Birds of Kingston, Ontario. Privately Published, Kingston.

Risley, C. J. 1981. The Status of the Eastern Bluebird (Sialia sialis) in Canada with Particular Reference to Ontario. Nongame Program, Ontario Ministry of Natural Resources, Toronto.

Risley, C. J. 1984. Limiting Factors of the Eastern Bluebird Population in Ontario. Ont. Ornithol. Meeting Abstracts: 4.

Risley, C. [J.] 1987. Eastern Bluebird Merle-bleu de l'Est Sialia sialis. pp.320-321 in M. D. Cadman; P. F. J. Eagles; F. M. Helleiner (Eds.). Atlas of the Breeding Birds of Ontario. Univ. Waterloo Press, Waterloo.

Robbins, C. S.; D. Bystrak; P. H. Geissler. 1986. The Breeding Bird Survey: its First Fifteen Years, 1965-1979. U. S. Fish & Wildl. Serv. Resource Publ. No. 157.

Roberts, T. H. 1981. Parasites of the Eastern Bluebird. Sialia 3:92-94.

Sadler, D. 1983. Our Heritage of Birds. Peterborough County in the Kawarthas. Orchid Press, Peterborough.

Saunders, W. E. 1891. Bluebird - Dickcissel. Ottawa Nat. 9:212-214.

Saunders. W. E. 1914. Correspondence. Ottawa Nat. 27:173-174.

Saunders, W. E.; M. S. Dale. 1933. History and List of Birds of Middlesex County, Ontario. Trans. Royal Can. Inst. 19, part 2:161-248.

Shepherd, D. 1987. Banding in Ontario: 1986. Ont. Bird Banding 19:4-11.

Sheppard, R. W. 1970. Bird Life of Canada's Niagara Frontier. Revised ed. Niagara Falls Nature Club, [Niagara Falls.]

Smith, L. 1975. Along the Bluebird Trail. Toronto Field Nat. 293:7-8.

Smith, L. 1978a. Report on Bluebird Nesting Boxes. Toronto Field Nat. 312:15.

Smith, L. A. 1978b. Eastern Bluebird Boxes in Ontario. Blue Jay 36:45.

Smith, L. A. 1979. Hard Times on the Bluebird Trail. Wood Duck 33:36-37.

Smith, L. 1982a. The Leo Smith Bluebird Trail. Ont. Bird Banding Assoc. Newsletter Nov. 1982:4-5.

Smith, L. A. 1982b. Bluebirds: Setting the Record Straight. Seasons 22(1): 13,15.

Smith, L. A. 1982c. Eastern Bluebird Nestbox Report. Blue Jay 40:218.

Smith, L. A. 1983. Does the Bluebird Get Rid of Her Eggs Because of Pesticides? Wood Duck 37:55.

Smith, L. A. 1984. Eastern Bluebird Nestbox Report. Blue Jay 42:116.

Smith, L. A. 1985a. Bluebirds Have Me on a Treadmill. Wood Duck 38:159.

Smith, L. A. 1985b. Bluebird Report: 1985. Wood Duck 39:25.

Snyder, L. L. 1939. A Plan of Ontario Subdivisions and Their Names for Naturalists. Can. Field-Nat. 53:22-24.

Speirs, J. M. 1975. Birds of Ontario County. Flycatchers to Shrikes. Fed. Ont. Nat., Toronto.

Speirs, J. M. 1985. Birds of Ontario. Vol. 2. Natural Heritage, Toronto.

Sprague, R. T.; R. D. Weir. 1984. The Birds of Prince Edward County. Kingston Field Nat., Kingston.

Stone, W. B.; J. C. Okoniewski. 1988. Organochlorine Pesticide-related Mortalities of Raptors and Other Birds in New York, 1982-1986. Chapt. 42, pp. 429-438 in T. J. Cade; J. H. Enderson; C. G. Thelander; C. M. White (Eds.). Peregrine Falcon Populations/ Their Management and Recovery. The Peregrine Fund, Boise, Idaho.

Taman, L. 1986. Bluebirds. Peep 28(4):2-3.

Taman, L. 1987. Bluebirds. Peep 29(4):2.

Taman, L. 1988. Nest Box Report 1988. Peep 30(4):2.

Tate, J., Jr. 1986. The Blue List for 1986. Amer. Birds 40:227-236.

Taverner, P. A. 1919. Bird-houses and Their Occupants. Ottawa Nat. 32: 119-126.

Taverner, P. A. 1922. The Disappearance and Recovery of the Eastern Bluebird. Can. Field-Nat. 36:71-72.

Thomas, J. W.; D. C. McCluskey. 1974. Effects of Aerial Application of DDT for Tussock Moth Control on Nestling Survival of Mountain Bluebirds and House Wrens. USDA Forest Serv. Res. Paper PNW-185.

Tucker, R. K.; J. S. Leitzke. 1979. Comparative Toxicology of Insecticides for Vertebrate Wildlife and Fish. Pharmacology and Therapeutics 6:167-220.

Tuttle, R. M. 1987. A Study of Winter Roost Site Management and the Use of Sites by Eastern Bluebirds in Delaware State Park, Delaware, Ohio. Sialia 9:43-49.

Wainio, A. 1981. The Bluebird's Champion. Nature Canada 10(1):31-32.

Walton, C. 1987. "Hollering Blue Murder." Nature Canada 16(3):22-29.

Warren, J. A. 1975. Bluebirds in Moscow and Centreville. Blue Bill 22:36.

Wendt, S.; L. Metras; A. Demers. 1986. Annual Report to Banders -Summary of Bird Banding in Canada in 1982. Can. Wildl. Serv. Progress Notes No. 159.

Wilson, A. 1968. Bluebird House Project -1968. Curlew 13(3):4.

Woodford, J. 1952. A Preliminary Report on the Bluebird Project. Intermediate Nat. 7:15-22 (not 16-22 as reported by Parker 1983).

Woodford, J. 1953. T. I. N. Bluebird Project: 1953 Report. Intermediate Nat. 8:28.

Woodford, J. 1955. The Bluebird Project -1954 Report. Ont. Field Biol. 9: 25.

Woodford, J. 1956. The Blue Bird Project--1955 Report. Ont. Field Biol. 10:29.

Woodford, J. 1957. The Bluebird in Ontario. Fed. Ont. Nat. Bull. 78: 7-10.

Wren, C. D. 1986. Mammals as Biological Monitors of Environmental Metal Levels. Environ. Monitoring and Assessment 6:127-144.

Zeleny, L. 1970. Enemies of the Bluebird. Purple Martin Capital News 27 May 1970, reprinted in Sialia 7:105-106, 1985.

Zeleny, L. 1976. The Bluebird: How You Can Help its Fight for Survival. Univ. Indiana Press, Bloomington.

Zeleny, L. 1977. Hope for the Bluebird. Natl. Geogr. 151:854-865.

Zeleny, L. 1978. Nesting Box Programs for Bluebirds and Other Passerines. Chapt. 7, pp. 55-60. in S. A. Temple (Ed.) Endangered Birds/ Management Techniques for Preserving Threatened Species. Univ. Wisconsin Press, Madison.

Zeleny, L. 1981. First Brood Summary 1980. An Indication of Winter Survival. Sialia 3:3-6.

Zeleny, L. 1982. Bluebird First Brood Summary - 1981. Sialia 4:12-14.

Zeleny, L. 1983. History of Bluebird Conservation. Sialia 5:43-52.

Zeleny, L. 1986. The Bluebird Parasitic Blowfly. Sialia 8:136-138.

Appendix 1: 1987 Questionnaire Distributed by W. F. Read

1987 EASTERN BLUEBIRD NEST BOX SURVEY

NAME: _____

ADDRESS: _____

DESCRIPTION OF NEST BOX (ie. floor size, depth, raccoon guard, etc.): _____

	1987	1986	1985	1984	1983	1982
NO. OF BOXES MAINTAINED						
NO. OF BOXES USED SUCCESSFULLY BY BLUEBIRDS (1)						
NO. OF SUCCESSFUL NESTINGS						
NO. OF YOUNG BLUEBIRDS FLEDGED(2)						
UNSUCCESSFULL BLUEBIRD NESTINGS (3)						
SUCCESSFUL NESTINGS OF OTHER SPECIES:						
House Wren						
Tree Swallow						
Black-capped Chickadee						
BANDING TOTALS						
EASTERN BLUEBIRDS BANDED						
TREE SWALLOWS BANDED						
NAME OF BANDER						

If exact figures are not available please use best estimates.

(1) Used successfully means at least one young Bluebird was fledged.

(2) A young bird is said to be fledged when it leaves the nest on its own power.

(3) Eggs were laid but for some reason no Bluebirds fledged.

If an Ontario Bluebird Society was organized, would you be interested in becoming a member? YES ____ NO ____

1. How many years have you maintained a nest box trail?
_____

2. Do you maintain and clean your nesting boxes each year?
_____

3. How many times during the nesting season do you check your boxes?
_____

4. How many pairs of Eastern Bluebirds are you aware of in your area that nest in natural cavities?
_____

5. Do you allow House Sparrows to nest successfully in your boxes?
Yes _____ No _____

6. Where are your boxes located? (Please check)

_____ pastureland
_____ open field
_____ cereal crops (corn, barley, oats, wheat, etc.)
_____ hedgerow
_____ woodland edge
_____ railway tracks
_____ lawn (any mowed area, park, golf course, etc.)
_____ other (specify: _____)

7. If eggs or nestlings were lost, indicate the importance of the presumed cause. (No. 1 for the most important to No. 8 for the least important)

____ pesticides/herbicides	____ humans
____ raccoons	____ squirrels
____ wrens	____ blowflies
____ house sparrows	____ other (specify: _____)

8. In your opinion, has the population of Eastern Bluebirds in your area increased or decreased over the past five or six years?

_____

I would welcome any comments or additional information that you may have. Please attach additional sheets if necessary. If you would like a copy of the completed report please include a self-addressed stamped envelope. Please mail the completed nest survey to:

William Read
2-165 Green Valley Drive
Kitchener, Ontario
N2P 1K3

Many thanks for your cooperation.

Appendix 2: Summary of Nest-box Trail Results Reported to William F. Read

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Bluebirds	No. Nestings Tree Sw.
Kenora District	1 Dryden -habitat: mowed area	V. Figley	1	1987	3	1	2
	2 Dryden -habitat: pastureland, open field	Mr.& Mrs. Barney Haukeness	1	1987	3	1	2
	3 Dryden -habitat: woodland edge, lawn, roadside	W. M. Hoidyssek	5	1983-1987	10-32	0-2	ann-ually
	4 Oxdrift -habitat: pastureland, open field, lawn	Mrs. Melvin Pollard	since 1950s	1982-1987	5	0-1	3-4
Rainy River District	no reports						
Thunder Bay District	5 Thunder Bay -habitat: not given	Mrs. Jean Lister	?	1986-1987	approx. 400	5-30	93
Cochrane District	no reports						
Algoma District	6 Blind River -habitat: open field, lawn	John N. Ashdown	1	1987	1	0	1
Sudbury District	7 Sudbury -habitat: some along roadsides	Sudbury Ornithol. Club	1?	1984	70	3	18

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Bluebirds	No. Nestings Tree Sw.
Manitoulin Island District	no reports						
Timiskaming District	8 Matachewan -habitat:	Lloyd Taman not given	25	1982-1987	5-153	2-13	5-46
Nipissing District	9 North Bay -habitat:	Ted Price, Nipissing Nat. Club open field	6	1982-1987	18-34	0	15-20
	10 Whitney -habitat:	Bob Swainson not given	2	1984-1985	4-12	2-3	2-7
Essex County	11 Essex -habitat:	Essex Region Conservation Authority not given	4	1985+ 1987	23-68	?	?
Lambton County	12 Sarnia -habitat:	Don A. Smith pastureland, cereal crops, railway tracks, wetlands	3	1985-1987	10-25	0	6-12
Kent County	13 Chatham -habitat: woodland	Lower Thames Valley Conservation Authority pastureland, open field, cereal crops, hedgerow, edge, lawn	3	1985-1987	250-300	?	?
	14 Wallaceburg -habitat:	Tom Chatterton, Sydenham Field Nat. pastureland, cereal crops	1	1987	80	0	28

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Bluebirds	No. Nestings Tree Sw.
Bruce County	15 Chesley	Howard H. Krug	10	1984-1987	13-15	10	0 (removed)
	-habitat: pastureland, open field, woodland edge						
	16 Lion's Head	Ken Maynard	?	1987	50	6	?
	-habitat: not given						
	17 Port Elgin	Doug Martin	9	1979-1987	2-23	0-1	2-17
	-habitat: pastureland, woodland edge, regenerating pasture						
	18 Port Elgin	Martin Parker	1	1987	6	0	3
	-habitat: pastureland						
	19 Sauble Falls	Dennis Lewington	2	1986-1987	8-32	2-10	2-19
	-habitat: pastureland, hedgerow, cemetery						
Huron County	20 Clinton	Thomas Lobb	6	1982-1987	8-30	0-2	4-18
	-habitat: pastureland, overgrown pasture, hay fields						
	21 Goderich	Geoffrey Walker	3	1985-1987	20-200	0-2	15-190
	-habitat: pastureland, hedgerow, woodland edge						
	22 Lucknow	William A. Henderson	9	1982-1987	146-300	8-50	96-172
	-habitat: pastureland, open field, hedgerow, railway tracks, side roads						
Middlesex County	23 Dorchester	Carl E. Hearn	10	1982-1987	45-75	0-1	8-20
	-habitat: pastureland, cereal crops, hedgerow						
Elgin County	24 Port Stanley	Joe Hurst	16	1982-1987	20-30	2-9	3-4
	-habitat: pastureland, open field, lawn						

Appendix 2 (Cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Blue-birds	No. Nestings Tree Sw.
Elgin County (cont.)	25 St. Thomas	Robert Hubert	5	1983-1987	11-20	1-5	4-10
	-habitat: pastureland, open field, cereal crops, woodland edge						
Perth County	no reports						
Oxford County	26 Bright	Daniel Entz	1	1987	12	1	5
	-habitat: pastureland, orchard						
	27 Bright	David Kubassek	1	1987	8	1	4-5
	-habitat: pastureland						
	28 Embro	J. W. Lambe	5	1987	40	0	?
	-habitat: bushy						
	29 Tillsonburg	Yvonne Homick	4-5	1987	6	2	Yes
	-habitat: pastureland						
Grey County	30 McNab Lake Manage. Area	Grey Sauble Conservation Authority (Anne Lennox)	about 12	1987 +?	?	?	?
	-habitat: along fence rows, open field						
	31 Meaford Tank Range	John C. Clarke	25	1987	approx. 50	20	?
	-habitat: open field						
	32 Meaford	Dale Glover	7	1982-1987	20-34	0-2	9-11
	-habitat: pastureland, open field, cemetery, lawn						

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Bluebirds	No. Nestings Tree Sw.
Grey County (cont.)	33 Owen Sound -habitat:	Lorne Smith not given	?	1982-1987	250-875	0-79	?
	34 Thornbury -habitat:	Malcolm Kirk & Lynne Richardson pastureland, open field, lawn	5	1986-1987	?	24-38	36-41
Wellington County	35 Fergus -habitat:	David R. Lamble pastureland, open field, cereal crops	7	1982-1987	120-220	0-2	35-105
	36 Guelph -habitat:	Bryan Wyatt pastureland, open field, cereal crops, hedgerow	10	1987	111	2	60
Waterloo County	37 Ayr -habitat:	Harold D. Ghent pastureland	2	1986-1987	?	1	1
	38 Ayr -habitat:	Norman Shantz pastureland, open field, cereal crops, woodland edge, railway tracks	30+	1987	38	9	16
	39 Bloomingdale -habitat:	Ross Little pastureland, open field, cereal crops	1	1987	?	1	2
	40 Kitchener -habitat:	Edward Meissner pastureland, along highway	1	1987	28	0	16
	41 Kitchener -habitat:	William F. Read pastureland, open field, woodland edge, railway tracks	2	1986-1987	160	30	40-50
Brant County	no reports						

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Blue-birds	No. Nestings Tree Sw.
Haldimand-Norfolk Regional Municipality	42 Cayuga -habitat:	Dorothy E. Armstrong pastureland, hedgerow	1	1987	1	1	0
	43 Fisherville -habitat:	William M. Fletcher pastureland, open field, cereal crops, woodland edge	2	1986-1987	16-24	3	10
	44 Taquanyah Nature Centre -habitat:	Bruce Duncan pastureland, open field, hedgerow, lawn	10	1982-1987	25	0	20-47
Dufferin County	45 Orangeville -habitat:	Frank G. W. Adams pastureland, open field, woodland edge, lawn	12	1982-1987	4-8	2-4	1-3
	46 Orangeville -habitat:	Don Moffat pastureland, open field, lawn	26	1982-1987	30	6-8	16-20
	47 Shelburne -habitat:	Boyne River Natural Science pastureland, open field, woodland edge	5	1987	21	6?	5?
Dufferin, Simcoe, Peel, York, & Durham Counties	48 11 townships -habitat:	Leo A Smith not given	19-21 (see text)	1982-1987	500	100-160	350-400
Simcoe County	49 Coldwater -habitat:	David Hibbard open field, hedgerow	1	1987	4	0	1
	50 Glen Huron -habitat:	Glen Best pastureland, lawn	?	1982-1987	8	1	3-4

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Bluebirds	No. Nestings Tree Sw.
Simcoe County (cont.)	51 Hawkestone	Brian Fleming	7	1987	30-60	about 30	?
	-habitat: pasture, open field, woodland edge, lawn						
	52 Orillia	Ray Kiff	4	1984-1987	1-60	1-27	20 (1987)
Peel County	no reports other than Peel County portion of L. A. Smith trail						
Halton County	53 Campbellville	Bill Tindale	6	1982-1987	5	0	0-1
	-habitat: hedgerow, woodland edge						
Regional Muncipality of Hamilton-Wentworth	54 Millgrove	Art N. Butwicke	3	1985-1987	12-51	0-2	8-46
	-habitat: pastureland, open field, woodland edge, lawn						
	55 Mount Hope	Norma Ridge	4	1984-1987	2	0	?
	-habitat: suburban by open field						
	56 Winona	G.Coker, S.Tabone, & R.Hughes	6	1982-1987	60-125	8-25	12-50
	-habitat: open field, hedgerow, vineyard						
Niagara Peninsula	57 Allenburg	Niagara Peninsula Conservation Authority	7	1986-1987	14-28	1-5	2-6
	-habitat: open field, hedgerow, woodland edge, lawn, orchards						

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Blue-birds	No. Nestings Tree Sw.
Niagara Peninsula (cont.)	58 Fonthill	Ontario Ministry of Nat. Resources	1	1985	40	?	?
	-habitat: pastureland, lawn, trees						
	59 Port Colborne	Port Colborne & District Conservation Club	1	1987	96	1	"most of our boxes"
	-habitat: pastureland, open field, cereal crops, hedgerow, woodland edge, railway tracks						
	60 Ridgeway	Bob Eberly	2	1986-1987	56(+?)	0-1	45 (1987)
	-habitat: pastureland, cereal crops, hedgerow, woodland edge, lawn						
Parry Sound District	61 Lake Manitou-wabing	Ray Hughes	1	1987	9	1	7
	-habitat: pastureland, woodland edge						
Muskoka District	62 Brace-bridge	First Brace-bridge Girl Guides	1	1987	19	0	16
	-habitat: pastureland, woodland edge, lawn						
Rural Municip-ality of York	63 Klein-burg	M. & A. Rusnell	6	1982-1987	5-31	0-1	0-5
	-habitat: open field, woodland edge						
	64 Union-ville	Ken Bond	4	1984-1987	3-4	0-1	1-2
	-habitat: pastureland, open field, crane yard						
Durham County	65 Bowman-ville	Lionel A. Parker	3	1983-1987	12-16	2	"most of our boxes"
	-habitat: pastureland, open field						

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Recovered	No. Boxes	No. Nestings Bluebirds	No. Nestings Tree Sw.
Victoria County	66 Kirkfield -habitat: not given	Dave Calvert	?	1987	75	24	?
Haliburton District	67 Minden -habitat: not given	Dennis Barry	?	1987	25	10	?
Peterborough County	68 Millrock -habitat: pastureland, open field, cereal crops	Don Porter	3	1985-1987	6-45	0-8	6-14
	69 Peterborough -habitat: pastureland, open field, hedgerow, woodland edge	Queen Elizabeth School	1	1987	350	30	?
	70 Warsaw -habitat: pastureland	Glen McMullen	1	1987	12	6	5
Northumberland	71 Brighton -habitat: pastureland, open field, hedgerow, road edge	R. Martin Bird	5	1983-1987	15-51	0-11	13 (1983)
	72 Harwood -habitat: not given	Hazel Bird	20	1987	175	81-85	?
Hastings County	73 Tweed -habitat: lawn, fence row, maples	Gerald J. O'Hearn	1	1987	3	1	1
	74 Tweed -habitat: not given	Bob Swainson	1	1986	12 put up, 6 stolen, 6 remained	1	4
Prince Edward County	no reports						

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Bluebirds	No. Nestings Tree Sw.
Renfrew County	75 Arnprior	Mcnamara Field Nat. Club	20	1982-1987	24-359	? (13-165 fledglings)	6-50
	-habitat: pastureland, open field, hedgerow, woodland edge, railway tracks						
	76 Pembroke	A. C. S. Lambert	4	1984-1987	60-550	6-63	20-75
	-habitat: pastureland, open field, cereal crops, woodland edge, lawn, country roadsides						
	77 Pembroke	Pembroke & Area Bird Club (Myron Labark/Ken Hooles)	4	1984-1987	196-929	24-93	82-132
	-habitat: pastureland, cereal crops, woodland edge, railway tracks, lawn						
Lennox & Addington County	78 Centreville	J. E. Hughes	22	1987	200	55	90
	-habitat: roadside						
	79 Enterprise	D. Keeling	10	1987	15	3	11
	-habitat: pastureland, railway tracks, lawns						
	80 Flinton	Bruce W. Hasler	5	1983-1987	1-3	1-2	1
	-habitat: lawn, fenceline						
Frontenac County	81 Mountain Grove	Terry Stinchome	1	1987	2	1	1
	-habitat: pastureland, open field						
	82 Parham	Gary E. Ridout	1	1987	2	1	0
	-habitat: pastureland						

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Bluebirds	No. Nestings Tree Sw.
Frontenac County (cont.)	83 Plevna	Clarendon Central Public School (B. Martin)	1	1987	40	2	2
	-habitat: pastureland, open field, woodland edge						
	84 Sharbot Lake	Bob Swainson	1	1987	5	5	0
	-habitat: pastureland						
Lanark County	85 Almonte	I. & E. McRae	20	1982-1987	40-54	2-3	18-28
	-habitat: pastureland, open field, cereal crops, lawn, laneway						
	86 Perth	R. C. Braley	6	1982-1987	186-300	43-114	54-99
	-habitat: country roads						
	87 Perth	Bob Mount	2	1986-1987	2	0	1
	-habitat: lawn						
	88 Perth	Carson Thompson, Rideau Valley Conservation Authority	9	1981, 1983-	57-70	20-21	8-28
	-habitat: pastureland, open field, hedgerow, woodland edge						
Leeds/ Grenville County	89 Ganan-oque	Wright Smith	10	1982-1987	17-26	7-15	2-4
	-habitat: pastureland, open field, woodland edge						
	90 Mallory-town	K. Dewar	2	1986-1987	5-20	0	5-18
	-habitat: hedgerow, woodland edge, lawn						

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Bluebirds	No. Nestings Tree Sw.
Leeds/ Grenville County (cont.)	91 Merrickville -habitat: hedgerow, lawn, garden	Grant Baker	20	1982-1987	12-15	1	10
	92 Merrickville -habitat: woodland edge, lawn	Stan Pitura	20	1982-1987	11-14	1	8-9
	93 Merrickville -habitat: open field, hedgerow, lawn	C. S. Read	6	1983-1987	2-8	1-3	0-2
	94 Westport -habitat: not stated	A. Briggs-Jude	?	1987	120	20	?
Ottawa-Carleton District	95 Kanata -habitat: pastureland, open field, hedgerow	Colleen Ringelberg	5	1983-1987	12	0-1	1-3
	96 Manotick -habitat: open field	Eva Lange	3	1985-1987	6	0-3	Yes
	97 Nepean -habitat: pastureland, open field, woodland edge	Walter Hopewell	8	1982-1987	50-55	0-2	9-26
	98 Ottawa -habitat: not stated	Gordon McNay	19+	1987	75	?	?
	99 Ottawa -habitat: pastureland, open field, cereal crops, woodland edge	Ottawa Duck Club	2	1987	12	4	6
	100 Ottawa area -habitat: open field, woodland edge	William Petrie	4	1984-1987	8-31	0-5	4-20

Appendix 2 (cont.)

Jurisdiction	Location	Operator*	No. Years in Use	Year(s) Reported	No. Boxes	No. Nestings Bluebirds	No. Nestings Tree Sw.
Ottawa-Carleton District (cont.)	101 Stittsville -habitat: pastureland, open field, cereal crops	Cecil Jessiman	15	1982-1987	25-70	11-40	8-18
Dundas, Russell, Stormont, Prescott & Glengarry Counties	no reports						

* addresses are listed in Appendix 3

Appendix 3: Addresses of Respondents to Bill Read's 1987 Survey:

Frank G. W. Adams, R. R. 1, Orangeville, Ont. L9W 2Y8

Dorothy E. Armstrong, R.R. 5, Cayuga, Ont. N0A 1E0

John N. Ashdown, Box 1023, Blind River, Ont. P0R 1B0

Grant Baker, R. R. 2, Merrickville, Ont. K0G 1N0

Dennis Barry, c/o Enniskillen Public School, Enniskillen, Ont. L0B 1H0

Glen Best, Glen Huron, Ont. L0M 1L0

Hazel Bird, Box 45, Harwood, Ont. K0K 2H0

R. Martin Bird, 247 Main St. W., R.R. #4, Brighton, Ont. K0K 1H0

Ken Bond, R.R. 1, Unionville, Ont. N0L 2L0

Boyne River Natural Science, R.R. 4, Shelburne, Ont. L0N 7S0

R. C. Braley, 96 Drummond St. E., Perth, Ont. K7H 1G8

Art Briggs-Jude, Bluebird Acres, Westport, Ontario K0G 1X0

Albert N. Butwick, Box 40, Millgrove P.O., Ont. L0R 1V0

Dave Calvert, 610 Grierson St., Oshawa, Ont. L1G 5J4

Tom Chatterton, Sydenham Field Naturalists, 407 Dora Dr., Wallaceburg, Ont. N8A 2K2

John C. Clarke, Box 77, Meaford, Ont. N0H 1Y0

Geo. Coker, S. Tabone, and R. Hughes, 1326 #8 Highway, Winona, Ont. L0R 2L0

Keith Dewar, St. Lawrence Islands National Park, Box 469, R.R.3, Mallorytown, Ont. K0E 1R0

Bruce Duncan, Taquanyah Nature Centre, 1049 Kirkwall Rd., R.R. 1, Dundas, Ont. K9H 5E1

Rob Eberly, 470 Greenwood Drive, Ridgeway, Ont. L0S 1N0

Daniel Entz, R.R. 4, Bright, Ont. N0J 1B0

Lange Eva, R.R. #1, Box 159, Manotick, Ont. K0A 2N0

Essex Region Conservation Authority, 360 Fairview Ave. W., Essex, Ont. N8M 1Y6

V. Figley, 72 Aubrey Rd., R. R. 2, Dryden, Ont. P8N 1H6

First Bracebridge Girl Guides, c/o G. Taylor, Box 934, Bracebridge, Ont. P0B 1C0

Brian Fleming, R.R. 2, Hawkestone, Ont. L0L 1T0

William M. Fletcher, R.R. 2, Fisherville, Ont. N0A 1G0

Harold D. Ghent, Box 118, Ayr, Ont. N0B 1E0, (519) 632-7275

Dave Glover, 3 Blake St., Meaford, Ontario N0H 1Y0

Grey Sauble Conservation Authority, R. R. 4, Owen Sound, Ont. N4K 5N6, (519) 376-3076

Bruce W. Hasler, R.R.1, Flinton, Ont. K0H 1P0

Mr. & Mrs. Barney Haukeness, Box 15, Site 25, R.R. 2, Dryden, Ont. P8N 2Y5

Carl E. Hearn, R.R. 2, Dorchester Ont. N0L 1G0

William A. Henderson. Box 459, Lucknow, Ont. N0G 2H0

David Hibbard, R. R. 2, Coldwater, Ont. L0K 1E0

Willi M. Hoidyssek, Box 17, Site 25, R.R. #2, Dryden, Ont. P8N 2Y5

Ken Hooles (Pembroke Bird Club), R.R. #7, Pembroke, Ont. K8A 6W8

Yvonne Homick, R.R. 2, Tillsonburg, Ont. N4G 4G7

Walter W. Hopewell, 3421 Carling Ave., Nepean, Ont. N2H 7V5

Robert Hubert, 10 Paulson Court, St. Thomas, Ont. N5R 1M9

James Eric Hughes, Centreville, Ont. K0K 1N0

Ray Hughes, Box 329, Winona, Ont. L0R 2L0

Joe Hurst, R.R. 1, Port Stanley, Ont. N0L 2A0

Cecil Jessiman, 52 Fernbank Rd., Stittsville, Ont. K1G 0X4

David Keeling, Box 25, Enterprise, Ont. K0K 1Z0

Ray Kiff, General Delivery, R.R. #6, Orillia, Ont. L30 6H6 (Orillia Naturalists Club)

Malcolm Kirk and Lynne Richardson, 46 Napier West, Thornbury, Ont. N0H 2P0

Howard H. Krug, Box 405, Chesley, Ont. N0G 1L0

David Kubassek, R.R. 3, Bright, Ont. N0J 1B0

Myron Labark (Pembroke & Area Bird Club), R. R. 7, Pembroke, Ont. K8A 6W8, (613) 735-1278

J. W. Lambe, R. R. 2, Embro, Ont. N0J 1J0

Albert C. S. Lambert, 95 Spruce St. W., Pembroke, Ont. K8A 7S2

David R. Lamble, 745 Guelph St., Fergus, Ont. N1M 2X5

Dennis Lewington, 20 Ramsgate Drive, Stoney Creek, Ont. L8G 3V5

Mrs. Jean Lister, 160 Branchard St., Thunder Bay, Ont. P7A 7J7

Ross Little, Box 68, Bloomingdale, Ont. N0B 1K0

Thomas Lobb, R. R. #2, Clinton, Ont. N0M 1L0

Lower Thames Valley Conservation Authority, 100 Thames St., Chatham, Ont. N7L 2Y8

Macnamara Field Naturalists Club, 61 Laird St., Arnprior, Ont. K75 2E1

B. Martin, Clarendon Central Public School, Plvena, Ont. K0H 2M0

Doug Martin, 176 Stoke Dive, Kitchener, Ont. N2N 2C1

Ken Maynard, Box 12, Lions Head, Ont. N0H 1W0

Glen McMullen, 94 West St., Warsaw, Ont. K0L 3A0

Gordon McNay, 284 Kirchoffer Ave., Ottawa, Ont. K2A 1Y2

Ian and Elinor McRae, Oak Ridge Farms, R. R. 1, Almonte, Ont. K0A 1A0

Erwin Meissner, 38 Roberts Crescent, Kitchener, Ont. N2E 1A5

Don Moffat, R.R. 1, Orangeville, Ont. L9W 2Y8

Bob Mount, R.R. 5, Perth, Ont. K7H 3C7

Niagara Peninsula Conservation Authority, Centre St., Allenburg, Ont. L0S 1A0

Gerald J. O'Hearn, 400 Hungerford Rd., Tweed, Ont. K0K 3J0

Ontario Ministry of Natural Resources, Box 170, Fonthill, Ont. L0S 1E0

Ottawa Duck Club, c/o George Martin, 35 Lindenlea Rd., Ottawa, Ont. K1M 1A7

Lionel A. Parker, 154 King St. E., Bowmanville, Ont. L1C 1N8

Martin Parker, Box 1647, Port Elgin, Ont. N0H 2C0

William Petrie, c/o Ottawa Banding Group, P.O. Box 3633, Station Q, Ottawa, Ont. K1Y 4J7

Stan Pitura, R.R. 3, Merrickville, Ont. L0G 1N0

Mrs. Melvin Pollard, L3 C2, Eton, Oxdrift, Ont. P0V 2J0

Port Colborne & District Conservation Club, Box 541, Port Colborne, Ont. L3K 5X7

Don Porter, 269 Wilson St., Peterborough, Ontario K9J 1S9

Ted Price, Nipissing Naturalists Club, 154 Balsam Crescent, North Bay, Ont. P1B 6M3

Queen Elizabeth School, 830 Barnardo Ave., Peterborough, Ont. K9H 5V9

Charles S. Read, Cedarwinds, R.R. 3, Merrickville, Ont. K0G 1N0

William F. Read, #2-165 Green Valley Drive, Kitchener, Ont. N2P 1K3

Norma Ridge, Box 209, Mount Hope, Ont. L0R 1W0

Gary E. Ridout, R.R. #1, Parham, Ont. K0H 2K0

Dr. Colleen Ringelberg, 440 Hazeldgan Road, Kanata, Ont. K2L 1V2

Margaret and Art Rusnell, Kleinberg, Ont. L0J 1C0

Norman Shantz, R.R. 1, Ayr, Ont. N0B 1E0

Don A. Smith, 2082 Lakeshore Rd., Sarnia, Ont. N7T 7H6

Leo A. Smith, Apt. 408, 65 Sympatica Crescent, Brantford, Ont. N3P 1M7

Lorne Smith, 1688 7th Ave. E., Owen Sound, Ont. N4K 2Z4

Wright Smith, 69 Appleby Priv., Ottawa, Ont. K2C 3P4, (613) 225-1811

Terry Stinchcombe, R.R. 1, Mountain Grove, Ont. K0H 2E0

Rob Swainson, R.R. #2, Sharbot Lake, Ont. K0H 2P0

Lloyd Taman, 145 Moyner Ave., Matchewan, Ont. P0K 1M0

Carson Thompson, Rideau Valley Conservation Authority, Box 201, Perth, Ont. K7H 3E4

Bill Tindale, R.R. 2, Campbellville, Ont. L0P 1B0

Geoffrey Walker, Huron Fringe Naturalists, R.R. 3, Goderich, Ont. N7A 3X9

Bryan Wyatt, 63 Woodland Glen Dr., Guelph, Ont. N1G 3S3

Appendix 4: Ontario Members of the North American Bluebird Society Who Were Not Participants in Read's Survey

Nicole Bagshaw, R.R. 2, Lindsay, Ont. K9V 4R2

Jacques Bouvier, 100 Eddy St., Pembroke, Ont. K8A 7X3

Mr.and Mrs.C. Bowles, R.R. 7, Jarvis River, Thunder Bay, Ont. P7C 5V5

Robert O. Braley, 4 Cadillac Bl., R.R.1, Omemee, Ont. K0L 2W0

Mr. Charles Brooks, R.R. 2, Godfrey, Ont. K0H 1T0

Mr. John Clarry, 45 Glen Elm Ave., Toronto, Ont. M4T 1V1

Mr. D. Cryderman, R.R. 2, Beamsville, Ont. L0R 1B0

Mr. W. D. Fould, 12 Tarlton Rd., Toronto, Ont. M5P 2M4

W. F. Hammell, Box 1018, Bracebridge, Ont. P0B 1C0

Gordon Harrison, 303-1155 Goodfellow, Peterborough, Ont. K9J 7X1

Mike Intven, 265 Sunset Dr., St. Thomas, Ont. N5R 3C4

Mr. Jim Keddy, Thunder Bay Correction Centre, P.O. Box 1900, Thunder Bay, Ont. P7C 4Y4

Dr. D. D. Kiff, 17 Dunedin St., Orillia, Ont. L3U 5T3

Mrs. Norah E. K. Lane, 44 Cranbrook Ave., Toronto, Ont. M5M 1M4

Peter Leaver, 13 Monck St., Point Edward, Ont. N7V 1M5

Donald R. Lee, 65 Phair Ave., Wallaceburg, Ont. N8A 2M4

Bruce G. MacDonald, R.R.1, 580E Talbot Rd., Windsor, Ont. N9A 6J3

H. A. MacDougall, P.O. Box 156, Bayfield, Ont. N0M 1G0

Ivan W. Martin, R.R. 1, Wallenstein, Ont. N0B 2S0

Mr.C. E. McDonald, 223 Bartley Bull, Brampton, Ont. L6W 2K9

B. McFayden, Box 38, Portland, Ont. K0G 1V0

Lilli Mech, 12 Malvern Ct., Brampton, Ont. L6W 1H1

John L. Nadal, 252 Markland Dr., Etobicoke, Ont. M9C 1R7

John C. Northcott, 84 Chatsworth Dr., Toronto, Ont. M4R 1R7

Frank Packard, 132 Pt. Colony Rd., Bobcaygeon, Ont. K0M 1A0

Mrs. Isobel Palmer, R.R. 4, Lakefield, Ont. K0L 2H0

Murray A. Palmer, R.R.3, Indian River, Ont. K0L 2B0

James E. Sauer, Box 477, Munster, Ont. K0A 3P0

W. Garry Smith, R.R. #1, Mountain Grove, Ont. K0H 2E0

Peter Somerville, 2661 Kingston Rd., Scarborough, Ont. M1M 1M3

Mrs. F. K. B. Stewart, #1A, 42 Glen Elm, Toronto, Ont. M4T 1T7

Mr. J. D. Sylvester, 58 Norman Rogers Dr., Kingston, Ont. K7M 2P9

Mrs. Rhea Topp, R.R. 1, Canfield, Ont. N0A 2C0

G. J. Yaki, Nature Travel Service, 127A Princess St., Kingston, Ont. K7L 1A8

Gayle Zimmer, R.R. #1, Mosley, Ont. N0L 1V0