

**COMMITTEE ON THE
STATUS OF ENDANGERED
WILDLIFE IN CANADA**

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**COMITÉ SUR LE STATUT
DES ESPÈCES MENACÉES
DE DISPARITION AU
CANADA**

**OTTAWA (ONT.) K1A 0H3
(819) 997-4991**

**STATUS REPORT ON THE HOODED WARBLER
*WILSONIA CITRINA***

IN CANADA

BY

ANNETTE M. PAGE

AND

MICHAEL D. CADMAN

**STATUS ASSIGNED IN 1994
BY THE COMMITTEE**

REASON: SMALL POPULATION, CONTINUING THREATS TO HABITAT.

OCCURRENCE: ONTARIO

**COSEWIC - A committee of representatives from
federal, provincial and private agencies which
assigns national status to species at risk in
Canada.**

**CSEMDC - Un comité de représentants d'organismes
fédéraux, provinciaux et privés qui attribue un
statut national aux espèces canadiennes en péril.**

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WILSONIA CITRINA
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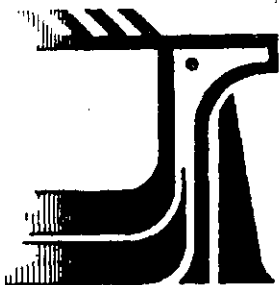
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on the Status
of Endangered
Wildlife
in Canada

Comité sur le
statut des espèces
menacées
de disparition
au Canada

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SPECIES: "Species" means any species, subspecies, or geographically separate population.

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ONTARIO RARE BREEDING BIRD PROGRAM
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355 LESMILL ROAD

STATUS ASSIGNED IN 1979
VULNERABLE

TABLE OF CONTENTS

	page
A. ABSTRACT.	1
B. DISTRIBUTION	1
B.2. Americas	1
Breeding	1
Wintering	3
Migration	3
B.2. Canada	3
C. PROTECTION	6
D. POPULATION SIZE AND TREND	7
D.1. United States.	7
D.2. Canada	10
E. HABITAT	14
E.1. Habitat preferences.	14
E.2. Distribution of habitat	16
E.3. Trend in quality and quantity of critical habitat.	16
E.4. Habitat protection	23
F. GENERAL BIOLOGY	23
F.1. Reproductive Capability	23
F.2. Species Movement.	25
F.3. Behaviour/Adaptability.	26
G. LIMITING FACTORS	29
H. SPECIAL SIGNIFICANCE OF THE SPECIES.	30
I. EVALUATION AND PROPOSED STATUS	30
J. REFERENCES	32
K. ACKNOWLEDGEMENTS	36

LIST OF FIGURES

1. Principal breeding and winter ranges of the Hooded Warbler in North America. 2
2. Symbols denote 10-km squares (within 100-km blocks) in which the Hooded Warbler was reported to the Breeding Bird Atlas and the Ontario Rare Breeding Bird Program in Ontario. 4
3. Habitat types across southern Ontario 17
4. Aerial photo showing a sample of the amount of forest cover remaining in southwestern Ontario 18
5. Percentage of woodlands remaining on farms in the Carolinian Forest Region of southern Ontario (from Census of Canada Agricultural statistics) 20

LIST OF TABLES

1. Summary of Hooded Warbler records from the Atlas of the Breeding Birds of Ontario by Site Region. 5
2. Available State Nature Conservancy Ranks and Official Status Designations for the Northeastern and Northcentral United States 8
3. Breeding Bird Atlas Data Summaries for the Northeastern and Northcentral United States. 9
4. Comparison of the amount of woodland on farms in the Carolinian Forest Region in 1891 and 1981 (from Census of Canada Agricultural statistics). 21

A. ABSTRACT

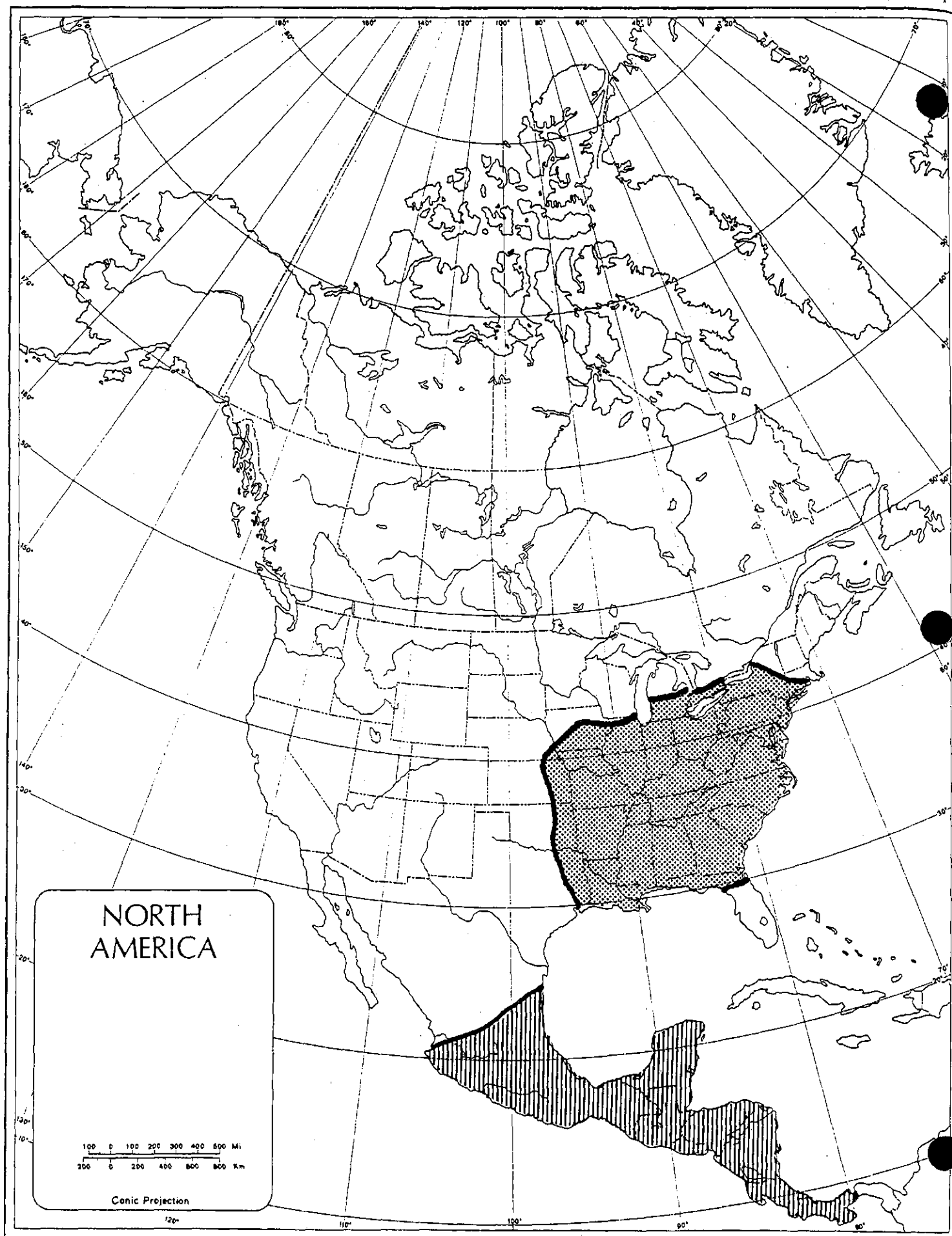
The Hooded Warbler (*Wilsonia citrina*) currently breeds in Canada almost entirely within the Carolinian Forest Region of southwestern Ontario. The species is area-sensitive, requiring large, mature tracts of forest with a relatively open canopy and a dense understory for breeding. Prior to settlement, this habitat was widespread and extensive in the Carolinian Region, but forest clearing and fragmentation of most of the large forests in the area have drastically reduced both the quantity and quality of breeding habitat. At present, very little suitable breeding habitat for the species remains in Ontario; existing forests tend to be small and fragmented, and have little remaining forest interior. Because of this, the species breeds in small, fragmented populations within its range in the province. In addition, long-term data indicate significant declines in Hooded Warbler numbers in recent years due to habitat loss (forest clearing and fragmentation, and residential and commercial development) on both the breeding and wintering grounds. Habitat in the region continues to be altered or destroyed, and Hooded Warblers are expected to continue to decline in numbers as habitat continues to be destroyed. Little is known of the pre-settlement Hooded Warbler population in Canada, but because of fairly large populations in Michigan and Ohio at that time, and the availability of large amounts of suitable breeding habitat in Ontario, it is reasonable to assume that the species was widespread and fairly common in Ontario prior to settlement. Only 80 to 176 pairs are currently estimated to be breeding annually in the province. This estimate, together with known declines in the amount of suitable breeding habitat available since settlement, suggests that the Hooded Warbler has declined substantially from pre-settlement numbers throughout the Carolinian Forest Region of Ontario. Because of this, as well as the extremely small population size, very localized distribution, and continuing loss of suitable habitat in Ontario, it is recommended that the Hooded Warbler be designated as Threatened in Canada.

B. DISTRIBUTION

B.2. Americas

Breeding

The Hooded Warbler breeds only in North America, from extreme southeastern Nebraska (rarely), central and northeastern Iowa (rarely), central (rarely northern) Illinois, southern Michigan, southern Ontario, northwestern Pennsylvania, central and southeastern New York, southern Connecticut and Rhode Island south to eastern Texas (south to Matagorda County), the Gulf coast and northern peninsular Florida, and west to eastern Kansas (casually) and eastern Oklahoma (American Ornithologists' Union 1983; see Figure 1).



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Figure 1. Principal breeding and winter ranges of the Hooded Warbler in North America. Stippled area indicates the breeding range, and vertical lines indicate the winter range.

Wintering

The Hooded Warbler winters from Mexico (Nayarit [rarely], Oaxaca and southern Tamaulipas [casually farther north]) south along both slopes of Middle America (rare on Pacific slope south of Honduras) to Panama (east to the Canal Zone, including Isla Coiba) (American Ornithologists' Union 1983; see Figure 1). There have also been reports from South America, although at present this is not considered to be part of the main wintering range (M.E. Gartshore pers. comm.).

Migration

The Hooded Warbler migrates regularly through the eastern Plains states (west to eastern New Mexico and western Texas), southeastern states, the Antilles (east to the Virgin Islands, and casually to Saba and Martinique), Bahama Islands, Bermuda, and islands in the western Caribbean Sea, rarely to California. It is casual in North America from Washington, Oregon, Nevada, Colorado, eastern Wyoming and North Dakota south to southern Arizona (summer records, possibly breeding) and southern New Mexico, and north to southern Minnesota, Wisconsin, southern Quebec, New Brunswick and Nova Scotia. Elsewhere, it is casual in Trinidad, and there is a sight report for the British Isles (American Ornithologists' Union 1983).

B.2. Canada

In Canada, the Hooded Warbler breeds only in extreme southern Ontario, primarily in the Carolinian Forest Region where it is a rare to locally uncommon summer resident (Cadman *et al.* 1987; James 1991; see Figure 2). During Ontario's Breeding Bird Atlas (1981-1985), the species was reported in only 21 (1%) of 1824 squares surveyed in southern Ontario, and of these, all but one (a "probable" breeding record from Simcoe Co. in the Southern Great Lakes Forest Region) were located in the Carolinian Forest Region (Table 1). Breeding was "confirmed" in only four squares, one in Middlesex Co. and three in Haldimand-Norfolk R.M., during the Atlas project.

Since the Atlas project, breeding has been "confirmed" in at least 20 sites in the Carolinian Forest Region, including one in Hamilton-Wentworth R.M., one in Niagara R.M., seven in Elgin Co., and at least 11 in Haldimand-Norfolk R.M. (G. and M. Bowlby, H. Currie, R. Dobos, M.E. Gartshore, D. Graham, B. Lamond and W. Rayner pers. comm.). There is also one historical "confirmed" breeding record from Esquesing Tract in the Halton County Forest Area (R.D. James pers. comm.), and recent breeding evidence ("possible" or "probable") has been reported from Halton, Waterloo and York R.Ms. (M. Austen, T. Cheskey, C. Ellingwood, M.E. Gartshore and J. Jalavo pers. comm.). Outside of the Carolinian Region, breeding has been "confirmed" only at Awenda Provincial Park in Simcoe Co. (a nest with three eggs which failed to hatch).

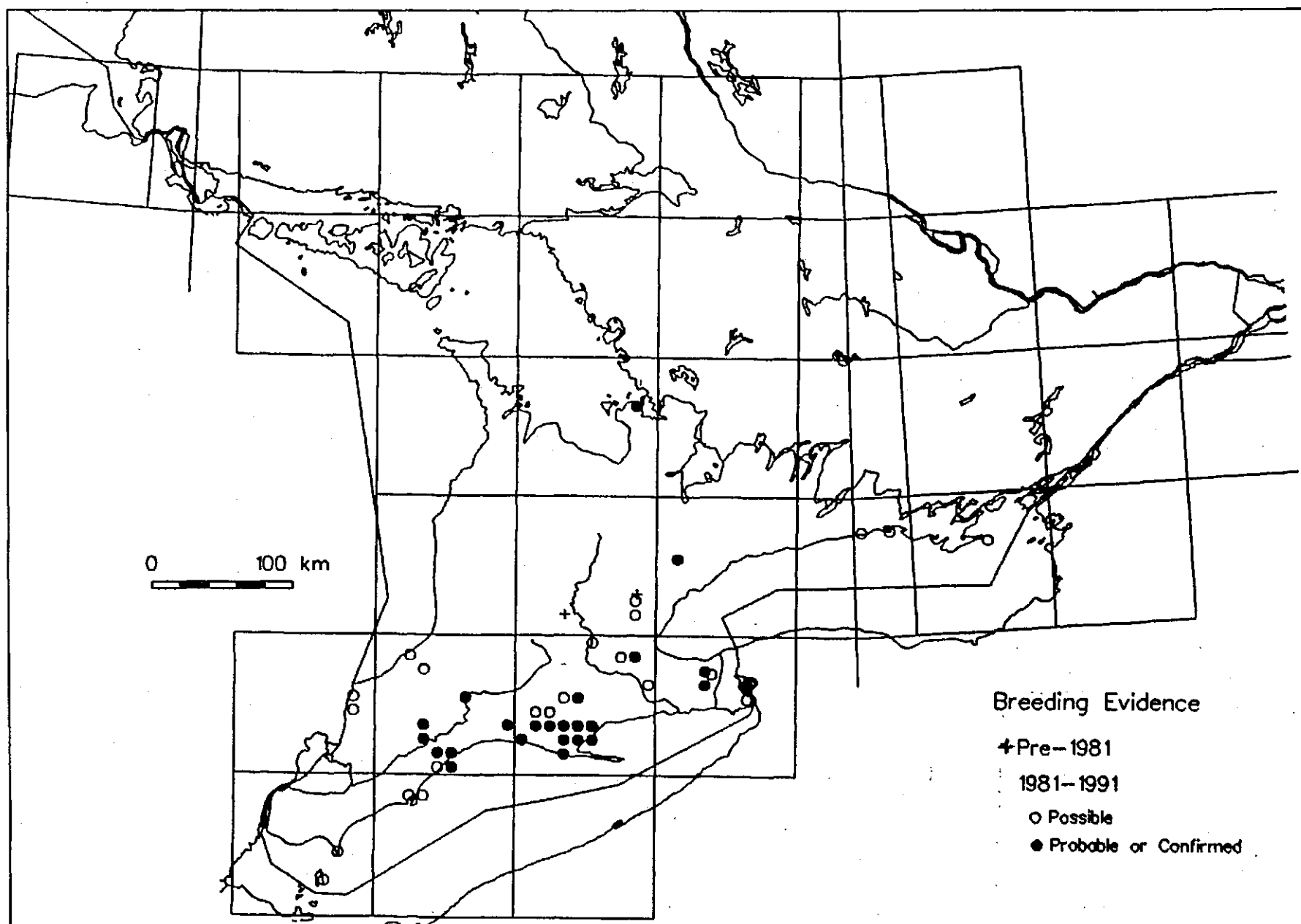


Figure 2. Symbols denote 10-km squares (within 100-km blocks) in which the Hooded Warbler was reported to the Breeding Bird Atlas and the Ontario Rare Breeding Bird Program in Ontario.

Table 1. Summary of Hooded Warbler records from the Atlas of the Breeding Birds of Ontario by Site Region.

<u>Region</u>	<u># of Squares</u>	<u>% of Squares *</u>	<u>% frequency by Region</u>
1. Hudson Bay	0	0.0	0
2. Northern Boreal Forest	0	0.0	0
3. Boreal Forest	0	0.0	0
4. Southern Boreal Forest	0	0.0	0
5. Northern Great Lakes Forest	0	0.0	0
6. Southern Great Lakes Forest	1	0.2	5
7. Carolinian Forest	20	6.1	95

* Number of squares for which data were received during the breeding bird atlas:

Region 1 - 164 squares	Region 5 - 887 squares
Region 2 - 368 squares	Region 6 - 638 squares
Region 3 - 713 squares	Region 7 - 329 squares
Region 4 - 558 squares	

In addition, one singing male was recorded at Wicklow (just west of Presqu'ile Provincial Park), Northumberland Co., in June 1994 (M. Richardson pers. comm.), and the species summered at Presqu'ile Provincial Park in 1991, 1992, 1993 (Weir 1991; Ridout 1992; Henshaw and Kerr 1992b; M.E. Gartshore pers. comm.), and 1994 (two males and one female were observed in 1994) (M. Richardson pers. comm.). The Hooded Warbler is now considered to be regular during spring at Presqu'ile (M. Richardson pers. comm.). These records suggest that the Hooded Warbler may breed in appropriate habitat anywhere in southern Ontario (Gartshore 1988), but the sparsity of records north of the Carolinian Region reflects the species' southerly distribution, and probably suggests that the species breeds primarily in the Carolinian Region.

A closer inspection of breeding records indicates a strong correlation between the occurrence of Hooded Warblers and sand plains or sand deposits in southern Ontario (Gartshore 1988). Sand plains occur in the province as far north as Simcoe and Bruce Cos. and east to Prince Edward Co. Cadman (1994) stated that at this point it is unclear whether the birds are choosing sites on sand plains preferentially or whether there are simply more large wooded areas on sand plains, but M.E. Gartshore (pers. comm.) stated that there are equally large forests on the Haldimand Clay Plain that have no Hooded Warblers, except where there is sand. Further research into this possible correlation is required.

Sites in the province that have been used by breeding Hooded Warblers for at least two years include Springwater Conservation Area and Howey's Woods in Elgin Co.; Skunk's Misery in Middlesex Co.; South Walsingham Sand Ridges/Big Creek Flood Plain, Deer Creek

Valley, Vanessa Swamp, Wyecombe Swamp, and Langton Woods in Haldimand-Norfolk R.M.; and Dundas Valley in Hamilton-Wentworth R.M. (McCracken 1987; Atlas files; M. Alton, S. Connop, R. Dobos, D. and S. Fowler, M.E. Gartshore, D. Graham, LPBO, B. Maddeford, W. Rayner, W.G. Stewart and A. Wormington pers. comm.). Based on Atlas results and a detailed survey of Haldimand-Norfolk R.M. in 1985 and 1986, Sutherland and Gartshore (1987) considered the Hooded Warbler to be probably uncommon on the Norfolk Sand Plain in eastern Elgin Co., southern Oxford Co., and Haldimand-Norfolk R.M., but rare elsewhere in southern Ontario.

Non-breeding birds have been reported in Ontario as far north as Ottawa (Godfrey 1986), Manitoulin Island (Godfrey 1986), Shippagan Island in Cochrane District (James 1984), and North Twin Island in the James Bay area (Manning 1981), and as far east as Presqu'ile Provincial Park in Northumberland Co. (M.E. Gartshore and M. Richardson pers. comm.), Prince Edward Point in Prince Edward Co. (M. Richardson and R. Weir pers. comm.) and Redhorse Lake in Lennox/Addington/Frontenac R.M. (J. Ewart pers. comm.). Elsewhere in Canada, the Hooded Warbler is a scarce visitor in Nova Scotia, southern Quebec, and New Brunswick, and is casual in Manitoba and Newfoundland (Godfrey 1986).

C. PROTECTION

The Hooded Warbler and its nests and eggs are protected in Canada and the United States from hunting and collecting under the Federal Migratory Birds Convention of 1916. Twelve sites reported to the ORBBP between 1981 and 1990 are owned by Conservation Authorities or the Ministry of Natural Resources, offering the species a small amount of additional protection.

Recent amendments to the Planning Act under Bill 163, which have been approved by the Provincial Government but will not come into effect until the legislation is proclaimed, would apply to Hooded Warbler habitat if the species is officially designated as "endangered", "threatened" or "vulnerable" in Ontario. These amendments fall under the Natural Heritage, Environmental Protection and Hazard Policies, and state that: "Development will not be permitted ... in significant portions of the habitat of endangered species and threatened species. Development will not be permitted on adjacent lands if it negatively impacts the ecological functions of the features listed above." Significant portions of the habitat of vulnerable species, significant natural corridors, significant woodlands south of the Canadian Shield, areas of natural and scientific interest, shorelines of lakes, rivers and streams, and significant wildlife habitat will be classified into areas where either: "no development is permitted; or development may be permitted only if it does not negatively impact the features or the ecological functions for which the area is identified" (Ministry of Municipal Affairs 1994) In addition, the existing Trees Act allows municipalities to pass a bylaw restricting and regulating the cutting of trees; some municipalities have included

special restrictions for environmentally significant areas (B. Vankierkhof pers. comm.). Both of these Acts may offer the Hooded Warbler some additional protection in Ontario.

If the Hooded Warbler was officially designated as endangered in Ontario, the Endangered Species Act would also offer the species and its habitat some additional protection.

D. POPULATION SIZE AND TREND

D.1. United States

Evidence suggests that in general, the Hooded Warbler is a widespread and common breeder in the eastern United States. Globally, the species is described as demonstrably secure by the Nature Conservancy, and it has never been placed on American Birds' Blue List. Breeding Bird Survey data from the entire continent indicate a non-significant increase in the population from 1966 to 1988, while data from Eastern North America, where the majority of Hooded Warblers breed, indicate that the population increased at an average rate of 3.2% per year from 1966 through 1988 ($p < 0.01$). This significant increase has occurred at a time when the amount of forested land in Eastern North America is increasing, and probably explains the noted increase in Hooded Warbler numbers in that region. However, this trend towards increasing woodland is not taking place in the Hooded Warbler's range in Canada (southwestern Ontario), and available habitat there is minimal. Although BBS data indicate an increase in the Eastern North American population, a study conducted by Robbins (1979) found that the Hooded Warbler had completely disappeared from four of six sample woodlots in Maryland where it was known to breed in the 1940s and 1950s, and had declined substantially in the other two.

Nature Conservancy ranks and official status designations (Table 2) indicate that the species is secure in most northeastern and northcentral states for which information is available, but that it occurs in low numbers and is of concern in some states on the northern and western edge of its range. It is of Special Concern in Indiana, is Threatened in Wisconsin, and is on the Watch List in Massachusetts. Atlas data (Table 3) indicate that the Hooded Warbler is more widely distributed in the southern tier of states in the northeastern and northcentral United States, and that its numbers generally decrease towards the northern edge of its range, with reports in fewer than 10% of blocks in Michigan, Illinois, Delaware, New York, and Rhode Island. However, it remains quite widely distributed in Ohio and Connecticut, where it was reported in 35% and 16.5% of blocks, respectively. The species was not reported from the remaining New England States during their Atlas projects.

Table 2. Available State Nature Conservancy Ranks and Official Status Designations for the Northeastern and Northcentral United States.*

<u>State</u>	<u>Rank</u>	<u>Designation</u>
Connecticut	S4B, SZN	Not Listed
Delaware	S2B	
Iowa	S3?	
Illinois	S4	Not Listed
Indiana	S3	Special Concern
Kentucky	S4S5	Not Listed
Massachusetts	S2	Watch List
Maryland	S5	Not Listed
Maine	SA	Not Listed
Michigan	S3	Special Concern-proposed
Minnesota	S?	Not Listed
New Hampshire		Not Listed
New Jersey	S4	Declining
New York	S5	Not Listed
Ohio	S?	Not Listed
Pennsylvania	S4	Not Listed
Rhode Island	S3B, SZN	
Virginia	S5	Not Listed
Vermont		Not Listed
Wisconsin	S2B, SZN	Threatened
West Virginia	S5	Not Listed

* Ranks as of 1993; Designations as of 1990.

** B refers to breeding status; N refers to non-breeding status.

S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.

S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences).

S4 = Widespread, abundant, and apparently secure in state, with many occurrences, but it is of long-term concern.

S5 = Demonstrably widespread, abundant, and secure in state and essentially ineradicable under present conditions.

SA = Accidental or casual in state, including species recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range.

SZ = Not of practical conservation concern in state because there are no definable occurrences, although the taxon is native and appears in the state; typically applies to migrants.

S? = Unranked.

Table 3. Breeding Bird Atlas Data Summaries for the Northeastern and Northcentral United States.

State	Years of Survey	# of blocks surveyed	# and % of blocks with breeding records				
			poss.	prob.	conf.	total	(%)
Conn.	1982-86	597	40	41	18	99	16.5
Del.	1983-87	222	5	6	2	13	5.9
Ill.	1986-90	1011	4	6	4	14	1.4
Ky.	1985-91	727	171	52	23	246	33.8
Me.	1978-83	706	0	0	0	0	0
Md.	1983-87	1256	133	238	58	429	34.2
Mass.	1974-78	1116	0	0	0	0	0
Mich.*	1983-88	1896	33	31	6	70	3.7
N.H.	1981-86	178	0	0	0	0	0
N.Y.	1980-85	5323	155	161	105	421	7.9
Ohio	1982-87	969	40	196	103	339	35.0
Ohio**	1982-87	764	38	167	79	284	37.2
Penn.	1983-89	4928	532	681	205	1418	28.8
R.I.	1982-88	165	3	5	4	12	7.3
Vt.	1976-81	179	0	0	0	0	0
W. Va.	1984-89	502	94	147	80	321	63.9

* = based on townships

** = priority blocks

In the late 1800s, the Hooded Warbler was described as common in mesic forest north to Ottawa, Newaygo, Kent, and Montcalm counties in Michigan (Brewer 1991a). However, in 1990 the Hooded Warbler was recommended for inclusion on Michigan's Special Concern List as a result of the Michigan Atlas findings (Brewer 1991a). It was reported in 85 blocks in the state, and was considered to have declined in some areas. In an extensive investigation of the changes in avifauna of southern Michigan, Brewer (1991b) lists the Hooded Warbler as one of the species that have decreased because of deforestation and settlement.

In New York, the species was considered rare in the early 19th century, but it had apparently become established by the early 20th century (Eaton 1988). However, it is not clear whether the species has truly changed status or whether there is now more information concerning its breeding locations and population size. Currently it is locally distributed, having been reported in only 8% of squares surveyed during the Atlas project (1983-1888), but it is usually fairly common in areas where it occurs (Eaton 1988). Atlas data indicate that it has expanded into some areas where breeding was previously unknown and is now scarce or absent in some previously known breeding areas (Eaton 1988).

The Hooded Warbler's distribution in Ohio was formerly quite limited, as it was common in the south but only locally common in the north (Jones 1903 in Peterjohn and Rice 1991). The species' range in the state has expanded this century, and during Ohio's Atlas project (1982-1987), it was recorded in 37% of all blocks covered, with records from 71% and 61% of blocks on the Glaciated and Unglaciated Allegheny Plateau, respectively. Other physiographic regions with less mature forest had birds in only 10 to 15% of blocks. However, it is not clear whether the expansion in this century in Ohio is recent or a recolonization of reforested areas. The species is now most widely distributed in the eastern half of Ohio (Peterjohn and Rice 1991).

D.2. Canada

In Canada, the Hooded Warbler breeds only in the Carolinian Forest Region and (rarely) adjacent areas in southern Ontario. Forest fragmentation and destruction have drastically reduced the amount of suitable breeding habitat for the species in Ontario, and as a result, the Hooded Warbler population in the province is currently very small and fragmented. The Nature Conservancy considers the Hooded Warbler to be imperiled in both Canada and Ontario because of rarity or because of some factor(s) making it very vulnerable to extirpation, and it is designated as accidental or casual in Quebec and Nova Scotia. It has never been reported on BBS routes in Canada, reflecting the fact that, in Canada, the species occurs in very low numbers and has a restricted range, and that it occurs in wooded habitat not well sampled by BBS routes.

Based on the availability of suitable breeding habitat, the Hooded Warbler probably occurred widely in the Carolinian Forest Region of southern Ontario prior to European settlement. However, presumably because it is small and occurs in the centre of large forest tracts, nothing is known of its occurrence in southern Ontario until the mid to late 1800s. The species was first recorded in Canada in the Hamilton area prior to 1860 (McIlwraith 1860 in Gartshore 1988), and the first specimen was taken at Hyde Park, Middlesex Co., between 1878 and 1882 (Saunders and Dale 1933). Other early reports included individuals at Rondeau Provincial Park, Kent Co., around 1884 (Macoun and Macoun 1909), near Kingston, Frontenac Co., in the late 1800s (Macoun 1900), near Hamilton prior to 1886 (McIlwraith 1886), at Woodstock, Oxford Co., in 1906 (Macoun and Macoun 1909), and an immature female at Point Pelee on August 21, 1912 (Gartshore 1988). Baillie (1925) stated that the species was a rare migrant in southern Ontario, but did not discard the possibility of breeding because of the Pelee record mentioned previously. One was reported at Long Point, Haldimand Co., in 1888 (Snyder and Logier 1931), but there were no more reports from that area until 1939 when a pair was located in Backus Woods (McCracken 1987). However, McIlwraith (1886) stated that the species was found occasionally near Port Rowan, and Snyder and Logier (1931) speculated that the Hooded Warbler may be a summer resident in the Long Point area.

The first known Hooded Warbler breeding location in Canada was Springwater Forest (formerly White's Woods) in Elgin Co., where the species was observed in the summers of 1940 and 1941, and nests were located in 1949, 1950 and 1952 (Brooman 1954). Baillie (1967) stated that the species has bred regularly there since the first nesting, and Speirs and Frank (in Speirs 1985) estimated that 10 pairs per 100 acres were present in 1970. However, breeding was not "confirmed" at Springwater during the Atlas project, and the species was not located there between 1986 and 1989 inclusive (W. Rayner and D. and S. Fowler pers. comm.; Gartshore 1988). M.E. Gartshore (pers. comm.) stated that the sapling region is now so extensive due to past forest management that ground cover is shaded out.

The second nesting location in Ontario was not discovered until June 1957, near Tillsonburg, Oxford Co. (Baillie 1962), and more recently, breeding has been confirmed in Middlesex, Elgin, Oxford, Halton, and Simcoe Cos., and Haldimand-Norfolk, Hamilton-Wentworth, and Niagara R.Ms. (Cadman et al. 1987; ONRS data; G. and M. Bowlby, H. Currie, R. Dobos, M.E. Gartshore, D. Graham, J. Jalava, B. Lamond, LPBO, W. Rayner and A. Wormington pers. comm.). In addition, "possible" or "probable" breeding evidence has been reported from Essex, Kent, Lambton, Northumberland, Waterloo, and York Cos. or RMs. (Cadman et al. 1987; R.C. Brooman, C. Campbell, T. Cheskey, S. Connop, H. Currie, C. Ellingwood, M.E. Gartshore, M.E. Hebb, T. Hince, J. Jalava, D. Perrin, K. Roy, P.A. Woodliffe and A. Wormington pers. comm.), and summer records, with no evidence of breeding, have been reported in Lambton (Speirs 1985), Kent (Speirs 1985), Halton (Weir 1986), and Frontenac Cos. (J. Ewart), and Ottawa-Carleton R.M. (Speirs 1985). Occurrences of the Hooded Warbler around Kingston have become more frequent, pointing to the possibility of the species oversummering or breeding in eastern Ontario, but there is still no evidence of attempted nesting in the Kingston area (Weir 1989; R. Weir pers. comm.). These records, plus a thorough review of breeding records by Gartshore (1988), indicate that the species' breeding range is wider than was previously known, and suggest at first glance that numbers are increasing. However, it is more likely that the species is being found in places where few people had searched previously (Gartshore 1988).

ORBBP Regional Coordinators suggested that there was a slow increase in the population size from 1950 to 1990 in both Elgin Co. and Haldimand-Norfolk R.M. (but see below), and that the population was stable (but very small) in Hamilton-Wentworth R.M. over the same time period. In addition, M.E. Gartshore (pers. comm.) stated that there has been a steady, even exponential, increase in Hooded Warbler numbers at spring banding stations. However, numbers have undoubtedly declined substantially since settlement due to forest clearing and fragmentation, and these practices continue to threaten the Hooded Warbler and the few remaining suitable woodlots in southern Ontario. As a result, threatened status has recently been proposed for the species in Ontario (Austen et al. 1994; Cadman 1994).

Forests in the Haldimand-Norfolk area, particularly on the Norfolk Sand Plain, are very important breeding areas for the species in Ontario, and support Canada's largest known breeding population (McCracken 1987). In the 1980s, one site in Haldimand-Norfolk was found to contain the greatest number of breeding Hooded Warblers in Canada; eighteen and thirty territories were found there in 1985 and 1986, respectively, during a detailed field study (McCracken 1987). Although these numbers are higher than any reported previously in Ontario, there is some question as to whether or not they actually represent a recent increase in the Hooded Warbler population (McCracken 1987). Gartshore (1988) stated that "during and since the Atlas, observers may have tended to establish "confirmed" breeding through indirect evidence, and this may account for the increased records in general." However, most recent records are a result of the Natural Areas Inventory of Haldimand-Norfolk, the Kent-Elgin Natural Areas Survey, the Niagara Escarpment Study, and follow-up, ongoing studies by M.E. Gartshore and the Long Point Bird Observatory (Gartshore 1988; M.E. Gartshore pers. comm.). These intense surveys discovered Hooded Warblers in some areas which had probably never been previously searched for the species, and help to explain why numbers seem to have recently increased in Haldimand-Norfolk R.M. and Elgin Co.

Sutherland and Gartshore (1987) stated that the Hooded Warbler has probably always bred in Ontario in low numbers, but that it generally was overlooked by naturalists unfamiliar with its habits. Using Atlas data, an annual breeding population of 25 to 53 pairs has been estimated for Ontario, but because not all suitable habitat was thoroughly investigated, the population may have actually been closer to 100 pairs during the Atlas project (Sutherland and Gartshore 1987). Gartshore (1988) estimated the following numbers of breeding pairs by county: Elgin 17-50, Haldimand-Norfolk 50-100, Hamilton-Wentworth 1-2, Halton 1-2, Lambton 4-5, Kent 1-2, Middlesex 4-10, Oxford 2-4, and Waterloo 0-1 (for a provincial population of 80 to 176 pairs). Since these estimates were made, extensive inventories in Hamilton-Wentworth R.M. from 1989 through 1991 found that the known population there had increased to 3-4 breeding pairs (M.E. Gartshore pers. comm.), and in 1994 breeding was "confirmed" in Niagara R.M. with the discovery of 4-8 pairs and a nest with young at the Fonthill Sandhills Valley ANSI (M.E. Gartshore and J. Jalavo pers. comm.). In 1991, there were some 22 nests reported near Walsingham, Norfolk Co., alone (Weir 1991), and "usual numbers" were found there again in 1994 (M.E. Gartshore pers. comm.). It is clear from these figures that the population in Ontario is small and largely concentrated in the relatively heavily forested areas in Haldimand-Norfolk R.M. and Elgin Co.

The following is a list of recent (1993 and 1994) breeding records of Hooded Warblers in Ontario (most of which were provided by M.E. Gartshore). In 1994, during the Woodlands Biodiversity Study (M. Austen and LPBO), the following observations were made in Haldimand-Norfolk R.M.: two pairs on June 1, one singing male and one female heard on July 4, and one male observed on August 25, in Landon' Woods; two males and one female on June 1 in Smith Tract; one pair heard on June 1 and June 15 in King Tract; one singing male and one female on May 30 in MacKay-Kyte-Laforge Tract; and one singing male on June 22 (R. Pieters), a singing male in a different location on June 22 (S. Gates), two singing males and one female on June 3-4 in a third location (G. Hungler), one singing male on July 5 in a fourth location (R. Jenkins), and one singing male and one female on July 4 in a fifth location (M.E. Gartshore pers. comm.). During the Forest Bird Monitoring Program in 1994, J. McCracken heard one male in the north tract of Backus Woods, and M.S.W. Bradstreet recorded one singing male in Spooky Hollow (M.E. Gartshore pers. comm.).

During the Niagara Escarpment Study in 1993 (J. Jalava, R. Knapton and Shawn Blaney), at least 4-8 pairs and 2-4 fledged young were discovered at the Fonthill Sandhills Valley ANSI in Niagara R.M., and one pair was observed at the Shorthills Wildlife Sanctuary in Niagara R.M. (M.E. Gartshore and J. Jalava pers. comm.). Other recent breeding records outside of Haldimand-Norfolk R.M. include: one pair and a nest with eggs on July 2, 1993 (and fledged young on August 2, 1993) at the Pistol Range on Paddy's Green Road in Dundas Valley, Hamilton-Wentworth R.M. (M.E. Gartshore pers. comm.); a singing male in the northern section of Dundas Valley (north of the Pistol Range, in a separate woodlot) in 1993 (J. Jalava pers. comm.); a singing male on Martin's Road in Ancaster, Hamilton-Wentworth R.M., in 1994 (M.E. Gartshore pers. comm.); one singing male in the Speyside Forest ANSI, Halton R.M., in early June, 1993 (not found on subsequent visits to the site) (M.E. Gartshore and J. Jalava pers. comm.); a territorial male at Point Pelee from June 1 to mid-July 1994 (the area's first summer record) (Henshaw and Kerr 1994); one singing male at Crawford Lake in late May or early June, 1993 and 1994 (this site was not checked later in the breeding season, so it is unknown whether the species bred there, or whether the records are of migrant birds) (M. Austen pers. comm.); two males and one female at Presqu'ile Provincial Park during spring 1994; and a singing male in June 1994 at Wicklow, Northumberland Co., just west of Presqu'ile Provincial Park (M. Richardson pers. comm.). Breeding has not been "confirmed" in eastern Ontario, but the above records, plus recent fall records from Prince Edward Point, suggest that the Hooded Warbler is breeding in Prince Edward Co. and the Presqu'ile area (M. Richardson pers. comm.).

E. HABITAT

E.1. Habitat preferences

In Ontario, the Hooded Warbler occurs in the understories of mature, extensive, mesic upland deciduous or mixed forest, where very small clearings (i.e. tree gaps) with low, dense, shrubby vegetation less than 2 m in height have been created naturally or by logging (Sutherland and Gartshore 1987; Gartshore 1988). The species will begin to use selectively logged deciduous forests one to five years after harvesting, and will remain there for up to 12 years or longer, until saplings exceed a height of 5 m and begin to shade out ground cover (Gartshore 1988). At Springwater Forest in Ontario, the formerly dense shrub layer now consists of 5-10m high maple saplings and the ground is virtually devoid of cover, resulting in the disappearance of breeding Hooded Warblers which were once common there (Gartshore 1988). However, while selective logging might help this species, it could be detrimental to the Acadian Flycatcher, and since there are not enough forests of sufficient size left in Ontario to manage separate areas for these two species, selective logging is not recommended as a management practice for the Hooded Warbler.

Of eight nests reported to the Ontario Nest Records Scheme (ONRS), seven were located in deciduous woods and one was in a mixed woods, and all wooded habitats contained an understory of deciduous saplings and shrubs (Peck and James 1987). One deciduous stand was on rolling sand ridges, and the nest was located at the edge of a clearing (Peck and James 1987).

Gartshore (1988) measured the vegetation at six Haldimand-Norfolk nest sites and found that the canopy height averaged 27.7m, the canopy cover was 88%, and the shrub cover was 87%. Sixty-six species of woody plants were found in the shrub layer at the six sites, and the dominant species were maple-leaved viburnum (Viburnum acerifolium), red raspberry (Rubus idaeus var. strigosus), black raspberry (R. allegheniensis), white ash (Fraxinus americana), choke cherry (Prunus virginianus), and red maple (Acer rubrum) (Gartshore 1988).

In Ontario, the species is restricted to larger forest tracts in the Carolinian Forest Region dominated by white oak, red maple, white pine, and American beech. It is less common in the ecotones of sugar maple-silver maple swamp, eastern hemlock-yellow birch ravines, and mature white pine plantations with a dense deciduous shrub layer (Sutherland and Gartshore 1987). Community associates in Michigan include Acadian Flycatchers and Cerulean Warblers (Brewer 1991a).

The Hooded Warbler is an area-sensitive species, requiring large tracts of mature forest in which to breed (Robbins 1979). Wilcove (undated) stated that Hooded Warblers are consistently absent from small (less than 20 ha, or 50 acres), isolated woodlots. In Maryland, MacClintock *et al.* (1977) found an isolated block of mature forest of less than 14.2 ha (35.5 acres) which lacked Hooded Warblers, but a similar control area within a large 160 ha (400 acres) tract had 10 pairs per 40.5 ha (100 acres). Using Breeding Bird Survey data from central and eastern Maryland, Robbins (1979) estimated the minimum forest area required to sustain viable breeding populations of Hooded Warblers to be 80 acres, or 30 ha, but because of other breeding population data, these figures are known to be lower than the actual size the species requires. Also, minimum size requirements vary depending on the region in which studies have been undertaken - a species requiring a 10 ha (25 acres) woodlot in one region may need a 100 ha (250 acres) tract in another (Terborgh 1992 in Riley and Mohr, in prep.), depending, perhaps, on the amount of woodland in the general area. In Ohio, most breeding pairs of Hooded Warblers inhabit the interiors of extensive woodlands that are at least 16 to 20 ha (40 to 50 acres) in size, and they generally avoid small isolated woodlots and narrow riparian corridors (Peterjohn and Rice 1991). Few such extensive woodlots remain in the Carolinian Forest Region of southern Ontario.

Gartshore (1988) pointed out a correlation between the breeding season records in southern Ontario and the location of sand plains. At this point, it is unclear whether the birds are choosing sites on sand plains preferentially or whether there are simply more large wooded areas on sand plains, which offer relatively poor agricultural land. However, the fact that this species is absent in the large blocks on the Haldimand Clay Plain (except where there is sand) suggests that the species is preferentially selecting sand plains (M.E. Gartshore pers. comm.).

Stopover sites during migration include coastal woodlands along the southwest coast of Louisiana dominated by hackberry (*Celtis laevigata*) and live oak (*Quercus virginiana*), and wooded islands along the coasts of Alabama, Mississippi and eastern Louisiana (Ogden and Stutchbury 1994). Overwintering individuals are strongly territorial and segregate by sex, with males occupying mature or at least canopied forest, and females late-successional brush/scrub fields, secondary forest, disturbed habitats and "tintales" (seasonally flooded areas dominated by scattered deciduous trees) (Lynch *et al.* 1985 in Brewer 1991a; Ogden and Stutchbury 1994). This intense intraspecific competition appears to result in many individuals being unable to obtain wintering territories (Ogden and Stutchbury 1994). Because the former habitat is declining due to tropical deforestation and the latter habitat is increasing, an unbalanced sex ratio, with a shortage of males, may result and be a factor in low reproduction on the breeding grounds (Brewer 1991a).

E.2. Distribution of habitat

Prior to settlement, extensive amounts of suitable Hooded Warbler breeding habitat could be found throughout the Carolinian Forest Region of southern Ontario and adjacent areas of the Southern Great Lakes Forest Region. Since settlement, however, these forests have been greatly destroyed or fragmented, such that at present, very little suitable breeding habitat remains in southern Ontario (see Figures 3 and 4). Most remaining areas of suitable Hooded Warbler breeding habitat in Canada are found in Elgin Co. and Haldimand-Norfolk R.M. which contain many areas of good breeding habitat (Gartshore 1988), and these are the areas from which most recent Hooded Warbler records have been reported. Lambton, Kent, and Middlesex Cos. contain several areas of good habitat and Halton region and Hamilton-Wentworth R.M. have only a few areas of good habitat (Gartshore 1988).

E.3. Trend in quality and quantity of critical habitat

Since European settlement, the amount of forest cover in the Carolinian Forest Region of Ontario has been drastically reduced, individual forests have become smaller and fragmented, the amount of forest interior has declined, and the amount of "edge" habitat has increased. As a result, suitable Hooded Warbler breeding habitat has undoubtedly been greatly reduced in the province. In fact, many remaining forests may be too small to sustain viable Hooded Warbler breeding populations, although further studies need to be done before this can be said with confidence.

Prior to settlement, much of southern Ontario was forested both on the shield and off, and much of that forest was probably mature. In the Carolinian Region, forests were primarily deciduous, with cedar and tamarack swamps in some low-lying areas. Perhaps up to 10% of the forest consisted of forest openings, providing habitat for "edge" species.

Studies in existing mature hardwood forests reveal that southern Ontario's forests would have been generally stable with a low rate of natural disturbance. Large scale disturbances, such as catastrophic wildfire, were relatively rare, with perhaps 1000 years between stand destructions (Lorimer 1989). Stand destructions would be more frequent in areas of shallow sandy soils such as the Oak Ridges Moraine. About 20% of the forested landscape would consist of young stands originating after catastrophic disturbances, and 80% would be old or mature affected primarily by partial stand destruction and a high frequency of small gap disturbances (Lorimer 1989). Small disturbances resulted from disease, insect infestations, creeping fires, drought and blowdowns, and could change the species composition of the forest without complete stand replacement. Over a long period of small scale disturbance, mature forest would be patchy and uneven aged, with a fine-grained mosaic of generation stages (Noss 1991). About 70% of the stand area would be occupied by mature or large trees, with less than 10% in gaps at any one time.

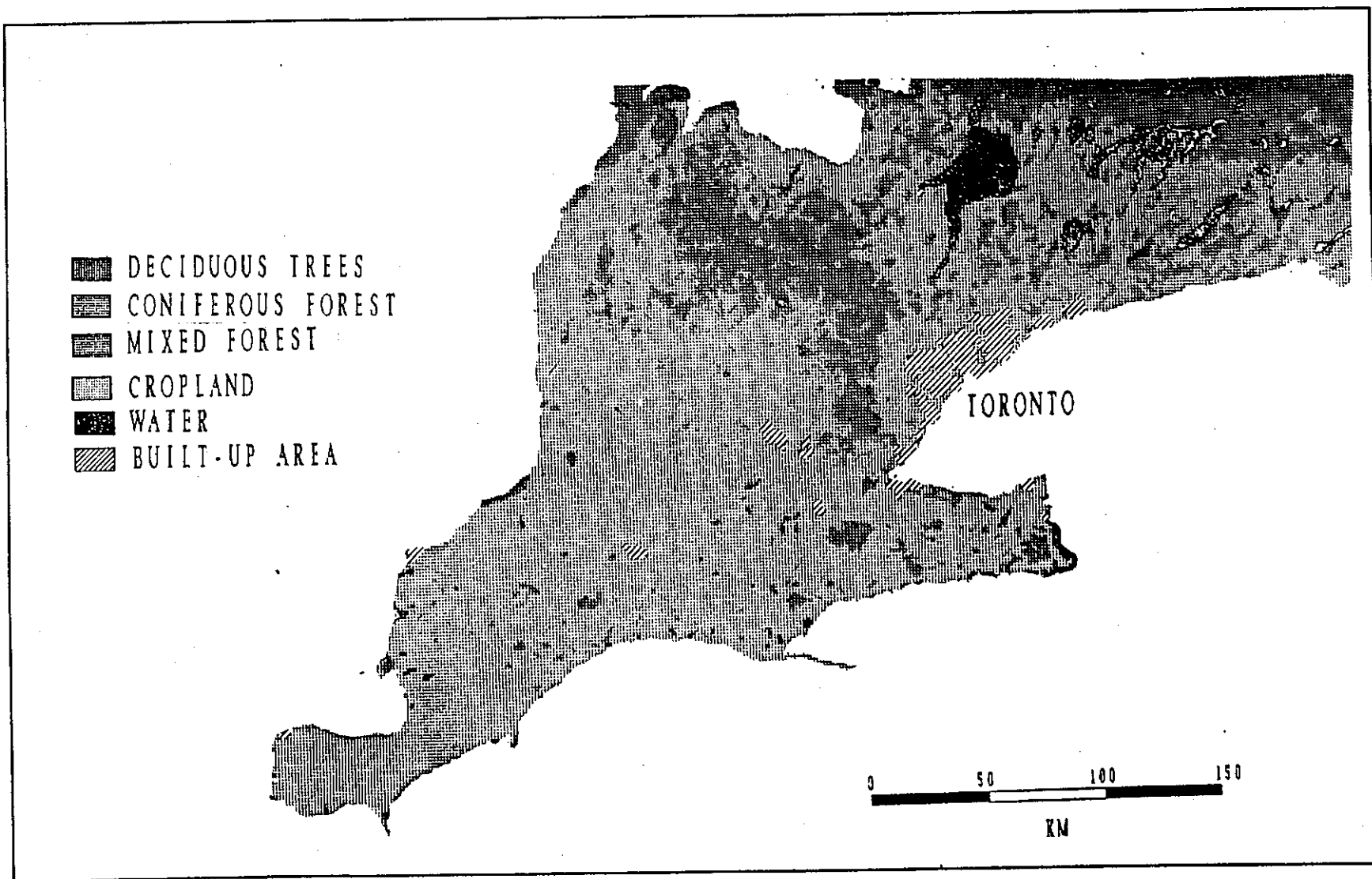


Figure 3. Habitat types across southern Ontario

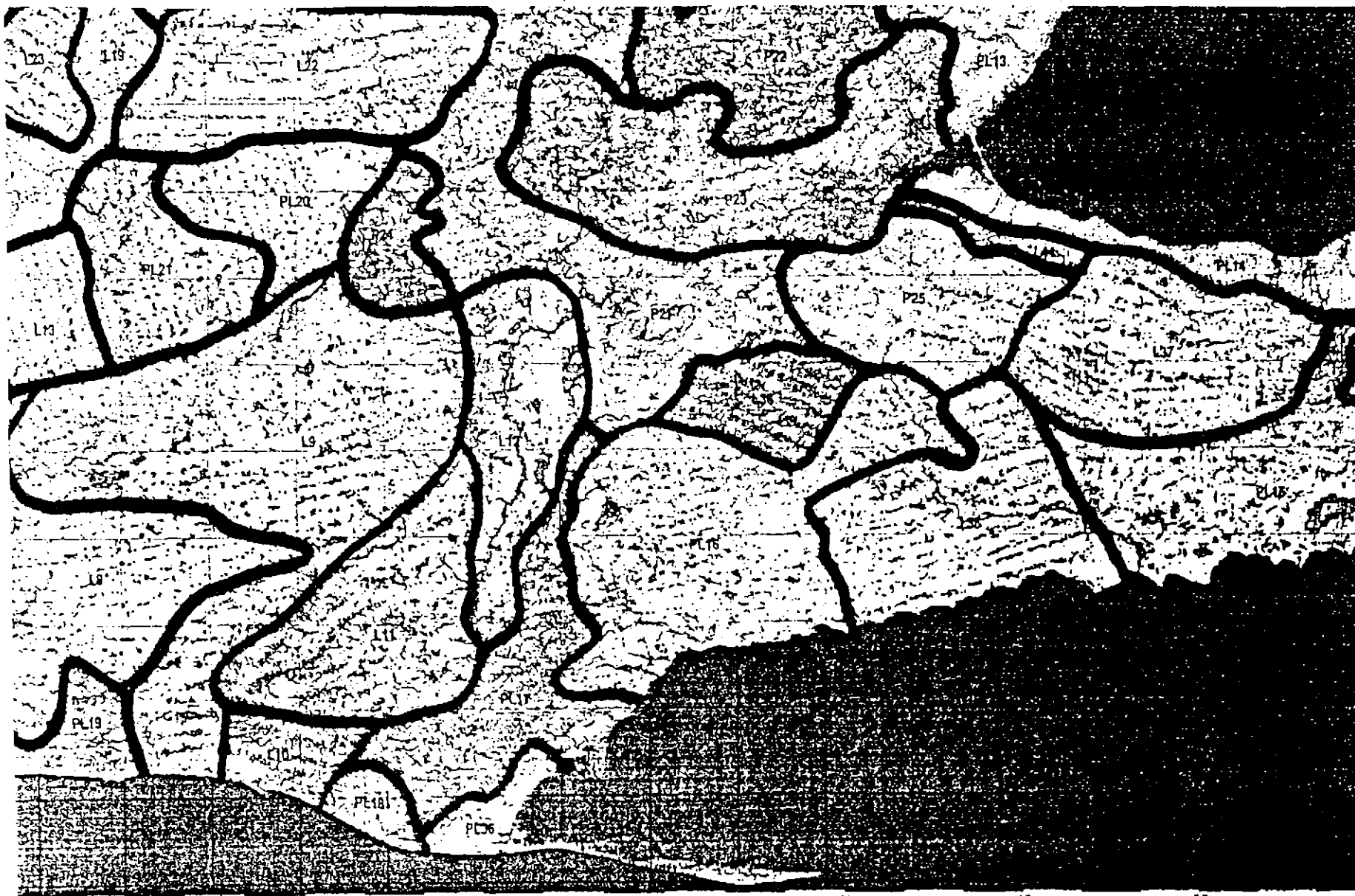


Figure 4. Aerial photo showing a sample of the amount of forest cover remaining in southern Ontario

The amount of suitable habitat for Hooded Warblers has undoubtedly decreased greatly with the clearing of forests in the Carolinian Forest Region. Whereas the presettlement forest was extensive and mature, today's remaining woodlands are primarily small, young and fragmented. The available information confirms the overall loss of forest south of the Canadian Shield. Thirty of the counties south of the Shield now have less than 25% of their landscapes forested, and most of the Carolinian Forest Region counties have far less than that: Essex and Kent counties have less than 5% forest cover remaining (Riley and Mohr, in prep.). Eastern Elgin and western Haldimand-Norfolk still support 16-25% forest cover (Gartshore 1988).

Agricultural statistics collected through the Census of Canada provide one of the best sources of information on trends in area of land covered in forest (Table 4, Figure 5). It is important to note that by 1891, when statistics were first collected, much of southern Ontario's forest had already been removed. The area of woodland on reporting farms in the Carolinian Forest Region at that time averaged 19.4% per county. This percentage dropped quickly to only 8.2% in 1911, and then stayed at approximately that level until 1971 when it dropped to 7.4%, and 1981 when it dropped further to 6.6%. The loss of woodland on farms in the Carolinian Forest Region from 1891 to 1981 averaged 63% per county (Table 4), and was highest in Essex and Kent counties which lost 93% and 85% of their woodlands on farms, respectively (Table 4). Losses in other counties with important known Hooded Warbler breeding sites are somewhat smaller, but still significant (35% in Elgin Co., 56% in Haldimand-Norfolk R.M., 59% in Middlesex Co., and 60% in Hamilton-Wentworth R.M.) (Table 4). Clearly, the woodlands of the Carolinian Forest Region, and particularly those of the extreme southwest, have been and continue to be severely depleted by human activity.

As well as habitat loss, habitat degradation (in the form of forest fragmentation) has occurred at an alarming rate in southern Ontario, especially in the Carolinian Forest Region (see Figures 3 and 4). Hounsell (1991) described southern Ontario as "an agriculturally-dominated landscape" and "a vast area of extensive forest fragmentation." Many conservation biologists believe that "habitat fragmentation is the most serious threat to biological diversity and is the primary cause of the present extinction crisis" (Noss 1987 in Riley and Mohr, in prep.). A recent study by Cheryl Pearce (1993) found that 95% of the remaining forest patches in the 60 km x 60 km (360,000 ha) study area (Lake Erie shoreline north to Woodstock in the west and the Six Nations Reserve in the east) are less than 24 ha in area, while 99% of the remaining forest patches are less than 100 ha in area. Only six of the remaining 11,064 patches are greater than 1000 ha. In addition, most of the forest patches in the study area are very elongated with highly convoluted margins (i.e. high edge/area ratios), and could be considered forest corridors rather than forest patches.

Percent Woods on Farms

All Carolinian Counties

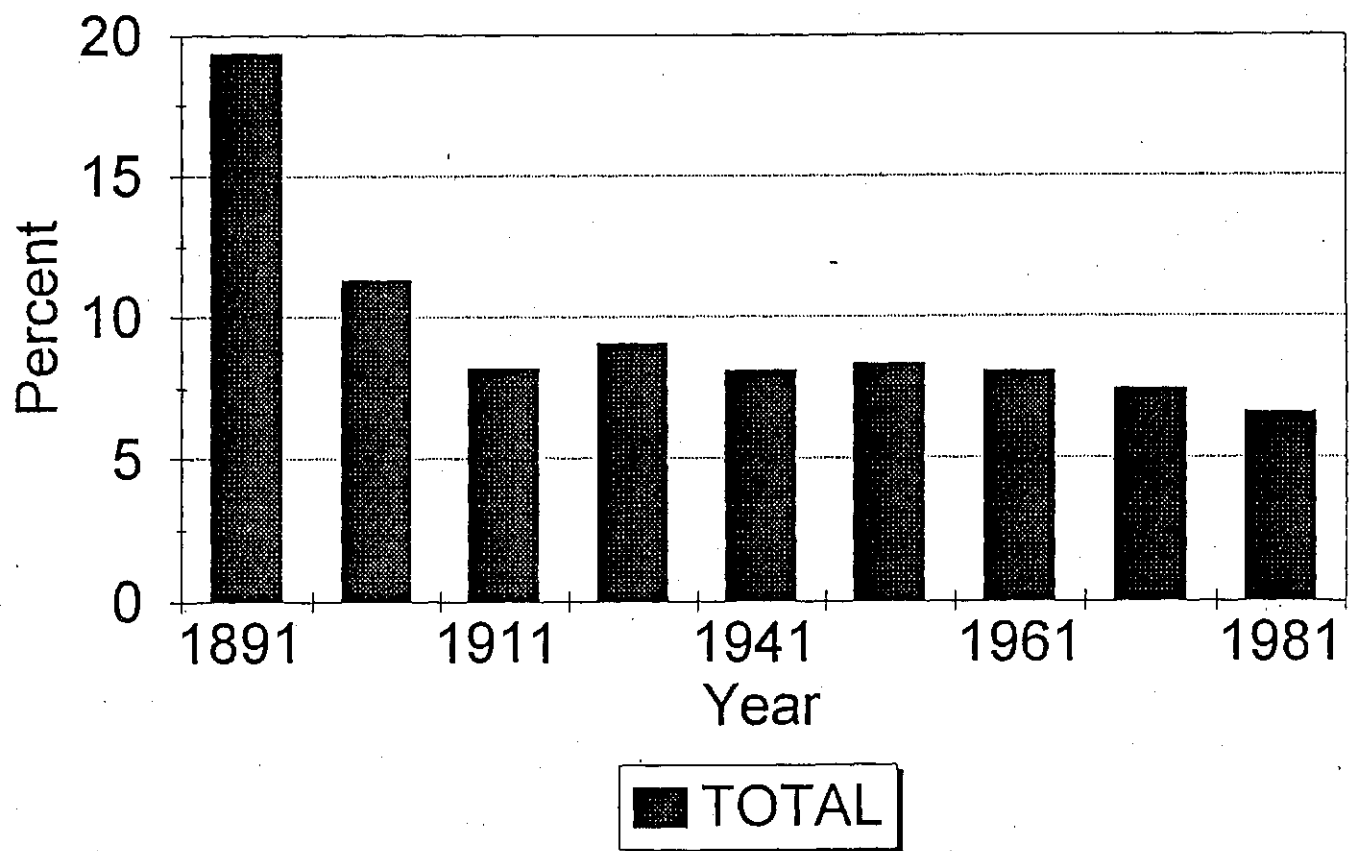


Figure 5. Percentage of woodlands remaining on farms in the Carolinian Forest zone of southern Ontario (from Census of Canada Agricultural statistics).

Table 4. Comparison of the percent of woodland on farms in the Carolinian Forest Region in 1891 and 1981 (From Census of Canada Agricultural data).

<u>County</u>	<u>% in 1891</u>	<u>% in 1981</u>	<u>% lost</u>
Brant	22.4	6.8	70
Elgin	14.7	9.5	35
Essex	23.8	1.7	93
Haldimand-Norfolk	25.4	11.1	56
Halton	22.1	11.6	48
Hamilton-Wentworth	16.9	6.7	60
Kent	15.2	2.3	85
Lambton	24.0	7.6	68
Middlesex	15.5	6.4	59
Niagara	17.5	6.8	61
Oxford	15.2	6.1	60

Most of the remaining patches could have no functional forest interior at all (the actual amount depends on the edge width criterion used): using a 0-100 m edge zone, 8,882 of the 11,064 patches (80%) would have no functional forest interior remaining, and if a 0-300 m edge zone was used, 9,547 patches (86%) would have no functional forest interior. Many authors (cited in Pearce 1993) have suggested that true forest interior habitat could be more than 60 m to 600 m from the non-forest/forest margin for animals ("faunal edge"). Since the Hooded Warbler is a forest-interior species, the required distance from forest edge to forest interior habitat is probably closer to 600 m than 60 m. One area which is large enough to still have functioning forest interior is the St. Williams Forest/Backus Woods/Wilson Tract area, which forms a large, almost continuous forest cover. However, these woods have been dissected by small forest access roads and hiking trails, and further fragmentation could reduce or even eliminate interior conditions (Pearce 1993). It is important to mention that the area studied by Pearce (1993) is the most heavily forested area remaining in the Carolinian Region. The area of forest interior in other parts of the Carolinian Region is far lower, with some areas, such as Essex and Kent Cos., having essentially no forest interior remaining.

Widespread fragmentation and clearing of forest habitat in both the breeding and wintering range has led to declines in many area-sensitive, forest-dwelling neotropical migrant species throughout eastern North America (Robbins *et al.* 1989; Hounsell 1991). BBS data indicate that the Hooded Warbler population in eastern North America underwent a significant increase in numbers (at a rate of 3.2% per year) between 1966 and 1988 ($p < 0.01$), but this may be

because selective cutting of trees seems not to be harmful to the Hooded Warbler and may even increase populations by encouraging a dense understory; windthrows have the same effect in undisturbed forest (Brewer 1991a). Conversely, other studies (i.e. Robbins 1979; Droege and Sauer 1988) show significant decreases in Hooded Warbler numbers, and since the species is an area-sensitive, forest-dwelling neotropical migrant, factors contributing to overall decline in this group of bird species (such as loss of habitat heterogeneity, potential barriers to dispersal between woodlots, area-dependent biotic interactions with predators, brood parasites such as the Brown-headed Cowbird, and interspecific competition) still detrimentally affect the Hooded Warbler and have undoubtedly led to local declines in numbers. The factors mentioned above become more common and/or effective as forest size declines, or forest edge become more prevalent (Ambuel and Temple 1983 and Wilcove 1985 in Hounsell 1991), and will have a negative effect on the annual reproductive success rate of species such as the Hooded Warbler. Large woodlots dominated by edge (possessing a high edge-to-area ratio) are also of little value to these species. Pearce (1993) stated that "the fragmentation of forest cover into small isolated patches, and the reduction in functioning forest interior, leave the forest more susceptible to blowdown, drought, disease, and insect infestations, and invasions through the edge zones by small predators such as raccoons, blue jays, and cats, and cowbirds. These stresses, combined with increased competition for a shrinking habitat, may account for 80% to 100% of the lack of nesting success of neotropical migrant songbirds, even in forests of 1,000 to 2,000 ha." Species that are area-sensitive or sensitive to habitat edges, have low annual reproductive rates, or nest in conspicuous places, are most apt to decline as woodland patches become smaller and forest edge increases (Ambuel and Temple 1983 and Temple 1986 in Hounsell 1991). Ecological generalists and edge inhabiting species, on the other hand, benefit (Temple 1986 in Hounsell 1991). M.E. Gartshore (pers. comm.) believes that certain aspects of the Hooded Warbler's breeding biology (i.e. long breeding season, the fact that it is double-brooded, etc.) enable it to cope relatively well with Brown-headed Cowbird parasitism.

Hounsell (1991) has proposed a method of categorizing landscapes into those with high, medium, and low conservation value, as defined: "landscapes with high conservation value have a high percent forest cover; high degree of neighbourhood and connectivity, facilitating the efficient colonization of discrete forest patches; component patches are typically large with forest interior effectively buffered from edge effects, with occasional extensive tracts acting as a colonizing source area. As the percent forest cover declines within the landscape and component patches become either more edge-dominated and/or smaller and more isolated, the conservation value will decrease to the point of virtually no value, at which point, regional extirpations of species can be expected." From Hounsell's perspective, much of the Carolinian forest in Ontario is of low or medium low conservation value, which

happen to correspond to areas denuded or partially denuded of large forest tracts (areas that are unlikely to support species such as the Hooded Warbler). However, because of the scarcity of woodlots throughout the Carolinian region, it is essential that all woodlots be protected at all costs, not just those with 'high' conservation value. In fact, the need to protect woodlots with 'low' conservation value (i.e. in Essex and Kent Cos. in extreme southwestern Ontario) is more urgent than anywhere, as these woodlots are all that remain in the area.

E.4. Habitat protection

Seven (17%) of 41 Hooded Warbler breeding stations reported in the Carolinian Forest Region during the Atlas and preliminary ORBBP work are within naturalist club nature reserves, conservation areas, "Environmentally Sensitive Areas", provincial parks, national parks, and/or national wildlife areas, and provide the species with some (but still insufficient) protection (McColeman and Eagles 1990). Only three sites (all with "possible" breeding evidence) reported to the ORBBP between 1981 and 1990 are located within national or provincial parks, and an additional 12 sites are owned by Conservation Authorities or the Ministry of Natural Resources. The most serious immediate threats to the Hooded Warbler's breeding habitat are ongoing forest destruction and fragmentation, and it is essential that all remaining large, mature tracts of forest within the species' breeding range be protected from further alteration.

Amendments to the Planning Act may affect Hooded Warbler habitat, as well (see section C.).

F. GENERAL BIOLOGY

F.1. Reproductive Capability

The Hooded Warbler generally matures in one year. The longevity record is seven years, 11 months (Klimkiewicz et al. 1983). The male establishes the territory, and females settle on a male's territory within several days of arrival (Ogden and Stutchbury 1994). The female chooses the nest site and builds a cup nest, which usually takes two to six days to complete (Ogden and Stutchbury 1994). The average clutch size is three to four eggs, although five have rarely been recorded (Bent 1963; Ehrlich et al. 1988). Five nests reported to the Ontario Nest Records Scheme contained from one to four eggs (one with one egg, two with three eggs, and two with four eggs) (Peck and James 1987). In addition, M.E. Gartshore (pers. comm.) has one record of a clutch of five eggs in Ontario. Incubation is conducted entirely by the female and lasts 12 days (Harrison 1984; Ehrlich et al. 1988; Ogden and

Stutchbury 1994). Young are altricial, and leave the nest eight to nine days after hatching (Ogden and Stutchbury 1994). Although unable to fly well when they first leave the nest, their legs and feet are remarkably well-developed and they are active climbers and scramblers (Bent 1963). The young can usually fly two to three days after they leave the nest (Ogden and Stutchbury 1994). Cooperation between the two parents in the care of the young is highly developed (Bent 1963). The nestlings are brooded by the female only, but both the male and female feed the young from the day of hatching (Ogden and Stutchbury 1994). Once fledged, the brood is usually divided, with half being cared for by each adult (Ogden and Stutchbury 1994). However, on average there is a great deal of individual variation in parental care (M.E. Gartshore pers. comm.). Adults and young spend a lot of time together; the adults feed and care for the young for up to six weeks after they hatch, and the young probably remain with the adults for another two weeks after that (M.E. Gartshore pers. comm.).

The Hooded Warbler is an early nester. In Ohio, nest construction is prevalent during May, and clutches are complete by mid-May in the south and May 25 to June 10 near Cleveland (Peterjohn and Rice 1991). The young fledge in Ohio between June 15 and July 10 (Peterjohn and Rice 1991). Egg dates in Michigan range from late May to early June, but nests with young have been found up to the last week in July (Brewer 1991a). The breeding season in Ontario typically begins in late May and ends in mid-July (Department of Transmission Environment 1980) or later (M.E. Gartshore pers. comm.). Gartshore (1988) listed May 9 as the earliest date for territorial birds in 1988, and September 28 as the latest. Egg dates in the province range from June 9 to July 27 (Peck and James 1987; James 1991). Nests with young have been reported in Ontario from June 6 to August 7, and fledged young from June 13 to August 16 (ORBBP files; ONRS data; Gartshore 1988); M.E. Gartshore (pers. comm.) stated that it is now known that this species regularly has young in August. The species is double-brooded in Ontario, and it will persistently renest throughout the summer until successful or until it is too late in the season to make any further attempts (Gartshore 1988; M.E. Gartshore pers. comm.).

Nesting success, average annual survival rate, reproductive rate, growth potential, and age/sex ratio of the existing Hooded Warbler population in Canada are not well known. One study showed that only one seventh of the pairs in a 65-acre tract were successful in their first attempt (Bent 1963). Nests are frequently disturbed or destroyed, apparently by predators (Bent 1963). Several nests in Ontario have been reportedly destroyed by rain, woodcutting, and predation (ONRS data; ORBBP files), but M.E. Gartshore (pers. comm.) stated that survival in Ontario is usually good. Ogden and Stutchbury (1994) found that over 95% of territorial males were still present at the end of the breeding season. Banding studies in the South Walsingham Forest, Haldimand-Norfolk R.M., found that mortality and/or disbursement rates are highest in the first year (Gartshore and Agro 1994).

F.2. Species Movement

The Hooded Warbler is a long-distance, nocturnal migrant, and appears to reach North America by a flight across the Gulf of Mexico; there also seems to be a heavy migration along the coast of Texas (Bent 1963; Griscom and Sprunt 1979). However, the species seems to follow slightly different fall and spring routes (Ramos 1986 in Ogden and Stutchbury 1994). The Hooded Warbler typically departs the breeding grounds from late July until late September, and arrives on the wintering grounds from early August to late October or early November; it generally leaves the wintering grounds from early to mid-March, and arrives on the breeding grounds from March to early April through mid-May (Ogden and Stutchbury 1994). Males arrive on the breeding grounds before the females, but the females are not far behind (Bent 1963; Harrison 1984). The species generally returns to Ontario in early May and leaves from September 15-20, although it has been recorded as early as early April and as late as late November (James 1991; M.E. Gartshore pers. comm.). Extreme early dates of spring arrival in the province are March 28 (Toronto) and March 30 (Hamilton) (Bent 1963).

In spring and fall migration, the Hooded Warbler occurs in fairly high numbers along the shores of Lakes Erie and Ontario. The relatively large number of birds observed on migration suggests that Ontario's breeding population would be considerably larger if there was habitat available for breeding. Tom Hince (pers. comm.) describes the species as a regular spring migrant at Point Pelee National Park, with up to 50 individuals per spring passing through the park. In 1992, at least 27 birds were recorded at Point Pelee from April 20 to May 25 (Henshaw and Kerr 1992a), and in 1993 at least 39 were recorded there from April 29 to May 24, with a peak of eight on May 11 (Henshaw and Kerr 1993). A record-late spring migrant was recorded at Pelee on June 9, 1992 (Henshaw and Kerr 1992b). In fall, the Hooded Warbler is usually found at Pelee from early to late September (Stirrett 1973 in Speirs 1985). Ussher (1965 in Speirs 1985) gave May 15 as his 11-year average arrival date at Rondeau, with the earliest on April 30. At the Long Point Bird Observatory, the Hooded Warbler is generally recorded in spring after the first week of May but as early as April 25 (LPBO unpublished data in Ogden and Stutchbury 1994), while at Walsingham the species returns between May 11 and 18 (M.E. Gartshore pers. comm. in Ogden and Stutchbury 1994). During spring 1992, a maximum of six Hooded Warblers was reported at Long Point on May 12 (Henshaw and Kerr 1992a), and in 1993 a total of 23 individuals was recorded at Long Point, with a peak around May 12 (Henshaw and Kerr 1993). Dates for fall transients at Long Point range from August 23 to October 14 (1963-1993) (Ogden and Stutchbury 1994). Spring and fall sightings in the Kingston region have increased in recent years, and the species is described as a rare regular spring and casual autumn visitor there; most sightings (27 of 35) have occurred at Prince Edward Point (Weir 1989). The average spring

arrival date in Kingston region is May 12, and the earliest is May 2 (Weir 1989). During spring 1992, five individuals were recorded in the Kingston area (Henshaw and Kerr 1992a). During fall migration, the species has been noted at Prince Edward Point as early as August 24 and as late as September 21 (Weir 1989).

F.3. Behaviour/Adaptability

The Hooded Warbler is quite highly specialized in terms of habitat, nest location, and diet. Breeding habitat must contain extensive tracts of mature, dense woodlands (preferably beech-maple communities) with clearings containing low, dense, shrubby vegetation. The presence of a dense understory is probably the critical feature (McCracken 1987). Although extensive tracts of forest are essential, individual territories are quite small. In general, breeding territories range from about 0.5 to 0.75 ha in size (Ogden and Stutchbury 1994). Both the male and female defend the territory, and instead of using a regular singing post, the male sings as he moves back and forth within the limits of the territory (Bent 1963; Ogden and Stutchbury 1994). Nesting territories are occupied immediately upon arrival on the breeding grounds, and rival males have been known to fight fiercely in the breeding season (Bent 1963; Griscom and Sprunt 1979). However, males have individually distinctive songs, and can associate each neighbour's song with its usual location. They can also remember their individual neighbour's songs from year to year, which presumably reduces the cost of territorial defense (Ogden and Stutchbury 1994). In winter, males and females maintain and defend well-defined individual feeding territories using loud, metallic chip calls, and by attacking conspecific intruders (Ogden and Stutchbury 1994). The average territory size in a Veracruz study was 0.28 ha (Rappole and Warner 1980 in Ogden and Stutchbury 1994), but territory size and density of wintering individuals may vary depending on habitat (Bennett 1980 in Ogden and Stutchbury 1994).

The density of breeding pairs appears to depend somewhat upon forest type: in mature northern hardwood forest in New York, 0.7 pairs per 40.5 ha (100 acres) were found, while in the Appalachian oak-hickory forest the density increased to five pairs per 40.5 ha (Baird 1986a in Eaton 1988). An average of 14 pairs of Hooded Warblers were found nesting in an area of approximately 26 ha (22 pairs/40.5 ha) in Cleveland, Ohio (Bent 1963), and a large (160 ha) tract of forest in Maryland contained 10 pairs per 40.5 ha (MacClintock *et al.* 1977). In Ontario, nesting areas are few and widely spaced, but the density of birds can be quite high in suitable forests: near Walsingham, Haldimand-Norfolk R.M., at least nine pairs were found in 75 ha (5 pairs/40.5 ha), and 10 pairs were found in 40 ha in Springwater Forest, Elgin Co. (Sutherland and Gartshore 1987). However, the species is essentially a solitary nester, remaining within the forest interior and rarely wandering to the edges, and this plus its small size make it relatively

inconspicuous once the foliage is fully developed (Peterjohn 1989). Consequently, its presence is most often detected through both its song and chipping, which carry for a long distance (Bent 1963; Peterjohn 1989; M.E. Gartshore pers. comm.). Males sing on spring migration, and as soon as their territories are established they sing continually throughout the nesting season (Harrison 1984), at least until early September in Ontario (Gartshore 1988). The species spends most of its life in the lower story of the forest (Bent 1963).

The species is monogamous, but males tend to wander widely, probably for the purpose of engaging in extra-pair copulation (Gartshore 1988; Ogden and Stutchbury 1994). Ogden and Stutchbury (1994) state that extra-pair matings are a common and important feature of the Hooded Warbler's social behaviour. In one study, 47% of females produced young from males other than their mates, and all of the males identified as fathering extra-pair young were immediate neighbours (Ogden and Stutchbury 1994).

Returning males tend to occupy the same territory in successive years, but females usually return to a different territory (Ogden and Stutchbury 1994). A study conducted in the South Walsingham Forest, Haldimand-Norfolk R.M., from 1988 to 1993 found that 62% (21 of 34) of banded breeding adult males returned in at least one subsequent year, while only 42% (16 of 38) of adult females returned in at least one subsequent year (Gartshore and Agro 1994). Numbers are similar in Pennsylvania (63.6% for males, and 39% for females (BJS in Ogden and Stutchbury 1994). Females have a greater tendency to move longer distances from one year to the next, which may account for the differential return rate between males and females (Gartshore and Agro 1994). Eleven percent of male young of the year, and 10.8% of female young of the year, returned to the natal area to breed, which is surprisingly high for a temperate passerine (Gartshore and Agro 1994). Most females remain with their mates throughout the breeding season, but some (less than 10%) move to a different territory within a breeding season (Ogden and Stutchbury 1994). Both sexes show strong site tenacity to, and defend separate, winter feeding territories (Ehrlich *et al.* 1988; Ogden and Stutchbury 1994).

Nests are neat, compact structures placed on a base of dead leaves, and are composed of bark strips and dried plant fibres and lined with fine materials such as dry, soft grasses, bits of plant fibres, and other soft material such as horsehairs (Bent 1963; Ehrlich *et al.* 1988). Nest materials are held in place with spider web (Ogden and Stutchbury 1994). Nests are usually placed in twig forks in low saplings, grape tangles, shrubs or similar cover well within a small thicket, ranging in height from one to six feet from the ground, but usually at heights of two to three feet from the ground (Bent 1963; Department of Transmission Environment 1980; Peterjohn 1989). Six nests reported to the ONRS ranged in height from 0.3 to 1m (1 to 3.3 ft) above ground (Peck and James 1987).

Although placed close to the ground, nests are so inconspicuous and well-camouflaged that they may often be overlooked by predators (Bent 1963). Nests are sometimes placed just over the edge of a ravine so that they are just below the level of the surrounding ground, and consequently they are well-screened and out of the way (Bent 1963).

The Hooded Warbler is entirely insectivorous during the breeding season, and because it is highly adept at flycatching, it consumes many flying insects as well as ants, grasshoppers, locusts, caterpillars, beetles, larvae, roundworms, plant-lice and spiders (Department of Transmission Environment 1980). In winter, insects and other small arthropods are consumed (Ogden and Stutchbury 1994). During the breeding season, males may forage higher than females, but on the wintering grounds, foraging behaviour or height does not differ between the sexes despite the occupation of different habitats (Ogden and Stutchbury 1994). Most foraging on the breeding grounds occurs at heights of 10 to 18 m, while on the wintering grounds most foraging occurs at heights of 1 to 3 m (Ogden and Stutchbury 1994).

Some human disturbance to the Hooded Warbler's habitat (i.e. forest clearing and fragmentation, and the resulting decline in habitat quality) is a serious threat to its survival (see sections D and E.3). However, some selective cutting may be beneficial to the species by creating small clearings essential for breeding, particularly in the absence of functional old growth systems (M.E. Gartshore pers. comm.). Because its diet consists exclusively of insects, pesticide use and pollution may also negatively affect this species.

The Hooded Warbler's breeding habits are quite inconspicuous, and it is not overly tame, aggressive, or curious, meaning that its normal behaviour does not expose it to danger. However, female Hooded Warblers almost always chip while off the nest but near it (M.E. Gartshore pers. comm.). The species is not susceptible to special conditions such as fire, fluctuating water levels, severe winters, or wet or dry seasons, but it is very susceptible to human activities leading to the destruction or fragmentation of extensive woodlots. It is also susceptible to cold spells or other conditions that affect insect populations.

Captive breeding and transplanting programs have never been attempted in Ontario, and are not recommended or warranted at this time. In 1962 at the Patuxent Wildlife Research Centre in Maryland, 169 individuals of neotropical species (warblers and flycatchers) were netted and removed from a study plot as part of a simulated pesticide study. The intent was to return these birds to the study plot, but the agency responsible for caring for them could not keep them alive, and consequently none were returned (Robbins 1979).

G. LIMITING FACTORS

The primary limiting factor for Hooded Warbler populations in Canada is the dependence of the species on extensive, mature tracts of forest with tall trees and a dense understory. Consequently, it is negatively affected by forest destruction and fragmentation, which is particularly important within the species' range in Canada where most of the suitable forests have been altered or destroyed. Suitable breeding habitat is now only sparsely distributed throughout the species' range in Canada, and this has resulted in the small population becoming very thinly distributed throughout available woodlots.

The Hooded Warbler is a frequent Brown-headed Cowbird (Molothrus ater) host throughout its range, and it is unknown how this may affect numbers (Department of Transmission Environment 1980; Harrison 1984; Ehrlich et al. 1988), although the effects are likely less than in other parulids (M.E. Gartshore pers. comm.). One reason for this is the Hooded Warbler's very long breeding season; in Ontario, most nests produced after July 15 are not parasitized (M.E. Gartshore pers. comm.). In the Detroit-Windsor area, all four nests known to Kelley et al. (1963) had been parasitized by cowbirds. Of six nests reported to the Ontario Nest Records Scheme with information on cowbird parasitism, four (67%) contained cowbird eggs (Peck and James 1987). Ogden and Stutchbury (1994) reported cowbird parasitism rates as follows: 45% in southern Ontario (M.E. Gartshore pers. comm.), 75% in Illinois (S. Robinson pers. comm.), 62% in Pennsylvania (BJS), and 18% in Ohio. It appears that Hooded Warblers are preferentially selected as cowbird hosts; in Pennsylvania in 1993, 21 of 39 (54%) Hooded Warbler nests were parasitized, but of other songbirds nesting within 3 m of the ground, only one of 29 (3%) nests were parasitized (Ogden and Stutchbury 1994). Forest fragmentation and the resultant increase in edge habitats has enhanced this problem, as well as increasing natural predation on nests and young by other species of birds and mammals.

Because the Hooded Warbler is a ground or low-elevation nester, it is among the species most vulnerable to mammalian predation, as well as predation by snakes and birds (Morse 1989). Probable nest predators include Blue Jays (Cyanocitta cristata), American Crows, (Corvus brachyrhynchos), eastern chipmunks (Tamias striatus), red squirrels (Tamiasciurus hudsonicus), raccoons (Procyon lotor), striped skunks (Mephitis mephitis), weasels (Mustela), opossums (Didelphis virginiana), and black rat snakes (Elaphe obsoleta) (Ogden and Stutchbury 1994). Nest predation rate in Ontario was found to be 36% (n=109) (M.E. Gartshore pers. comm. in Ogden and Stutchbury 1994). Predation may be the main cause of adult mortality on the wintering grounds (Ogden and Stutchbury 1994). Four different parasitic infections affect the Hooded Warbler (Department of Transmission Environment 1980).

H. SPECIAL SIGNIFICANCE OF THE SPECIES

The Hooded Warbler is generally widespread and common throughout most of its range in the eastern United States, but it is officially designated as Threatened in Wisconsin, and is a species of special concern in Indiana and Michigan (proposed). Threatened status has also been proposed for the species in Ontario. Because of the inaccessibility of its breeding habitat and the small population size, it is relatively unknown to the general public and therefore the degree of public interest is likely minimal.

The Hooded Warbler is at the northern edge of its range in Canada, and such marginal populations are considered to be valuable in terms of genetic composition and adaptability (Scudder 1989 in Cannings 1992). No other Wilsonia species of warblers have been assigned a status in Canada, but several other warbler species are considered to be vulnerable, threatened or endangered in Ontario and/or Canada.

Carolinian Forest habitat critical to the survival of the Canadian population of the Hooded Warbler supports breeding populations of other bird species which are rare in Canada, including the Red-bellied Woodpecker (Melanerpes carolinus), Carolina Wren (Thryothorus ludovicianus), Acadian Flycatcher (Empidonax virescens), Cerulean Warbler (Dendroica cerulea), Prothonotary Warbler (Protonotaria citrea), Louisiana Waterthrush (Seiurus motacilla), Yellow-breasted Chat (Icteria virens), and White-eyed Vireo (Vireo griseus). Many vulnerable, threatened, or endangered plants such as the Cucumber Tree (Magnolia acuminata), Eastern Prickly Pear Cactus (Opuntia humifusa), American Chestnut (Castanea dentata), and Blue Ash (Fraxinus quadrangulata), to name only a few, are also found within the Carolinian Forest Region.

I. EVALUATION AND PROPOSED STATUS

Currently, the Hooded Warbler breeds in Canada in small, fragmented populations in the Carolinian Forest Region (and occasionally in adjacent areas) of Ontario, and the total Canadian population is estimated to be only 80 to 176 pairs. The distribution and abundance of the Hooded Warbler in Canada prior to settlement is unknown, although it is reasonable to assume that the species was considerably more widespread and abundant than it is now. The species prefers areas of extensive woodland in the Carolinian Forest Region, and those habitats have been substantially reduced in the province due to forest destruction and fragmentation. Most land in the Carolinian Forest, which was formerly largely forested, is now agricultural. Census of Canada data reveal that the percentage of woodland on farms in Carolinian counties was less than 7% in 1981, down from 19% in 1891. Forest interior habitat in the Carolinian Forest Region has also been

reduced. Much of the extensive original forest in southern Ontario would have been forest interior, but there is now essentially no forest interior in southwestern Ontario southwest of London (S. Hounsell pers. comm.), and very little forest interior remaining in the Carolinian Region (Pearce 1993).

The populations of area-sensitive, forest-dwelling species whose Ontario distribution is restricted to the area south of the Canadian Shield will have been greatly reduced by forest loss, such that their populations in Ontario will now be only a small fraction of their former size. The Hooded Warbler, Louisiana Waterthrush, and Cerulean Warbler have been noted to have declined markedly over the same time period in Michigan, where similar patterns of forest clearing have taken place (Brewer 1991b). Unfortunately, there is no information on the early populations of these species in Ontario, probably because of their small size and preference for forest interior habitat which made them very easy to overlook. However, the remaining populations of these species in the Carolinian Forest Region are concentrated primarily in Haldimand-Norfolk R.M., which has the highest remaining area of forest in the region, strongly suggesting that these species are restricted within the Carolinian Forest Region by availability of forest habitat.

Although its former population level can never be obtained, the considerable reduction of the species' habitat, its area-sensitivity, its current restriction to the remaining heavily wooded portions of the Carolinian Forest Region, and its current small population size strongly suggest that the Hooded Warbler has decreased considerably in the province directly because of human activity. There are some indications of a small increase in population in recent years, so the species should perhaps not be considered Endangered at this time. It is therefore recommended that the Hooded Warbler be designated as Threatened in Canada, but should be monitored for evidence of further declines, at which time its' status should be reevaluated.

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