

COSEWIC
Assessment and Status Report

on the
Canada Warbler
Wilsonia canadensis

in Canada



THREATENED
2008

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada



COSEPAC
Comité sur la situation
des espèces en péril
au Canada

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COSEWIC Assessment Summary

Assessment Summary – April 2008

Common name

Canada Warbler

Scientific name

Wilsonia canadensis

Status

Threatened

Reason for designation

Most (80%) of the breeding range of this species occurs in Canada. While regional trends may vary, overall the species has experienced a significant long-term decline. This decline is particularly evident in the case of the species' Canadian range and there is no indication that this trend will be reversed. The reasons for the decline are unclear, but loss of primary forest on the wintering grounds in South America is a potential cause.

Occurrence

Yukon Territory, Northwest Territories, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Prince Edward Island, Nova Scotia

Status history

Designated Threatened in April 2008. Assessment based on a new status report.



COSEWIC
Executive Summary

Canada Warbler
Wilsonia canadensis

Species information

The Canada Warbler (*Wilsonia canadensis*) is a small, brightly coloured passerine. The males are typically more brightly coloured than the females and immatures, with blue-grey upperparts and tail contrasting with a yellow throat and breast. In both sexes, black stripes form a collar on the breast, although it is less defined in the females. The adults keep the same plumage year round. The plumage of the immatures is similar to that of the adults, but generally duller.

Distribution

Approximately 80% of the Canada Warbler's global breeding range is located in Canada, where it breeds in all provinces and territories except Nunavut and Newfoundland and Labrador. It winters in northwestern South America.

Habitat

The Canada Warbler uses a wide range of deciduous, coniferous and mixed forests, with a well-developed shrub layer and a structurally complex forest floor. It is most abundant in moist, mixed forests. It also occurs in riparian shrub forest on slopes and in ravines, in stands regenerating after natural and anthropogenic disturbances and in old-growth forests with canopy openings and a well-developed shrub layer. In its wintering range, the Canada Warbler uses primarily mature cloud rainforests located at an altitude of 1,000 to 2,500 m, as well as second-growth forests, forest edges, coffee plantations, agricultural field edges and semi-open areas.

Canada Warbler habitat is believed to be in decline primarily in its wintering range, where up to 95% of the primary mountain forests have been converted to agriculture since the 1970s. Habitat loss has also been observed in the eastern part of its breeding range, where wet forests have been drained for urban development and forest converted to agricultural land.

Biology

The Canada Warbler is typically monogamous and lays four to five eggs. Incubation usually lasts about 12 days. The chicks remain in the nest for 10 days, and are dependent on parents for two to three weeks after they leave the nest.

Population sizes and trends

The Canadian population of Canada Warbler is estimated at roughly 2.7 million individuals. Breeding Bird Survey (BBS) data for Canada suggest that the species has declined by 4.5%/year between 1968 and 2007, which amounts to a loss of approximately 85% of the population during that period. Between 1997 and 2007, the species declined by 5.4%/year, which corresponds to a decline of 43% of the population in the most recent 10-year period. These declines are most evident in the eastern portions of the breeding range, where the majority of the population occurs. Other survey methods also report declines in the Canada Warbler population.

Limiting factors and threats

The factors responsible for the decline of the Canada Warbler have not been identified. Habitat loss and degradation on the wintering range are thought to be the most likely factors. In Canada, habitat loss due to conversion of swamp forests in the east, agricultural activities and road development in the boreal forest in the western part of the range and possibly a decrease in spruce budworm (*Choristoneura fumiferana*) outbreaks in eastern forests since 1970 may have also contributed to the decline.

Special significance of the species

Eighty-five percent of the global breeding population of Canada Warbler occurs in Canada. For this reason, Canada has a major responsibility for the conservation of this species.

Existing protection or other status designations

Canada Warbler adults, nests and eggs are protected in Canada under the *Migratory Birds Convention Act, 1994*. It is considered a high-priority species by Partners in Flight in Canada and the United States.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2008)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.



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Canadian Wildlife Service

Environnement Canada
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Canada

The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Canada Warbler *Wilsonia canadensis*

in Canada

2008

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SPECIES INFORMATION

Name and classification

Wilsonia canadensis (Linnaeus, 1766) is commonly called the Canada Warbler. The French name is 'Paruline du Canada'. The taxonomy is as follows:

Class: Aves
Order: Passeriformes
Family: Parulidae
Genus: *Wilsonia*
Species: *canadensis*

Morphological description

The Canada Warbler is a small (total length 12–15 cm, body mass 9.5–12.5 g), brightly coloured bird with a thin bill and short tail. The males are typically more brightly coloured than the females and immatures, with bluish-grey upperparts and tail contrasting with a yellow neck and throat. The head is bluish with a black forehead and cheeks, which join with a band of well-defined black stripes that run across the breast. In both sexes, the supraloral stripe is yellow and the lores and anterior auriculars are black. The undertail coverts are white in all plumages. In the females, the upperparts and tail are dull bluish-grey and the throat and breast are yellow with fine, less distinct, brownish lines. The forehead and cheeks of the female are bluish-grey, rather than black as in the males. The adult plumage is kept year round. The plumage of the immatures is similar to that of the adults but duller (Conway 1999).

The characteristic plumage (i.e., bluish back, yellow breast and black stripes forming a collar) and song of the Canada Warbler differentiate it from most other species of warblers that breed in Canada. It can be confused with the Magnolia Warbler (*Dendroica magnolia*), which has a yellow breast with black stripes and the Kentucky Warbler (*Oporornis formosus*), which also has a yellow breast and black cheek, which extends down the length of the throat.

Genetic description

No genetic studies have been conducted on the Canada Warbler (Conway 1999).

Designatable units

There are no subspecies of Canada Warbler (Conway 1999) and no known distinctions between populations that would warrant consideration of designatable units below the species level. This report is based on the species as a whole.

DISTRIBUTION

Global range

The Canada Warbler breeds across the southern boreal region of Canada and across much of southeastern Canada, northeastern United States, the Great Lakes region, and in a disjunct area of the southern Appalachian Mountains in eastern Tennessee, western South Carolina, and extreme northern Georgia (Conway 1999; Figure 1). In the United States it breeds in northeastern Minnesota, northeastern Wisconsin, the western and northern peninsula of Michigan, central Pennsylvania, northwestern New Jersey, southern Connecticut, southern Rhode Island, and southeastern Massachusetts (Conway 1999). Its range extends south through the southern Appalachian Mountains in eastern Tennessee, western South Carolina, and extreme northern Georgia (Conway 1999; Figure 1).

Its winter range includes, to the north, the eastern part of the Andes foothills in Venezuela and northern Colombia and, to the south, Ecuador, northern Peru, and the Tepui region of northern Brazil (Robinson *et al.* 1995; American Ornithologist's Union 1998).

Canadian range

The Canadian range of the Canada Warbler extends from the Maritime provinces to British Columbia, where its range appears to be expanding (Campbell *et al.* 2007) and includes portions of all Canadian provinces and territories except Nunavut and Newfoundland and Labrador (Figure 1). Its breeding range includes the extreme southeastern Yukon (Sinclair *et al.* 2003), northeastern British Columbia (from Smith River in the north, south to Dawson Creek; Campbell *et al.* 2001; South Peace Bird Atlas Society 2006), the southwestern corner of the Northwest Territories (from Fort Simpson in the north to Fort Liard; Machtans and Latour 2003), northern and central Alberta (from Wood Buffalo National Park in the north, south to Cold Lake; Semenchuk 1992), north-central Saskatchewan (Flotten Lake in the north, south to Nipawin; Smith 1996), central and southeastern Manitoba (Moose Lake in the north, south to Whiteshell Provincial Park and the extreme southeast corner of the province; Manitoba Avian Research Committee 2003), north-central and southern Ontario (Favourable Lake in the north, south to Elgin County; Cadman *et al.* 1987; Wormington pers. comm. 2008), south-central and southern Quebec (Manicouagan Reservoir in the north, south to Gatineau; Gauthier and Aubry 1996), and all of New Brunswick, Prince Edward Island and Nova Scotia (including Cape Breton Island; Erskine 1992).

An estimated 80% of the Canada Warbler's global breeding range occurs in Canada (based on range sizes by jurisdiction in PIF Landbird Population Estimates Database 2007), with an extent of occurrence of approximately 2.2 million km² (NatureServe 2007). The area of occupancy of the Canada Warbler is approximately 27,000 km². This value is based on the home range estimate of two ha (Chase 2005), multiplied by a population estimate of 1.35 million pairs, derived from an extrapolation from the Ontario Breeding Bird Atlas (see Abundance section for details).

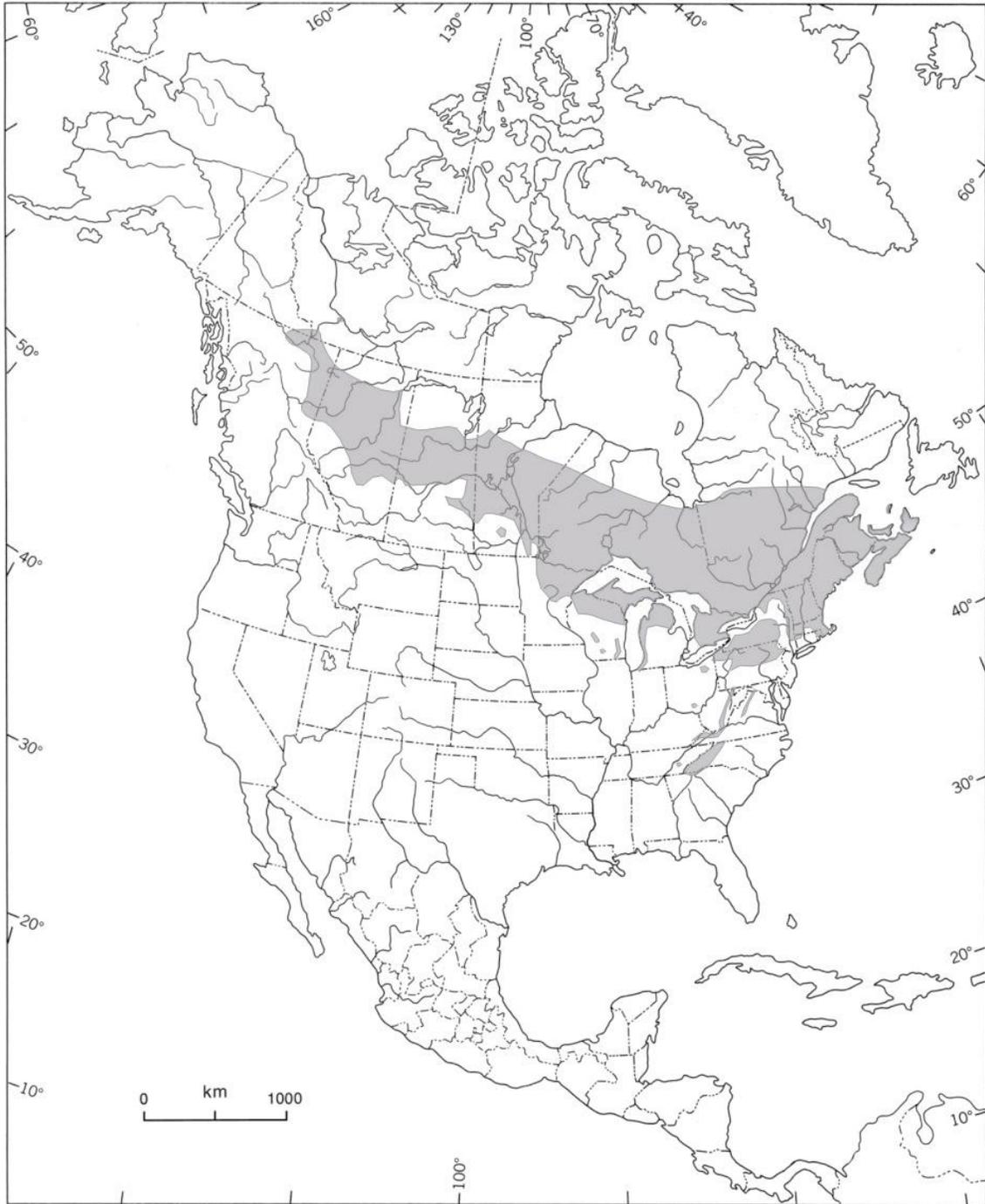


Figure 1. North American breeding range of the Canada Warbler (based on Cadman *et al.* 1987; Gauthier and Aubry 1996; Conway 1999, Campbell *et al.* 2001; Sinclair *et al.* 2003; Lambert and Faccio 2005; Bird Studies Canada 2006a; South Peace Bird Atlas Society 2006; NatureServe 2007).

HABITAT

Habitat requirements

Breeding range

The species is found in a variety of forest types, but is most common in wet, mixed deciduous-coniferous forest with a well-developed shrub layer (Conway 1999). It is often found in shrub marshes, red maple (*Acer rubrum* L.) stands, cedar stands, conifer swamps dominated by black spruce (*Picea mariana*) and larch and riparian woodlands along rivers and lakes (Peck and James 1987; Brauning 1992; Semenchuk 1992; Foss 1994; Larue *et al.* 1995; Cooper *et al.* 1997; Wildlife Resource Consulting Service MB Inc. and Silvitech Consulting 1997; Conway 1999; Drapeau *et al.* 2000; Manitoba Avian Research Committee 2003; Lambert and Faccio 2005; Chase 2005). It is also associated with ravines and steep brushy slopes near these habitats (Cooper *et al.* 1997; Lambert and Faccio 2005; South Peace Bird Atlas Society 2006).

In some parts of the range, the species will also breed in mature (>90 years) upland forests with canopy gaps that promote a dense, well-developed shrub layer (Schieck *et al.* 1995; Enns and Siddle 1996; Cooper *et al.* 1997; Hobson and Bayne 2000a; Hobson *et al.* 2000; Schieck and Hobson 2000; Schieck *et al.* 2000; Cumming and Machtans 2001; Machtans and Latour 2003; Hannon *et al.* 2004; Lambert and Faccio 2005; E. Bayne pers. comm. 2007; South Peace Bird Atlas Society 2006).

Throughout its breeding range, the Canada Warbler can also be locally abundant in regenerating forests (i.e., 6–30 years post-disturbance) following natural (forest fires) or anthropogenic (harvesting) disturbances (Titterington *et al.* 1979; Wildlife Resource Consulting Service MB Inc. and Silvitech Consulting 1995; Christian *et al.* 1996; Hobson and Schieck 1999; Drapeau *et al.* 2000; Schieck and Hobson 2000; Hobson and Bayne 2000b; R. Berger pers. comm. 2006).

Spring and fall migration

During migration, the Canada Warbler is associated with habitats having a well-developed shrub layer, such as forest edges, riparian habitats, and second-growth forests (Conway 1999). In Central America, it uses the shrub layer and upper layers of humid to semi-humid forests and forest edges from sea level to 2,500 m (Binford 1989; Howell and Webb 1995). In Honduras and Panama, it occurs in open forests, second-growth forests, shrubland habitat and mangrove forests (Monroe 1968).

Winter range

In South America, the Canada Warbler uses mature rainforests and cloud rainforests at an altitude of 1,000–2,100 m, but may also use second-growth forests and forest edges (Ridgely and Tudor 1989; Curson *et al.* 1994). In Colombia, it occurs primarily in mountainous areas and foothills at 1,000–2,500 m (Hilty 1980). In Peru and Ecuador, the species uses rainforests on the east slope of the Andes and the adjacent

lowlands (Paynter 1995). It also uses more open habitats, such as coffee plantations, agricultural field edges and semi-open areas (DeGraaf and Rappole 1995).

Habitat trends

Breeding range

Much of the forested wetlands in the eastern part of the species range have been drained (Tiner 1984; Conway 1999) and converted to agriculture or urban developments (Cadman *et al.* 1987; Gauthier and Aubry 1996). Regeneration of forest following clearing in the early to mid-1900s probably provided habitat for Canada Warblers. However, the continued maturation of the forest in those areas since that time has likely reduced the suitability of the habitat (Conway 1999).

In the western part of the range, boreal mixedwood forest has been converted to agriculture, potentially decreasing the amount of Canada Warbler habitat (Hobson *et al.* 2002). The annual rate of deforestation in the boreal forest transition zone of central Saskatchewan between 1966 and 1994 was 0.89%, three times higher than the global average (Hobson *et al.* 2002). Moreover, it is estimated that 7.3 million ha of boreal forest have already been converted for urban development and agriculture in Manitoba, Saskatchewan and Alberta (Senate Subcommittee on the Boreal Forest 1999).

Forests in western Canada are also believed to be in decline due to their permanent conversion by logging, road construction, oil and gas drilling and other industrial infrastructure (Senate Subcommittee on the Boreal Forest 1999; Schneider *et al.* 2003). According to the Senate Subcommittee on the Boreal Forest (1999), 70% of stands more than 90 years old in northwestern Canada have already been harvested and converted to plantations by forestry activities. Models developed to predict the cumulative impacts of current industrial development (including forestry, oil and gas development and other activities) planned in northeastern Alberta indicate that, at the current rate of development, old-growth stands of softwoods would be eliminated within 20 years and old-growth stands of hardwoods within 65 years (Schneider *et al.* 2003). Even under a management scenario involving the application of best practices, a major decline in old-growth stands is also predicted (Schneider *et al.* 2003).

Although the loss of old-growth forests may be offset by stand regeneration, post-treatment silvicultural practices that reduce the shrub layer could adversely affect the quality of Canada Warbler habitat in these areas (Gauthier and Aubry 1996). Further studies are therefore needed to assess the impact of silvicultural practices on the quantity and quality of managed forests for Canada Warbler in Canada.

Winter range

According to Davis *et al.* (1997), the forests of the northern Andes (i.e., primarily in Colombia), located between 500 and 2,000 m in altitude, the main winter grounds of the Canada Warbler (Conway 1999), are among the most threatened forests in the world.

Approximately 90% of all primary forest in the northern Andes, including 95% of the cloud rainforest, has been deforested since the 1970s (Henderson *et al.* 1991). In Colombia alone, the rate of deforestation in the early 1990s is believed to have been between 1.5 and 2.2 million acres per year (World Press Review 1993) and only 5% of the primary forest of the western slope of the Andes remains (Dodson and Gentry 1991). Although no current data are available, it is highly likely that the area covered by primary forest has continued to decline since the 1990s. The same appears to be true for the cloud forests of Ecuador and northern Peru, although the habitat has been lost at a much slower rate (Terborgh 1989; Dillon 1994).

Habitat protection/ownership

In Canada, the breeding habitat of the Canada Warbler is generally on public lands, where the degree to which the habitat is protected is unknown. The species is, however, present in 21 of Canada's national parks (P. Achuff pers. comm. 2006) and in several other protected sites under provincial jurisdiction. The total area of these protected sites accounts for less than 10% of Canada's total area (Senate Subcommittee on the Boreal Forest 1999) and is likely a small proportion of the species' breeding range. Notable examples of protected sites in boreal areas where Canada Warblers breed include: Wood Buffalo National Park (35,437 km²) in Alberta, Prince Albert National Park (3,874 km²) and Lac La Ronge Provincial Park (3,362 km²) in Saskatchewan, Wapusk National Park (11,475 km²) and Riding Mountain National Park (2,973 km²) in Manitoba, Wabakimi Provincial Park (8,711 km²), Woodland Caribou Provincial Park (4,795 km²) and Georgian Bay Islands National Park (13 km²) in Ontario and La Mauricie National Park (540 km²) in Quebec and Prince Edward Island National Park (22 km²) in Prince Edward Island.

The vast majority of Crown forests have been allocated to the forest industry for timber and pulp production. Most provinces have adopted forest management practices that might help to reduce the impact of forestry on Canada Warbler habitat (e.g., riparian woodland protection programs; Biodiversity Field Guide of the Forest Practices Code of British Columbia Act; Cooper *et al.* 1997). In addition, a number of forest certification systems have been adopted by various forest companies and implemented on over 15 million ha in several sectors of Canada's boreal forests (Forest Stewardship Council 2006).

BIOLOGY

Reproduction

The Canada Warbler usually nests in wet forested areas, often in dense ferns or fallen logs (Conway 1999). It has a typical clutch size of four to five eggs, with one clutch produced annually (Peck and James 1987; Curson *et al.* 1994; Conway 1999). Incubation lasts approximately 12 days (Conway 1999) and chicks remain in the nest for about 10 days (Conway 1999). The post-fledging dependent period probably lasts two to three weeks, as it does in other species of wood warblers (Curson *et al.* 1994).

The generation time is estimated at two to three years, taking into account the species' age at first breeding (one year; Conway 1999) and maximum life span (eight years) (Klimkiewicz *et al.* 1983).

Survival

The maximum recorded age in North America for the Canada Warbler is seven years, 11 months (Klimkiewicz *et al.* 1983).

Survival estimates for the Canada Warbler in Canada come primarily from the Monitoring Avian Productivity and Survivorship program (MAPS; Michel *et al.* 2005). The objective of MAPS is to determine the productivity and survival rate of North American landbirds using the capture-mark-recapture method from a network of constant-effort monitoring stations across North America (Michel *et al.* 2005). The proportion of adults recaptured annually at these stations provides a measure of the apparent survival rate. The survival rate of the Canada Warbler was estimated between 1992 and 2003, for Alaska and boreal Canada (three stations) and the northeastern United States (seven stations; Michel *et al.* 2005). The apparent adult survival rate for Alaska and boreal Canada was 0.482 ± 0.063 and for the northeastern United States 0.374 ± 0.116 ; both are considered low (Michel *et al.* 2005).

Productivity

The only data on Canada Warbler productivity come from the MAPS program between 1995 and 2001 (Michel *et al.* 2005). Productivity is estimated at each MAPS station, taking into consideration the ratio of the number of young captured to the number of adults captured (productivity index). The results show a downward trend in the productivity index for the Canada Warbler between 1995 and 2001 (Michel *et al.* 2005).

Movements and dispersal

Data gathered at the LSLBO banding station in Alberta suggest that the fall migration begins around 10 July and ends around 20 September (Jungkind 2001). The species arrives at its breeding grounds between 12 May and 14 June (Jungkind 2001).

Adult birds captured in several Atlantic coast states (i.e., Connecticut, New Jersey and Maryland) during spring migration were recaptured, probably on their breeding site, several years later in the St. Lawrence Valley in Quebec ($n = 3$) and southern New Brunswick ($n = 1$; Brewer *et al.* 2000). Two adults captured in Michigan in the spring were recaptured in southern Ontario (Brewer *et al.* 2000).

Food and feeding habits

The Canada Warbler feeds primarily on flying insects (i.e., Diptera and Lepidoptera) and spiders in the shrub layer (Conway 1999). Although not considered a

spruce budworm specialist, it may also feed heavily on this insect during outbreaks (Crawford and Jennings 1989; Patten and Burger 1998). It uses a variety of foraging techniques, including flycatching, sallying, hover gleaning, foliage gleaning and ground gleaning (Conway 1999).

During the breeding season, the species forages in both conifers and hardwood trees. In Wisconsin, it concentrates its foraging effort in conifers (Sodhi and Paszkowski 1995), whereas in northern British Columbia, it forages primarily in red osier dogwood (*Cornus sericea*) and young white birch (*Betula papyrifera*; Enns and Siddle 1996).

During migration, the Canada Warbler forages in the shrub layer at heights of less than 7 m (Keast 1980). On its wintering grounds, it often feeds within mixed-species flocks (Ridgely and Gwynne 1989).

Interspecific interactions

Like most forest passerines, the Canada Warbler is territorial during the breeding season. However, it can occur in small groups within mixed-species flocks during dispersal, migration and on wintering sites (Bent 1953; Ridgely and Gwynne 1989). Agonistic interactions with other warblers during foraging in the breeding season are also reported (Conway 1999).

No specific information is available on interactions with predators (Conway 1999).

Home range and territory

Telemetry studies in Vermont have shown that males establish their territories in late May (Chase 2005). Average territory sizes, based on this study and another in the Fort Liard area, ranged from 0.4 ha (n = 29 pairs; Chase 2005) to 0.75 ha ± 0.36 SD (n = 40 territories; Machtans 2006), respectively. The average home range size, based on the Vermont study, was two ha (Chase 2005).

Behaviour and adaptability

The Canada Warbler requires a well developed shrub layer in its breeding habitat. Given this, it exhibits a certain degree of adaptability to human disturbances such as forest harvesting. The species occupies forest regenerating following harvesting, particularly stands between 6-20 years post-harvest in the east (Lambert and Faccio 2005) and 20-30 years post-harvest in the west (Hobson and Schieck 1999; Schieck and Hobson 2000). This is presumably because the shrub layer peaks during early regeneration stages (Sodhi and Paszkowski 1995; Norton and Hannon 1997; Tittler *et al.* 2001). The Canada Warbler also occupies stands recovering from fire (Hobson and Schieck 1999; Schieck and Hobson 2000), although the species is less abundant in stands regenerating from fire than those regenerating from harvest (Hobson and Schieck 1999).

Canada Warblers also appear to be relatively tolerant of the habitat fragmentation that results from forest harvesting (Schmiegelow *et al.* 1997). This may be because of the regeneration, and thus a well-developed shrub layer, that occurs adjacent to the fragments following harvesting (Schmiegelow *et al.* 1997). On the contrary, there is evidence to suggest that the species is relatively intolerant of fragmentation associated with agriculture (Robbins *et al.* 1989; Hobson and Bayne 2000c).

On its wintering grounds, the Canada Warbler demonstrates a certain degree of adaptation to changes occurring in its habitat (Terborgh 1989). In the Andes, the species made relatively heavy use of coffee plantations (Terborgh 1989; Finch and Stangel 1993), although a certain percentage of forest cover must be maintained above the plantations (Terborgh 1989).

POPULATION SIZES AND TRENDS

Search effort and monitoring programs

The Breeding Bird Survey (BBS)

The Breeding Bird Survey is a large-scale program that monitors breeding bird populations across North America (Sauer *et al.* 2005). Breeding bird abundance data are collected by volunteers at 50, 400-m radius stops spaced 0.8 km apart along permanent 39.2-km routes (Downes and Collins 2007). In Canada, the surveys usually take place in June during the breeding season of most forest birds and are conducted from 0.5 hour before to approximately 4.5 hours after sunrise.

The BBS provides relatively good coverage of those areas of the breeding range where Canada Warbler abundance is high (Figure 2).

The Partners in Flight population estimate database (http://www.rmbo.org/pif_db/laped/) provides an estimate of the proportion of the global breeding range (80% of which is in Canada) of the Canada Warbler, in lat/long degree blocks, that is sampled by the BBS and it also rates BBS coverage in relation to species abundance. These data suggest that 54% of the global breeding range of the Canada Warbler is sampled by the BBS and that 36.4% of the population (by abundance) has good coverage (67-100% of range covered), 18.1% has fair coverage (33-67% of range covered) and 39.2% has poor coverage (10-33% of range covered). Finally, relative abundance estimates from the BBS and the Ontario Breeding Bird Atlas (see below) point counts indicate that the highest relative abundances for the Canada Warbler are found in areas sampled by the BBS (P. Blancher pers. comm. 2008). BBS analyses also weight trends by abundance, so in the case of the Canada Warbler, the trend is most strongly influenced by BBS routes in the east where densities are highest.

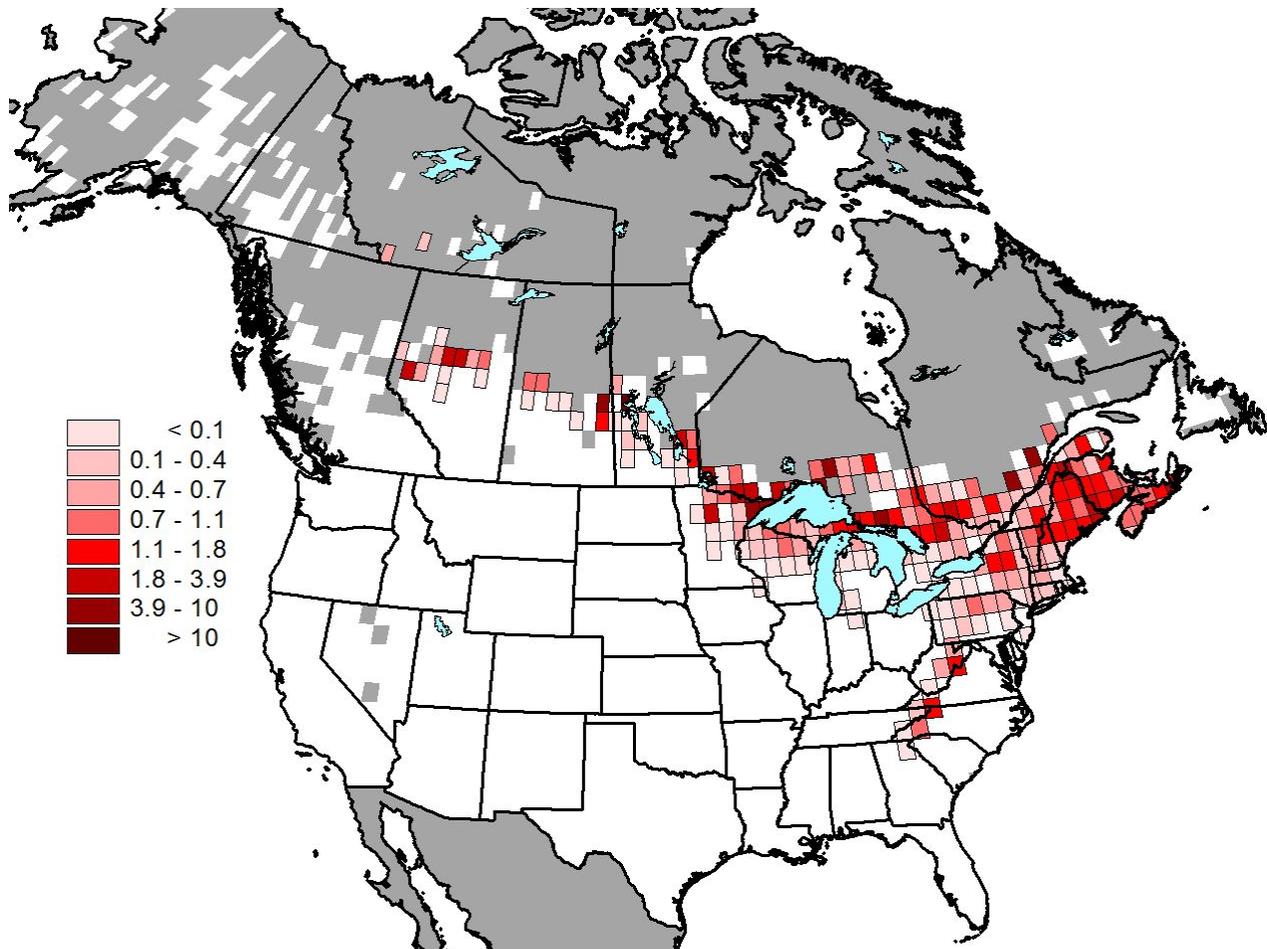


Figure 2. Relative abundance of Canada Warblers, based on Breeding Bird Survey abundance data calculated for each lat/long degree block from 1987-2007, in relation to the portion of the breeding range sampled by the Breeding Bird Survey. Grey areas = not sampled by BBS, white areas = sampled, but no Canada Warblers (P. Blancher pers. comm. 2008).

Étude des populations des oiseaux du Québec (ÉPOQ)

In Quebec, the ÉPOQ database, which manages the bird checklists that have been regularly produced by thousands of volunteers since 1955, is used for determining Canada Warbler population trends in Quebec (Cyr and Larivée 1995). The ÉPOQ database covers all regions located south of the 52nd parallel during all seasons (Cyr and Larivée 1995).

The main disadvantage of this method for surveying the Canada Warbler is that it covers mostly inhabited regions in the south (i.e., St. Lawrence Lowlands), with less coverage of more northerly parts of the range. Moreover, the method does not control for the number of observers per checklist, weather conditions, spatial variation in search effort over time, but only for the total number of observation hours (Cyr and Larivée, 1995).

Ontario Breeding Bird Atlas (OBBA)

The OBBA compares the distribution and abundance of breeding birds between 1981-1985 and 2001-2005, and is an important source of information on the status of the Canada Warbler in Ontario (Bird Studies Canada 2006a). The data are gathered by volunteers who visit 10 x 10-km plots at least three times during the breeding period (Bird Studies Canada 2006a). The percent change in the distribution of the Canada Warbler in Ontario over a period of 20 years is then calculated by comparing the percentage of the 10 x 10-km squares/blocks with breeding evidence in the first atlas period to the percentage of squares/blocks with breeding evidence in the second atlas period, adjusting for observation effort (Bird Studies Canada 2006a).

This method is considered adequate for estimating Canada Warbler abundance in Ontario, because of the large number of samples gathered during the two periods and the standardized methodology used (Bird Studies Canada 2006a). In addition, this program generally covers the entire breeding range of the species in Ontario (Bird Studies Canada 2006a).

Ontario Forest Bird Monitoring Program (FBMP)

The Ontario Forest Bird Monitoring Program began in 1987 and is coordinated by the Canadian Wildlife Service, Ontario Region. Its objective is to document forest bird population trends and the relationships between the birds and their habitat during the breeding period in relatively unfragmented forest landscapes (Canadian Wildlife Service 2006). Volunteers use point counts to survey birds in both large forest areas and forest fragments.

One of the limitations of this program for monitoring Canada Warblers is that the species occurs at relatively few sites, making the interpretation of long-term trends difficult. However, this method is more likely to detect Canada Warblers than other monitoring programs, because sampling is done primarily in unfragmented forest areas (Canada Wildlife Service 2006).

Canadian Migration Monitoring Network

This program is designed to monitor populations of migratory passerines at a series of 23 monitoring stations across Canada (Bird Studies Canada 2006b). Fall migration, in particular, can provide information on population trends for birds breeding in the boreal forest and farther north, as they move from their northern breeding grounds to their southern wintering grounds. The primary activities carried out at these stations are bird banding and daily visual counts of birds during spring and fall migration periods.

The main source of bias with this monitoring program is its assumption that the number of birds observed at these stations is proportional to the actual number of birds migrating on the days monitored. A second limitation is that most stations have been operating for less than 10 years, so cannot provide long-term trend information.

Canadian Breeding Bird (Mapping) Census Database

This database provides information on the density of breeding birds in plots located in every Canadian province and territory, except Prince Edward Island (Kennedy *et al.* 1999). Experienced observers use “spot-or territory-mapping” methods to assess the density of breeding birds in each plot (Kennedy *et al.* 1999). This sampling method is one of the most accurate for estimating forest bird density (Bibby *et al.* 2000). One of the main limitations of this program is most censuses are several decades old, and therefore data do not reflect current densities.

Project for the Prediction of Bird Presence and Density for Quebec (PPPDAQ)

Recently launched by the Canadian Wildlife Service, Quebec Region (J.-L. Desgranges and P. Agin unpubl. data), the objective of this project is to model bird presence and density at the ecoregion and ecozone scales, by forest habitat type and by tree family using learning algorithms. The database contains 3,306 point counts obtained using the IPA technique primarily in Quebec and the adjacent provinces and states taken from published and unpublished studies by various sectors (academia, government, private and other). With respect to the Canada Warbler, the density of breeding pairs was estimated for four contexts: 1) Boreal Shield – disturbed mixed forest – birches; 2) Boreal Shield – well-drained mixed forest – maples; 3) Mixedwood Plains – poorly drained mixedwood forest; and 4) Atlantic Maritime – poorly drained mixedwood forest – ash).

The main limitation of this program is that Canada Warbler density is obtained from several sampling stations and then extrapolated to large areas (i.e., the ecoregions scale), which can result in overestimating the species’ density in little used or unused forest stands. The proposed models also assume that Canada Warbler densities are homogeneous across a given spatial scale, yet it is known that the species has a highly grouped distribution and generally responds to finer-scale environmental variables than those used in the models. The major advantage of this program is that it covers several spatial scales.

National Boreal Bird-Habitat Modelling (NBBHM) Project

The National Boreal Bird-Habitat Modelling Project is a joint initiative of the Western Boreal Conservation Initiative (WBCI) and the University of Alberta’s Boreal Ecosystems Assessment for Conservation Networks (BEACONS; <http://www.borealbirds.ualberta.ca>). Its objective is to evaluate habitat relationships and distribution patterns of birds in Canada’s boreal. In collaboration with researchers from universities, government agencies and industry, the NBBHM Project is developing spatially explicit models that will be used to predict the distribution and abundance of boreal birds with the objective of incorporating this information into decision-making processes. This research program is particularly important in estimating the relative abundance of the Canada Warbler in several ecodistricts of the boreal forest.

Abundance

According to abundance estimates obtained from the BBS, Canada Warbler populations throughout North America currently total 1.4 million individuals (Rich *et al.* 2004). In Canada, the population is estimated at approximately 1.2 million breeding adults (85% of North American population in Canada, PIF Landbird Population Estimates Database 2007), or approximately 600,000 breeding pairs. The accuracy of these estimates is considered adequate (accuracy of 3 on a scale of 1 to 6, see Appendix B in Rich *et al.* 2004).

Recent Canada Warbler abundance estimates for Ontario based on the Ontario Breeding Bird Atlas between 2001 and 2005, suggest a population of 900,000 individuals (i.e., 450,000 breeding pairs) in that province (Blancher and Couturier 2007). This estimate is considered to be more accurate than the BBS estimates because the atlas has numerous samples gathered in large interior tracts of forest (P. Blancher pers. comm. 2008).

Another estimate of population size can be derived from the Ontario Breeding Bird Atlas. If Ontario, with its 450,000 pairs, accounts for roughly 33% of the Canadian breeding range, Quebec and the Maritimes another 33% and the remaining provinces the final 33% (see Figure 1), then a Canadian population would be approximately 1,350,000 breeding pairs or 2.7 million adults based on extrapolations from the Ontario numbers.

The most comprehensive surveys of Canada Warbler breeding densities based on the Canadian Breeding Bird Census (BBC) suggest that the highest densities are in the eastern parts of the range, including Ontario, Quebec, and New Brunswick (Table 1). High densities have also been reported from Manitoba (Table 1) and southern Northwest Territories, with densities up to 0.65 pairs/ha (Machtans 2006).

Breeding densities in Quebec, based on the PPPDAQ, range from 0.18 to 0.4 pairs/ha and are generally lower than those estimated by the BBC. Densities are higher in the Boreal Shield (disturbed mixed forest–birch), Canadian Shield (well drained mixed forest–maple), and Mixedwood Plains (poorly drained mixed forest) ecozones, each with 0.04 pairs/ha (J.-L. Desgranges and P. Agin unpubl. data). The density of the species is believed to be lower in the Atlantic Maritime ecozone (poorly drained mixed forest–ash), at only 0.02 pairs/ha.

The NBBHM suggests that the relative abundance of the Canada Warbler is higher in east-central Alberta, in several ecodistricts in southwestern Northwest Territories and in the area of the Ontario-Manitoba border east of Lake Winnipeg (D. Mazerolle unpubl. data). The abundance of the Canada Warbler is lower throughout northeastern British Columbia (D. Mazerolle unpubl. data).

Table 1. Summary of breeding densities per ha in Canada according to the Canadian Breeding Bird (Mapping) Census Database (Kennedy et al. 1999).

Province	Ecoregion	Density/ha	SD	n
British Columbia	Hay River Lowland	0.08		1
Alberta	Slave River Lowland	0.11	0.05	2
Saskatchewan	Mid-Boreal Uplands	0.03		1
Manitoba	Interlake Plain	0.23	0.12	3
	Lac Seul Upland	0.07		1
	Mid-Boreal Uplands	0.38		1
Ontario	Abitibi Plains	0.35	0.36	10
	Algonquin-Lake Nipissing	0.26	0.15	15
	Frontenac Axis	0.001		1
	Lake Erie Lowland	0.28	0.25	2
	Lake Nipigon	0.18	0.14	4
	Lake Timiskaming Lowlands	0.25		1
	Manitoulin-Lake Simcoe	0.16	0.07	9
	Rainy River	0.10		1
Quebec	Appalachians	0.52	0.30	5
	Southern Laurentians	0.14	0.15	2
	St. Lawrence Lowlands	0.33	0.30	9
New Brunswick	Appalachians	0.23	0.16	4
	Maritime Lowlands	1.24		1
	Northern New Brunswick Uplands	0.16	0.05	2
	Saint John River Valley	0.01		1
	Southern New Brunswick Uplands	0.09	0.06	2
Nova Scotia	Annapolis-Minas Lowlands	0.25		1
	Fundy Coast	0.04	0.05	2
	Southern Nova Scotia Uplands	0.001	0.00	3

n = number of plots

Fluctuations and trends

Breeding Bird Survey

The best available estimate of Canada Warbler trends comes from the BBS, which covers a significant portion of the species range and has reasonable precision for detecting significant change. Long-term BBS data show a significant decline of 4.5%/year between 1968 and 2007 (Figure 3, Table 2). This corresponds to an approximately 85% decline in the population over the last 38 years. In the most recent 10-year period (approximately three generations), 1997-2007, BBS data show a significant decline of 5.4%/year (Table 2), which amounts to a loss of 43% of the population in the last 10 years. Trends for Ontario, Quebec and the Maritimes, which include over 60% of the breeding range and most of the breeding population, all show declines on the long (1968-2007) and short (1997-2007) term (Table 2).

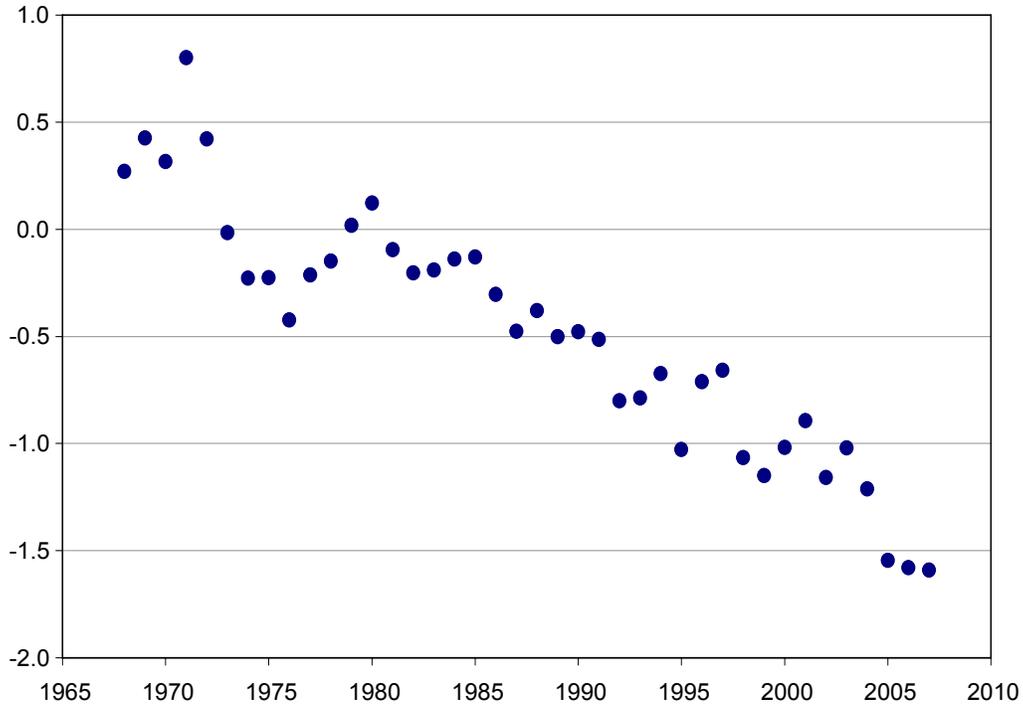


Figure 3. Annual trend indices (log scale) for the Canada Warbler in Canada between 1968 and 2007 according to BBS data (from Downes and Collins in prep.).

Trends can also be examined in relation to Bird Conservation Regions, with analyses based on routes through ecological regions, rather than provinces or territories. With the exception of the Boreal Taiga Plains, which includes less than 20% of the population (P. Blancher pers. comm. 2008), the trends for the Boreal Softwood Shield, Boreal Hardwood Transition and Atlantic Northern Forest regions, all show declines on the long and short term (Table 2).

Table 2. Annual indices of population change for Canada Warbler populations based on Breeding Bird Surveys (from Downes and Collins in prep.).

Region	Period	Index	P	n
Canada	1968-2007	-4.5	*	293
Canada	1997-2007	-5.4	*	186
Ontario	1968-2007	-2.4		90
Ontario	1997-2007	-2.4		54
Quebec	1968-2007	-4.3	*	89
Quebec	1997-2007	-7.8		55
New Brunswick	1966-2007	-5.4	*	36
New Brunswick	1997-2007	-1.4		23
Nova Scotia	1966-2007	-3.1	*	30
Nova Scotia	1997-2007	-20.0	*	19
Boreal Taiga Plains	1968-2007	3.3		36
Boreal Taiga Plains	1997-2007	1.2		26
Boreal Softwood Shield	1968-2007	-5.3	*	28
Boreal Softwood Shield+	1997-2007	—	—	—
Boreal Hardwood Transition	1968-2007	-3.0		101
Boreal Hardwood Transition	1997-2007	-4.1		67
Atlantic Northern Forest	1966-2007	-4.0	*	97
Atlantic Northern Forest	1997-2007	-4.8		62

* $P < 0.05$; blank = not significant; n = number of BBS routes; + no trend information available

Ontario Breeding Bird Atlas

A comparison of the species distribution in Ontario from the first (1981-1985) to the second (2001-2005) atlas period shows an overall non-significant decline of 15% in the number of occupied squares, with declines in all five regions of Ontario between the two atlas periods. Declines in occupied squares ranged from significant declines in the Southern Shield and Carolinian Life Zone of 10% and 36%, respectively, to a non-significant decline of 17% in the Northern Shield, where most of the population occurs (Bird Studies Canada 2006a).

Étude des populations des oiseaux du Québec (ÉPOQ)

The ÉPOQ database shows a significant long-term decline in the abundance of Canada Warblers of 5.0%/year ($P \leq 0.001$; Figure 4) in Quebec between 1980 and 2005.

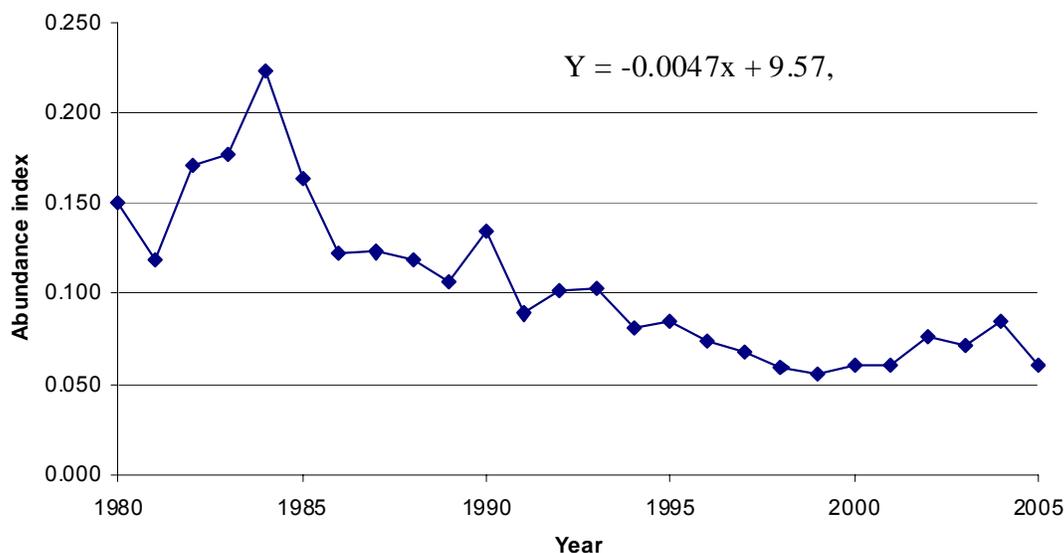


Figure 4. Annual indices of population change for the Canada Warbler in Quebec between 1980 and 2005 according to ÉPOQ data (from Larivée 2006).

Ontario Forest Bird Monitoring Program

The trends calculated from this program show a non-significant decline of 4.6%/year (n = 40 sites) between 1987 and 2005 for all of Ontario.

Canadian Migration Monitoring Network

One station, Long Point Bird Observatory, has long-term trend information on Canada Warblers during the fall migration. Information from this station shows a non-significant decline of 0.2%/year between 1967 and 2005. Four additional stations have trend information for fall migration during the last 10 years (Table 3). All but one show declines in Canada Warbler populations (Table 3).

Table 3. Summary of Canada Warbler population trends from the Canadian Migration Monitoring Network during fall migration (from Bird Studies Canada 2006b)

Region	Period	Annual index	P	Monitoring station
Lake Erie	1967-2005	-0.2	n.s.	Long Point Bird Observatory
Southern Manitoba	1993-2005	-6.08	*	Delta Marsh Bird Observatory
Southern Saskatchewan	1993-2005	2.85	n.s.	Last Mountain Bird Observatory
Lake Superior	1995-2005	-8.1	*	Thunder Cape Bird Observatory
Central Alberta	1994-2005	-3.53	n.s.	Lesser Slave Lake Bird Observatory

* P<0.05; n.s. = not significant.

In summary, data from the Breeding Bird Survey, which provide trend information on Canada Warbler populations across Canada, show significant long- and short-term declines. These declines are particularly obvious in the core of the breeding range in the eastern part of the country. Declines are also evident in a variety of regional surveys such as the Ontario Breeding Bird Atlas and the Étude des populations des oiseaux du Québec, although the magnitude of the decline varies with the survey.

Rescue effect (immigration from an outside source)

In the event of the extirpation of the Canadian population, immigration of individuals from a number of U.S. states bordering Canada is possible. Immigration is likely to be limited, however, because the species is also showing significant declines across its U.S. range (BBS: 1966 – 2006: -1.8%/year, $P = 0.00$, $n = 306$ routes; Sauer *et al.* 2005).

LIMITING FACTORS AND THREATS

The reasons for the decline of the Canada Warbler are not known. Indeed, changes in Canada Warbler habitat on both the wintering and breeding grounds have not been directly linked to changes in the population over time. Habitat loss and degradation on the wintering grounds are thought, however, to be important factors in the decline of the species (Lambert and Faccio 2005). Below, threats to the species on the wintering range and also potential threats to the species on the breeding range in Canada are discussed.

Habitat loss/degradation

Wintering range

The Canada Warbler winters in areas where pressure from human development is high and deforestation intensive (Terborgh 1989; Robinson 1997; Conway 1999). The forests of the northern Andes (primarily in Colombia), the main wintering grounds of the Canada Warbler, are among the most threatened in the world (Davis *et al.* 1997). Indeed, in Colombia alone, 1.5 to 2.2 million acres/year of forest was cleared during the early 1990s (World Press Review 1993). Approximately 90% of all primary forest in the northern Andes, including 95% of the cloud rainforest has now been cleared (Henderson *et al.* 1991) for agriculture, fuel wood, cultivation of illegal drugs and non-selective herbicide spraying to eliminate these drug crops (Davis *et al.* 1997). Habitat loss is also associated with pipeline developments and road construction in the northern Andes (Davis *et al.* 1997; See Habitat Trends).

Breeding range

Although Canada Warblers exhibit a degree of adaptability to human disturbance, they are negatively impacted by changes in habitat that decrease the forest understory and also the forest canopy (Conway 1999).

Draining of swamp forests for agriculture and urban development, largely between 1950 and 1980, in the northeastern part of the species' range (Tiner 1984; Miller 1999) is thought to have contributed to the decline of Canada Warbler populations in eastern North America (Conway 1999). Continued maturation of forest in previously cleared farmlands may also have contributed to habitat loss in the northeastern portions of the range (Conway 1999).

Habitat has also been lost in other parts of the breeding range. Boreal mixedwood forest has been cleared for agriculture in western Canada (Senate Subcommittee on the Boreal Forest 1999; Hobson *et al.* 2002). Forest also been cleared for industrial development (i.e., road and pipeline construction, drilling sites, etc.) in the oil and gas sector in northwestern Canada (Cooper *et al.* 1997; Senate Subcommittee on the Boreal Forest 1999; Hobson *et al.* 2002; South Peace Bird Atlas Society 2006; See Habitat Trends).

Forest harvesting and the various silvicultural practices that adversely affect the development of the shrub layer in managed forests may also decrease habitat for the species (Askins and Philbrick 1987; Cooper *et al.* 1997; Norton and Hannon 1997; Schieck *et al.* 2000; Tittler *et al.* 2001). The impact of these factors is likely to vary, however, as birds will breed in 10- to 20-year old regenerating clearcuts.

Grazing by forest ungulates, such as the White-tailed Deer, that reduces the shrub layer may reduce the quality of Canada Warbler habitat in localized regions (Conway 1999). A study in Massachusetts found that Canada Warbler abundance dropped as deer abundance increased (DeGraaf *et al.* 1991). Similarly, a study on the Kentucky Warbler, which has a similar ecology to the Canada Warbler, found that warblers shifted from sites with excessively high deer densities to areas with lower deer densities (McShea *et al.* 1995). Deer populations are increasing throughout their range (Russell *et al.* 2001), which increases the likelihood that Canada Warbler habitat will be affected by grazing.

Habitat fragmentation

Information on the effects of habitat fragmentation on the Canada Warbler are mixed. Some studies suggest that the species is sensitive to fragmentation (Askins and Philbrick 1987; Robbins *et al.* 1989; Litwin and Smith 1992; Hobson and Bayne 2000c). On the other hand, other studies suggest that the species is tolerant to habitat fragmentation that results from forest harvesting (Schmiegelow *et al.* 1997; Schmiegelow and Monkkonen 2002), possibly because of the high rate of forest regeneration around fragments.

Road development

The occurrence of Canada Warblers during the breeding seasons is negatively affected by the proximity and length of paved roads in forested landscapes (Miller 1999; R. Zimmerling unpubl. data). Road development may be a particular threat to Canada

Warblers breeding in the boreal mixedwood forests of northern Alberta, where a significant increase in road development associated with industrial development is expected until 2030 (Schneider *et al.* 2003).

Decline in insect outbreak cycles

Although not generally recognized as a spruce budworm specialist (Conway 1999), Canada Warbler densities have been observed to increase during outbreaks (Crawford and Jennings 1989). A recent theoretical study also suggests that the decline in Canada Warbler populations over the last 30-40 years may be a response to a decline in spruce budworm outbreaks during the same period (D. Sleep unpubl. data).

SPECIAL SIGNIFICANCE OF THE SPECIES

Eighty percent of the global breeding population of Canada Warbler occurs in Canada, so it is a high-responsibility species for Canada.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

The North American Bird Conservation Initiative has designated the species as a Highest Priority Landbird in Bird Conservation Region 14 (Atlantic Northern Forest) (Dettmers 2003). Partners in Flight lists the Canada Warbler as a species of continental importance in Canada and the United States and a species of high conservation concern in the Northern Forest region (Rich *et al.* 2004). NatureServe (2007) ranks the Canada Warbler as globally secure (G5, Table 4) and the IUCN ranks it as Least Concern (BirdLife International 2004).

In Canada, Canada Warbler adults and their nests and eggs are protected under the *Migratory Birds Convention Act, 1994* (Environment Canada 2004), and under the 1982 British Columbia *Wildlife Act* (Cooper *et al.* 1997). The General Status of Species in Canada considers the species overall as Secure in Canada, with ranks ranging from May Be at Risk in the Yukon to Secure in most other provinces (CESCC 2006; Table 4). NatureServe ranks the species overall in Canada as Secure, with ranks ranging from Critically Imperiled in the Yukon to Secure in Saskatchewan, Ontario, and Nova Scotia when reviewed in 2000 (NatureServe 2007; Table 4). In Alberta, the species has a status rank of "Sensitive" due primarily to its sensitivity to the loss or deterioration of its habitat by various types of land use (Alberta Government 2007). It is also one of 10 species of high conservation concern for forest managers in commercial forest in the Alberta boreal mixedwood (Hannon *et al.* 2004). In British Columbia, the species is considered Vulnerable (blue-listed) because of uncertainty about the effects of forest harvesting on the quality of its habitat (Cooper *et al.* 1997). In the Northwest Territories, the species' status is undetermined (Working Group on General Status of NWT Species 2006).

In the United States, the species is considered Secure (N5B, Table 4). However, it is considered Critically Imperiled (S1) or Imperiled (S2) in three Midwestern U.S. states (Illinois, Indiana and Ohio). The Northeast Endangered Species and Wildlife Diversity Technical Committee also consider the species to be a high conservation and research priority (Therres 1999). In the tropical hardwood forests of the Andes, Finch and Stangel (1993) rank the Canada Warbler as a vulnerable species due to intensive deforestation in this region.

Table 4. Ranks assigned to the Canada Warbler in North America, based on NatureServe (2007) and General Status Ranks (CESCC 2006).

Region	Nature Serve *	General Status
Global	G5	---
United States	N5B	---
Canada	N5B	Secure
British Columbia	S3S4B	Sensitive
Alberta	S4	Sensitive
New Brunswick	S4B	Secure
New Scotia	S5B	Secure
Prince Edward Island	S4B	Sensitive
Yukon Territory	S1B	May Be at Risk
Saskatchewan	S5B	Secure
Manitoba	S4B	Secure
Ontario	S5B	Secure
Quebec	S5	Secure
Northwest Territories		Undetermined

*S1 indicates that a species is critically imperiled because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines, making it especially vulnerable to extirpation; S2 indicates that a species is imperiled because of rarity or other factors making it very vulnerable to extirpation, usually with 6 to 20 occurrences or few individuals remaining (i.e., 1,000 to 3,000); S3 indicates that a species is vulnerable in the nation or state/province because it is rare or uncommon, or found only in a restricted range, or because of other factors making it vulnerable to extirpation; S4 indicates a species is uncommon but not rare; some are cause for long-term concern due to population declines or other factors; S5 indicates that a species is secure because it is common, widespread, and abundant in the nation or state/province. B indicates breeding population.

TECHNICAL SUMMARY

Wilsonia canadensis

Canada Warbler

Paruline du Canada

Range of occurrence in Canada: Yukon, Northwest Territories, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island

Extent and Area Information

• <i>Extent of occurrence (EO) (km²)</i>	2,200,000 km ²
• <i>Specify trend in EO</i>	Unknown
• <i>Are there extreme fluctuations in EO?</i>	Unknown
• <i>Area of occupancy (AO) (km²)</i> home range of 2 ha (Chase 2005) * 1.35 million breeding pairs (see Abundance section for estimate of population size)	27,000 km ²
• <i>Specify trend in AO</i>	Unknown
• <i>Are there extreme fluctuations in AO?</i>	Unknown
• <i>Number of current locations</i>	Unknown
• <i>Specify trend in #</i>	Unknown
• <i>Are there extreme fluctuations in number of locations?</i>	Unknown
• <i>Specify trend in area, extent or quality of habitat</i>	Declining

Population Information

• <i>Generation time (average age of parents in the population)</i>	2–3 years
• <i>Number of mature individuals</i> (see Abundance section for estimate of population size)	approximately 2.7 million
• <i>Total population trend:</i>	declining
• <i>% decline over the last/next 10 years or 3 generations</i> • <i>based on BBS trends between 1997 and 2007</i>	43%
• <i>Are there extreme fluctuations in number of mature individuals?</i>	Unknown
• <i>Is the total population severely fragmented?</i>	Unknown
• <i>Specify trend in number of populations</i>	Unknown
• <i>Are there extreme fluctuations in number of populations?</i>	Unknown
• <i>List populations with number of mature individuals in each:</i>	Unknown

Threats (actual or imminent threats to populations or habitats)

<ul style="list-style-type: none"> • Habitat loss in wintering grounds due to clearing of primary mountain forest • Habitat loss/degradation in breeding grounds due to clearing for agriculture, urban development and road development

Rescue Effect (immigration from an outside source)

• <i>Status of outside population(s)?</i> USA: significant decline of 1.8%/year (1966–2006) Imperiled in the following states: Illinois, Indiana, Ohio	
• <i>Is immigration known or possible?</i>	yes
• <i>Would immigrants be adapted to survive in Canada?</i>	yes
• <i>Is there sufficient habitat for immigrants in Canada?</i>	yes
• <i>Is rescue from outside populations likely?</i>	Limited given declines in U.S.

Quantitative Analysis

None

Current Status

COSEWIC: Threatened (April 2008)

Status and Reasons for Designation**Status:**

Threatened

Alpha-numeric code:

A2b

Reasons for Designation:

Most (80%) of the breeding range of this species occurs in Canada. While regional trends may vary, overall the species has experienced a significant long-term decline. This decline is particularly evident in the case of the species' Canadian range and there is no indication that this trend will be reversed. The reasons for the decline are unclear, but loss of primary forest on the wintering grounds in South America is a potential cause.

Applicability of Criteria

Criterion A: (Declining Total Population): Meets criterion A2b, with a reduction in population size of > 30% in the last three generations, based on an appropriate index of abundance.

Criterion B: (Small Distribution, and Decline or Fluctuation): Not applicable - Extent of Occurrence > 20,000 km² and Area of Occupancy > 2,000 km².

Criterion C: (Small Total Population Size and Decline): Not applicable - total population size > than 10,000.

Criterion D: (Very Small Population or Restricted Distribution): Not applicable - population size > than 1,000 and Area of Occupancy > than 20 km².

Criterion E: (Quantitative Analysis): Not applicable.

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AUTHORITIES CONSULTED

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