

COSEWIC
Assessment and Update Status Report

on the

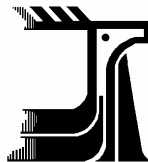
Red-shouldered Hawk
Buteo lineatus

in Canada



NOT AT RISK
2006

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA



COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

COSEWIC 2006. COSEWIC assessment and update status report on the Red-shouldered Hawk *Buteo lineatus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 27 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Previous reports:

Kirk, David A. 1996. Update COSEWIC status report on the Red-Shouldered Hawk *Buteo lineatus* in Canada. Committee on the Status of Endangered Wildlife in Canada. 1-11 pp.

Risley, Christopher J. 1983. COSEWIC status report on the Red-Shouldered Hawk *Buteo lineatus* in Canada. Committee on the Status of Endangered Wildlife in Canada. 1-71 pp.

Production note:

COSEWIC would like to acknowledge Debra S. Badzinski for writing the status report on the Red-shouldered Hawk *Buteo lineatus* in Canada, prepared under contract with Environment Canada, overseen and edited by Marty Leonard, Co-chair, COSEWIC Birds Species Specialist Subcommittee.

For additional copies contact:

COSEWIC Secretariat
c/o Canadian Wildlife Service
Environment Canada
Ottawa, ON
K1A 0H3

Tel.: (819) 997-4991 / (819) 953-3215

Fax: (819) 994-3684

E-mail: COSEWIC/COSEPAC@ec.gc.ca

<http://www.cosewic.gc.ca>

Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur la Buse à epaulettes (*Buteo lineatus*) au Canada – Mise à jour.

Cover illustration:

Red-shouldered Hawk — used with permission from Mark Peck.

©Her Majesty the Queen in Right of Canada 2006
Catalogue No. CW69-14/8-2006E-PDF
ISBN 0-662-43296-7



Recycled paper



COSEWIC Assessment Summary

Assessment Summary – April 2006

Common name

Red-shouldered Hawk

Scientific name

Buteo lineatus

Status

Not at risk

Reason for designation

In Canada, this forest-nesting species has been stable or increasing, depending on the region, over the last 10 to 20 years. The main threat to the species is habitat loss and degradation, which is likely to be most serious in the southern parts of its Canadian range. Populations are stable or increasing in most parts of the United States, so there is also a potential outside source for rescue.

Occurrence

Ontario, Quebec, New Brunswick

Status history

Designated Special Concern in April 1983. Status re-examined and confirmed in April 1996. Status re-examined and designated Not at Risk in April 2006. Last assessment based on an update status report.



COSEWIC
Executive Summary

Red-shouldered Hawk
Buteo lineatus

Species information

The Red-shouldered Hawk, *Buteo lineatus*, is a medium-sized hawk that can be distinguished by its reddish-brown shoulder patches, notched outer four primaries and less than half-feathered tarsus. Its upper parts are mainly brown, its tail blackish above and whitish below with several wide dark bars with intervening narrow white bars and a white tip. Its underparts are white with reddish-brown barring. The most common vocalization is the “kee-aah” call that is given early in the breeding season.

Distribution

The eastern and central North American breeding population ranges west through southern Canada to the eastern edge of the United States Great Plains, south to Florida, the Gulf states and eastern Mexico. In Canada, the Red-shouldered Hawk occurs in southern Ontario, Quebec and New Brunswick, with the majority of the population in Ontario. The wintering range of the Red-shouldered Hawk includes southern Wisconsin, Oklahoma, southern Ohio and southern New England south to the Gulf Coast, but they are occasionally found wintering within their Canadian breeding range. Approximately 1% of the North American Red-shouldered Hawk population breeds in Canada.

Habitat

The Red-shouldered Hawk breeds in a variety of forest types, including bottomland hardwood, riparian areas, flooded deciduous swamps and upland mixed deciduous-coniferous forest. Nearby wetlands or other aquatic areas are essential. This species is area sensitive, preferring extensive forest stands consisting of mature to old-growth canopy trees with variable amounts of understory. Large, contiguous forest tracts are essential to sustain breeding populations of this species.

Biology

The Red-shouldered Hawk feeds on a wide variety of prey, but small mammals, amphibians and snakes comprise the bulk of their diet in most areas. Nests are usually located below the canopy and more than halfway up the tree in a crotch of the main

trunk. The Red-shouldered Hawk is monogamous and lays 3-4 eggs per year. On average, pairs fledge 1.3 chicks/nest and 55.2% of nests fledge at least one chick. Adult Red-shouldered Hawks occupy the same territory for life and young tend to settle close to their natal territory.

Population sizes and trends

The current population estimate for the Red-shouldered Hawk in Canada is 6,270 breeding pairs or 12,540 individuals. Data from a variety of surveys suggest that the population has been stable to increasing over the last 10 to 20 years.

Limiting factors and threats

The most serious threats facing the Red-shouldered Hawk include loss and fragmentation or degradation of favoured deciduous forest breeding areas and wetland feeding areas. Loss and fragmentation of habitat also have indirect effects, including reduction in prey supply and increased interspecific competition.

Special significance of the species

The Red-shouldered Hawk is considered an indicator species of sustainable forest management because it is an area sensitive species that requires mature forest habitat. The Red-shouldered Hawk is also a top predator and thus may be potentially valuable as an indicator of environmental health.

Existing protection

This species, but not its habitat, is protected by provincial game and fish legislation. The Red-shouldered Hawk is classified as Special Concern in Canada by COSEWIC, Special Concern in Ontario and May Be At Risk in New Brunswick, although the latter is not a legal designation. In Ontario, nests on Crown land north of the Canadian Shield are protected through the application of spatial and temporal buffers.



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 5th 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 (2006)

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 it 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.



Environment
Canada

Environnement
Canada

Canadian Wildlife
Service

Service canadien
de la faune

Canada

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

**Update
COSEWIC Status Report**

on the

Red-shouldered Hawk
Buteo lineatus

in Canada

2006

TABLE OF CONTENTS

SPECIES INFORMATION.....	4
Name and classification.....	4
Morphological description.....	4
Genetic description.....	4
DISTRIBUTION.....	5
Global range.....	5
Canadian range.....	5
HABITAT.....	8
Habitat requirements.....	8
Habitat trends.....	9
Habitat protection/ownership.....	10
BIOLOGY.....	10
Life cycle and reproduction.....	10
Predation.....	11
Diet.....	11
Dispersal/migration.....	11
Interspecific interactions.....	12
Adaptability.....	12
POPULATION SIZES AND TRENDS.....	12
Search effort.....	12
Abundance.....	14
Fluctuations and trends.....	15
Rescue effect.....	18
LIMITING FACTORS AND THREATS.....	18
Habitat loss and alteration.....	18
Competitive interactions.....	19
Disturbance.....	19
Contaminants.....	19
SPECIAL SIGNIFICANCE OF THE SPECIES.....	20
EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS.....	20
TECHNICAL SUMMARY.....	21
ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED.....	23
INFORMATION SOURCES.....	24
BIOGRAPHICAL SUMMARY OF REPORT WRITER.....	27

List of figures

Figure 1. Distribution of the Red-shouldered Hawk, <i>lineatus</i> subspecies, in North America. Breeding range, wintering range and year-round range are shown.....	6
Figure 2. Distribution of the Red-shouldered Hawk in Ontario according to the first (1981-1985) Ontario Breeding Bird Atlas and the first four years of the second (2001-2004) Ontario Breeding Bird Atlas.....	7
Figure 3. Distribution of the Red-shouldered Hawk in Quebec, based on data from the Quebec Breeding Bird Atlas (1984-1989).....	8

Figure 4. Estimated annual indices for Red-shouldered Hawks using data from the Ontario Red-shouldered Hawk and Spring Woodpecker Survey (1991-2004).	15
Figure 5. Numbers of migrating Red-shouldered Hawks/hour observed at the Niagara Peninsula Hawkwatch during spring 1980-2003.....	16
Figure 6. Numbers of migrating Red-shouldered Hawks/hour observed at Ste. Anne-de-Bellevue (spring) and St. Stanislas-de-Kostka (fall) 1980-2004.....	17
Figure 7. Trends in numbers of Red-shouldered Hawks reported to the Étude des Populations d'Oiseaux du Québec (ÉPOQ) Checklist Program.	18

List of tables

Table 1. Red-shouldered Hawk breeding evidence collected during the first Ontario Breeding Bird Atlas (1980-1985) and the first four years of the second Ontario Breeding Bird Atlas (2001-2004).....	16
---	----

SPECIES INFORMATION

Name and classification

Class:	Aves
Order:	Falconiformes
Family:	Accipitridae
Genus:	<i>Buteo</i>
Species:	<i>lineatus</i>
Subspecies:	<i>lineatus</i>
Common names:	
English:	Red-shouldered Hawk, Chicken Hawk, Elegant Hawk, Hen Hawk, Red-bellied Hawk and Winter Hawk
French:	Buse à épaulettes

The Accipitridae family is comprised of 233 species worldwide (Dickinson 2003). The genus *Buteo* is the largest in the family, and contains 26 species. There are five recognized subspecies of *Buteo lineatus*: *lineatus*, *alleni*, *extimus*, *texanus*, and *elegans* (Crocoll 1994) that are separated based on geography and physical characteristics. The *lineatus* subspecies is found in the eastern half of North America from central Ontario (46th parallel) south to the east coast of Mexico (Crocoll 1994). *Lineatus*, the only subspecies confirmed in Canada, is the subject of this report.

Morphological description

The Red-shouldered Hawk is a medium-sized hawk that can be distinguished by its reddish-brown shoulder patches, notched outer four primaries and less than half-feathered tarsus. Its upper parts are mainly brown, its tail blackish above and whitish below with several wide dark bars with intervening narrow white bars and a white tip. Its underparts are white with reddish-brown barring. Females are larger than males but have similar colouring. Immatures are more uniformly brown with streaking on the underparts and numerous whitish crossbars on the brownish tail. The immature plumage is retained for 18 months before it moults into adult plumage (Bent 1937). In the field, the Red-shouldered Hawk is most often confused with the Red-tailed Hawk (*Buteo jamaicensis*) and the Broad-winged Hawk (*B. platypterus*). The Red-shouldered Hawk can be distinguished from other hawks by shape (longer tail and rounded wing-tips), flight action (fast flapping) and a crescent-shaped translucent panel in the outer primaries (Crocoll 1994). The most common vocalization is the “kee-aah” call that is given early in the breeding season.

Genetic description

There is no information available.

DISTRIBUTION

Global range

The eastern and central North American breeding population ranges west through southern Canada from southern New Brunswick, southern Quebec and southern Ontario to the eastern edge of the United States Great Plains, south to Florida, the Gulf states and eastern Mexico (Crocoll 1994; Figure 1). In western North America, a disjunct population breeds west of the Sierra Nevada from northern California to northern Baja, California. Breeding records are known from suitable habitat throughout this range. The wintering range of the Red-shouldered Hawk includes southern Wisconsin, Oklahoma, southern Ohio and southern New England south to the Gulf Coast (Figure 1). In winter, Red-shouldered Hawks are most common in southern Texas, Florida and the Mississippi Valley (National Audubon Society 2002). The *lineatus* subspecies breeds from eastern Oklahoma, central Arkansas, Tennessee and northern South Carolina, north to New Brunswick, southern Quebec, south-central Ontario, northern Michigan, northern Wisconsin and central Minnesota. This subspecies is typically a short-distance migrant and is occasionally found wintering within its Canadian breeding range.

The present distribution of the Red-shouldered Hawk is similar to its historic distribution in North America. In some northern regions, however, it has become locally extirpated, or has extended its range northward. In the last few decades, it has declined in southern Michigan, but extended its range to the northern part of the state (Michigan Department of Natural Resources 1980; Postupalsky 1980). A similar range expansion has occurred in Minnesota (Minnesota Department of Natural Resources 1975), and in Ontario (Ontario Breeding Bird Atlas, Red-shouldered Hawk and Spring Woodpecker Survey unpublished data).

Canadian range

In Canada, the Red-shouldered Hawk occurs in Ontario, Quebec and New Brunswick, with the majority of the population in Ontario (Figure 1). In Ontario, most breeding records for Red-shouldered Hawks are from the Great Lakes Forest Region, and a few additional breeding sites have been identified in the Carolinian and Southern Boreal forests (2nd Ontario Breeding Bird Atlas unpublished data; Figure 2). Ontario Breeding Bird Atlas data show that the distribution of the Red-shouldered Hawk in Ontario has changed very little over the past 20 years (Figure 2). However, there appears to be a small increase in the number of locations in the northern extent of the species' range.

In Quebec, the species' breeding range is restricted to maple grove forests. It is sparsely distributed within appropriate habitat in the following regions: Montérégie, Montréal, south of the Laurentians in the Outaouais region, Bois-Francs and in the western part of the Eastern Townships (Morneau and Dionne 1997; Figure 3). The Red-shouldered Hawk is uncommon in New Brunswick, and found in scattered locations throughout the western and southern parts of the province. The Red-shouldered Hawk is reported from British Columbia, but records have not been verified (Campbell *et al.* 1990).

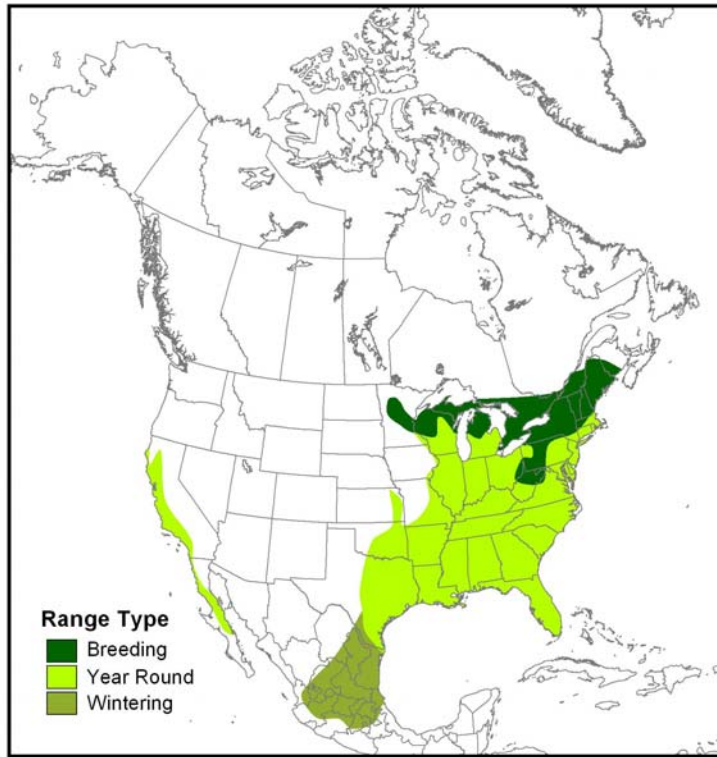


Figure 1. Distribution of the Red-shouldered Hawk, *lineatus* subspecies, in North America. Breeding range, wintering range and year-round range are shown. Data provided by NatureServe in collaboration with Robert Ridgely, James Zook, The Nature Conservancy - Migratory Bird Program, Conservation International - CABS, World Wildlife Fund - US and Environment Canada – WILDSPACE.

One percent of the Red-Shouldered Hawk's breeding population is in Canada based on BBS data from 1984-2003 (P. Blancher pers. comm.). Based on the range map (Figure 1), the extent of occurrence (EO) for the Red-shouldered Hawk in Canada is 200,000 km². Within this range, approximately 40% of the area is forested, which suggests that the maximum area of occupancy (AO) is 80,000 km². This estimate of AO should be considered a maximum because not all forested area provides suitable breeding habitat (see Habitat requirements).

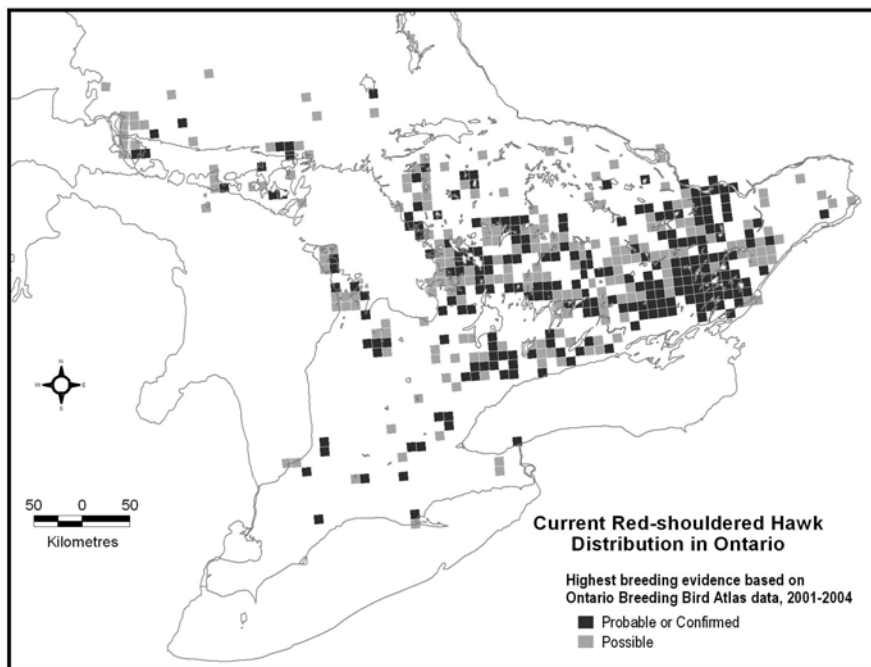
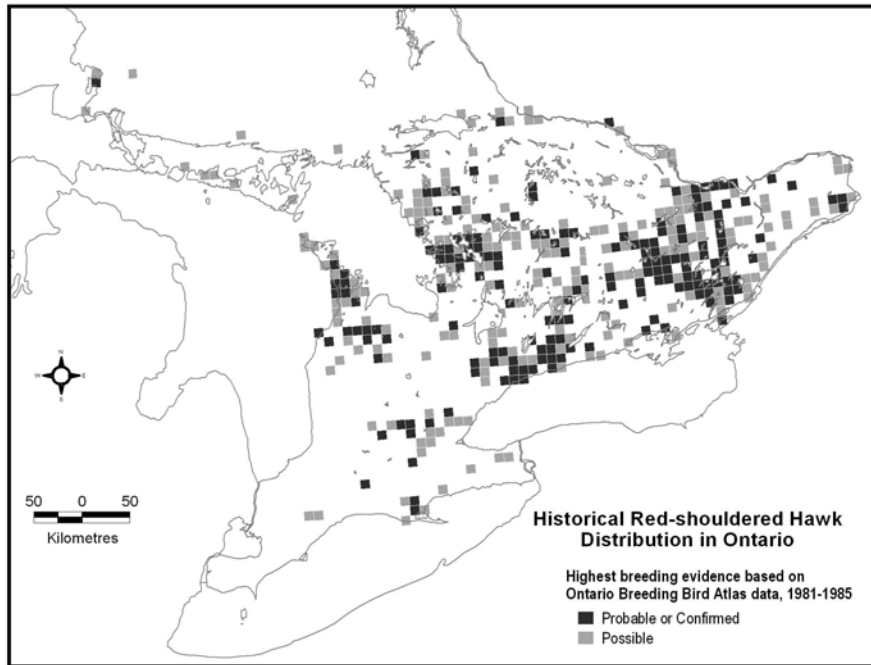


Figure 2. Distribution of the Red-shouldered Hawk in Ontario according to the first (1981-1985) Ontario Breeding Bird Atlas and the first four years of the second (2001-2004) Ontario Breeding Bird Atlas. Data from the second atlas should be considered preliminary.

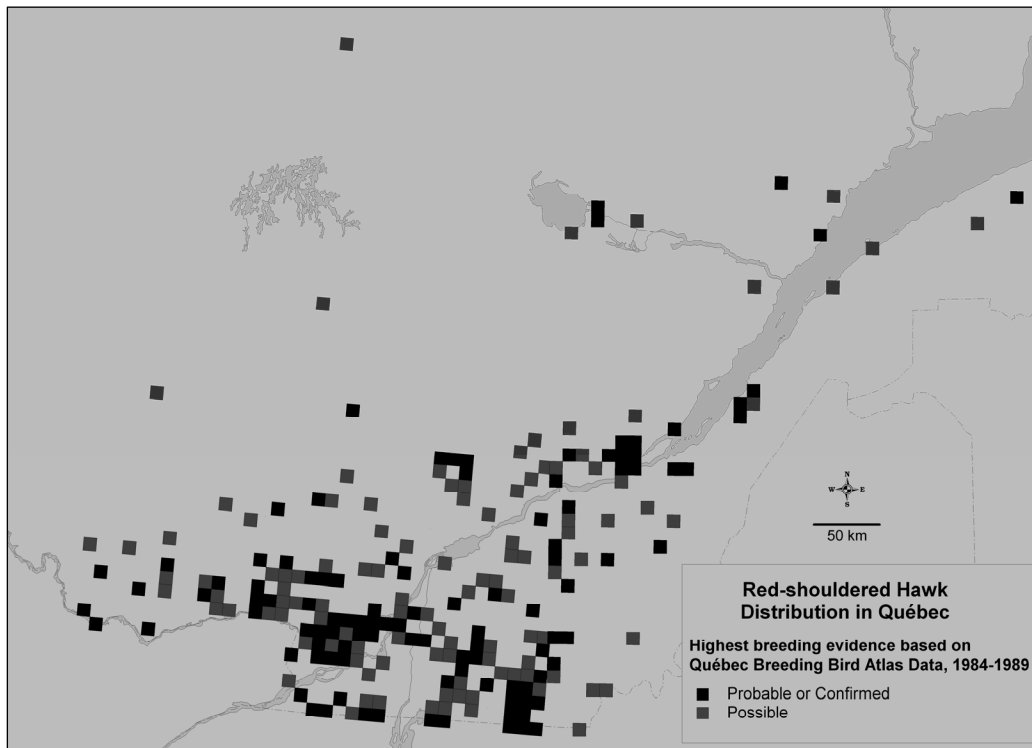


Figure 3. Distribution of the Red-shouldered Hawk in Quebec, based on data from the Quebec Breeding Bird Atlas (1984-1989).

HABITAT

Habitat requirements

The Red-shouldered Hawk breeds in a variety of forest types, including bottomland hardwood, riparian areas, flooded deciduous swamps and upland mixed deciduous-coniferous forest. Nearby wetlands or other aquatic areas are essential. Red-shouldered Hawks do not readily use upland forests except in areas immediately adjacent to bottomland or riparian habitat (Bednarz and Dinsmore 1981; Howell and Chapman 1997) or ponds and wetlands (Szuba and Norman 1989). This species is area sensitive, and prefers extensive forest stands consisting of mature to old-growth canopy trees with variable amounts of understory (Crocoll 1994). Canopy closure appears to be a critical nest site characteristic (Jacobs and Jacobs 2002). Forest stands with the appropriate species composition, age and density are typically at least 10 ha within a mature forest that is at least 100 ha (Naylor and Szuba 1992). Although this species has been found in woodlots as small as four ha in Ontario (Campbell 1975), it is typically found in forests that are considerably larger (Bryant 1986; Naylor and Szuba 1992). Some pairs may persist at sites that have become unsuitable for a number of years because of high levels of mate and site fidelity (Bryant 1986).

Red-shouldered Hawk nests in Ontario are typically found in stands with a high percentage of sugar maple (*Acer saccharum*), yellow birch (*Betula lutea*), or other hardwoods such as American beech (*Fagus grandifolia*), red maple (*A. rubrum*), and red oak (*Quercus rubra*). Older (at least 60 years old) stands are preferred and canopy closure must be greater than 70%. Optimal nesting habitat also has a total basal area of at least 20 m²/ha and at least 5 m² of this contains trees greater than 40 cm dbh (Naylor and Szuba 1992). Because of the dependence of Red-shouldered Hawks on wetlands for foraging, most nests are located within 250 m of a water body.

Large, contiguous forest tracts are necessary to sustain breeding populations of Red-shouldered Hawks. A study in Quebec found that the average home range size was 91.2 ha according to the harmonic mean and 122.9 according to the convex polygon mean (Nature-Action Quebec 1999).

Habitat trends

The total amount and distribution of preferred habitat of the Red-shouldered Hawk in North America has declined drastically in the last 200 years. Originally, the hardwood forests that covered most of eastern North America, including southern Ontario, were composed of the wet beech-oak-hemlock and maple floodplain forest favoured by the Red-shouldered Hawk. As a result of the colonization of North America, the forests were gradually cut or cleared, and the quantity of forested habitat decreased. The overall quality of habitat also deteriorated as areas were drained or selectively logged. On average, townships in southern Ontario (south of the Canadian Shield) contained only 24% forest cover by the 1950s, and many townships in southwestern Ontario contained only 8% cover (Ontario Department of Lands and Forests 1957). Despite this extensive change, the Red-shouldered Hawk was still found nesting, even in areas with only 11% and 16% cover (Ontario Department of Lands and Forests 1957; Caster and Perks 1961). It is not known, however, whether these breeding attempts were successful.

During the 1950s, the loss of forest habitat began to slow because of forest regeneration on abandoned farmland. Presently, there seems to be sufficient habitat available in eastern and central Ontario to maintain the species. However, many of the counties south of the Canadian Shield have less than 25% forest cover, and most have far less than that. Historically, loss of forest to farmland in southwestern Ontario has had a large negative impact on the Red-shouldered Hawk and loss and fragmentation of habitat in this region are ongoing concerns. Open canopy and fragmentation of contiguous forest has created habitat that is more suitable to the larger and more aggressive Great Horned Owl (*Bubo virginianus*) and Red-tailed Hawk (the Red-shouldered Hawk's closest competitor; Bednarz and Dinsmore 1981).

In other regions, cottage development may reduce breeding habitat for Red-shouldered Hawks (Armstrong and Euler 1983), although there have been observations of birds nesting within sight of cottages in some areas (Brian Naylor pers. comm.). Few Red-shouldered Hawks now breed southwest of Toronto (2nd Ontario Breeding Bird

Atlas unpublished data). In Quebec, there appears to be sufficient habitat available; however, forest fragmentation is a concern throughout the Quebec range as forests continue to be lost to logging, conversion for agriculture and urban sprawl. There is insufficient quantitative information on the impacts of habitat loss on populations (Crocoll 1994).

Habitat protection/ownership

The Red-shouldered Hawk occurs on both private and public land; however, there is little available information on the distribution of the species according to ownership. In New Brunswick, it appears that the Red-shouldered Hawk is found on private land more often than on public land (Hart 2004), and the same appears to be true for Quebec (F. Shaffer pers. comm.). There are 29 Aboriginal Lands in Ontario and Quebec within the Red-shouldered Hawk's breeding range, but it is not known which are occupied by the species. The Red-shouldered Hawk is known to occur in several National Parks or National Historic Sites throughout its range, including: Bruce Peninsula National Park (ON), Cap Tourmente National Wildlife Area, Gatineau Park (QC), Georgian Bay Islands National Park (ON), La Mauricie National Park (QC), Lac Saint-François National Wildlife Area (QC), National Defence shooting range in Saint-Bruno (QC), Rideau Canal (ON), St. Lawrence Islands National Park (ON), Trent Severn Waterway (ON). In Ontario, breeding has been confirmed in the following provincial parks: Algonquin, Bon Echo, Charleston Lake, Inverhuron, Peter's Woods, Frontenac, Kawartha Highlands Signature Site, Murphy's Point, MacGregor Point, Silent Lake, Fitzroy, Smokey Head-White Bluff and Killbear. Also in Ontario, nests on Crown land receive protection during the Forest Management Planning Process using spatial and temporal buffers. In Quebec, Red-shouldered Hawks occur in the following provincial parks: les parcs de Frontenac, du Mont-Orford, du Mont Saint-Bruno, d'Oka, de Yamaska, de Mont-Tremblant.

BIOLOGY

The information on Red-shouldered Hawk biology was obtained from The Birds of North America account No. 107 (Crocoll 1994) unless otherwise referenced.

Life cycle and reproduction

Red-shouldered Hawks are monogamous, and migrants arrive on territory between February and April, depending on the latitude. Courtship, territory establishment and nest building begin shortly after the pairs return. Nest building (or refurbishing) begins before the end of courtship and takes four to five weeks. Both sexes take part in nest building and refurbishing, using dead and live sticks, shreds of bark, mosses, lichens and fresh sprigs of conifer. Nests are usually located below the canopy, more than halfway up the tree in a crotch of the main trunk. Pairs will often reuse the same nest for several years.

Clutch size averages three to four eggs, and pairs have one clutch/year. Nest success and number of fledglings produced varies widely (published estimates: 1.1-2.6 fledglings/nest, with an average of 1.3). Fifty-five percent of nests fledge at least one chick (Szuba and Norman 1990). Potential factors influencing nest productivity include food availability, timing of nesting and possibly parental age. Based on a small number of banding studies, first-year mortality was 0.587 and later years was 0.297. The longevity record for Red-shouldered Hawks is 19 years, 11 months, but average survival of birds banded between 1955 and 1979 was 25.6 months. Most individuals do not breed until they are greater than one year old, but there are records of yearlings breeding with adults.

Predation

Potential predators of eggs, young and/or nesting adults include Great Horned Owls, Red-tailed Hawks, Peregrine Falcons (*Falco peregrinus*), raccoons (*Procyon lotor*), martens (*Martes americana*), and fishers (*M. pennanti*).

Diet

The Red-shouldered Hawk feeds on a wide variety of prey, but small mammals (chipmunks, mice, voles), frogs and snakes comprise the bulk of their diet in most areas. This species hunts diurnally from perches in forest with open understory or along forest edges, especially forest/wetland edges.

Dispersal/migration

Adult Red-shouldered Hawks apparently occupy the same nesting territory for life. There is little information available on natal philopatry, but four nestlings banded in Wisconsin were later retrapped as breeding adults less than 24 km from their natal territory.

Red-shouldered Hawks breeding in Canada migrate south for the winter. Christmas Bird Count data show some winter records along Lake Erie in southwestern Ontario, but these may be birds that have migrated from more northerly locations. This species also winters irregularly in southern Quebec. Immatures move south from September through December while adults move from October into December. Fall migration peaks in October at banding sites in southern Ontario. Spring migration in Ontario peaks in March (Niagara Peninsula HawkWatch unpublished data). Dates for spring and fall migration in Quebec are reported in David (1996).

Red-shouldered Hawks migrate along inland ridges and along the coast. Migrants usually fly alone, but may form small flocks of three or more individuals. This species will cross small water bodies (<25 km) but will avoid larger water barriers. During migration, it is associated with woodlands, but is often seen in smaller woodlands or more fragmented landscapes than it frequents during the breeding season. In winter, Red-shouldered Hawks are found in areas near water, such as swamps, marshes and

river valleys. Individuals tend to frequent open habitat more often during winter than in the breeding season.

Interspecific interactions

Aggressive territorial interactions are known to occur between Red-tailed Hawks, Great Horned Owls and Red-shouldered Hawks. When nesting, Red-tailed and Red-shouldered Hawks have non-overlapping territories (Craighead and Craighead 1956). Red-tailed Hawks and Great Horned Owls will usurp the previous year's nesting locations of Red-shouldered Hawks (Bent 1937; Hanna 1973; Campbell 1975).

Adaptability

The species is characterized by its shy, secretive nature and in the breeding season is generally seen only in forest interior habitats. They will, however, breed in suburban areas in some regions (Dykstra *et al.* 2001). The *lineatus* subspecies appears to avoid areas of human use (Helferty *et al.* 2002). Raptors, in general, are very susceptible to human disturbance, particularly early in the breeding season (James 1984) and forests with low canopy closure (which likely occur in areas near human habitation) are associated with Red-shouldered Hawk nesting failure in Ontario (Szuba *et al.* 1991).

POPULATION SIZES AND TRENDS

Search effort

Data on Red-shouldered Hawk abundance and population trends are collected through several different programs in Canada. A brief description of methodology, potential biases and utility of the program in monitoring changes in Red-shouldered Hawk populations are discussed below.

Breeding Bird Survey

The Breeding Bird Survey is a roadside survey, conducted annually in mid-June in road-accessible locations throughout North America. Although the BBS takes place throughout the Red-shouldered Hawk's range, it has limited value for monitoring Red-shouldered Hawks because it takes place well after the main period for this species' conspicuous calling and display flights. For this reason, the species is generally reported in low numbers. The relative abundance of Red-shouldered Hawks on Canadian routes from 1966-2003 was only 0.03 birds/route. Trends for Red-shouldered Hawks in both Canada and for all of North America calculated from BBS data should be viewed with some caution because they have a credibility measure category that reflects data with a deficiency (Sauer *et al.* 2004).

Ontario Red-shouldered Hawk and Spring Woodpecker Survey

In Ontario, Red-shouldered Hawks are surveyed through this specialized survey that uses tape playback to elicit vocal responses from Red-shouldered Hawks during the period when they are most vocal (17 April–7 May; Badzinski 2004). Mean detection rates for this survey are typically around 3.0 birds/route (Badzinski 2004). Power analyses conducted using the Red-shouldered Hawk survey data show that 31 routes need to be surveyed annually in order to detect a 20% change over 10 years (Francis 1999). From 2000-2004, the number of routes completed varied from a low of 52 routes in 2004 to a high of 64 routes in 2001, which is more than adequate to detect a 20% change over 10 years. Like all roadside surveys, this survey has some biases. Detection rate likely varies among observers, differences in the quality of the stereo used for playback may affect response rate, and forest interior habitats may be underrepresented. Despite these limitations, the use of taped calls and the earlier timing of this survey result in a higher proportion of birds being counted at each survey station. This method is, therefore, more appropriate for monitoring population trends and forms the basis for an Ontario population estimate.

Breeding bird atlases

Breeding bird atlases collect data on the distribution and abundance of Red-shouldered Hawks, but are only done once every 20 years. The first breeding bird atlas in Quebec ran from 1984-1989, the Maritime Atlas from 1986-1990 and the Ontario Atlas from 1981-1985. The second Ontario Breeding Bird Atlas began in 2001 and will be completed in 2005. Data from breeding bird atlases are useful in tracking changes in distribution of species over time. If point counts are included as part of atlas methodology, data can also be used to examine relative abundance and population size. It is important, however, that changes in observer effort across atlas periods be considered.

Hawk migration monitoring

There are several hawk watch stations in Ontario, Quebec and the neighbouring states that monitor trends in numbers of migrant Red-shouldered Hawks in spring and fall. Observers at the stations count migrating raptors using a standardized protocol that includes a record of the number of observer hours. Appropriately analyzed, these data can be used to determine trends in numbers of birds of a given species over time (Hussell and Brown 1992). Migration data can be used to estimate minimum population size; however, without knowing the percentage of the population that is being counted, and the ultimate destination of the birds, accurate population estimates are not possible.

Bird checklist program

The Association Québécoise des Groupes d'Ornithologues (AQGO) operates a checklist program in Quebec - Étude des Populations d'Oiseaux du Québec (ÉPOQ), which is North America's longest-running and largest checklist program. The Quebec

checklist program is a compilation of birders' observations from birding trips at any time of year and at any location. Checklist data can be used to investigate bird population trends (Cyr and Larivée 1995); however, trends generated from the checklist data tend to be positively biased (Dunn *et al.* 1996). This positive bias occurs because of improving birding skills over time or shifts by birders to more productive areas as species decline in previously-favoured spots (Dunn *et al.* 1996). Despite these potential biases, negative trends are considered reliable indicators of true declines. From 1969-2003, 118,484 checklists with 4,053 Red-shouldered Hawk observations were submitted for southern Quebec, and 196,516 checklists with 3,259 observations for central Quebec (F. Shaffer pers. comm.).

Christmas Bird Count

Most Red-shouldered Hawks winter in the United States, so appropriately analyzed Christmas Bird Count data from the United States are useful in examining overall continent-wide trends and winter distribution. The Christmas Bird Count is conducted in more than 1,800 locations across Canada, the United States and Latin America. Here, observers attempt to count all birds within a 24-km diameter circle on a selected day between 14 December and 5 January.

Abundance

Over the last 20 years, there have been a variety of population estimates for Red-shouldered Hawks in Canada. Risley (1982) originally estimated a total Canadian population of Red-shouldered Hawks at 468 pairs. Austen *et al.* (1994), using data from the first Ontario Breeding Bird Atlas, then estimated the Ontario population of Red-shouldered Hawks at 824 – 2,372 breeding pairs. Kirk *et al.* (1995), using data from a variety of sources, estimated the Red-shouldered Hawk population in Canada at 2,000 – 5,000 pairs, which was considerably higher than previous estimates.

The most current population estimate (2004) for Red-shouldered Hawks in Ontario, derived from Red-shouldered Hawk and Spring Woodpecker Survey data (1991-2004) is 5,850 breeding pairs (P. Blancher pers. comm.). Data were screened to exclude routes of questionable observer ability, and the few data from routes north of 47 or south of 43 degrees latitude were also excluded. Counts of Red-shouldered Hawks were determined for each survey station across all years surveyed, and then averaged across stations within routes, across routes within 10 x 10 km breeding bird atlas squares, and then across atlas squares within each atlas block (up to 100 km on a side) in order to avoid overweighting any part of the breeding range. Counts at stations were assumed to include all hawks within 500 m of the observer. Average counts per block were then extrapolated to the forested parts of each survey block to obtain a population estimate. The estimate is based on several assumptions: it assumes that all habitat at each survey station is suitable habitat for hawks, and not of lower quality than off-road forest habitat, it assumes that all birds within a 1 km diameter circle are detected, whether male or female (or missed birds are offset by birds drawn in from farther away), and it assumes that the number of hawks south of 43 and north of 47 degrees latitude is negligible.

There are no recent population estimates for the species in Quebec, but, data from the Breeding Bird Atlas (1984-1989) suggested a minimum of 400 pairs, and a maximum of 1,000 pairs (F. Shaffer pers. comm.). Similarly, the Maritime Breeding Bird Atlas (1986-1990) suggested the New Brunswick Red-shouldered Hawk population was less than 20 pairs (Erskine 1992). However, observations of Red-shouldered Hawks over the past 15 years and results of recent surveys suggest that this underestimates the breeding population in New Brunswick (D. Sabine pers. comm.). Based on these provincial estimates, a conservative population estimate for Canada would be 6,270 pairs (5,850+400+20).

Fluctuations and trends

BBS data show no significant changes in Red-shouldered Hawk populations in Canada from 1980-2003 or from 1994-2003 (0.65%/year, N=19, P=0.85; -2.8%/year, N=11, P=0.61, respectively) and a significant increase in the United States from 1994-2003 (2.7%/year, N=631, P<0.005; Sauer *et al.* 2004). In Ontario, the Red-shouldered Hawk and Spring Woodpecker Survey results suggest that the population has not changed significantly from 1991-2004 (-0.3%/year, 95% confidence interval: -1.5 to 0.9%, P=0.60; Figure 4; Badzinski 2004).

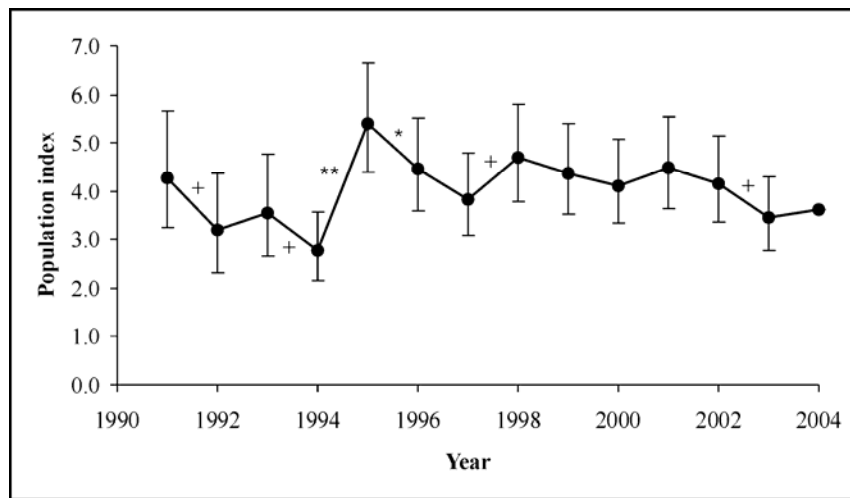


Figure 4. Estimated annual indices for Red-shouldered Hawks using data from the Ontario Red-shouldered Hawk and Spring Woodpecker Survey (1991-2004). Indices were derived from a generalized linear model assuming Poisson residuals and a log-link function. 95% confidence limits refer to differences from 2004, which was chosen as the baseline year. Year-to-year comparisons based on post hoc contrasts were significantly different as marked: + P<0.10, * P<0.05, ** P<0.01.

Data from the second Ontario Breeding Bird Atlas suggest a stable distribution in Ontario, although there have been some local changes (Figure 2). During the first Ontario Breeding Bird Atlas (1981-1985), Red-shouldered Hawks were found in 384 squares (10 km x 10 km) throughout Ontario. In the first four years of the second Breeding Bird Atlas (2001-2004), Red-shouldered Hawks have been found in 427 squares (2nd Ontario Breeding Bird Atlas unpublished data; Table 1). This

apparent increase should be viewed with some caution, however, because of differences in search effort between the two atlases. The Quebec and Maritime Breeding Bird Atlases were completed in 1989 and 1990 respectively, so there are no data available on recent population changes from these sources.

Table 1. Red-shouldered Hawk breeding evidence collected during the first Ontario Breeding Bird Atlas (1980-1984) and the first four years of the second Ontario Breeding Bird Atlas (2001-2004).

Atlas Squares (10 km x 10 km) reporting Red-shouldered Hawks	1 st Atlas	2 nd Atlas
Squares with confirmed breeding	66	87
Squares with probable or possible breeding	318	340
Total squares	384	427

Data from hawk watch stations in Ontario suggest stable or increasing numbers of birds in both spring and fall migration counts. Although these data have been corrected for variation in observer effort, they have not been log transformed and so should be interpreted with caution. Spring migration data from the Niagara Peninsula Hawkwatch in Beamer, Ontario show an apparent increase from 1980-1990, followed by an apparent decline from 1990-2004 (Figure 5). Fall migration data from Holiday Beach Migration Observatory in southwestern Ontario (1980-2004; Chartier and Stimac 2002) and Cranberry Marsh Raptor Watch in Grimsby, Ontario (1990-2003) show no change in numbers of migrating Red-shouldered Hawks. Data from hawk migration stations in Quebec (which were appropriately analyzed), however, show a significant linear increase in both spring and fall from 1980-2004 ($P < 0.001$; Shaffer and Dionne 2004; Figure 6). Data from these numerous hawk watch stations suggest that the population of Red-shouldered Hawks has been stable over the last 10 and 20 years with an apparent local increase in Quebec.

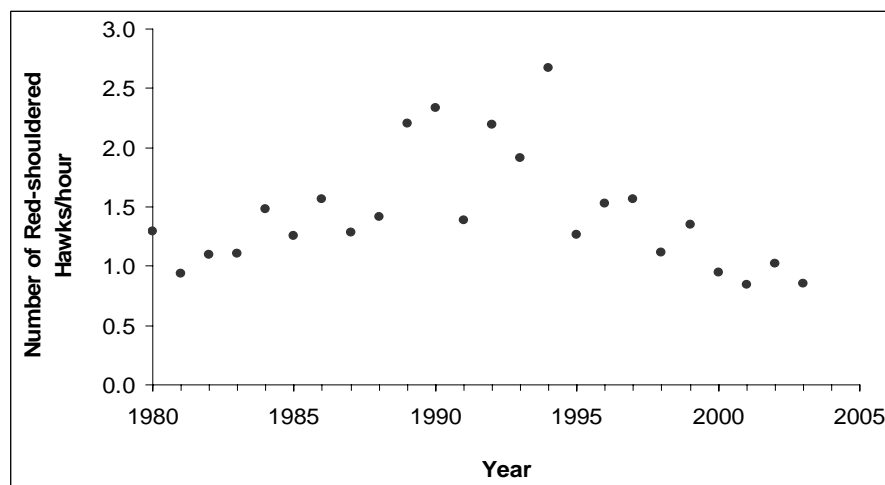


Figure 5. Numbers of migrating Red-shouldered Hawks/hour observed at the Niagara Peninsula Hawkwatch during spring 1980-2003.

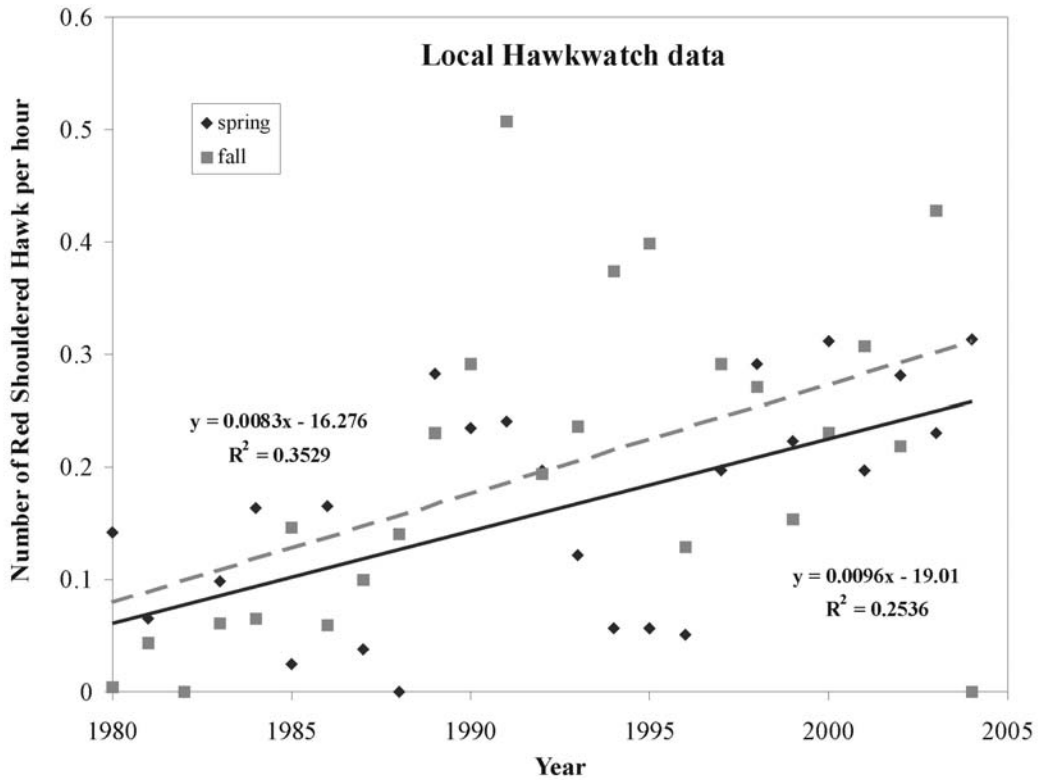


Figure 6. Numbers of migrating Red-shouldered Hawks/hour observed at Ste. Anne-de-Bellevue (spring) and St. Stanislas-de-Kostka (fall) 1980-2004. The dotted and full lines represent the trend calculated for the spring and fall season, respectively.

The ÉPOQ Checklist Program suggests that the numbers of Red-shouldered Hawks in Quebec have increased significantly from 1990-2003 (Figure 7). Although ÉPOQ trends are positively biased (Dunn *et al.* 1996), it is highly unlikely that there has been any important decline in Quebec.

Summary of fluctuations and trends

Data from a variety of sources suggest that the Red-shouldered Hawk population in Canada has been stable over the past 10 and 20 years, with some local increases. There is no evidence of population declines. Data from Ontario show a stable population over these time periods whereas data from Quebec suggest that the Red-shouldered Hawk population may have increased.

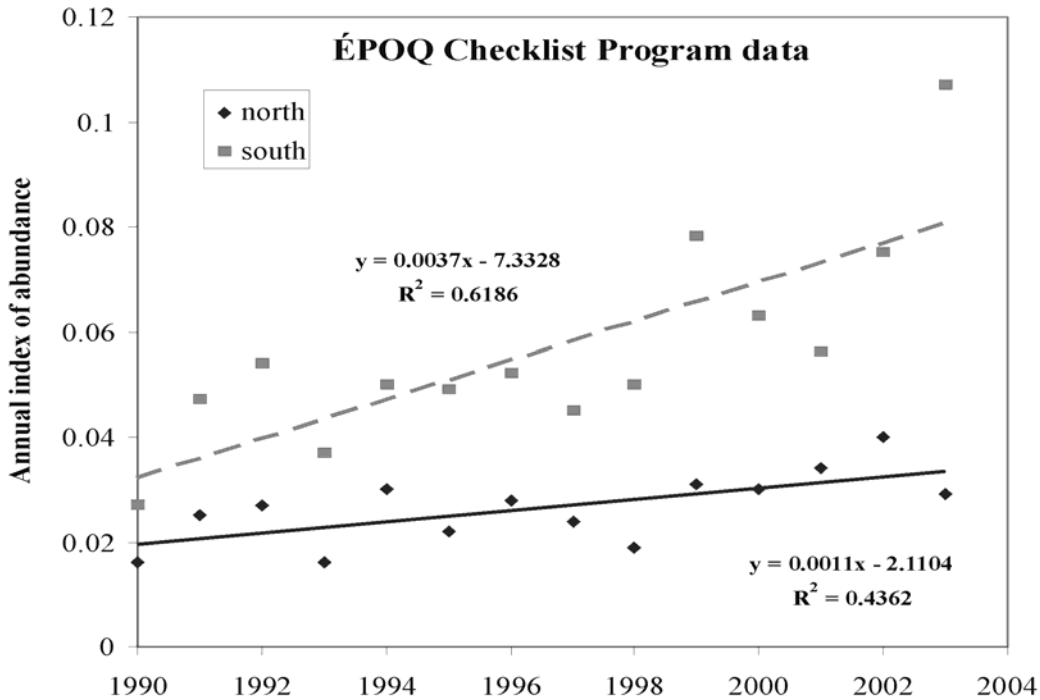


Figure 7. Trends in numbers of Red-shouldered Hawks reported to the Étude des Populations d'Oiseaux du Québec (ÉPOQ) Checklist Program. Data show a significant increase in Red-shouldered Hawks in both the northern and southern regions of the species' range in Quebec.

Rescue effect

Over the last 20 years, both BBS data (Sauer *et al.* 2004) and Christmas Bird Count data (National Audubon Society 2002) suggest that the Red-shouldered Hawk population in the United States is stable or increasing throughout much of its range (Sauer *et al.* 2004). Thus, the U.S. population of Red-shouldered Hawks appears healthy and capable of providing immigrants to Canada. Because this species is migratory, it is physiologically capable of dispersing to new areas, but there is little information available on dispersal distances and rates of natal philopatry. There is no information on whether birds hatched in the United States will emigrate to Canada.

LIMITING FACTORS AND THREATS

Habitat loss and alteration

The most serious threats facing Red-shouldered Hawks in the southern portion of their Canadian range (i.e. south of the Canadian Shield) include habitat loss, and fragmentation or degradation of favoured deciduous forest breeding areas and wetland feeding areas (Helferty *et al.* 2002). Loss of wetland habitats also negatively affects this species through the disappearance of preferred prey (i.e. amphibians, snakes).

Campbell (1975) suggested that Red-shouldered Hawk pairs with lower access to reptile or amphibians might have lower reproductive success.

Because Red-shouldered Hawks use extensive, contiguous mature forests, logging practices have the potential to negatively impact this species. Nesting areas that have undergone heavy partial harvests have lower rates of activity than those without harvesting or light selection cuts (Bryant 1986; Naylor *et al.* 2004). Selective thinning of forests in Wisconsin has resulted in an increase in Great Horned Owls and a reduction in Red-shouldered Hawks (J. Jacobs in Crocoll 1994). However, potential negative effects can be mitigated through the application of guidelines (which are applied in central Ontario) that prohibit heavy cuts within 300 m of nests and retain more than 20 ha of appropriate habitat (Naylor *et al.* 2004).

Loss and degradation of habitat also has indirect effects on this species. For example, incursions and replacements by Red-tailed Hawks have been strongly associated with reductions in mean tree density and tree-crown diameter from selective cutting of woodlots (Bryant 1986), and other changes in woodlot size and structure (Craighead and Craighead 1956; Postupalsky 1989). Habitat loss and fragmentation have been and will likely continue to be most severe in the most southern portions of its Canadian range.

Competitive interactions

Red-shouldered Hawks may be displaced from their nesting locations by Red-tailed Hawks and Great Horned Owls (Bent 1937; Hanna 1973; Campbell 1975).

Disturbance

Many Red-shouldered Hawks will avoid areas of human use (Helferty *et al.* 2002). For example, human disturbance (from ATVs, horseback riders, joggers, turkey hunters, campers, etc.) has pushed this species into the more remote wilderness areas remaining in the Pequannock watershed of northern New Jersey (Bosakowski and Smith 1989). In some areas, however, they are considered a suburban bird (Dykstra *et al.* 2001).

Contaminants

In the past, several toxic chemicals and insecticides have been found in Red-shouldered Hawk tissues and eggs (e.g. DDE, DDT, mercury, PCBs, dieldrin, heptachlor epoxide; Hanna 1973) and have been implicated in egg shell thinning (Campbell 1975). Because of the reduction of these compounds in aquatic ecosystems, it is likely that contaminants are not a major threat to this species. There is no available information, however, to support or refute this hypothesis.

SPECIAL SIGNIFICANCE OF THE SPECIES

The Red-shouldered Hawk is considered an indicator species of sustainable forest management because it is an area sensitive species that requires mature forest habitat (McLaren *et al.* 1998). Red-shouldered Hawks are also top predators, which means that they may be potentially valuable as indicators of environmental health.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

This species, but not its habitat, is protected by provincial game and fish legislation. The global status for Red-shouldered Hawks is G5 (reviewed 1996), and in the United States it is N5, although it is considered a species of concern in some states (NatureServe 2005). In Canada it is ranked as N4B (NatureServe 2005) and was classified as Special Concern by COSEWIC in 1996. The IUCN considers the Red-shouldered Hawk a species of Lesser Concern (BirdLife International 2004).

In Ontario, Red-shouldered Hawks are classified as Special Concern by the Ontario Ministry of Natural Resources and have an S-Rank of S4B. In Ontario, nests on Crown land receive protection during the Forest Management Planning Process using spatial and temporal buffers. These guidelines require the establishment of a 28-ha area of concern to protect nesting areas that have been active at least once in the last five years (Naylor *et al.* 2004). In addition, Red-shouldered Hawk habitat is modelled during the preparation of forest management plans for Crown land using spatial suitability models. Active nests are also afforded protection under the Fish and Wildlife Conservation Act (1997), and the species is a Specially Protected Raptor under the Fish and Wildlife Conservation Act.

In Quebec, the species is also ranked as S4 and was officially removed from the "Liste des espèces de la faune vertébrée susceptibles d'être désignées menacées ou vulnérables" by the government of Quebec in 2003 (Shaffer and Dionne 2004). This decision was taken in light of the information contained in a provincial status report for the species in Quebec (Morneau and Dionne 1996). In Quebec, the Red-shouldered Hawk is protected under Section 26 of the *Act respecting the conservation and development of wildlife*. In New Brunswick, the Red-shouldered Hawk is ranked as S2B and is listed as "May Be At Risk", although the latter is not a legal designation.

TECHNICAL SUMMARY

Buteo lineatus

Red-shouldered Hawk

Buse à épaulettes

Range of Occurrence in Canada: southern Ontario, Quebec, New Brunswick

Extent and Area Information	
<ul style="list-style-type: none"> Extent of occurrence (EO)(km²) [calculated from range map (Figure 1) using ArcView] 	200,000 km ²
<ul style="list-style-type: none"> Specify trend in EO 	Stable
<ul style="list-style-type: none"> Are there extreme fluctuations in EO? 	No
<ul style="list-style-type: none"> Area of occupancy (AO) (km²) [maximum based on approximately 40% of EO being forested and therefore suitable breeding habitat (Figure 1)] 	80,000 km ²
<ul style="list-style-type: none"> Specify trend in AO 	Stable to increasing
<ul style="list-style-type: none"> Are there extreme fluctuations in AO? 	No
<ul style="list-style-type: none"> Number of known or inferred current locations 	Not applicable
<ul style="list-style-type: none"> Specify trend in # 	Not applicable
<ul style="list-style-type: none"> Are there extreme fluctuations in number of locations? 	Not applicable
<ul style="list-style-type: none"> Specify trend in area, extent or quality of habitat 	Stable generally, but may be declining in some areas.
Population Information	
<ul style="list-style-type: none"> Generation time (average age of parents in the population) 	unknown, > 2 years
<ul style="list-style-type: none"> Number of mature individuals 	12,540 (6,270 pairs)
<ul style="list-style-type: none"> Total population trend: 	
<ul style="list-style-type: none"> % decline over the last/next 10 years or 3 generations. 	Stable to increasing
<ul style="list-style-type: none"> Are there extreme fluctuations in number of mature individuals? 	No
<ul style="list-style-type: none"> Is the total population severely fragmented? 	No
<ul style="list-style-type: none"> Specify trend in number of populations 	Not applicable
<ul style="list-style-type: none"> Are there extreme fluctuations in number of populations? 	No
<ul style="list-style-type: none"> List populations with number of mature individuals in each: 	Not applicable
Threats (actual or imminent threats to populations or habitats)	
Known threats include habitat loss and fragmentation, increased interspecific competition caused by habitat alteration and human disturbance. Threats vary with region.	
Rescue Effect (immigration from an outside source)	
<ul style="list-style-type: none"> Status of outside population(s) USA: The Red-shouldered Hawk population is generally stable or increasing throughout most of its range in the United States, although it is listed as a species of concern in several states 	
<ul style="list-style-type: none"> Is immigration known or possible? 	Not confirmed, but likely
<ul style="list-style-type: none"> Would immigrants be adapted to survive in Canada? 	Yes
<ul style="list-style-type: none"> Is there sufficient habitat for immigrants in Canada? 	Habitat in south western Ontario may be limited
<ul style="list-style-type: none"> Is rescue from outside populations likely? 	Yes
Quantitative Analysis	
None	
Current Status	
COSEWIC: Special Concern (1996) Not at risk (2006)	

Status and Reasons for Designation

Status: Not at Risk	Status Criteria: Not applicable
<p>Reasons for Designation: In Canada, this forest-nesting species has been stable or increasing, depending on the region, over the last 10 to 20 years. The main threat to the species is habitat loss and degradation, which is likely to be most serious in the southern parts of its Canadian range. Populations are stable or increasing in most parts of the United States, so there is also a potential outside source for rescue.</p>	
<p>Applicability of Criteria</p>	
<p>Criterion A: (Declining Total Population): Does not meet criterion - population has been stable over last 10 to 20 years.</p>	
<p>Criterion B: (Small Distribution, and Decline or Fluctuation): Does not meet criterion - Extent of Occurrence is greater than 20,000 km² and Area of Occupancy is greater than 2,000 km².</p>	
<p>Criterion C: (Small Total Population Size and Decline): Does not meet criterion - population is greater than 10,000 individuals.</p>	
<p>Criterion D: (Very Small Population or Restricted Distribution): Does not meet criterion - population is greater than 1,000 individuals and Area of Occupancy is greater than 20 km².</p>	
<p>Criterion E: (Quantitative analysis): None</p>	

ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED

Acknowledgements

Thanks to François Shaffer and Mark Dionne (Canadian Wildlife Service) for providing data on Red-shouldered Hawks in Quebec. François Shaffer also prepared the range map for Quebec. ÉPOQ checklist data were provided by Jacques Larivée of the Association québécoise des groupes d'ornithologues. Thanks to the Ontario Ministry of Natural Resources and Bird Studies Canada for providing data from the Red-shouldered Hawk and Spring Woodpecker Survey. Thanks to the official sponsors of the Ontario Breeding Bird Atlas (Bird Studies Canada, Canadian Wildlife Service, Federation of Ontario Naturalists, Ontario Field Ornithologists, and Ontario Ministry of Natural Resources) for supplying Atlas data, and to the thousands of volunteer participants who gathered data for the project. Thanks to coordinators and volunteers at Holiday Beach Migration Observatory (Bob Petitt), Cranberry Marsh Raptor Watch (Doug Lockrey), and Niagara Peninsula Hawkwatch for collecting and providing data for use in this report. Data from Montréal hawkwatch stations were collected and generously provided by Mabel McIntosh and Robert Barnhurst.

Thanks to Andrew Couturier for providing maps for the report. Thanks also to the following reviewers who provided valuable comments on earlier drafts of the report: François Shaffer, Michel Robert, Elsa M. Gagnon, Erica Dunn, Richard Knapton, Daniel Banville, Dick Cannings, Marty Leonard, Michel Gosselin, Lyle Friesen, Corina Brdar, Burke Korol, Brian Huis, Brian Naylor, Chris Risley, Don Sutherland, Allen Woodliffe, Mike Oldham and Alan Dextrase.

Authorities contacted

Achuff, Peter. November 2004. National Botanist, Parks Canada, Waterton, Park, AB.
Blancher, Peter J. Chief, Migratory Birds Populations, Canadian Wildlife Service, Hull, QC.

Blaney, Sean. November 2004. Botanist and Assistant Director, Atlantic Canada Conservation Data Centre, Sackville, NB.

Goulet, Gloria. November 2004. Coordinator - Aboriginal Traditional Knowledge, COSEWIC Secretariat, Gatineau, QC.

Naylor, Brian. April 2005. Forest Habitat Biologist North Bay, Ontario Ministry of Natural Resources, North Bay, ON.

Risley, Chris. November 2004. Species at Risk Biologist, Species at Risk Unit, Biodiversity Section, Fish and Wildlife Section, Ontario Ministry of Natural Resources, Peterborough, ON.

Sabine, Dwayne. November 2004. Biologist, Species at Risk Program, New Brunswick Department of Natural Resources and Energy, Fredericton, NB.

Shaffer, Francois. September 2004. Wildlife Biologist, Species at Risk. Canadian Wildlife Service, Sainte-Foy, QC.

Sutherland, Don. November 2004. Zoologist, Ontario Natural Heritage Information Centre, Ontario Ministry of Natural Resources; Peterborough, ON.

Whittam, Becky. October 2004. Regional Coordinator, Bird Studies Canada, Atlantic Region, Sackville, NB.

INFORMATION SOURCES

- Armstrong, E. and D. Euler. 1983. Habitat usage of two woodland *Buteo* species in central Ontario. *Canadian Field Naturalist* 97: 200-207.
- Austen, M.J.W., M.D. Cadman and R.D. James. 1994. Ontario Birds at Risk: status and conservation needs. Federation of Ontario Naturalists and Long Point Bird Observatory.
- Badzinski, D.S. 2004. Red-shouldered Hawk and Spring Woodpecker Survey. 2004 final report. Unpublished report for Ontario Ministry of Natural Resources – Wildlife Assessment Program.
- Bednarz, J.C. and J.A. Dinsmore. 1981. Status, habitat use and management of Red-shouldered Hawks in Iowa. *Journal of Wildlife Management* 45:236-241.
- Bent, A.C. 1937. Life histories of North American birds of prey. *United States National Museum Bulletin* 167: 180-212.
- Blancher, P.J. pers. comm. 2005. Email correspondence to D. Badzinski. May 2005. Partners in Flight Biologist, Canadian Wildlife Service, National Wildlife Research Centre, Ottawa, ON.
- Bosakowski, T. and Smith, D.G. 1989. Survey of the woodland raptor community in the Pequannock watershed. Unpublished report. 19 pp.
- Bryant, A.A. 1986. Influence of selective logging on Red-shouldered Hawks, *Buteo lineatus*, in Waterloo region, Ontario, 1953-1978. *Canadian Field Naturalist* 100: 520-525.
- BirdLife International 2004. *Buteo lineatus*. In: IUCN 2004. *2004 IUCN Red List of Threatened Species*. <www.redlist.org>. Downloaded on 29 November 2004.
- Campbell, C.A. 1975. Ecology and reproduction of red-shouldered hawks in Waterloo region, southern Ontario. *Journal of Raptor Research* 9: 12-17.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall. 1990. The birds of British Columbia. Volume 2. Royal British Columbia Museum.
- Caster, W. and D.E. Perks. 1961. Nesting hawks and owls in the Toronto area. *Bulletin of the Federation of Ontario Naturalists*. No. 94: 12-15.
- Chartier, A. and D. Stimac. 2002. Hawks of Holiday Beach, 2nd Edition.
- Craighead, J.J. and F.C. Craighead, Jr. 1956. Hawks, Owls, and Wildlife. The Stackpole Company, Harrisburg, Pennsylvania, and the Wildlife Management Institute, Washington, D.C.
- Crocoll, S.T. 1994. Red-shouldered Hawk (*Buteo lineatus*). In: The Birds of North America, No.107 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
- Cyr, A. and J. Larivée. 1995. Atlas Saisonnier des Oiseaux du Québec. Presses de l'Université de Sherbrooke, Société de loisir ornithologique de l'Estrie, Sherbrooke, 711 p.

- David, N. 1996. Liste commentée des oiseaux du Québec. Association québécoise des groupes d'ornithologues, Montréal. 169 pp.
- Dickinson, E. 2003. The Howard & Moore Complete Checklist of the Birds of the World. 3d ed. Princeton Univ. Press, Princeton, N.J.
- Dunn, E.H., L. Larivée and A. Cyr. 1996. Can Checklist Programs be used to monitor populations of birds recorded during the migration season? *Wilson Bull.*, 108: 540-549.
- Dykstra, C.R., J.L. Hays, J.B. Daniel and M.M. Simon. 2001. Home range and habitat use of suburban Red-shouldered Hawks in southwestern Ohio. *Wilson Bull.*, 113: 308-316.
- Erskine, A.J. 1992. Atlas of breeding birds of the Maritime Provinces. Nimbus Publishing Limited and the Nova Scotia Museum. 270 pp.
- Francis, C.M. 1999. Red-shouldered Hawk and Spring Woodpecker Survey. 1998 Final Report. Unpublished report for Ontario Ministry of Natural Resources – Wildlife Assessment Program.
- Hanna, E. 1973. The status and ecology of the red-shouldered hawk (*Buteo l. lineatus*) in southern Ontario. Unpublished report. 41 pp.
- Hart, R. 2004. New Brunswick forest hawk and spring woodpecker survey. 2003 Report. Unpublished report by Bird Studies Canada. 15 pp.
- Helferty, N.J., M.J. McMurty and E. Mosley. 2002. Management and recovery strategy for Red-shouldered Hawk (*Buteo lineatus*) in Aurora District. 27 pp.
- Howell, D.L. and B.R. Chapman. 1997. Home range and habitat use of Red-shouldered Hawks (*Buteo lineatus*) in Georgia. *Wilson Bull.*, 109: 131-144.
- Hussell, D.J.T. and L. Brown. 1992. Population changes in diurnally-migrating raptors at Duluth, Minnesota (1974-1989) and Grimsby, Ontario (1975-1990). Ontario Ministry of Natural Resources, Maple, ON, Canada.
- Jacobs, J.P. and E.A. Jacobs. 2002. Conservation assessment for Red-shouldered Hawk (*Buteo lineatus*) in national forests of North Central States. USDA Forest Service Eastern Region.
- James, R.D. 1984. Habitat management guidelines for Ontario's forests: nesting Accipiters, Buteos, and eagles. Ontario Ministry of Natural Resources #51607.
- Kirk, D.A., D. Hussell and E. Dunn. 1995. Raptor population status and trends in Canada. *Bird Trends* 4: 2-9.
- McLaren, M., N. Dawson, G. Holborn, D. Phoenix and M. Twiss. 1998. Monitoring Ontario's Wildlife: What will the Wildlife Assessment Program measure? Wildlife Assessment Program WAP 98-02.
- Michigan Department of Natural Resources. 1980. Michigan's endangered and threatened species. Lansing, Michigan. 30 pp.
- Minnesota Department of Natural Resources. 1975. The uncommon ones. Publication number 10-75-10M. 32 pp.
- Morneau, F. and A. Dionne. 1997. Rapport sur la situation de la Buse à épaulettes (*Buteo lineatus*) au Québec. Ministère de l'Environnement et de la Faune, Direction de la faune et des habitats, G.R.E.B.E. inc. 73 p.
- National Audubon Society 2002. The Christmas Bird Count Historical Results [Online]. Available <http://www.audubon.org/bird/cbc> [October 2004].

- Nature-Action Quebec. 1999. Sélection de l'habitat de chasse de la Buse à épaulettes en Montérégie. Rapport final. Nature-Action Quebec.
- NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.5. NatureServe, Arlington, Virginia.
- Naylor, B.J. and K.J. Szuba. 1992. Locating Red-shouldered Hawk nests. Pages 1-19 in Selected wildlife and habitat features: inventory manual for use in timber management planning (W.B. Ranta ed.). Ontario Ministry of Natural Resources.
- Naylor, B.J., J.A. Baker and K.J. Szuba. 2004. Effects of forest management practices on Red-shouldered Hawks in Ontario. *The Forestry Chronicle* 80: 54-60.
- Naylor, B. pers. comm. 2006. Email correspondence to M. Leonard. January 2006. Forest Habitat Biologist North Bay, Ontario Ministry of Natural Resources. North Bay, ON.
- Ontario Department of Lands and Forests. 1957. Forest resource inventory. Report No. 20 of the Lake Simcoe District, Division of Timber Management.
- Postupalsky, S. 1980. The red-shouldered hawk breeding in Michigan's upper peninsula. *Jack-Pine Warbler* 58: 73-76.
- Posupalsky, S. 1989. Past and current nesting status of the red-shouldered hawk in Michigan. Unpublished report to Michigan Department of Natural Resources.
- Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.
- Risley, C.J. 1982. Status report on the Red-shouldered Hawk (*Buteo lineatus*) in Canada. Committee on the Status of Endangered Wildlife in Canada.
- Sabine, D. pers. comm. 2004. Email correspondence to D. Badzinski. November 2004. Biologist, Species at Risk Program, Fish and Wildlife Branch. New Brunswick Department of Natural Resources. Fredericton, NB.
- Shaffer, F. and M. Dionne. 2004. Evaluation of Red-shouldered Hawk trends for the province of Quebec. Unpublished report by Canadian Wildlife Service, Sainte-Foy office.
- Shaffer, F. 2004. pers. comm. 2004. Email correspondence to D. Badzinski. November 2004. Wildlife Biologist, Species at Risk. Canadian Wildlife Service. Sainte-Foy, QC.
- Sauer, J.R., J.E. Hines and J. Fallon. 2004. The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1. USGS Patuxent Wildlife Research Center, Laurel, MD.
- Szuba, K.J. and A.J. Norman. 1989. Preliminary survey of nesting Red-shouldered Hawks in Maple district. Queen's Printer, Ontario. 49 pp.
- Szuba, K.J. and A.J. Norman. 1990. Survey of Red-shouldered Hawks nesting in Maple district, 1989. OMNR, Maple District and Lake Simcoe Region Conservation Authority. 51 pp.
- Szuba, K., B. Naylor and J.A. Baker. 1991. Nesting habitat of Red-shouldered Hawks in the Great-Lakes St. Lawrence forest region of central and southeastern Ontario. OMNR, Central Ontario Forest Technology Development Unit. Technical Report 14. 24 pp.

BIOGRAPHICAL SUMMARY OF REPORT WRITER

Debra Badzinski is presently employed as Bird Population Biologist with Bird Studies Canada (BSC) – a non-profit institution dedicated to the research, monitoring, and conservation of Canada’s birds. She graduated from the University of Western Ontario with an Honours Bachelor of Science in Ecology and Evolution in 1996 and obtained her M.Sc. from Trent University in 2000. Her M.Sc. research focused on the population dynamics of Semipalmated Plovers (*Charadrius semipalmatus*) breeding at Churchill, Manitoba. Debra has been with Bird Studies Canada since 1999 where she coordinates a variety of volunteer-based surveys including National Nocturnal Owl Survey, and the Red-shouldered Hawk and Spring Woodpecker Survey. She also works on a variety of programs which focus on birds at risk, including Hooded Warblers, Barn Owls, Short-eared Owls, and the provincially Endangered Bald Eagle.