

# COSEWIC Assessment and Status Report

on the

## **Barn Owl** *Tyto alba*

Eastern Population  
Western Population

**in Canada**



**Eastern Population – ENDANGERED  
Western Population – THREATENED  
2010**

**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. 2010. COSEWIC assessment and status report on the Barn Owl *Tyto alba* (Eastern population and Western population) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv + 34 pp. ([www.sararegistry.gc.ca/status/status\\_e.cfm](http://www.sararegistry.gc.ca/status/status_e.cfm)).

Previous report(s):

COSEWIC. 2001. COSEWIC assessment and update status report on the Barn Owl *Tyto alba* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 11 pp. ([www.sararegistry.gc.ca/status/status\\_e.cfm](http://www.sararegistry.gc.ca/status/status_e.cfm)).

Kirk, D.A. 1999. Update COSEWIC status report on the Barn Owl *Tyto alba* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-11 pp.

Campbell, E.C. and R.W. Campbell. 1984. COSEWIC status report on the Barn Owl *Tyto alba* in Canada. Committee on the Status of Endangered Wildlife in Canada. 77 pp.

Production note:

COSEWIC would like to acknowledge Lorraine Andrusiak for writing the status report on the Barn Owl (Eastern and Western populations) *Tyto alba* in Canada, prepared under contract with Environment Canada, overseen and edited by Jon McCracken, 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.: 819-953-3215

Fax: 819-994-3684

E-mail: [COSEWIC/COSEPAC@ec.gc.ca](mailto: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 l'Effraie des clochers (*Tyto alba*) au Canada.

Cover illustration/photo:  
Barn Owl — Lorraine Andrusiak.

©Her Majesty the Queen in Right of Canada, 2011.

Catalogue No. CW69-14/102-2011E-PDF

ISBN 978-1-100-18550-7



Recycled paper



## COSEWIC Assessment Summary

### Assessment Summary – November 2010

**Common name**

Barn Owl - Eastern population

**Scientific name**

*Tyto alba*

**Status**

Endangered

**Reason for designation**

Eastern Canada supports a tiny fraction of the global population of this charismatic nocturnal raptor that preys on small rodents. Owing to its intolerance of cold climates and deep snow cover, populations in Canada are restricted to parts of southern British Columbia and southwestern Ontario, where the species is now close to being extirpated. Across the northern extent of its eastern North American breeding range, the species is declining and is threatened by ongoing loss and degradation of grassland and old field habitat and by the conversion of old wooden barns and other rural buildings to more modern structures. This owl is also exposed to increasing levels of road-kill mortality owing to expansion of the road network and increases in traffic volume.

**Occurrence**

Ontario

**Status history**

The species was considered a single unit and designated Special Concern in April 1984. In April 1999, the Western and Eastern populations were assessed separately. The Eastern population was designated Endangered. Status re-examined and confirmed in May 2000 and November 2010.

### Assessment Summary – November 2010

**Common name**

Barn Owl - Western population

**Scientific name**

*Tyto alba*

**Status**

Threatened

**Reason for designation**

Western Canada supports a small fraction of the global population of this charismatic nocturnal raptor that preys on small rodents. Owing to its intolerance of cold climates and deep snow cover, populations in Canada are restricted to parts of southern British Columbia and southwestern Ontario. The Western population in British Columbia is small and threatened by ongoing loss and degradation of grassland and old field habitat to intensive agriculture and urbanization and by the conversion of old wooden barns and other rural buildings to more modern structures. This owl is also exposed to increasing levels of road-kill mortality owing to expansion of the road network and increases in traffic volume.

**Occurrence**

British Columbia

**Status history**

The species was considered a single unit and designated Special Concern in April 1984. In April 1999, the Western and Eastern populations were assessed separately. The Western population was designated Special Concern. Status re-examined and confirmed in November 2001. Status re-examined and designated Threatened in November 2010.



**COSEWIC**  
**Executive Summary**

**Barn Owl**  
*Tyto alba*

Eastern Population  
Western Population

**Species information and special significance**

The Barn Owl (*Tyto alba*) is a medium-sized, long-legged owl with a distinctive, heart-shaped facial disk and dark eyes. Its upper body colour is variably rufous, golden or buff, lightly to heavily vermiculated with grey, and with tiny white and black spots. The lower body colour is white to buff, unspotted to heavily spotted with dark brown or rust. Flight feathers on the wings and tail have dark brown bars.

Within the climatic tolerances of its breeding range, the Barn Owl is a good ecological indicator of native and agricultural grasslands. Because it is associated with traditional small-scale mixed farming, trends in its population reflect intensification of agriculture. There have been global declines in this species as a result of habitat loss, toxic chemicals, human disturbance and severe winters. The species is economically beneficial to farmers in its role as predator of rodent populations. The Barn Owl is also a popular and emotive species to the general public.

**Distribution**

The Barn Owl is one of the most widely distributed of all land birds and is found on every continent except Antarctica. Its northern distribution is limited by winter temperatures. As such, in the Americas, it breeds locally in parts of southern Canada and the northern U.S., but becomes much more common and ubiquitous south through the southern U.S., Mexico and South America.

There are two populations (designatable units) in Canada. The Western population is resident year-round in southern British Columbia, mostly in the southwestern corner of the province. It occurs locally on southeastern Vancouver Island from Victoria to Nanaimo, and rarely north to Campbell River and the Gulf Islands. It is most common in the Fraser Valley east to Hope, but is rare and sporadic in the central/southern interior. The Eastern population is very small and found sporadically in southwestern Ontario (mostly within 50 km of the Lower Great Lakes). Definitive evidence for breeding has not been reported in Québec.

## **Habitat**

Barn Owls require landscapes that provide adequate foraging habitat for their primary prey (voles and mice), and suitable sites for nesting. Primary foraging habitats include old agricultural fields, rough pasture, hayfields, grassy roadsides, and grassy marshes. A wide variety of natural and artificial nest structures are used by Barn Owls, including cavities in live and dead trees, chimneys, elevated platforms in barn lofts, silos, hangars, water towers, bridges/overpasses, attics, and nest boxes.

## **Biology**

Barn Owls breed for the first time at 1 year old. Life-span is, however, typically short (2-3 years on average). Second broods in one year are rare in temperate regions like Canada, and usually coincide with abundant prey. Clutch size is variable depending on latitude, but usually ranges between four and eight eggs. Fledglings become independent at about 120 days of age. If there is adequate suitable foraging habitat and linkage to source populations, Barn Owls can respond well to nest box programs, but the success of such programs varies regionally.

## **Population sizes and trends**

In British Columbia, the Western population consists of 250-1000 mature individuals, and is probably closer to the lower estimate. In Ontario, the Eastern population consists of no more than about 20 mature birds. Detailed data on population trends are not available, but both populations are likely declining in concert with declines in suitable nesting and foraging habitat.

## **Limiting factors and threats**

Loss of foraging habitat due to marked changes in agricultural practices and other land uses threaten both the Eastern and Western populations. The availability of nesting sites has also severely declined, owing to the conversion of old, open wooden farm buildings to modern, closed metal structures. The extent to which this trend has been mitigated by recent nest box programs is equivocal; some success has been documented in British Columbia but not in Ontario. Barn Owls are also particularly susceptible to being killed on roads, which represents a significant cause of mortality. Finally, because Barn Owls are poorly adapted to low temperatures and deep snow, bouts of severe winter weather act to limit populations in Canada.

## Existing protection

The Barn Owl is not covered under the federal *Migratory Birds Convention Act*. COSEWIC previously assessed the Western population of Barn Owl in April 1999 as Special Concern; it is currently listed as Special Concern on the federal *Species at Risk Act* (SARA) Schedule 1. SARA prohibitions do not apply to Special Concern taxa. The Barn Owl, its eggs and active nests are protected in British Columbia under the *British Columbia Wildlife Act*.

COSEWIC previously assessed the Eastern population of Barn Owl in April 1999 as Endangered; it is presently listed as Endangered on SARA Schedule 1, which affords protection to the birds and their residences on federal lands. In Ontario, the Barn Owl is classified as Endangered under the province's *Endangered Species Act, 2007*. It is also protected as a 'Specially Protected Bird' under Ontario's *Fish and Wildlife Conservation Act*.

## TECHNICAL SUMMARY (1)

*Tyto alba*

Barn Owl, Eastern population

Effraie des clochers, Population de l'Est

Range of Occurrence in Canada: southwestern Ontario (eastern population)

### Demographic Information

Generation time (average age of parents in the population)	2-3 yrs
Is there an observed, inferred, or projected continuing decline in number of mature individuals? The eastern population is so small that estimation of trends is difficult.	Unknown
Estimated percent of continuing decline in total number of mature individuals within 2 generations.	Not applicable
Observed, estimated, inferred, or suspected percent change in total number of mature individuals over the last 10 years, or 3 generations.	Unknown
Projected or suspected percent change in total number of mature individuals over the next 10 years, or 3 generations.	Unknown
Observed, estimated, inferred, or suspected percent change in total number of mature individuals over any 10 years, or 3 generations period, over a time period including both the past and the future.	Unknown
Are the causes of the decline clearly reversible and understood and ceased?	Not applicable
Are there extreme fluctuations in number of mature individuals?	No

### Extent and Occupancy Information

Estimated extent of occurrence - Based on a minimum convex polygon of the species' recent occurrences as shown in Figure 3.	24,680 km <sup>2</sup>
Index of area of occupancy (IAO) - based upon a 2 x 2 km grid overlay, assuming a maximum of 10 nest sites per year (Badzinski 2007) that are each separated by at least 2 km (unlike BC, no more than one pair of Barn Owls is known to nest within the same 2 x 2 km cell).	40 km <sup>2</sup>
Is the total population severely fragmented?	No
Number of "locations" - maximum of 10 different breeding sites, based upon estimated maximum number of breeding pairs from Badzinski (2007). However, the extent to which threats to individual sites are likely to extend to multiple "locations" is unknown.	Unknown
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	No (stable)
Is there an observed, inferred, or projected continuing decline in index of area of occupancy? - eastern population is too small to discern trends	Unknown
Is there an observed, inferred, or projected continuing decline in number of populations?	Not applicable
Is there an observed, inferred, or projected continuing decline in number of locations?	Not applicable
Is there an observed or projected continuing decline in area, extent and quality of habitat? -foraging habitat declining, number of nest/roost sites declining; no evidence that nest box program in Ontario provides any benefit; traffic volume and roadways increasing	Declining
Are there extreme fluctuations in number of populations?	Not applicable
Are there extreme fluctuations in number of locations?	Not applicable

Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

**Number of Mature Individuals (in each population)**

Population	N Mature Individuals
Eastern (Ontario) - estimated number of breeding adults (Badzinski 2007)	10-20
Total	10-20
Number of populations	1

**Quantitative Analysis**

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Not available
--	---------------

**Threats (actual or imminent, to populations or habitats)**

Ongoing loss of foraging habitat, ongoing loss of traditional rural nesting and roosting sites (e.g., old barns), high rates of road mortality with increases in the road network and traffic volume, and poisoning from second-generation rodenticides. The population is also limited by high rates of mortality during severe winters.
---

**Rescue Effect (immigration from an outside source)**

Status of outside population(s) U.S.: critically imperilled in U.S. states bordering Ontario	
Is immigration known?	Yes
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Perhaps, but the small amount of remaining habitat is declining
Is rescue from outside populations likely? - dependent on persistence of small and declining populations in adjacent U.S.	Unlikely

**Current Status**

COSEWIC: Endangered (November 2010)
-------------------------------------

**Status and Reasons for Designation**

<b>Status:</b> Endangered	<b>Alpha-numeric code:</b> D1
<b>Reasons for designation:</b> Eastern Canada supports a tiny fraction of the global population of this charismatic nocturnal raptor that preys on small rodents. Owing to its intolerance of cold climates and deep snow cover, populations in Canada are restricted to parts of southern British Columbia and southwestern Ontario, where the species is now close to being extirpated. Across the northern extent of its eastern North American breeding range, the species is declining and is threatened by ongoing loss and degradation of grassland and old field habitat and by the conversion of old wooden barns and other rural buildings to more modern structures. This owl is also exposed to increasing levels of road-kill mortality owing to expansion of the road network and increases in traffic volume.	



### Applicability of Criteria

<b>Criterion A</b> (Decline in Total Number of Mature Individuals): Not applicable; evidence for inferred declines due to habitat loss is not sufficient to establish a % loss in population size.
<b>Criterion B</b> (Small Distribution Range and Decline or Fluctuation): Meets Endangered B2 for area of occupancy <500 km <sup>2</sup> , but does not clearly satisfy two other required criteria.
<b>Criterion C</b> (Small and Declining Number of Mature Individuals): Meets Endangered C2a(i), because population contains fewer than 250 mature individuals. However, good evidence for a continuing decline is lacking because population is so small.
<b>Criterion D</b> (Very Small or Restricted Total Population): Meets Endangered D1, with fewer than 250 mature individuals.
<b>Criterion E</b> (Quantitative Analysis): Not available.

## TECHNICAL SUMMARY (2)

*Tyto alba*

Barn Owl, Western population

Effraie des clochers, Population de l'Ouest

Range of Occurrence in Canada: southern British Columbia (western population)

### Demographic Information

Generation time (average age of parents in the population)	2-3 yrs
Is there an observed, inferred, or projected continuing decline in number of mature individuals? Inferred and projected based upon a 15-year period ending in 2008 that documented 53% loss of grassland foraging habitat and about 30% loss of suitable nest sites in barns, though the latter is likely offset to some extent by provision of nest boxes (see <b>Habitat Trends</b> ).	Yes
Estimated percent of continuing decline in total number of mature individuals within 2 generations.	Unknown
Observed, estimated, inferred, or suspected percent change in total number of mature individuals over the last 10 years, or 3 generations.	Unknown (decline is inferred)
Projected or suspected percent change in total number of mature individuals over the next 10 years, or 3 generations.	Unknown
Observed, estimated, inferred, or suspected percent change in total number of mature individuals over any 10 years, or 3 generations period, over a time period including both the past and the future.	Unknown
Are the causes of the decline clearly reversible and understood and ceased? Conversion of pasture and haylands into urban, commercial and intense agricultural uses continues.	No
Are there extreme fluctuations in number of mature individuals? Severe winter weather can result in high levels of mortality, but does not affect the population by an order of magnitude.	No (not extreme)

### Extent and Occupancy Information

Estimated extent of occurrence – based on a minimum convex polygon of the species' recent occurrences as shown in Figure 2.	28,375 km <sup>2</sup>
Index of area of occupancy (IAO) - based upon a 2 x 2 km grid overlay, assuming a range of between 125 and 500 occupied nest sites per year (Campbell and Campbell 1983; this report) that are each separated by at least 2 km. IAO calculated in this way is overestimated because multiple pairs can frequently occur in the same 2 x 2 km cell. Hence, IAO is less than 2000 km <sup>2</sup>	500-2000 km <sup>2</sup>
Is the total population severely fragmented?	No
Number of "locations" - probably >10 locations; a minimum of 116 sites was occupied in Surrey/Delta in BC (Hindmarch 2010), but the extent to which threats to individual sites are likely to extend to multiple "locations" is unknown.	Unknown (probably >10)
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	No (stable)
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Likely

Is there an observed, inferred, or projected continuing decline in number of populations?	No
Is there an observed, inferred, or projected continuing decline in number of locations?	Unknown
Is there an observed or projected continuing decline in area, extent and quality of habitat? - foraging habitat declining; number of nest/roost sites declining, though nest box programs may provide some augmentation; traffic volume and roadways increasing	Yes
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations?	Not likely
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

#### Number of Mature Individuals (in each population)

Population	N Mature Individuals
Western - population estimate provided by BC Conservation Data Centre (2008)	250-1000
Total	250-1000
Number of populations	1

#### Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Not available
--	---------------

#### Threats (actual or imminent, to populations or habitats)

Ongoing loss of foraging habitat, ongoing loss of traditional rural nesting and roosting sites (e.g., old barns), high rates of road mortality with increases in the road network and traffic volume, and poisoning from second-generation rodenticides. The population is also limited by high rates of mortality during severe winters.
---

#### Rescue Effect (immigration from an outside source)

Status of outside population(s) U.S.: Washington state populations thought to be secure and stable.	
Is immigration known?	Yes
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Perhaps, but habitat is declining
Is rescue from outside populations likely? - the small amount of remaining habitat is declining	No

#### Current Status

COSEWIC: Threatened (November 2010)
-------------------------------------

### Status and Reasons for Designation

<b>Status:</b> Threatened	<b>Alpha-numeric code:</b> C2a(i); D1
<b>Reasons for designation:</b> Western Canada supports a small fraction of the global population of this charismatic nocturnal raptor that preys on small rodents. Owing to its intolerance of cold climates and deep snow cover, populations in Canada are restricted to parts of southern British Columbia and southwestern Ontario. The Western population in British Columbia is small and threatened by ongoing loss and degradation of grassland and old field habitat to intensive agriculture and urbanization and by the conversion of old wooden barns and other rural buildings to more modern structures. This owl is also exposed to increasing levels of road-kill mortality owing to expansion of the road network and increases in traffic volume.	

### Applicability of Criteria

<b>Criterion A</b> (Decline in Total Number of Mature Individuals): Not applicable; evidence for inferred declines due to habitat loss is not sufficient to establish a % loss in population size.
<b>Criterion B</b> (Small Distribution Range and Decline or Fluctuation): Not applicable. Meets Threatened B2 for area of occupancy <2000 km <sup>2</sup> , but does not satisfy two other required criteria.
<b>Criterion C</b> (Small and Declining Number of Mature Individuals): Meets Threatened C2a(i) because population is inferred to be declining based upon habitat loss and does not contain more than 1000 mature individuals.
<b>Criterion D</b> (Very Small or Restricted Total Population): Meets Threatened D1, with fewer than 1000 mature individuals.
<b>Criterion E</b> (Quantitative Analysis): Not available.

## **PREFACE**

This is an update of a previous status report (COSEWIC 2001). The Barn Owl's distribution and extent of occurrence in Canada have not changed substantially since then. However, new information on population size, habitat trends, threats, and potential for rescue from the U.S. collectively point to a heightened level of conservation concern for this species' populations in British Columbia and Ontario. Recovery actions in Ontario, which included a nest box program, have thus far not proven successful. The British Columbia population is estimated to be smaller than previously reported, and the remaining breeding habitat has been declining markedly.



## 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 (2010)

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.



Environment  
Canada

Canadian Wildlife  
Service

Environnement  
Canada

Service canadien  
de la faune

Canada

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

# **COSEWIC Status Report**

on the

## **Barn Owl**

*Tyto alba*

Eastern Population  
Western Population

**in Canada**

2010

## TABLE OF CONTENTS

WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE .....	4
Name and classification .....	4
Morphological description .....	4
Genetic description .....	4
Designatable units .....	5
Special significance .....	5
DISTRIBUTION .....	6
Global range .....	6
Canadian range .....	6
HABITAT .....	11
Habitat requirements .....	11
Habitat trends .....	12
BIOLOGY .....	13
Life cycle and reproduction .....	13
Predation .....	15
Physiology .....	15
Dispersal/migration .....	16
Interspecific interactions .....	17
Adaptability .....	17
POPULATION SIZES AND TRENDS .....	18
Search effort .....	18
Abundance .....	18
Fluctuations and trends .....	20
Rescue effect .....	21
LIMITING FACTORS AND THREATS .....	21
Reduced habitat availability and quality .....	21
High levels of road mortality .....	22
Contaminants/poisoning .....	23
Disease and parasites .....	24
Predation .....	24
Intrinsic limiting factors .....	24
PROTECTION, STATUS, AND RANKS .....	25
Legal protection and status .....	25
Non-legal status and ranks .....	25
Habitat protection and ownership .....	25
ACKNOWLEDGEMENTS AND AUTHORITIES CONSULTED .....	26
Authorities consulted .....	26
INFORMATION SOURCES .....	27
BIOGRAPHICAL SUMMARY OF REPORT WRITER .....	34



## List of Figures

- Figure 1. Breeding distribution of the Barn Owl in the New World ..... 7
- Figure 2. Distribution of the Barn Owl, *Tyto alba*, in British Columbia ..... 8
- Figure 3. Breeding distribution of the Barn Owl in Ontario, based upon Ontario  
Breeding Bird Atlas data collected in 1981-85 (black dots) and 2001-05..... 10

## WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

### Name and classification

English Name: Barn Owl (formerly known as Common Barn-Owl)

French Name: Effraie des clochers

Scientific Name: *Tyto alba*

*Tyto alba pratincola*, the American Barn Owl (henceforth referred to as Barn Owl), is one of at least 28 subspecies that have been recognized worldwide, including 9 that occur in North America, including the Caribbean (Marti *et al.* 2005). It is classified under order Strigiformes, family Tytonidae (Barn Owls), and is the only member of the Tytonidae family in Canada.

### Morphological description

The Barn Owl is a medium-sized owl weighing from 470 g (males) to 570 g (females; Marti *et al.* 2005). It has relatively small, dark eyes and a distinctive, pale, heart-shaped facial disk edged with dark feathers. Ear tufts are not present. Dorsal body colour is variably rufous, golden or buff, lightly to heavily vermiculated with grey, and with tiny white and black spots. The ventral body colour is white to buff, unspotted to heavily spotted with dark brown or rust. The underwing feathers are white with few to many dark spots. Flight feathers on the wings and tail have dark brown bars. The legs are long and sparsely feathered, and the toes are tipped with black talons. The Barn Owl's combination of heart-shaped facial disk, dark eyes and long legs make the species unlikely to be confused with other owl species.

Females are, on average, larger, darker in colour and more heavily marked than males, but there is considerable overlap between the sexes (Colvin 1984; Altwegg 2007). Barn Owls do not hoot, but make a variety of screams, chitters and hisses.

### Genetic description

McLarty (1995) conducted genetic analysis of Barn Owl populations in British Columbia, and compared DNA fingerprints with those of owls from northern Utah and southern California. Her results suggested that little gene flow occurred between those populations, and that the two American populations were more similar to each other than they were to the British Columbia population. Genetic variation was lowest in the British Columbia population, even though samples from there were collected from a larger geographical area than were the samples from California and Utah. The British Columbia population was closer, genetically, to the Utah population than to the California population. Little additional information is available on genetics of North American Barn Owls.

## Designatable units

This species was considered a single unit in the original COSEWIC status report (Campbell and Campbell 1983). Thereafter, the Western and Eastern populations were assessed separately (COSEWIC 2001). This updated report continues to treat the Barn Owl as two designatable units in Canada. The Western population (Population 1) occupies southern British Columbia, while the Eastern population (Population 2) breeds in southwestern Ontario.

In terms of assessing discreteness of the two populations, both belong to the same subspecies and there are no comparative genetic studies available. However, birds on the Pacific coast are distinctly smaller and darker than those in the east (Pyle 1997). This suggests reproductive separation and regional adaptation. Although the overall Canadian breeding range appears to be connected through the United States, Barn Owl populations across the northern U.S. are small and localized, and the species is absent from high-elevation montane areas. Hence, its northern range is not as continuous as depicted in the range map (Figure 1). In addition, the two Canadian populations occupy two quite different Ecological Areas (Pacific versus Great Lakes Plains). Moreover, the species is largely a permanent resident and hence relatively sedentary throughout its range, which likely restricts gene flow.

In consideration of the significance of the two designatable units, loss of one population from Canada would create a significant geographic gap in the Barn Owl's national distribution.

While the Barn Owl is thought to occasionally breed in southern Manitoba and southwestern Québec (see **Canadian range** below), such events are so rare and sporadic that these jurisdictions are not considered to be part of the species' regular breeding range.

## Special significance

The Barn Owl is the only member of the Tytonidae family in North America and hence represents a single distinct taxon. It is an important ecological indicator in grassland and agricultural areas. Because it is associated with traditional small-scale mixed farming, downward trends in its population have reflected intensification of agriculture. There have been global declines in this species as a result of habitat loss, toxic chemicals, human disturbance and severe winters (Marti *et al.* 2005). The species is economically beneficial to farmers in its role as predator of rodent populations. The Barn Owl is also an 'extremely popular and emotive species' to the general public (Askew *et al.* 2007).

Like all owls, Barn Owls cast pellets containing the undigested bones of their prey. The Barn Owl's habit of long-term use of roost and nest sites within anthropogenic structures makes collection of pellets convenient. These pellets are often used for dissection in classrooms and public presentations, and thus the species contributes to education and understanding of owls and their biology and occasionally aids in the identification of rare rodents and insectivores (Kremsater *et al.* 1993).

No information on Aboriginal Traditional Knowledge was available on this species in Canada.

## **DISTRIBUTION**

### **Global range**

The Barn Owl is one of the most widely distributed of all land birds (Marti *et al.* 2005). It is found throughout most of Eurasia and Africa, and is resident in Australia and in the western Pacific to the Society Islands (AOU 1998). In the Americas, it reaches its northern limit in southwestern and south-central British Columbia and southern Ontario. In the United States, the Barn Owl is found in Washington, southern Idaho, Montana, South Dakota, Iowa, southern Wisconsin, southern Michigan, New York, southern Vermont and Massachusetts and south through the remaining states. It is sparsely and patchily distributed across most its range in the northern U.S. The broad-scale range map (Figure 1) does not reflect this characteristic. South of the United States, its range extends through Mexico, Central America and South America, as far south as Tierra del Fuego.

### **Canadian range**

In Canada, Barn Owls are known to breed only in southern British Columbia (Western population) and southern Ontario (Eastern population; Godfrey 1986). The species is a year-round resident in southern British Columbia, mostly in the southwestern corner of the province. The first record occurred in 1909 (Brooks 1909), but nesting was not documented until 1941 (McTaggart-Cowan 1942). The early clearing of forests and development of agriculture in the lower Fraser Valley is thought to have produced suitable habitat for the species, which probably extended its range into B.C. from the northern United States. Numbers increased from 1940 to 1980 as a result of mild winters and expansion of suitable agricultural habitat.



Figure 1. Breeding distribution of the Barn Owl in the New World (from Wildspace 2010).

During the 1980s in British Columbia, the Barn Owl's breeding distribution included the Georgia Depression and Southern Interior ecoprovinces, within the Coastal Douglas-fir, Coastal Western Hemlock and Bunchgrass biogeoclimatic zones (Fraser *et al.* 1999). Campbell *et al.* (1990) regarded the Barn Owl as a rare resident on southeastern Vancouver Island east to Nanaimo and very rare north to Campbell River and the Gulf Islands. In Canada, it is most common in the Fraser Valley east to Hope, where it is best described as uncommon. Elsewhere in B.C., it is a rare resident in the south Okanagan Valley, and it may breed in the Kootenay Valley at Creston (R. Cannings pers. comm. 2010; see Figure 2).

The BC Breeding Bird Atlas currently underway has thus far recorded Barn Owls in 29 10x10 km squares from six atlas regions in southwestern British Columbia: South Okanagan (2 squares), Victoria-Southern Gulf Islands (2 squares), Central Fraser Valley (7 squares), Chilliwack-Hope (2 squares), Comox Valley-Campbell River (4 squares), and Greater Vancouver (12 squares; British Columbia Breeding Bird Atlas 2010). Recent breeding is known as far east in the Fraser Valley as Laidlaw (D. Clegg pers. comm. 2008). The species is accidental in other parts of British Columbia.

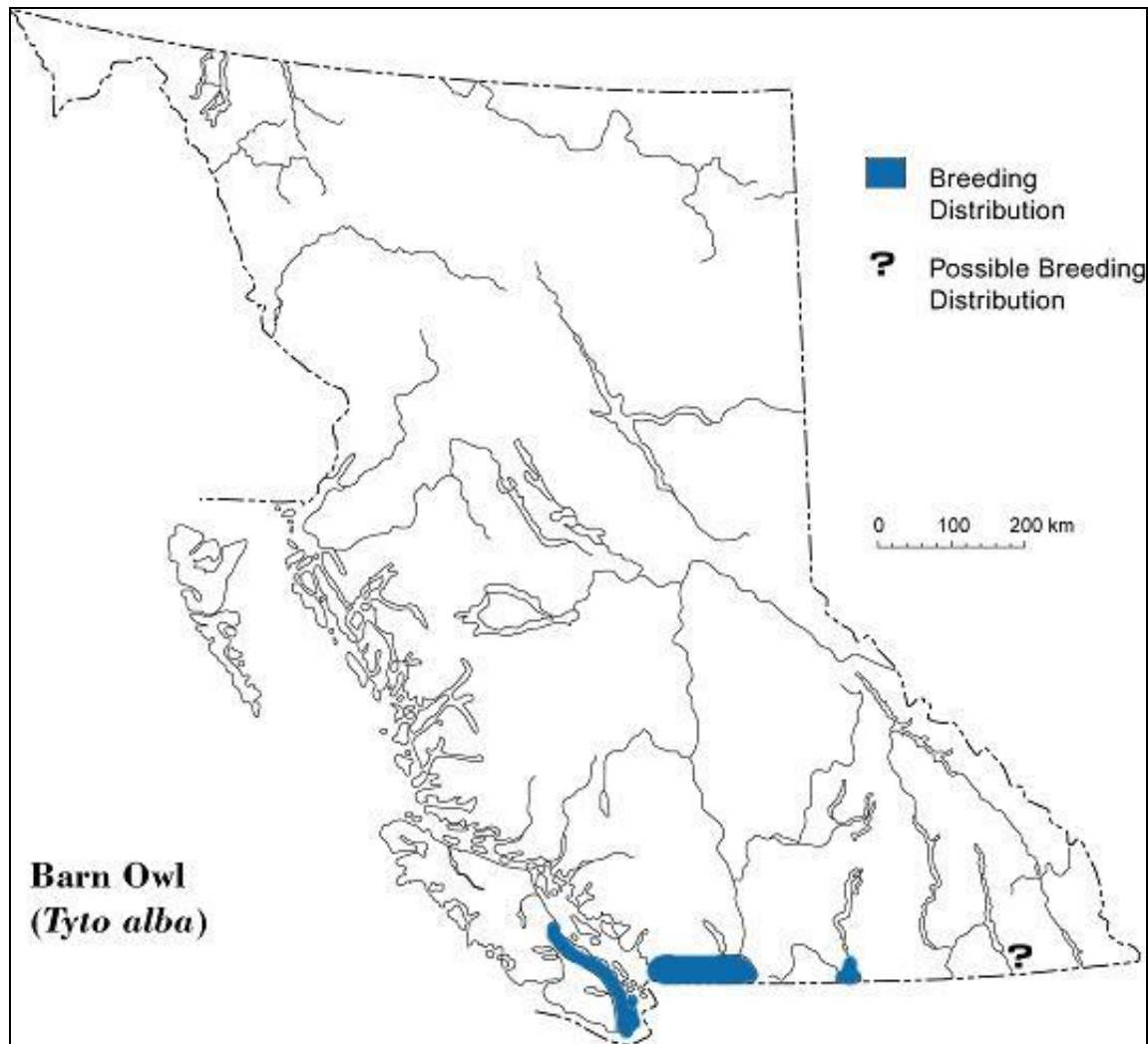


Figure 2. Distribution of the Barn Owl, *Tyto alba*, in British Columbia (from Fraser *et al.* 1999 and R. Cannings pers. comm. 2010).

Ontario's Barn Owl population (i.e., the eastern breeding population) is found in the Mixedwood plains ecozone, within the Lake Simcoe-Rideau and Lake Erie-Lake Ontario ecoregions. The Barn Owl may have been present in small numbers in tallgrass prairie and oak savannah habitats in parts of southern Ontario prior to European settlement (Austen *et al.* 1996). However, it is more likely that it began to colonize the province in the late 1800s and early 1900s, having expanded its range northward first into Ohio and Michigan, following the early proliferation of hayfields and pastures as well as wooden barns and other outbuildings.

In Ontario, its breeding range is concentrated within about 50 km of Lake Erie and the adjacent Lake Ontario shoreline, likely owing to the climatic moderating effect afforded by these large bodies of water (Solymár and McCracken 2002). The recent second *Atlas of the Breeding Birds of Ontario* (Cadman *et al.* 2007) documented Barn Owls in seven 10 x 10 km atlas squares from 2001 to 2005, with breeding confirmed in only two (Chatham-Kent atlas region), and possible or probable in five squares (Chatham-Kent, Niagara, Toronto, Hamilton and Wellington regions; Figure 3).

During the 1980s and early 1990s, the main area where the Barn Owl occurred in Ontario was in the Niagara Peninsula region in Regional Municipality of Niagara and adjacent Haldimand County, but it has been speculated that many of the records during that period may have been captive-bred and released birds (Austen *et al.* 1994). It is estimated that there are currently 5-10 breeding pairs in Ontario (Badzinski 2007). Recent nesting is known only from Haldimand County (two young fledged in 2007) and the Municipality of Chatham-Kent.

One or two Barn Owl observations are recorded every few years in Quebec. It is not confirmed as a resident there, partly because records between January and March are lacking (F. Shaffer pers. comm. 2008). Nesting has not been documented, but if it occurs, it is rare (F. Shaffer, pers. comm. 2008; D. Banville pers. comm. 2008). The species is not formally ranked in the province (A. Paquet pers. comm. 2008). Most Quebec records are in the southwest part of the province (Ouellet 1974; David 1995). There is one possible record of breeding in North Hatley, involving five young birds calling near a farmhouse 20 km from the United States border on 30 July 1987 (David 1995). While it is possible that these birds originated from a nest in the United States, the tendency for very young Barn Owls to stay close to their natal site means that they probably bred in Quebec (David 1995). There is also another possible breeding record near Lacolle, where Barn Owl eggs were reportedly seen in a barn in 1979 and 1980. David (1979) lists two additional possible breeding records as unsubstantiated: Saint Hubert in 1961 (no details); and a female bird that had recently laid eggs that was taken from a taxidermist at Masson.

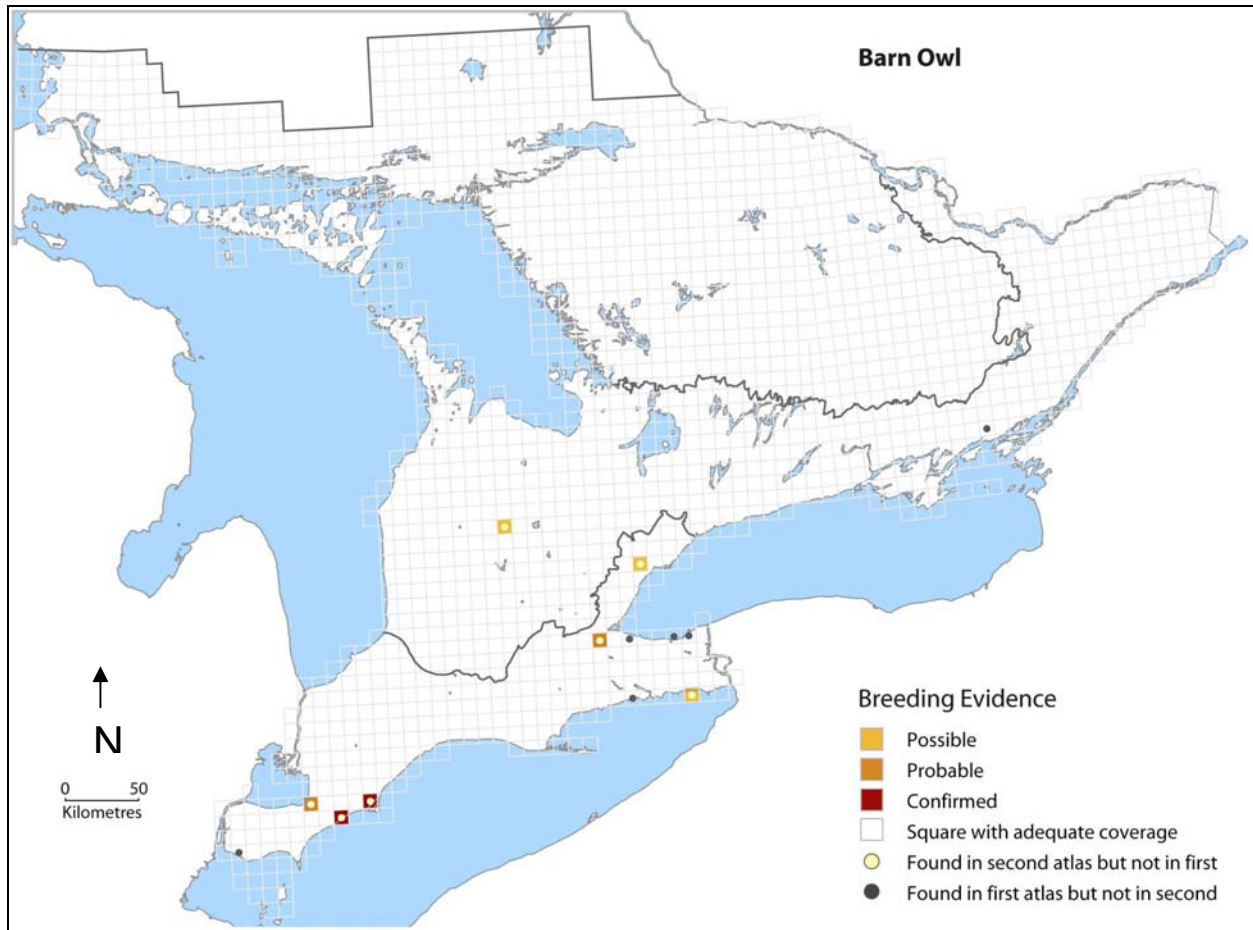


Figure 3. Breeding distribution of the Barn Owl in Ontario, based upon Ontario Breeding Bird Atlas data collected in 1981-85 (black dots) and 2001-05 (coloured squares; from Cadman *et al.* 2007).

Elsewhere in Canada, the Barn Owl is listed as a vagrant or accidental in the Maritime provinces (S. Blaney pers. comm. 2008), with six records in New Brunswick to 2004 (Christie *et al.* 2004). It is not known to have bred successfully in Manitoba. One nesting attempt was recorded west of Winnipeg in 1994, but this is clearly an isolated occurrence. Casual records exist for the province in every month except December and March (Nero 1995 cited in Duncan and Duncan 1997; Manitoba Avian Research Committee 2003). The Barn Owl is considered accidental in Alberta, with only two records (W. Nordstrom pers. comm. 2008; R. Gutsel, pers. comm. 2008). It is also accidental in Saskatchewan, where 11 records are known (J. Keith pers. comm. 2008).



The Canadian extent of occurrence (EO) is estimated at 54,056 km<sup>2</sup>, including 28,375 km<sup>2</sup> in British Columbia and 24,681 km<sup>2</sup> in Ontario, based upon a minimum convex polygon of the species' recent occurrences as shown in Figures 2 and 3. The index of area of occupancy (IAO) for the Eastern population is 40 km<sup>2</sup>, based on a 2 x 2 km grid overlay, and assuming a maximum of 10 occupied nest sites per year (Badzinski 2007) that are each separated by at least 2 km. The IAO for the Western population is no more than 2000 km<sup>2</sup>, based upon a 2 x 2 km grid overlay, and assuming a maximum of 500 nest sites per year (Campbell and Campbell 1983; this report) that are each separated by at least 2 km. In actual fact, because multiple pairs do occur in some 2 x 2 km cells in British Columbia (R. Cannings pers. comm. 2010), IAO would be somewhat less than 2000 km<sup>2</sup>.

## HABITAT

### Habitat requirements

Barn Owls require open foraging habitat with an abundance of small mammal prey, and nearby protected cavity sites for nesting. Primary foraging habitats include old agricultural fields, rough pasture, hayfields, grassy roadsides, margins of row crop fields, marine foreshore and marshes. Old fields and grassland set-asides that are 2-4 years old are among the most productive habitats for *Microtus voles* in Delta, British Columbia (M. Merkens pers. comm. 2008; Hindmarch 2010), a favourite prey item. Barn Owls roost in dense conifers, buildings, hollow trees, nest boxes and occasionally on the ground in fields of tall grass (Andrusiak 1994; Marti *et al.* 2005).

A wide variety of natural and artificial nest structures has been used by Barn Owls in Canada, including cavities in live and dead trees, chimneys, elevated platforms in barn lofts, silos, hangars, water towers, bridges/overpasses, attics, crevices between stacked hay bales, and behind insulation in buildings (Campbell and Campbell 1983; Peck and James 1983; Andrusiak 1994). Nests in natural tree cavities have been located in British Columbia in live and dead Balsam Poplar (*Populus balsamifera*), live and dead Douglas-fir (*Pseudotsuga menziesii*), live Bigleaf Maple (*Acer macrophyllum*) and dead Western Red Cedar (*Thuja plicata*; L. Andrusiak pers. obs.), and in Ontario in a Hackberry (*Celtis occidentalis*; Peck and James 1983). Tree cavities tend to be short-lived as nest sites (Colvin 1984; Andrusiak 1994). It has been suggested that anthropogenic nest sites may offer thermal advantages, which may be particularly important to birds occupying the northern edge of the range, especially during cold winters (Johnson 1974; Campbell and Campbell 1983; Seymour 1988).

## Habitat trends

Increasing urbanization in British Columbia's Lower Mainland and changes in agricultural practices have resulted in declining amounts of suitable foraging habitat (Andrusiak 1994). Conversion of old-field, hayfields and rough pasture to more economically valuable row crops, such as berries, reduces habitat for small mammals. The total area of land used for agriculture has also declined in British Columbia (Province of British Columbia 2002). For example, over the 15-year period ending in 2008 in the Delta and Surrey area of the Fraser Valley, Hindmarch (2010) calculated that grassland cover had declined by about 53%, the amount of impermeable surface (urban development and green houses) had doubled, and traffic had increased by 33%. Additional information on habitat loss is presented in the section on **Limiting Factors and Threats**.

Little native grassland remains within the Barn Owl's historical range in southwestern Ontario (Solymár and McCracken 2002; Ontario Barn Owl Recovery Team 2009). Shifts away from livestock production and toward row cropping, as well as urban encroachment, have resulted in declines in Barn Owl foraging habitat. Most of the agricultural land is intensively managed and of low suitability for small mammals (Ontario Barn Owl Recovery Team 2009).

The strong trend toward replacement of old wooden farm buildings with modern metal structures has been noted in British Columbia (Andrusiak 1994; Hindmarch 2010) and Ontario (Solymár and McCracken 2002). Modern farm buildings do not generally allow access to birds.

In the Fraser Valley, Hindmarch (2010) found that Barn Owls continued to occupy 68 of 116 sites (58.6%) that were previously occupied in the early 1990s. However, nearly one-third of sites occupied 15 years earlier were no longer available to owls because they had been removed or fallen down ( $n=22$ ), replaced with an inaccessible steel barn, sealed up ( $n=10$ ) or burned ( $n=3$ ). After excluding unavailable sites, 85% (68 of 80) of the sites used in the 1990s remained occupied.

Nest box programs may be able to reverse trends in declining nest site availability, but nest boxes will not result in population recovery in areas where declines are due to factors other than limited nesting sites (Colvin 1985), including lack of a reasonable population base. For example, recent provision of about 300 nest boxes in and on barns in southwestern Ontario (where the species is very rare) failed to attract a single breeding pair over a 5-year period (Badzinski 2007; Ontario Barn Owl Recovery Team 2009).

## BIOLOGY

Barn Owl reproductive biology is relatively well-known due to the species' wide distribution. Some information specific to Canada is available through theses (Andrusiak 1994; Hindmarch 2010) and other reports (Campbell and Campbell 1983). Detailed or long-term population statistics are not available for Canada, but have been reported for several areas in the United States.

### Life cycle and reproduction

The Barn Owl is capable of prolific breeding under optimum conditions. Multiple broods (common in southern latitudes, but rare in Canada), year-round breeding, high fecundity and early sexual maturity allow the species to take advantage of periods of abundant prey (Campbell and Campbell 1983; Colvin 1985).

Barn Owls may breed in any month of the year, as long as sufficient prey and suitable climactic conditions are present (Andrusiak 1994; Walk *et al.* 1999; NatureServe 2008). Eggs are laid at 2-3 day intervals (Marti 1994). Incubation begins immediately, so the eggs hatch asynchronously after 29-34 days of incubation. Asynchronous hatching results in considerable variation in body size of nestlings within a brood, and brood reduction is common (Marti 1994).

Only the female incubates the eggs and broods the young, while the male provisions her with food. In a study in France, the male was the sole provider of food until the female first left the nest, about 15 days after the hatching of the first egg, whereupon both adults fed the young (Durant *et al.* 2004). Owlets grow rapidly and even surpass adult body mass due to increased water retention (Durant *et al.* 2008). Mass loss then occurs before the owlets fledge at about 64 days (Smith *et al.* 1974; Marti 1994). Both parents continue to feed the young after fledging, and fledglings are independent at 120 days (Marti 1997).

Long-term data on reproductive parameters are not available for Canada. Over 3 years in British Columbia's Lower Mainland, mean clutch size and standard deviation was  $6.5 \pm 3.5$ , mean brood size at time of banding was  $3.3 \pm 2.0$ , and mean number of nestlings fledged was  $2.6 \pm 2.1$  (Andrusiak and Cheng 1997). The number of eggs in 56 clutches reported in Campbell and Campbell (1983) ranged from 1 to 12, with 4 eggs being the most common. Hindmarch (2010) monitored 54 nest sites in Surrey and Delta in British Columbia in 2007 and 2008. Clutch size ranged from 2 to 8 eggs, with a mean and standard deviation of  $4.6 \pm 0.29$  in 2007 ( $n=18$ ), and  $6.1 \pm 0.37$  in 2008 ( $n=19$ ). The number of owlets fledged per brood was  $2.59 \pm 0.18$  in 2007 ( $n=29$ ) and  $2.86 \pm 0.23$  in 2008 ( $n=37$ ). In British Columbia, prey abundance and composition was found to have a strong effect on nest productivity (Hindmarch 2010).

In an 18-year study of 262 individuals in northern Utah at the northern edge of the species' breeding range, mean age of first breeding was 1.06 years (range <1 to 3), mean number of years breeding was 1.30 (range 1 to 7), and mean number of years breeding successfully was 1.03 (range 0 to 6; Marti 1997). Individuals that lived longer produced more offspring, but age at first breeding was not correlated strongly to lifetime reproductive success. Lifetime averages were 9.76 eggs and 5.58 fledglings produced. Twenty-two percent of females that laid eggs did not fledge any young. Barn Owls bred successfully an average of  $1.03 \pm 0.83$  years. The mean number of breeding descendants per female was 0.26. Double-brooding was recorded in only 11% of pairs, and usually occurred after a mild winter enabled early initiation of the first brood (Marti 1997).

The Barn Owl is generally monogamous, but polygyny occurs rarely (Marti 1990b). No data are available regarding extra-pair copulations in North America, but in Switzerland, paternity analyses of 54 broods with a total of 211 offspring revealed that only one young was not sired by the male that was feeding it (Roulin *et al.* 2004).

Stewart (1952) analyzed band recoveries across North America and found that the average life-span of Barn Owls in the U.S. was about 1.5 years. However, there was a considerable difference in the longevity of southern versus northern owls. On average, those in the north lived less than half as long as those in the south (1.1 years versus 2.4 years). Analysis of 117 band returns of Barn Owls banded or recovered in Canada (North American Bird Banding Program 2008) resulted in an average survival of 19 months post-banding. Birds banded in their first year or as nestlings (95 birds) survived an average of 15 months, while those banded as adults (18 birds) survived an average of 39 months. Based upon the above, and because Barn Owls are capable of breeding within their first year of life, a reasonable estimate of the average generation time of adults in the Canadian population is about 2-3 years.

Home range size is likely dependent on the availability of prey (small mammals) within a particular geographic area (Marti *et al.* 2005). Home ranges of individual Barn Owls may overlap in situations where there is an abundant food supply (Marti *et al.* 2005; D. Fraser pers. comm. 2009). Home range sizes have not been measured in Canada, but reported values in the United States range from 198 ha in Nebraska (Gubanyi 1989 cited in NatureServe 2008) to 921 ha in New Jersey (Colvin 1984).

Barn Owls are not particularly territorial (Smith *et al.* 1974). For example, occupied nests in two nest boxes in opposite corners of the same building have been found in British Columbia (L. Andrusiak pers. obs.). Up to 10 pairs were reported nesting in a barn in California (P. Bloom pers. comm. in McLarty 1995).

Barn Owls exhibit strong nest site fidelity (Campbell and Campbell 1983; Andrusiak 1994). If a nest site is destroyed, pairs often move to the nearest suitable structure.

Barn Owls readily use nest boxes, and nest box provisioning has been shown to increase population densities in areas where the species is already present in reasonable numbers (e.g., Marti *et al.* 1979). Of 30 nest boxes placed in Delta, British Columbia in 1992, 17 (57%) had been used for nesting by Barn Owls a year later (Andrusiak 1994). Colvin (1984) found that significantly more young were fledged from nest boxes than from other nest sites, and attributed this to increased protection against rain exposure, nest collapse and predators. Conversely, Johnson (1994) reported that numbers of fledglings produced by owls nesting in nest boxes were not significantly different from those nesting in other types of site (building, tree cavity). Some authors have found that short-term survival of owlets fledged from nest boxes is lower than owlets fledged from other types of nest structures such as church towers (Klein *et al.* 2007). Fledglings from nests located in barn lofts, attics or other building structures may benefit from the opportunity to practise flying skills in a protected environment before being subjected to inclement weather and predation outside (Klein *et al.* 2007).

## **Predation**

Predators of Barn Owls include larger raptors such as Great Horned Owls (*Bubo virginianus*; Campbell *et al.* 1990). Raccoons (*Procyon lotor*), rats (*Rattus* spp.), and domestic cats (*Felis domesticus*) and dogs (*Canis familiaris*) likely prey upon eggs and nestlings. Crows (*Corvus* spp.) will mob Barn Owls that are active during the day (L. Andrusiak pers. obs.). Mobbing can lead to mortality if young birds are kept grounded, because they are then susceptible to opportunistic terrestrial predators. No specific data are available regarding mortality rates due to predation.

## **Physiology**

The thermoneutral zone of the Barn Owl is 22.5-32.5° C (Edwards 1987). Barn Owls are vulnerable to severe winter weather, especially prolonged snow cover. Heat loss through long, sparsely-feathered legs, poor physiological adaptation to cold climates, difficulty in capturing prey beneath snow, and an energetically expensive hunting style (flight as opposed to hunting from a perch) have all been proposed as factors increasing the Barn Owl's risk of mortality during severe winters (Johnson 1974; Marti and Wagner 1985; Massemin and Handrich 1997; Thouzeau *et al.* 1999).

Barn Owls may be able to conserve energy by roosting in protected sites. A European study found that Barn Owls could save up to 26% of metabolic heat production by roosting in a building during wet and windy conditions, and up to 12% during dry, calm weather (McCafferty *et al.* 2001). The availability of protected nest and roost sites (e.g., barns) may be particularly important for owls at the northern limits of their range (Colvin *et al.* 1984).

A pair of wild Barn Owls in Texas consumed a mean of 54.8 g/day of prey biomass, including 84.3 g/day during the breeding season, 51.8 g/day during the pre-nesting season and 17.0 g/day during the post-nesting season (Hamilton and Neill 1981). Laboratory studies have indicated that captive Barn Owls initially in good body condition can fast for over 7 days at 5°C and still remain capable of flight and feeding, but that fasting for an additional 2 days would likely be fatal (Handrich *et al.* 1993). Studies in Europe indicate that after 8 days of at least 10 cm deep snow cover, most Barn Owls die when body mass reaches between 200 and 240 g, typically half of normal (Piechoki 1962, 1964 and Schönfeld *et al.* 1977 cited in Handrich *et al.* 1993).

## **Dispersal/migration**

Evidence for true seasonal migration (versus random dispersal) of Barn Owls in North America is weak (see McCracken 1998). In British Columbia, the species does not migrate and is present year-round. Owls banded in British Columbia have been recovered only in British Columbia and adjacent Washington state (North American Bird Banding Program 2008). There are also records of Barn Owls in Ontario in every month of the year (R. Gould pers. comm. 2008). While some of these undoubtedly represent birds (especially young of the year) that have dispersed northward from the adjacent U.S., there is no evidence for regular two-way exchange of individual birds between Ontario and adjacent states.

Subadults generally disperse in all directions from their natal site (Andrusiak 1994; Marti 1991, 1994), which can sometimes be mistaken for migration. Barn Owls tagged in Utah ( $n=144$ ) dispersed an average of 103 km from natal sites (Marti 1991), while Mummert *et al.* (2009) reported that nine Barn Owls in Pennsylvania dispersed an average of 104 km. They may occasionally travel up to 1900 km (Mueller and Burger 1959). Of seven band recoveries from hatch-year birds banded in Ontario, four were found dead in the U.S. (New Jersey, Ohio, and two in New York; North American Bird Banding Program 2008).

Adult owls tend to remain in the vicinity of their established breeding sites. Of at least 500 marked Barn Owls in Utah, only 19 moved from one breeding site to another (Marti 1991).

## Interspecific interactions

Barn Owls feed primarily on small mammals, especially microtine rodents (voles; Marti *et al.* 2005). Shrews (*Sorex* spp.), songbirds, moles (*Scapanus* spp. and *Condylura cristata*), rats (*Rattus* spp.), mice (*Mus* spp., *Peromyscus* spp., *Zapus* spp.) and young cottontail rabbits (*Sylvilagus* spp.) are also eaten (McTaggart-Cowan 1942; Dawe *et al.* 1978; Campbell 1983; Campbell *et al.* 1987). Townsend's Vole (*Microtus townsendii*) is the primary prey on the coast of southwestern British Columbia (McTaggart-Cowan 1942; Dawe *et al.* 1978; Campbell *et al.* 1987; Hindmarch 2010), while the Meadow Vole (*M. pennsylvanicus*) is the most common prey in interior British Columbia and in eastern Canada (Solymár and McCracken 2002; Van Damme and Nyhof 2004). Vole numbers and their availability to hunting owls influence owl numbers and breeding success.

Barn Owls occasionally compete with Rock Pigeons (*Columba livia*) for nest sites in barns and even in nest boxes (Walk *et al.* 1999; L. Andrusiak pers. obs.), and nesting pigeons are capable of displacing owls from nests (L. Andrusiak pers. obs.). Other species occupying tree-mounted nest boxes intended for Barn Owls have included Raccoons, squirrels, Wood Ducks (*Aix sponsa*) and honey bees (*Apis mellifera*; L. Andrusiak pers. obs.). Crows and Common Ravens (*Corvus corax*) will mob Barn Owls during the daytime (L. Andrusiak pers. obs.; Marti 1994).

## Adaptability

The Barn Owl can habituate to routine human disturbance, such as daily farm activities or road traffic beneath a highway overpass, and they have been observed roosting with apparent unconcern in noisy industrial buildings (L. Andrusiak pers. obs.). However, unusual disturbance such as nest inspection during the incubation or young nestling stages can lead to nest abandonment (Colvin and Hegdal 1986; Marti 1997; L. Andrusiak pers. obs.).

In addition to natural tree cavities and nest boxes, Barn Owls will accept a wide variety of structures as nest sites. Nests have been recorded in chimneys, a length of corrugated plastic drain pipe stored over rafters in a garage, and inside an aircraft pontoon stored upright against a wall (L. Andrusiak pers. obs.).

Because nest site fidelity is high, a destroyed nest site can often be successfully replaced with the provision of a nearby nest box.

## POPULATION SIZES AND TRENDS

### Search effort

Estimating Barn Owl numbers and population trends is difficult for a number of reasons: a) the species is secretive and nocturnal; b) the density of breeding pairs varies widely with habitat quality; c) the majority of nests and roosts are on private property; and d) pairs may breed at any time of the year. As a result, the species is apt to be widely overlooked during general bird surveys (e.g., Breeding Bird Survey, Christmas Bird Count) and even nocturnal owl surveys.

Barn Owl numbers and trends cannot be reliably estimated from Breeding Bird Survey (BBS) data for the reasons listed above and because BBS sample sizes are so low in Canada. Some population information is provided by the Christmas Bird Count (CBC) in regions where population sizes provide sufficient sample sizes, but it is faced with the same limitations noted above. Moreover, the number of Barn Owl detections registered on the CBC is heavily influenced by the amount of effort that observers expend specifically surveying for nocturnal owls. This type of directed effort is not only apt to vary widely each year, but information on amount of effort is not available to appropriately adjust raw count data. While breeding bird atlas data provide reasonable estimates of occurrence and to some extent abundance, they are repeated too infrequently (typically at 20-year intervals) to provide a reliable trend estimate for a species that is known to exhibit sharp annual population fluctuations in response to harsh winters (see **Limiting Factors and Threats**).

Regional estimates of Barn Owl population size can be gleaned from special, intensive studies and dedicated surveys that assess occupancy of nest boxes and barns (e.g., Andrusiak 1994; Hindmarch 2010). However, to date such studies in British Columbia and Ontario have been sporadic and do not provide robust long-term monitoring data.

As a result of the foregoing, data on Barn Owl abundance, and especially trends, are rather sparse.

### Abundance

Based on Partners in Flight, the total population for the U.S. and Canada is estimated at no more than 300,000 individuals (P. Blancher pers. comm. 2009). Hence, Canada supports about 0.3% of the population.

Estimates of Barn Owl population size need to consider that populations can fluctuate considerably in response to prey population cycles and winter conditions (see **Fluctuations and trends**). In the first COSEWIC status report, the number of mature individuals in Canada was estimated at 500-1500 birds (Campbell and Campbell 1983). This estimate was repeated by Kirk and Hyslop (1998). The current estimate is 260-1020 individuals, as outlined below.



The 1983 population estimate for British Columbia was 1000 birds (Campbell and Campbell 1983). More recently, this estimate has been revised downward, to 250-1000 mature individuals (BC Conservation Data Centre 2008), which appears reasonable. The actual figure is probably closer to the lower end of this range based on information from recent research studies, Christmas Bird Count information, and breeding bird atlas data (see below).

From 2006 to 2008, Hindmarch (2010) surveyed 143 potentially suitable nest sites in the Surrey and Delta region, where the species is most common, and found that 115 (80%) had evidence of use by Barn Owls, at least 78 (55%) of which had been used for breeding. If sites used for nesting count as occupancy by a pair and sites used only for roosting are counted as one individual, then the density estimate for the Surrey-Delta study area (approximately 680 km<sup>2</sup>) is 0.28 owls/km<sup>2</sup> or as many as 193 mature individuals. This is a maximum estimate, because it assumes that each individual used only one roost site, no birds were double-counted over the 3 years, and there was no mortality between years.

No similarly intensive breeding surveys have been conducted elsewhere in British Columbia, but recent breeding bird atlas distributional information shows that the Surrey-Delta region accounts for about 40% of the number of 10 x 10 km squares occupied during the breeding season (see **Canadian range**). Assuming that this region accounts for 40% of the total population (i.e., ignoring the fact that Barn Owl densities are much lower outside the Surrey-Delta area), the most liberal calculation of population size would yield a maximum estimate of about 500 mature individuals in the province.

Christmas Bird Count totals for British Columbia for 1991-2007 have ranged from 18 to 79 birds per year (0.0024 owls/party-hour to 0.0085 owls/party-hour; National Audubon Society 2008). Highest numbers were recorded in 2006, when 79 Barn Owls were reported from 13 count regions. Again, most CBC reports are from the Delta-Surrey region. No information is available on the amount of search effort that CBC participants spent specifically surveying for nocturnal owls, nor is information available about what proportion of the birds (counted in December) were mature individuals versus young of the year. CBC counts of Barn Owls fluctuate annually, in response to rodent cycles and winter conditions.

Few Barn Owls breed in eastern Canada. Currently, a maximum of 10 pairs is estimated to occur in Ontario (Badzinski 2007). Only five Christmas Bird Counts in Ontario between 1991 and 2007 reported a Barn Owl. None were reported from Quebec Christmas Bird Counts during the same period (National Audubon Society 2008).

## Fluctuations and trends

The Barn Owl is at the northern limit of its range in Canada, and has probably always been rare due to winter climate constraints and the limited amount of open foraging habitat. Barn Owl populations across their northern range fluctuate with winter severity, which increases adult mortality and decreases the number and success of breeding attempts the following year (Marti and Wagner 1985; Shawyer 1987; Andrusiak 1994; Marti 1994, 1997; Massemin and Handrich 1997; Altwegg *et al.* 2006). Barn Owl numbers are also affected by population fluctuations of their primary prey (Campbell *et al.* 1990; Klok and de Roos 2007).

The BBS does not reliably survey this nocturnal species. Hence, Barn Owls are detected on few routes, especially in Canada. Sample sizes are similarly constrained in the U.S., where most of the North American population occurs. Nevertheless, BBS results for the U.S. suggest statistically non-significant average annual declines of 2.3%/yr for the period 1966-2007 ( $n=46$  routes;  $p=0.28$ ) and 9.3%/yr for the period 1980-2007 ( $n=41$  routes;  $p=0.15$ ; (Sauer *et al.* 2008).

Robust data on population trends are not available for the Western population, but it has likely been declining because suitable nesting and foraging habitat has been declining markedly (D. Fraser pers. comm. 2009; see **Habitat trends** section).

There are insufficient data to assess trends for the Ontario population because of the species' historical and current rarity (fewer than 10 pairs currently). In 1983, the Ontario population was estimated to consist of a maximum of 25-30 pairs (Campbell and Campbell 1983), but was likely lower. During the first Ontario Breeding Bird Atlas (1981-85), 4-6 pairs were believed to have bred in the province (Weir 1987). Roughly the same results were reported for the second atlas from 2001 to 2005 (Badzinski 2007).

The Barn Owl has been declining throughout much of its range in interior North America since the 1950s at least (Stewart 1980; Colvin *et al.* 1984; Colvin 1985), including all of the states adjacent to Ontario. In New York, there was a 78% decline in Barn Owl occurrence in the 20-year interval between two breeding bird atlas projects conducted from 1980 to 1985 and 2000 to 2005; occupancy dropped from 126 atlas squares to only 28 and it has practically disappeared from the state (McGowan 2008). In Ohio, although the species is considered Threatened, a nest box program there has helped bolster populations (Ontario Barn Owl Recovery Team 2009).

## **Rescue effect**

The rapid reproductive potential of the species increases its chances of re-establishment from outside sources if local populations are extirpated. This assumes a healthy source population. However, in the U.S., the Barn Owl is classified as critically imperilled, imperilled or vulnerable in many states, including all states bordering Ontario. It is listed as 'apparently secure' or 'secure' in only nine states (Washington, Oregon, Nevada, Colorado, New Mexico, Texas, Arizona, South Carolina, and Louisiana) of the 44 states in which the species is ranked (NatureServe 2008).

With regard to potential rescue of the Western population in British Columbia, the Barn Owl is listed as 'apparently secure' in Washington and Oregon (NatureServe 2008). It is an uncommon but regular resident in Washington state in low-elevation areas on both sides of the Cascade Mountains (J. Buchanan pers. comm. 2008). The population there is thought to be stable. Birds banded in British Columbia have been recovered in Washington, so they likely also disperse into British Columbia from Washington. However, the chances of population rescue are considered low, given the small and declining amount of habitat remaining in British Columbia.

Although Barn Owls are capable of dispersing up to 1900 km (Mueller and Burger 1959), immigration of wild owls to Ontario is a rare event given the small numbers present in the province in any given year, the small and declining size of likely source populations in adjacent states, and what may be an effective barrier to northern dispersal that is presented by the Great Lakes (Solymár and McCracken 2002). Nevertheless, the small breeding population in Ontario now likely persists as a result of low levels of immigration from the U.S. (McCracken 1998).

## **LIMITING FACTORS AND THREATS**

### **Reduced habitat availability and quality**

The amount of suitable nesting and foraging habitat is considered to be a main factor limiting the occurrence and abundance of Barn Owls (Blodget 1989). Loss and degradation of key habitats is a significant threat in Canada and elsewhere (e.g., Bunn *et al.* 1982; Colvin 1984, 1985; Matteson and Petersen 1988; Marti *et al.* 2005).

The Delta-Surrey region is the population stronghold for Barn Owls in British Columbia. The amount of grassland habitat in this region has declined within the past 40 years due to changing agricultural practices and urban development (Merkens 2004). Over the 15-year period ending in 2008, grassland cover in this area declined by about 53%, and the amount of impermeable surface (urban development and greenhouses) doubled (Hindmarch 2010). Stewardship programs have promoted grassland set-asides as wildlife habitat, and those areas have proven valuable as foraging habitat for a variety of raptor species (Merkens 2004). However, economic factors have resulted in a general shift to berry crops (especially blueberries and

cranberries) as farms diversify (M. Merkens pers. comm. 2008). In 2001, the area under vegetable crops, greenhouses and berry crops, which do not provide foraging habitat required by Barn Owls, totalled 59% of the area within the Agricultural Land Reserve in Delta (British Columbia MAFF 2004).

Similar changes in land use have occurred in Ontario, where agricultural grassland habitat is being lost primarily because of urbanization (including expansion of the road network), non-farm rural residences, conversion of pasture to cropland, and natural succession of abandoned agricultural lands to forest. Recent trends in agricultural land use in Ontario for the period 1981 to 2006 from Statistics Canada's (2006) Census of Agriculture show that the amount of land used for improved and unimproved pasture decreased by about 54% and 28%, respectively, and the amount of summer fallow decreased by 81%.

Anthropogenic structures suitable for Barn Owl nesting and roosting have also declined in numbers. Older wooden barns (>50 years of age) often provide easy access for owls, but are being replaced by modern metal farm buildings that exclude birds (Solymár and McCracken 2002; Hindmarch 2010). In British Columbia, one recent study found that about 30% of barns that had been occupied 15 years previously were no longer available to owls (Hindmarch 2010). Obsolete barns and silos are either demolished or collapse from lack of maintenance. Entire nests of young owls are sometimes lost when dilapidated nesting structures collapse (L. Andrusiak pers. obs.). Tower silos are now obsolete as dairy farmers switch to bunker silos or silage wrapping methods that do not require covered storage. While many landowners enjoy having Barn Owls nesting in their buildings, others object to the fouling from owl pellets and droppings (Andrusiak 1994). Owners and tenants of industrial sites may be concerned about the effects of owl excreta on their products, and request that owls be removed (L. Andrusiak pers. obs.; Martin 1986). Barn Owls readily use artificial nest boxes, so declines in nest site availability are potentially reversible through nest box provisioning programs, at least in regions that have a reasonable population of owls to begin with.

### **High levels of road mortality**

The Barn Owl's habit of slow, low-altitude flight, its attraction to roadside verges as hunting habitat and its habit of perching on roadside fence posts make roads a significant source of mortality in North America and Eurasia (Shawyer 1987; Andrusiak 1994; Newton *et al.* 1997; Massemin and Zorn 1998; Massemin *et al.* 1998). Boves (2007) documented a mortality rate as high as 261 owls/100 km/year along a 248-km stretch of Interstate 84 in southern Idaho, most of them sub-adults. Of 341 Barn Owl carcasses examined by Andrusiak (1994) in British Columbia, 63% were road-kills. Preston and Powers (2006) reported 542 road-killed Barn Owls in the Fraser Valley in British Columbia in 1987 and 1995-2005. Of 18 records of the species in Ontario from 1999 to 2005, five were road-kills (Badzinski 2007).

In British Columbia, Hindmarch (2010) found that long-term (16 year) site occupancy by Barn Owls was greater at sites that experienced a smaller increase in traffic volume, and suggested that highway mortality may limit the species' distribution. Because of expanding road networks and traffic volumes in both British Columbia and Ontario, rates of Barn Owl road mortality would be expected to be increasing as well, as has been documented in Europe (Marti *et al.* 2005).

## **Contaminants/poisoning**

There are basically two types of contaminants at issue: organochlorines and rodenticides. The former can impact reproductive capacity through bio-accumulation, while the latter can cause secondary poisoning and death. Sheffield (1997) noted that owls are sensitive to a wide variety of toxic chemicals, including pesticides, PCBs, metals, and fluoride, and are highly susceptible to secondary poisoning through eating pesticide-poisoned prey. Yet, Blus (1996) found little evidence that pesticide poisoning had significantly affected North American owl populations.

The actual extent to which chlorinated hydrocarbons (e.g., DDT, DDE) have impacted Barn Owl populations is unknown, but the species is sensitive, and significant eggshell thinning (including egg breakage) was detected in some regions (e.g., Klaas *et al.* 1978). McLarty (1995) reported that nine Barn Owl livers collected in British Columbia had low levels of organochlorine and PCB residues. Given its relatively short lifespan, the Barn Owl is probably largely incapable of incorporating sufficient levels of chlorinated hydrocarbons to impact breeding success. Moreover, given recent substantial population improvements of other organochlorine-sensitive raptors in North America owing to a reduction in organochlorine levels in the environment (e.g., eagles and falcons), it would seem that any impact that these particular chemicals might have had on Barn Owls previously has been largely removed (McCracken 1998).

Poisoning problems from anticoagulant rodenticides have been documented for Barn Owls in North America and Europe (Mineau *et al.* 1999; Albert *et al.* 2009). For example, poisonings were implicated in about 6% of Barn Owl deaths in Britain over a 23-year period, and while organochlorine levels in Barn Owls declined over this time-frame, rodenticide poisoning increased (Newton *et al.* 1997). In Canada, rodenticides were judged to be the direct cause of death for 2 of 78 (3%) dead Barn Owls collected in British Columbia; 62% of these birds had residues of rodenticides in their livers and it was suggested that poisoning was an indirect cause of death (Albert *et al.* 2009). Rodenticide poisoning in raptors is attributed to the greater toxicity and greater persistence of the new second-generation chemicals on the market, many of which are powerful anticoagulants that have largely replaced warfarin to control rodents. Among the chemicals implicated (which fall under various brand names) are: difenacoum, bromadiolone, brodifacoum, flocoumafen, thallium sulfate, monocrotophos, and phorate (Newton *et al.* 1997; Sheffield 1997; Albert *et al.* 2009).

## **Disease and parasites**

Thirty-two Barn Owls were reportedly found dead of West Nile virus in the U.S. from 1999 to 2004 (Nemeth *et al.* 2006). West Nile virus caused the deaths of several species of captive owls in Ontario, although 10 Barn Owls at the same facility remained healthy (Gancz *et al.* 2002). The results of experimental infection studies suggest that Barn Owls are not competent amplifying hosts for West Nile virus in the transmission cycle (Nemeth *et al.* 2006). Avian tuberculosis has been found in Barn Owls in Britain (Hardy *et al.* 1980) but has not been reported in Canada. Kirkpatrick and Colvin (1986) reported detection of *Salmonella* spp. in 20% of a sample of 25 Barn Owl nest sites, and in 8 of 94 nestlings sampled in New Jersey. None of the nestlings appeared ill. The effect of *Salmonella* infection on Barn Owl mortality rates is unknown.

Heavy ectoparasite loads (lice; Insecta: Phthiraptera) may cause death of nestlings due to blood loss (M. Tolksdorf pers. comm. 2008). Infection with the protozoan *Trichomonas gallinae* causes avian trichomoniasis, which has been observed occasionally in nestling and adult Barn Owls in British Columbia and is fatal unless treated (L. Andrusiak pers. obs.; M. Tolksdorf pers. comm. 2008).

## **Predation**

Predation on adult Barn Owls by other raptors, such as Great Horned Owls, is known to occur. However, no data are available regarding the significance of predation on the species.

## **Intrinsic limiting factors**

Because Barn Owls are poorly adapted to cold climates, severe winter weather limits the species distribution in northern latitudes. Barn Owl winter mortality is known to be significant at the northern edge of the species' range (Stewart 1952; Marti and Wagner 1985). Prolonged cold temperatures and snow cover can also affect Barn Owl productivity during the following breeding season (Andrusiak and Cheng 1997; Marti 1997). Winters in southwestern Ontario are significantly colder and have greater snowfall than winters in southwestern British Columbia, and winter mortality may be particularly limiting for the eastern Barn Owl population (Ontario Barn Owl Recovery Team 2009). For example, mean January temperature and mean January snowfall at London, Ont., is -6.3° C and 53 cm, respectively. This contrasts to +2.8° C and 11 cm for Delta, B.C.

Climate change is expected to result in milder winters across the Barn Owl's Canadian range. Warmer winters with less snow cover could increase the abundance and/or geographical range of the species. Even so, a single severe winter event can quickly set populations back.

In eastern Canada, the species is limited by its very small population size. With no more than 10 breeding pairs, the Barn Owl population in Ontario is believed to be well below a minimum viable population level (Solymár and McCracken 2002).

## **PROTECTION, STATUS, AND RANKS**

### **Legal protection and status**

Like all raptors, the Barn Owl is not covered under the federal *Migratory Birds Convention Act*. The eastern Barn Owl population is currently listed as Endangered on SARA's Schedule 1. SARA provisions protect the species and its residences on federal land only. Critical habitat has not yet been defined under SARA, but federal protection will not apply to private lands, which encompass the vast majority of this species' nesting habitat.

In Ontario, the Barn Owl is classified as Endangered and is protected under the province's *Endangered Species Act, 2007*, which extends to the protection of habitat. As a raptor, it is also listed as a 'Specially Protected Bird' in Schedule 7 of the *Fish & Wildlife Conservation Act, 1997*, which prohibits hunting or trapping, and taking or destruction of nests and eggs.

The Western population of Barn Owl is currently listed as Special Concern on SARA's Schedule 1. SARA prohibitions do not apply to Special Concern taxa. The species is on British Columbia's 'Blue List' (equivalent to 'special concern'), and the birds, eggs and active nests are protected under the *British Columbia Wildlife Act*.

### **Non-legal status and ranks**

In Canada, the Barn Owl's general status is N3 ('sensitive'). It is ranked as S3 (sensitive) in British Columbia and as S1 ('critically imperilled') in Ontario. Of the 44 states in the U.S. in which the species is ranked, it is ranked as 'apparently secure' or 'secure' in only nine states (Washington, Oregon, Nevada, Colorado, New Mexico, Texas, Arizona, South Carolina, and Louisiana; NatureServe 2008). In U.S. states bordering Ontario, the Barn Owl is ranked as S1 (critically imperilled; New York, Wisconsin and Michigan), S2 (imperilled; Ohio) or S3 (vulnerable; Pennsylvania). It is also listed as S1 in the District of Columbia, Montana, Vermont, Illinois and Rhode Island (NatureServe 2008).

### **Habitat protection and ownership**

Most of the species' nesting habitat in Canada is on private lands, primarily agricultural and rural residential, but also industrial properties and city-owned structures such as bridges and overpasses. Known nest sites in protected areas in British Columbia include the Alaksen Wildlife Refuge, and in occupied nest boxes in several municipal parks in Surrey and Vancouver. Barn Owl foraging habitat – old fields, grassy

ditches, cropland margins, hay meadows and pastures – also occurs to a large degree on private land. Protected areas of foraging habitat in British Columbia include several Metro Vancouver parks and the Alaksen Wildlife Refuge. Much of the area formerly in rural grassland (pasture, hayfield) in southern Ontario is now intensively cultivated (D. Sutherland and A. Dextrase pers. comm. 2010). Natural grasslands are now scarce in southern Ontario, and most of what remains is privately owned. Rondeau and Long Point Provincial Parks have extensive graminoid marshland, at least some of which is suitable as Barn Owl habitat; and additional protected habitat is present in the Long Point, Big Creek and St. Clair National Wildlife Areas (D. Sutherland and A. Dextrase pers. comm. 2010).

## **ACKNOWLEDGEMENTS AND AUTHORITIES CONSULTED**

This report is based upon the previous status report for the Barn Owl (COSEWIC 2001), prepared by D.A. Kirk. Funding for the production of this update was provided by Environment Canada.

Helpful review comments were provided by Peter Blancher, Ruben Boles, Dick Cannings, Alan Dextrase, Rhonda Donley, Francois Fournier, Theresa Fowler, David Fraser, Darren Irwin, David Kirk, Richard Knapton, Elsie Krebs, Marty Leonard, Jon McCracken, Patrick Nantel, François Shaffer, Christina Rohe, Don Sutherland, and Allen Woodliffe. The assistance of Jon McCracken, Dick Cannings and Alain Filion is greatly appreciated. Thanks to Andrew Couturier for supplying the range map for Ontario, and to Jenny Wu (COSEWIC secretariat) for calculating extent of occurrence.

Thanks to the following British Columbia Breeding Bird Atlas partners for occurrence data: Bird Studies Canada, Canadian Wildlife Service, British Columbia Ministry of Environment, BC Nature, BC Field Ornithologists, Biodiversity Centre for Wildlife Studies, Louisiana Pacific, and the Pacific Wildlife Foundation, as well as all of the volunteer participants who gathered data for the project. For access to Ontario atlas data, thanks to Bird Studies Canada, Environment Canada, Ontario Nature, Ontario Field Ornithologists and Ontario Ministry of Natural Resources, as well as the thousands of volunteer participants who gathered data for the project

### **Authorities consulted**

Banville, Daniel. Biologiste, chef équipe Biodiversité, Ministère des Ressources naturelles et de la Faune, Québec. July 4, 2008.

Blancher, Peter. Research Scientist, Partners in Flight, Canadian Wildlife Service. June 2009.

Blaney, Sean. Assistant Director, Atlantic Canada Conservation Data Centre. June 27, 2008.

Buchanan, Joseph B. Washington Department of Fish and Wildlife. June 30, 2008.

Cannings, Richard. Senior Projects Officer, Bird Studies Canada, BC. July 2010.



Clegg, Dr. D. Greenbelt Veterinary Services, Chilliwack, BC.

Dextrase, Al. Senior Species at Risk Biologist, Ontario Ministry of Natural Resources, Peterborough. January 2010.

Fournier, François. Biologiste/biologist, Service canadien de la faune/Canadian Wildlife Service. July 18, 2008.

Fraser, Dave. Endangered Species Specialist, Ministry of Environment. Victoria, BC. December 11, 2009.

Gould, Ron. Species at Risk Biologist, Ontario Ministry of Natural Resources. July 25, 2008.

Gutsell, Robin. Non-game/Species at Risk Biologist. Alberta Sustainable Resource Development. June 30, 2008.

Hindmarch, Sofi. Graduate student, Simon Fraser University, Burnaby, British Columbia.

Keith, Jeff. Saskatchewan Conservation Data Centre. July 28, 2008.

Merkens, Markus. Delta Farmland and Wildlife Trust. July 30, 2008.

Nordstrom, Wayne. Alberta Natural Heritage Information Centre. June 26, 2008.

Paquet, Annie. Technicienne de la faune, Service de la biodiversité et des maladies de la faune, Ministère des Ressources naturelles et de la Faune, Québec.

Shaffer, F. Species at Risk Biologist, Canadian Wildlife Service (Québec region).

Sutherland, Donald A. Zoologist, Natural Heritage Information Centre, Peterborough, ON. January 2010.

Tolksdorf, Monika. Proprietor, Monika's Wildlife Shelter, British Columbia.

Toner, Maureen. Biologist, Species at Risk Program, Fish & Wildlife Branch, Department of Natural Resources, Fredericton, NB. July 4, 2008.

## INFORMATION SOURCES

Albert, C.A., L.K. Wilson, P. Mineau, S. Trudeau, and J.E. Elliott. 2009. Anticoagulant rodenticides in three owl species from western Canada, 1988-2003. *Archives of Environmental Contamination and Toxicology*. 58:451-459.

Altwegg, R., A. Roulin, M. Kestenholz and L. Jenni. 2006. Demographic effects of extreme winter weather in the Barn Owl. *Oecologia* 149:44-51.

American Ornithologists' Union (AOU). 1998. Check-list of North American Birds. Seventh Edition. The Committee on Classification and Nomenclature of the American Ornithologists' Union.

Andrusiak, L.A. 1994. Nesting and roosting habitat and breeding biology of the Barn Owl, *Tyto alba*, in the lower mainland of British Columbia. M.Sc. Thesis, University of British Columbia, Vancouver, BC.

- Andrusiak, L.A. and K.M. Cheng. 1997. Breeding biology of the Barn Owl (*Tyto alba pratincola*) in the Lower Mainland of British Columbia. Pp. 38-45 *In*: Proceedings of the Second International Symposium on the Biology and Conservation of Owls of the Northern Hemisphere, Feb. 5-9, 1997, Winnipeg, MB (J. R. Duncan, D. H. Johnson and T. H. Nicholls, eds.). USDA Forest Service General Technical Report NC 190.
- Askew, N., J. Searle and N. Moore. 2007. Agri-environment schemes and foraging of Barn Owls *Tyto alba*. *Agriculture, Ecosystems & Environment* 118:109-114.
- Austen, M.L., 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. 165 pp.
- Badzinski, D.S. 2007. Barn Owl. Pp. 288-289 in Cadman, M.D., D.A. Sutherland, G.G. Beck, D. Lepage, and A.R. Couturier, eds. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706 pp.
- B.C. Conservation Data Centre. 2008. British Columbia Species and Ecosystems Explorer. British Columbia Ministry of the Environment. Victoria, British Columbia. Available: <http://a100.gov.bc.ca/pub/eswp/> (accessed June 25, 2008).
- B.C. Ministry of Agriculture, Food and Fisheries (BCMAFF). 2004. Corporation of Delta Agricultural Land Use Inventory, 2002.
- Blodget, B.G. 1989. Common Barn-owl. Pp. 81-87 in Proceedings of the Northeast Raptor Management Symposium and Workshop (B. Giron Pendleton, ed.). National Wildlife Federation Scientific and Technical Series No. 13.
- Blus, L. 1996. Effects of pesticides on owls in North America. *Journal of Raptor Research* 30:198-206.
- Boves, T. 2007. The effects of roadway mortality on Barn Owls in southern Idaho and a study of ornamentation in North American Barn Owls. M. Sc. Thesis, Boise State University, Boise, ID.
- British Columbia Breeding Bird Atlas. 2010. Data accessed from NatureCounts, a node of the Avian Knowledge Network, Bird Studies Canada. Available: <http://www.birdatlas.bc.ca/english/index.jsp> Accessed: December 2010.
- Brooks, A. 1909. Three records for British Columbia. *Auk* 26:313-314.
- Bunn, D.S., A.B. Warburton, and R.D.S. Wilson. 1982. The Barn Owl. Buteo Books, Vermillion, South Dakota.
- Cadman, M.D., D.A. Sutherland, G.G. Beck, D. Lepage, and A.R. Couturier (eds.). 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto.
- Campbell, R.W. 1983. Feeding ecology of the Common Barn-owl in North America. M.Sc. Thesis, University of Washington, Seattle.

- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser. and M.C.E. McNall. 1990. Birds of British Columbia. Volume 2: Nonpasserines. Royal British Columbia Museum, Victoria.
- Campbell, E.C. and R.W. Campbell. 1983. Status report on the Common Barn-owl (*Tyto alba*) in Canada. Report to British Columbia Ministry of Environment, Fish and Wildlife Branch, and Committee on the Status of Endangered Wildlife in Canada.
- Campbell, R.W., D. A. Manuwal, and A. S. Harestad. 1987. Food habits of the Common Barn-owl in British Columbia. *Canadian Journal of Zoology* 65:578-586.
- Statistics Canada. 2006. 2006 Census of Agriculture, Farm Data, Initial Release. Statistics Canada. [www.statcan.ca/english/freepub/95F0301XIE/tables.htm](http://www.statcan.ca/english/freepub/95F0301XIE/tables.htm)
- Christie, D.S., B.E. Dalzell, M. David, R. Doiron, D.G. Gibson, M.H. Lushington, P.A. Pearce, S.I. Tingley and J.G. Wilson. 2004. Birds of New Brunswick: An Annotated List. New Brunswick Museum.
- Colvin, B.A. 1984. Barn Owl foraging behavior and secondary poisoning hazard from rodenticide use on farms. Ph.D. dissertation, Bowling Green State University, Bowling Green, OH.
- Colvin, B. 1985. Common Barn-owl population decline in Ohio and the relationship to agricultural trends. *Journal of Field Ornithology* 56:224-235.
- Colvin, B. and P. Hegdal. 1986. Techniques for capturing common Barn Owls. *Journal of Field Ornithology* 57(3):200-207.
- Colvin, B., P. Hegdal and W. Jackson. 1984. A comprehensive approach to research and management of Common Barn-owl populations. Pp. 270-282 in *Proceedings of Workshop of Management of Nongame Species and Ecological Communities* (W.C. McComb, ed.). University of Kentucky, Lexington, KY.
- COSEWIC. 2001. COSEWIC assessment and update status report on the Barn Owl *Tyto alba* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 11pp.
- David, N. 1979. Barn Owls in Québec. *Canadian Field-Naturalist* 93:323-324.
- David, N. 1995. Barn Owl. Effraie des clochers. Pp. 584-585 in *The Breeding Birds of Québec: Atlas of Breeding Birds of Southern Québec*. (J. Gauthier and Y. Aubry, eds.). Association Québécoise des groupes d'ornithologues, The Province of Québec Society for the Protection of Birds and the Canadian Wildlife Service, Environment Canada, Québec Region, Montreal.
- Duncan, J., and P. Duncan. 1997. Increase in distribution records of owl species in Manitoba based on a volunteer nocturnal survey using Boreal Owl (*Aegolius funereus*) and Great Gray Owl (*Strix nebulosa*) playback. Pp. 519-524 in *Biology and Conservation of Owls of the Northern Hemisphere: 2nd International symposium* (J.R. Duncan, D.H. Johnson, and T. H. Nicholls, eds.). Gen. Tech. Rep. NC-190. U.S. Dept. of Agriculture, Forest Service, North Central Forest Experiment Station, St. Paul, MN.

- Durant, J.M., M.M. Landys and Y. Handrich. 2008. Composition of the body mass overshoot in European Barn Owl nestlings (*Tyto alba*): insurance against scarcity of energy or water? *Journal of Comparative Physiology* 178:563-71.
- Durant, J.M., J.P. Gendner, and Y. Handrich. 2004. Should I brood or should I hunt: a female Barn Owl's dilemma. *Canadian Journal of Zoology* 82:1011-1016.
- Edwards, T.C. 1987. Standard rate of metabolism in the Common Barn Owl (*Tyto alba*). *Wilson Bulletin* 99:704-706.
- Fraser, D.F., W.L. Harper, S.G. Cannings, and J.M. Cooper. 1999. Rare Birds of British Columbia. B.C. Ministry of Environment, Lands and Parks, Wildlife Branch and Resources Inventory Branch, Victoria, BC.
- Gancz, A.Y., I.K. Barker, R. Lindsay, A. Dibernardo, K. McKeever, and B. Hunter. 2004. West Nile virus outbreak in North American owls, Ontario. 2002. *Emerging Infectious Diseases* 10:2135-2142.
- Godfrey, W.E. 1986. The Birds of Canada (revised edition). National Museums of Canada, Ottawa.
- Hamilton, K.L. and R.L. Neill. 1981. Food habits and bioenergetics of a pair of Barn Owls and owlets. *American Midland Naturalist* 106:1-9.
- Handrich, Y., L. Nicholas and Y. Le Maho. 1993. Winter starvation in captive Common Barn-owls: physiological states and reversible limits. *Auk* 110:458-469.
- Hardy, A.R., G.J. Hirons and P.I. Stanley. 1980. The relationship of body weight, fat deposit and moult to the reproductive cycles in wild Tawny Owls and Barn Owls. Pp. 159-163 in *Proceedings of International Symposium on Diseases of Birds of Prey* (J. E. Cooper and A. G. Greenwood, eds.), 1-3 July 1980. London, UK.
- Hindmarch, S. 2010. The effects of landscape composition and configuration on Barn Owl (*Tyto alba*) distribution, diet and productivity in the Fraser Valley, British Columbia. M.Sc. Thesis, Simon Fraser University, Burnaby, BC. 104 pp.
- Johnson, W.D. 1974. The bioenergetics of the Barn Owl, *Tyto alba*. M.Sc. thesis, California State University, Long Beach, CA.
- Kirk, D.A. and C. Hyslop. 1998. Population status and recent trends in Canadian raptors: a review. *Biological Conservation* 83:91-118.
- Kirkpatrick, C.E., and B.A. Colvin. 1986. *Salmonella* spp. in nestling Common Barn-owls (*Tyto alba*) from southwestern New Jersey. *Journal of Wildlife Diseases* 22:340-343.
- Klaas, E., S. Wiemeyer, H. Ohlendorf and D. Swineford. 1978. Organochlorine residues, eggshell thickness, and nest success in Barn Owls from the Chesapeake Bay. *Estuaries and Coasts* 1:46-53.
- Klein, Á., T. Nagy, T. Csörgő and R. Mátirs. 2007. Exterior nest boxes may negatively affect Barn Owl *Tyto alba* survival: an ecological trap. *Bird Conservation International* 17:273-281.

- Klok, C., and A. M. de Roos. 2007. Effect of vole fluctuations on the population dynamics of the Barn Owl *Tyto alba*. *Acta Biotheoretica* 55:227-241.
- Kremsater, L., L. Andrusiak and F.L. Bunnell. 1993. Status of the shrew-mole in British Columbia. Wildlife Branch, British Columbia Ministry of Environment, Lands and Parks. Wildlife Working Report WR-55.
- Manitoba Avian Research Committee. 2003. The Birds of Manitoba. Manitoba Naturalists Society, Winnipeg.
- Marti, C.D. 1990a. Sex and age dimorphism in the Barn Owl and a test of mate choice. *Auk* 107: 246-254
- Marti, C.D. 1990b. Same-nest polygyny in the Barn Owl. *Condor* 92: 261-263.
- Marti, C.D. 1991. Natal and breeding dispersal in Barn Owls. *Journal of Raptor Research* 33:181-189.
- Marti, C.D. 1994. Barn Owl reproduction: patterns and variation near the limit of the species' distribution. *Condor* 96:468-484.
- Marti, C.D. 1997. Lifetime reproductive success in Barn Owls near the limit of the species' range. *Auk* 114:581-592.
- Marti, C.D., and P.W. Wagner. 1985. Winter mortality in Common Barn-owls and its effect on population density and reproduction. *Condor* 87:111-115.
- Marti, C.D., P.W. Wagner and K.W. Denne. 1979. Nest boxes for the management of Barn Owls. *Wildlife Society Bulletin* 7:145-148.
- Marti, C.D., A.F. Poole, and L.R. Bevier. 2005. Barn Owl (*Tyto alba*). *The Birds of North America Online* (A. Poole, ed.). Cornell Laboratory of Ornithology, Ithaca, New York. Available at: [http://bna.birds.cornell.edu/BNA/account/Barn\\_Owl/](http://bna.birds.cornell.edu/BNA/account/Barn_Owl/)
- Martin, L.R. 1986. Barn Owls and industry: problems and solutions. Pp. 281-285 in *Proceedings Twelfth Vertebrate Pest Conference* (T.P. Salmon, Ed.). University of California, Davis, CA.
- Massemin, S. and Y. Handrich. 1997. Higher winter mortality of the Barn Owl compared to the Long-Eared Owl and the Tawny Owl: influence of lipid reserves and insulation? *Condor* 99:969-971.
- Massemin, S. and T. Zorn. 1998. Highway mortality of Barn Owls in northeastern France. *Journal of Raptor Research* 32:229-232.
- Massemin, S., Y. Le Maho, and Y. Handrich. 1998. Seasonal pattern in age, sex and body condition of Barn Owls, *Tyto alba*, killed on motorways. *Ibis* 140:70-75.
- Matteson, S. and L. Petersen. 1988. Wisconsin Common Barn-Owl Management Plan. Wisconsin Endangered Resources Report No. 37, Wisconsin Department of Natural Resources, Madison, WI. 128 pp.
- McCafferty, D.J., J.B. Moncrieff, and I.R. Taylor. 2001. How much energy do Barn Owls (*Tyto alba*) save by roosting? *Journal of Thermal Biology* 26:193-203.

- McCracken, J.D. 1998. A recovery plan for the Barn Owl in Ontario. Report to the Ontario Ministry of Natural Resources (Aylmer District), Ontario Hydro, and the Ontario Barn Owl Recovery Committee.
- McGowan, K.J. 2008. Barn Owl. Pp. 290-291 in *The Second Atlas of Breeding Birds in New York State*. (K.J. McGowan and K. Corwin, eds.). Cornell University Press, Ithaca, NY.
- McLarty, J.R. 1995. Genetic variation in three North American Barn Owl (*Tyto alba*) populations using DNA fingerprinting. M.Sc. Thesis, University of British Columbia, Vancouver, BC.
- McTaggart-Cowan, I. 1942. Food habits of the Barn Owl in British Columbia. *Murrelet* 23:48-53.
- Merkens, M. 2004. Value of grassland set-asides in increasing farmland habitat capacity for wintering raptors in the Lower Fraser River Delta. *In Proc. Species at Risk 2004: Pathways to Recovery Conference* (T.D. Hooper, ed.). March 2–6, 2004, Victoria, BC.
- Mineau, P., M.R. Fletcher, L.C. Glazer, N.J. Thomas, C. Brassard, L.K. Wilson, J.E. Elliott, L.A. Lyon, C.J. Henny, T. Bollinger, and S.L. Porter. 1999. Poisoning of raptors with organophosphorus pesticides with emphasis on Canada, U.S. and U.K. *Journal of Raptor Research* 33:1-37.
- Mueller, H.C., and D.D. Berger. 1959. Some long-distance Barn Owl recoveries. *Bird-banding* 30:182.
- Mummert, D., J. Flickinger, K. Wenner, R. Fritsky, T. Colt, T. Hoppe, and M. Giazzon. 2009. Pennsylvania's Barn Owl conservation initiative [abstract]. 65th Northeast Fish and Wildlife Conference. Retrieved from <http://www.neafwa.org/html/abstracts09/mummert.shtml>
- National Audubon Society. 2008. Christmas Bird Count Data. Historical results. <http://www.audubon.org/BIRD/CBC/hr/index.html>
- NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: July 23, 2008).
- Nemeth, N., D. Gould, R. Bowen, and N. Komar. 2006. Natural and experimental West Nile virus infection in five raptor species. *Journal of Wildlife Diseases* 42:1-13.
- Newton, I., I. Wyllie, and L. Dale. 1997. Mortality causes in British Barn Owls (*Tyto alba*), based on 1,101 carcasses examined during 1963–1996. Pp. 299–307 in: *Biology and conservation of owls in the Northern Hemisphere* (J.R. Duncan, D.H. Johnson, and T.H. Nicholls, eds.). 2nd International Symposium, Winnipeg, MB. United States Department of Agriculture Forest Service General Technical Report NC-190.
- North American Bird Banding Program. 2008. Barn Owl banding records (data file). Provided by Canadian Wildlife Service August 11, 2008.

- Ontario Barn Owl Recovery Team. 2009. Draft Recovery Strategy for the Barn Owl (*Tyto alba*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, ON. vi + 32 pp.
- Ouellet, H. 1974. Les Oiseaux des Collines Montérégiennes et de la région de Montréal, Québec, Canada. Musée national des Sciences naturelles Publications de Zoologie No. 5. Musées nationaux du Canada.
- Peck, G.K., and R.D. James. 1983. Breeding Birds of Ontario: Nidology and Distribution. Volume 1: Nonpasserines. Royal Ontario Museum, Toronto.
- Preston, M., and G. Powers. 2006. High incidence of vehicle-induced owl mortality in the Lower Mainland and central Fraser Valley, British Columbia. *Wildlife Afield*. 3(1 Supplement):15-23.
- Province of British Columbia. 2002. Agricultural Land Reserve. Provincial Agricultural Land Commission. Available:  
[http://www.landcommission.gov.bc.ca/alr/stats/Table2\\_incl-excl\\_RDallyears.htm](http://www.landcommission.gov.bc.ca/alr/stats/Table2_incl-excl_RDallyears.htm)  
 (accessed October 21, 2008).
- Pyle, P. 1997. Identification Guide to North American Birds. Part 1. Slate Creek Press. Bolinas, CA. 732 pp.
- Roulin, A., W. Müller, L. Sasvári, C. Dijkstra, A.L. Ducrest, C. Riols, M. Wink and T. Lubjuhn. 2004. Extra-pair paternity, testes size and testosterone level in relation to colour polymorphism in the Barn Owl *Tyto alba*. *Journal of Avian Biology* 35:492-500.
- Sauer, J.R., J.E. Hines, and J. Fallon. 2008. The North American Breeding Bird Survey, Results and Analysis 1966-2007. Version 5.15 2008, updated 15 May 2008. United States Geological Survey, Patuxent Wildlife Research Center, Laurel, MD.  
 Website: <http://www.mbr-pwrc.usgs.gov/bbs/bbs.html> [accessed October 2009].
- Seymour, J. 1988. Nestbox studies of Barn Owls. *BTO News* 155 (March-April).
- Shawyer, C.R. 1987. The Barn Owl in the British Isles: Its Past, Present and Future. The Hawk Trust, London.
- Sheffield, S.R. 1997. Owls as biomonitors of environmental contamination. pp. 383-398  
*In: Biology and conservation of owls in the Northern Hemisphere* (J.R. Duncan, D.H. Johnson, and T.H. Nicholls, eds.). 2nd International Symposium, Winnipeg, MB. USDA Forest Service General Technical Report NC-190.
- Smith, D. G., C. R. Wilson, and H. H. Frost. 1974. History and ecology of a colony of Barn Owls in Utah. *Condor* 76:131-136.
- Solymár, B. and J.D. McCracken. 2002. Draft National Recovery Plan for the Barn Owl and its Habitat – *Tyto alba*, Ontario population. Unpubl. rep. to Recovery of Nationally Endangered Wildlife (RENEW) Committee, Ontario.
- Stewart, P. 1952. Winter mortality of Barn Owls in central Ohio. *Wilson Bulletin* 64: 164-166.

- Stewart, P.A. 1980. Population trends of Barn Owls in North America. *American Birds* 34:698-700.
- Thouzeau, C., C. Duchamp, and Y. Handrich. 1999. Energy metabolism and body temperature of Barn Owls fasting in the cold. *Physiological and Biochemical Zoology* 72:170-179.
- Van Damme, L, and M. Nyhof. 2004. Food habits of the Barn Owl in the Southern interior of British Columbia. *Wildlife Afield* 1(1):3-5.
- Walk, J. W., T.L. Esker, and S.A. Simpson. 1999. Continuous nesting of Barn Owls in Illinois. *Wilson Bulletin* 111:572-573.
- Weir, R.D. 1987. Common Barn-Owl. pp. 202-203 *In Atlas of the Breeding Birds of Ontario* (M.D. Cadman, P.F.J. Eagles and F.M. Helleiner, eds.). Federation of Ontario Naturalists and Long Point Bird Observatory. Univ. Waterloo Press, Waterloo, ON.
- Wildspace. 2010. Project Wildspace, Environment Canada-Ontario Region. Available at <http://wildspace.ec.gc.ca/life.cfm?ID=COBO&Page=RangeMap&Lang=e>.

### **BIOGRAPHICAL SUMMARY OF REPORT WRITER**

Lorraine Andrusiak is a Registered Professional Biologist in the province of British Columbia. She completed her Master's thesis "Nesting and roosting habitat and breeding biology of the Barn Owl *Tyto alba* in the Lower Mainland of British Columbia" at the University of British Columbia. Lorraine has been employed by a wildlife consulting company since graduation and has worked in a variety of locations in British Columbia.