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Barn Owl

(Tyto alba) in Ontario

Ontario Recovery Strategy Series

Recovery strategy prepared under the *Endangered Species Act, 2007*

February 2010

Natural. Valued. Protected.

Ministry of Natural Resources

Ontario

About the Ontario Recovery Strategy Series

This series presents the collection of recovery strategies that are prepared or adopted as advice to the Province of Ontario on the recommended approach to recover species at risk. The Province ensures the preparation of recovery strategies to meet its commitments to recover species at risk under the Endangered Species Act, 2007 (ESA, 2007) and the Accord for the Protection of Species at Risk in Canada.

What is recovery?

Recovery of species at risk is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

What is a recovery strategy?

Under the ESA, 2007, a recovery strategy provides the best available scientific knowledge onwhat is required to achieve recovery of a species. A recovery strategy outlines the habitat needs and the threats to the survival and recovery of the species. It also makes recommendations on the objectives for protection and recovery, the approaches to achieve those objectives, and the area that should be considered in the development of a habitat regulation. Sections 11 to 15 of the ESA, 2007 outline the required content and timelines for developing recovery strategies published in this series.

Recovery strategies are required to be prepared for endangered and threatened species within one or two years respectively of the species being added to the Species at Risk in Ontario list. There is a transition period of five years (until June 30, 2013) to develop recovery strategies for those species listed as endangered or threatened in the schedules of the ESA, 2007. Recovery strategies are required to be prepared for extirpated species only if reintroduction is considered feasible.

What's next?

Nine months after the completion of a recovery strategy a government response statement will be published which summarizes the actions that the Government of Ontario intends to take in response to the strategy. The implementation of recovery strategies depends on the continued cooperation and actions of government agencies, individuals, communities, land users, and conservationists.

For more information

To learn more about species at risk recovery in Ontario, please visit the Ministry of Natural Resources Species at Risk webpage at: **www.ontario.ca/speciesatrisk**

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DECLARATION

The Ontario Ministry of Natural Resources has led the development of this recovery strategy for the Barn Owl in accordance with the requirements of the *Endangered Species Act, 2007* (ESA 2007). This recovery strategy has been prepared as advice to the Government of Ontario, other responsible jurisdictions and the many different constituencies that may be involved in recovering the species.

The recovery strategy does not necessarily represent the views of all of the individuals who provided advice or contributed to its preparation or the official positions of the organizations with which the individuals are associated.

The goals, objectives and recovery approaches identified in the strategy are based on the best available knowledge and are subject to revision as new information becomes available. Implementation of this strategy is subject to appropriations, priorities and budgetary constraints of the participating jurisdictions and organizations.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy.

RESPONSIBLE JURISDICTIONS

Ontario Ministry of Natural Resources
Environment Canada, Canadian Wildlife Service – Ontario
Parks Canada Agency

EXECUTIVE SUMMARY

In Canada, two distinct populations of the Barn Owl (*Tyto alba*) are recognized: an eastern population (Ontario) and a western population (British Columbia). The eastern population is designated as endangered by COSEWIC and is listed as such in Schedule 1 of the *Species at Risk Act* (SARA). This recovery strategy focuses on the eastern population of the Barn Owl, which is provincially designated as endangered under the *Endangered Species Act, 2007*.

In Ontario, the eastern population of the Barn Owl is at the northernmost limit of its North American range. Habitat loss is considered the major reason for the Barn Owl's decline in Canada; however, harsh winters, predation, road mortality and use of rodenticides may have also affected populations. The eastern population is particularly at risk due to historic and ongoing losses of foraging habitat, resulting from agricultural intensification and urban sprawl along the north shore of Lake Erie. This population is also limited by poor adaptability to cold winter temperatures and high amounts of snowfall.

The goal of this recovery strategy is to conserve, protect and restore the eastern population of the Barn Owl and the grassland habitat it depends on in Ontario. The following objectives are key elements of achieving this goal over the next five years:

1. Assist with the assessment of the status of the Barn Owl population in Ontario by providing information to the Committee on the Status of Species at Risk in Ontario (COSSARO) on current distribution, abundance and trends.
2. Increase availability of nest sites.
3. Identify, protect, restore and improve conservation of suitable habitat and its functionality.
4. Develop public awareness and support for Barn Owls and grassland habitat.

This recovery strategy recommends that nesting sites and structures, regularly used roosting sites, and foraging areas used by nesting pairs in the rearing of young be considered as areas for inclusion within a habitat regulation, due to their significance to the survival and recovery of the species in Ontario.

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1.0 BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Barn Owl

SCIENTIFIC NAME: *Tyto alba*

SARO List Classification: Endangered

SARO List History: Endangered (2008), Endangered – Not Regulated (2004)

COSEWIC Assessment History:
Eastern Population – Endangered (2000 and 1999)
entire species – Special Concern (1984)

SARA Schedule 1: Endangered (June 5, 2003)

CONSERVATION STATUS RANKINGS:

GRANK: G5	NRANK: N3	SRANK: S1

The glossary provides definitions for the abbreviations above.

1.2 Species Description

The Barn Owl is a medium-sized owl (Campbell and Campbell 1984) with an adult wingspan of 104 to 120 centimetres and a body length of 30 to 37 centimetres (NatureServe 2008 citing Colvin 1984 and Marti 1990). Feathers covering the upper body of adults are golden brown mixed with some grey. The breast and belly range from white to beige and are speckled with tiny black spots. The face is also generally white to beige, and the eyes are small and dark. A good distinguishing feature is the heart-shaped facial disk (NatureServe 2008).

Size and coloration vary depending on sex and age. Females are noted as being larger and heavier than males (569 vs. 475 grams), as well as darker and more heavily speckled (Pyle 1997). Although juveniles resemble adults, males less than one year old may have beige breasts (not common in adult males) and are less speckled than females (NatureServe 2008 citing Bloom 1978). In addition, moult patterns can distinguish adults from juveniles and determine the age of juveniles aged up to 36 months (Pyle 1997).

Although Barn Owls are less vocal than most other owl species (Rebane and Andrews 1995), they can produce 15 vocal and 2 non-vocal sounds (NatureServe 2008 citing Bunn et al. 1982). These vocalizations include a long screech often made in flight when

approaching the nest (contact call), an alarm call of an intense screech, and a squeaking/ticking call consisting of rapid, high-pitched notes, which is often associated with pair bonding (NatureServe 2008).

Barn Owls are birds of open countryside. They typically forage by flying low over grassland habitat and frequently hover in the air or perch on fence posts and trees along field edges (Rosenburg 1986).

Up to 35 subspecies of Barn Owl are recognized worldwide. Only one recognized subspecies is native to North America (*Tyto alba pratincola*); however, studies show that Barn Owls in lower mainland British Columbia are genetically distinct from those in Utah or California (McLarty 1995),and Barn Owls on the Pacific coast are smaller and darker than those in the east (Pyle 1997).

1.3 Distribution, Population Size, and Trends

The Barn Owl is among the most widely distributed of bird species in the world, occurring on every continent except Antarctica. It has a global rank of G5, indicating that it is globally secure (NatureServe 2008). It is predominantly a warm-climate species and as such, its principal breeding range within North America is the United States (figure 1).

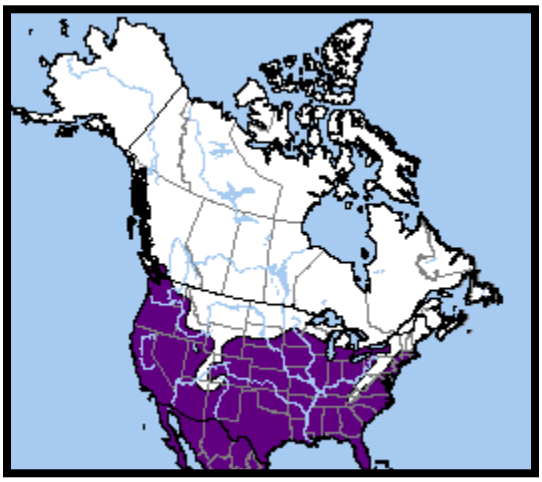

Figure 1. North American range map for the Barn Owl* (from NatureServe 2008)
* Purple represents permanent residency.

In the United States, the Barn Owl has a national rank of N5, or nationally secure (NatureServe 2008). The species is most common in the southern and coastal states, much less common and more localized in the northern interior states and generally absent from mountainous and heavily forested regions (Stewart 1980, Marti et al. 2005). While in the southern states the Barn Owl is considered common and its population

stable, the species has steadily declined in the northern states, especially in the northeastern and midwestern states (Colvin 1984) (see appendix).

In Canada, the species has a national rank of N3, or nationally vulnerable (NatureServe 2008). Here, two separate populations of the Barn Owl are recognized: an eastern population (Ontario) and a western population (British Columbia). Initially considered a single population, the species was designated as special concern by COSEWIC in April 1984. In April 1999, the western and eastern populations were assessed separately. The designation of the western population remained as special concern, while the eastern population was designated endangered, a status that was re-examined and confirmed in May 2000 (COSEWIC 2000). The Barn Owl is currently ranked S1 (critically imperilled) in Ontario (NatureServe 2008) and endangered on the Species at Risk in Ontario (SARO) List under the *Endangered Species Act, 2007* (ESA 2007).

The eastern population of the Barn Owl is at the northern limit of its range in North America in Ontario (and Quebec), where its breeding population in 1982 was estimated at 25 to 30 pairs (Campbell and Campbell 1984). Its sub-national rank of S1 indicates that currently the species is extremely rare provincially (five or fewer occurrences) and is especially vulnerable to extirpation (NatureServe 2008).

This recovery strategy does not relate to Barn Owls in Quebec, as any nesting there is considered irregular (Kirk 1999) and even questionable (Campbell and Campbell 1984, Austen and Cadman 1994, David 1996).

The Barn Owl is notoriously difficult to census, because the species does not typically respond to tape-recorded calls and identification of Barn Owl vocalization is difficult (R. Gould, pers. comm. 2006). In addition, it is a nocturnal species. Therefore, it may often be overlooked during general bird surveys (e.g., Breeding Bird Survey, Christmas Bird Count) and nocturnal owl surveys.

Before European settlement in Ontario, the Barn Owl was probably present in small numbers, foraging mainly in the province's limited tallgrass prairie and oak savannah habitat (Kirk 1999 citing Austen and Cadman 1994). The species probably became more frequent in the province (and bordering states) following the clearing of forests and their replacement with pastures and hayfields (Kirk 1999 citing Weir 1987 and Marti and Marks 1989) and the erection of barns and other structures that augmented the availability of nest and roost sites.

In Ontario, most Barn Owl sighting and nesting records have been within 50 kilometres of the north shore of Lake Erie and the adjacent Lake Ontario shoreline (figure 2). Breeding has been recorded in the Kingsville, Chatham-Kent, Strathroy, Blenheim, Queenston, Winchester (Austen and Cadman 1994 citing Godfrey 1986), Point Pelee National Park (McKay 2007) Cayuga and Kingston areas (NHIC 2009).

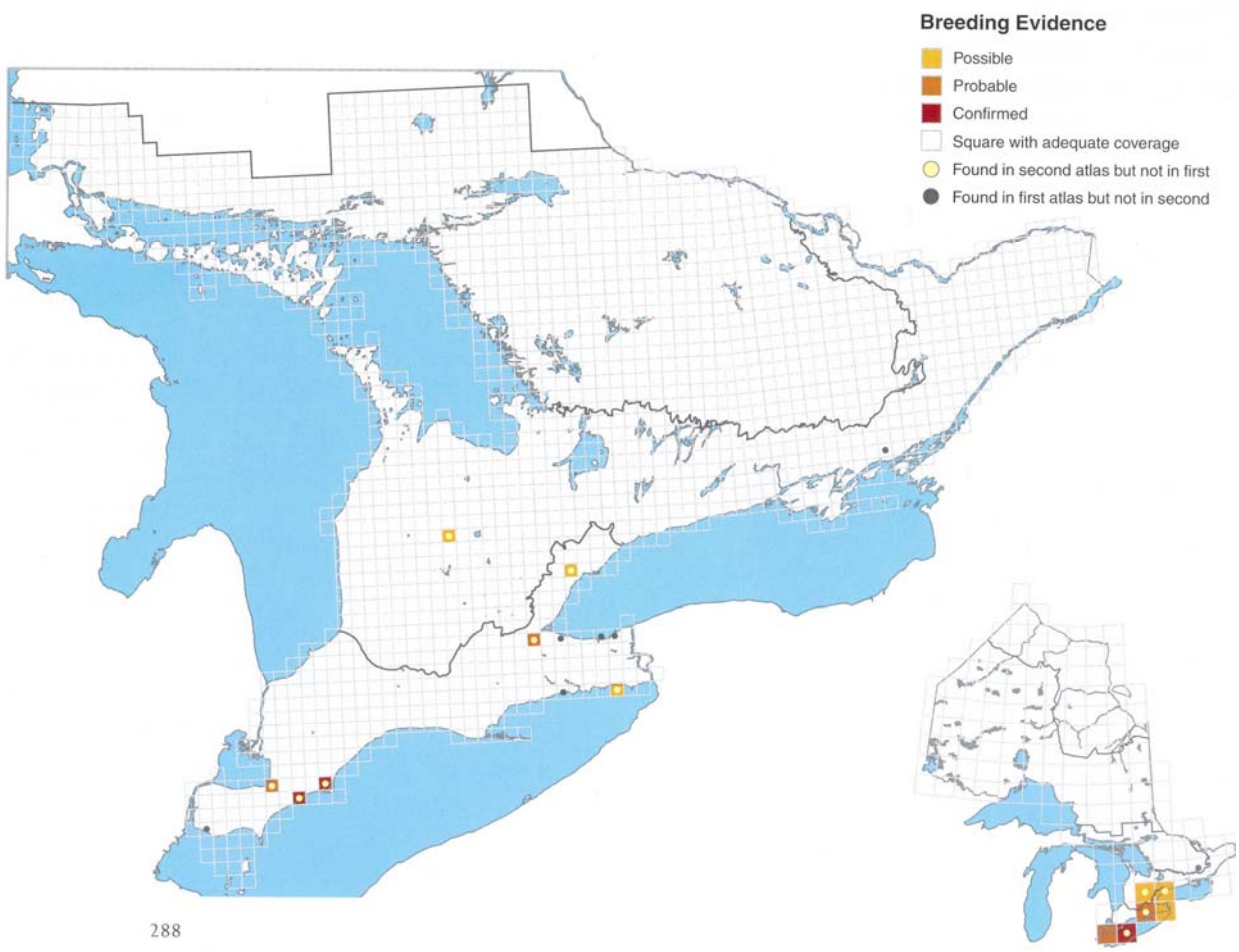

Figure 2. Barn Owl occurrence in southwestern Ontario, 2001–2005 (from Cadman et al. 2007)

The Barn Owl has been in decline throughout much of interior North America since at least the 1950s (Stewart 1980, Colvin et al. 1984, Colvin 1985). Declines in Barn Owl populations in the neighbouring Great Lakes states have probably exacerbated range retractions in Ontario. Ongoing declines of the species in the northeastern states (Colvin 1984) may have implications for the continued survival of the species in Ontario, particularly if northern populations rely on recruitment of birds that originate from farther south (immigrants).

No information has been published on recruitment rates for Barn Owls in Canada. Recruitment could occur from Ohio, Michigan, Pennsylvania and New York, because the Barn Owl in Ontario is at the northernmost edge of its range in North America and is adjacent to populations in those states. The Ohio population, although considered threatened (ODNR 2002), has been steadily increasing since a statewide nest box program was initiated in 1988 (D. Scott pers. comm. 1998). The Barn Owl Recovery Team in Ontario has attempted to duplicate this success through the installation of over 300 nest boxes since 1998 (R. Gould pers. comm. 2006); however, limited monitoring suggests that the species has not used any of these boxes. Adult Barn Owls from Ohio

may be entering Ontario around the Windsor area. Roughly 80 percent of all provincial Barn Owl sightings between 1999 and 2002 were in Essex and Kent counties, and Lambton-Middlesex directly to the north and east of Windsor.

Although sightings of individual Barn Owls have been reported, observations of active nests or paired birds in Ontario are very rare. Only three confirmed observations of breeding activity have been reported since 2001.

1.4 Needs of the Barn Owl

1.4.1 Habitat and Biological Needs

Foraging Habitat

Barn Owls are found in open country such as agricultural areas, old fields and orchards yet prefer pasture, sedge marshes and meadows (Kirk 1999). Before European settlement, Barn Owl habitat probably consisted of oak savannah adjacent to tallgrass prairie (Kirk 1999).

Diet

Across most of the North American range of the Barn Owl, its diet consists primarily of small mammals, especially voles (*Microtus* spp.) (Wallace 1948, Phillips 1951, Colvin and McLean 1986, Campbell et al. 1987). The Meadow Vole (*M. pennsylvanicus*) is the Barn Owl's preferred prey species in eastern North America, comprising between 60 and 90 percent of its diet in most years (Colvin 1984, Rosenburg 1986). When vole populations are low, Barn Owls will also prey on shrews, moles, young rats, various species of mice and occasionally birds (Cowan 1942, Giger 1965, Rudolph 1978, Colvin and McLean 1986).

Estimates of adult Barn Owl food intake range from about 50 to 150 grams per day (Marti et al. 2005), which is equivalent to one to three voles per day. It is estimated that a typical family of two adult and four young Barn Owls consumes about 1,000 rodents during the 10-week portion of the year when young are in the nest (Colvin 1985). These owls cast pellets at least once daily, which are distinctively ovoid, glossy black and about 25 by 50 millimetres in size (Burton 1973). In times of high prey density, the Barn Owl is known to cache surplus food in the nest during the early nesting stages (Wallace 1948, Marti et al. 2005), but there is no evidence of this behaviour outside the nesting season.

Barn Owls hunt most often within a couple of hours after sunset and before sunrise (Matteson and Petersen 1988, Marti et al. 2005). Unlike Great Horned Owls (*Bubo virginianus*), which hunt primarily from tall perches (e.g., trees, telephone poles), the Barn Owl hunts primarily on the wing in moth-like cruising flights close to the ground and from low perches (Bunn et al. 1982). The mechanics of its long wings make the

Barn Owl particularly efficient at hunting; it is able to hover and glide, as well as plunge quickly through the air (Campbell and Campbell 1984 citing Harte 1954, Clark 1971, Bunn et al. 1982).

Nest Sites

Nest sites of Barn Owls are associated with foraging areas (Campbell and Campbell 1984), although these birds tend not to feed in or near the structure that houses the nest. Barn Owls are known to nest in both natural and human-made structures (Campbell and Campbell 1984 citing Johnson 1974, Peck and James 1983, Campbell and Campbell 1984, Andrusiak and Cheng 1997, Ramsden 1998, Kirk 1999). It should be noted that nests in human-made features are much more likely to be reported and/or located than natural nests.

Natural nests are commonly situated in naturally formed cavities in large, hollow trees and in hollows in the faces of cliffs and riverbanks (Kirk 1999). These nests are large and fairly deep; the cavity entrance must be at least 15 centimetres in diameter and situated at an average height of 4.6 metres above the ground (Bunn et al. 1982). Barn Owls do not gather nesting material, but most females arrange a circular depression of shredded pellets as a nest (Marti et al. 2005).

In Canada, farm buildings and other human-made structures may be important for Barn Owl nesting and roosting, as they provide shelter from the elements and may aid in heat retention (Campbell and Campbell 1984 citing Johnson 1974, Andrusiak and Cheng 1997). The species also favours nest boxes and a great variety of human-made structures (e.g., barns, silos, bridges, belfries, warehouses, unused chimneys, hay stacks) in many areas (e.g., Hegdal and Blaskiewicz 1984, Kirk 1999) and uses traditional wooden barns as nest sites much more frequently than modern steel structures (Campbell and Campbell 1984, Ramsden 1998). In addition, prior to the 1950s, when most farmers owned a small amount of livestock for their own use, roosting Barn Owls may have benefited from the heat farm animals create in barns during the winter months (K. McKeever pers. comm. 1998). It is unknown whether Barn Owls successfully overwinter in Ontario at the present time.

The Barn Owl's North American breeding range and its poorly insulated body indicate that the species requires a relatively warm climate to survive (Keith 1964, Johnson 1974, Marti 1997, Massemin and Handrich 1997, Marti et al. 2005).

Overview of Life Cycle

Barn Owls can breed within their first year, though more than 90 percent do not breed until their second year (Marti 1997, Marti et al. 2005). They may breed during spring, summer or fall, and can have multiple clutches in a single year when conditions are favourable (Campbell and Campbell 1984, Stewart 1952, R. Gould pers. comm. 2009). Both clutch and brood size are associated with breeding season and availability of prey (Campbell and Campbell 1984). Breeding may be irregular from year to year (Campbell

and Campbell 1984), and the Barn Owl may not breed during a breeding season when food is scarce (Campbell and Campbell 1984 citing Wallace 1948).

Barn Owls breed as single pairs or in loose colonies of up to 90 pairs (Campbell and Campbell 1984 citing Reese 1972, Smith et al. 1972, Smith et al. 1974, and Rudolph 1978); however, there are no known colonies in Canada (Campbell and Campbell 1984).

1.4.2 Ecological Role

Due to their reliance on grassland-related prey species, Barn Owls may be an indicator of healthy, extensive grassland habitats. Individual birds or families probably have an impact on rodent numbers in localized areas.

1.5 Limiting Factors

Climate Factors

Barn Owls are poorly adapted to cold climates. Their feathers are less insulating than those of other owls, their legs are only sparsely feathered, they have less insulating adipose tissue and they have a higher metabolic rate than that of most other owl species. Combined, all of these characteristics make the species vulnerable to starvation during extremely cold winters and during extended periods of deep snow cover (which reduces hunting success) (Keith 1964, Johnson 1974, Marti 1997, Massemin and Handrich 1997, Marti et al. 2005). Persistent snow cover and cold temperatures can also significantly delay onset of the breeding season and reduce the number and success of breeding attempts (Marti and Wagner 1985, Marti 1997).

In southern British Columbia, Barn Owl productivity declined and mortality increased within a single year due to particularly harsh winter conditions (Andrusiak and Cheng 1997). A series of hard winters could likely have long-lasting impacts on Barn Owl populations across very large regions, making population rebound more difficult (Andrusiak and Cheng 1997).

Winter conditions in the Lake Erie region are harsher than those in British Columbia (table 1). Southern Ontario is obviously a climatologically challenging environment for Barn Owls.

Table 1. Comparison of average January conditions between 1971 and 2000 for London and Windsor, Ontario, and Vancouver, British Columbia (Environment Canada 2009)

	Daily Temperature	Days with Snowfall	Monthly Snowfall	Average Snow Depth	Month-end Snow Depth	Number of Days with Wind Chill below –20°C
London, Ontario	−6.3°C	21 days	52.6 cm	11 cm	13 cm	10 days
Windsor, Ontario	−4.4°C	15 days	35 cm	5 cm	4 cm	7.5 days
Vancouver, British Columbia	+3.3°C	5.5 days	16.6 cm	1 cm	0 cm	0 days

Population Density

Since Barn Owls in Ontario are at the northern extent of their range, population density is a factor in mate location and subsequent breeding success. Young Barn Owls have shown considerable dispersal ability and strong colonization potential; banded owls are often recovered hundreds of kilometres from their nest site (Stewart 1952, R. Gould pers. comm. 2006). In areas throughout their range where Barn Owls are considered common, breeding densities may be as low as 2 to 5 pairs per 10 square kilometres (Sharrock 1976, Taylor *et al*. 1988) and as high as 10 to 30 pairs per 10 square kilometres (Rebane and Andrews 1995). If the Ontario population is as rare as is believed, the probability is low that adults occurring here will locate a mate; however, with the creation and/or enhancement of favourable habitat, population increase and expansion in the southern part of the province may be possible.

Sibling Competition

Various forms of sibling competition have been observed among Barn Owl broods, including sibling cannibalism in the nest (Hawbecker 1945), but the frequency with which this occurs in Ontario is not currently known. Barn Owl chicks compete for food through inter-sibling vocalizations, and older and stronger siblings often out-compete younger hatchlings for food (Roulin 2001), contributing to very low survival and recruitment (Stewart 1952).

1.6 Threats

Loss of Availability of Habitat, Prey and Nesting Sites

Wherever the Barn Owl is in decline in Europe and North America, the chief cause is habitat loss resulting from changing agricultural practices (e.g., Bunn et al. 1982, Colvin 1984 and 1985, Matteson and Petersen 1988, Marti et al. 2005). These changes include the replacement of traditional wooden farm buildings with modern steel structures and the conversion of hayfields, grasslands, wetlands and pastures to intensive, large-scale, row crop operations that reduce rodent populations (Colvin 1984).

Before the large-scale mechanization of farm equipment and grain storage, corn and grain on individual farms were kept in corn cribs, granaries and silos. Also, most farm operations of that era had at least some livestock, which necessitated keeping corn and grain on the farm for feed, as well as sizeable amounts of hay and straw. Even small orchards were often present, along with longer grass associated with these orchards. This was all ideal mouse habitat, and stored grains were probably a supplementary food source for Barn Owls during times of heavy snow cover. The scale of farming has gradually changed to larger operations typically without livestock and therefore without pastureland, hay and straw, and with corn and grain storage in well-sealed structures at central depots.

In nearby Ohio, a study conducted in the early 1980s found a correlation between Barn Owl declines and reduction in livestock production (especially sheep farming) and associated pastureland acreage (Colvin 1984 and 1985). Associated with these decreases was an increase in production acreage of row crops (e.g., corn, soybeans). The trend was indicative of a general pattern of replacement of grassland-dominated types of agriculture with large-scale monoculture farming practices. A similar trend has occurred in Ontario. For example, by 1981, the acreage of pastureland in Ontario had decreased to 69 percent of that in 1971, while acreages of row crops such as corn and soybeans had increased almost twofold from 1971 levels (OMAFRA 1996). By 2001, acreage of pastureland in Ontario had decreased to 82 percent of that in 1991 and cropland had increased by 7 percent (McGee 2002).

Meadow Voles, the preferred prey of Barn Owls in Ontario, typically occupy habitats such as wet meadows, wetland edges, tallgrass prairie, abandoned farmland, pastureland and grassy hayfields (Birney et al. 1976). There is a direct negative correlation between increased acreage of intensive agriculture and vole populations (Colvin 1985). It is logical, then, that as favourable habitat for the Meadow Vole is lost, its populations, and consequently those of the Barn Owl, decline.

Barn Owl productivity is closely linked to prey availability (Colvin 1985, Rosenburg 1992). Meadow Vole populations are highly cyclical, with explosions and declines, usually over three- to five-year periods. In peak years, Meadow Vole densities may reach 370 individuals per hectare as compared with 40 to 110 individuals per hectare in average years. Under adverse conditions (i.e., dry summers or prolonged cool, rainy springs), populations can drop well below average numbers (Johnson and Johnson 1982). In years of low Meadow Vole numbers, Barn Owl productivity can drop dramatically (Colvin 1985); however, local Barn Owl populations are seemingly able to recover rapidly in subsequent years as vole populations recover (Colvin 1985, Rosenburg 1992).

There has been some debate on the importance of nest site availability to Barn Owl populations (Matteson and Petersen 1988). The availability of nest sites is probably a limiting factor for the Barn Owl (Bunn et al. 1982) in some regions where intensive agriculture has gradually replaced more pastoral farming, and old wooden-sided barns, representing potential nest sites, have been replaced by steel barn structures.

Furthermore, woodlots containing natural nest sites (e.g., snags) have all but disappeared.

Predation

Tree cavities in which Barn Owls nest undoubtedly offer some protection from avian nest predators (Nice 1954). The literature reports few incidences of Barn Owl nest depredation, but losses of nestlings and eggs are believed to be mostly due to predation by the Virginia Opossum (*Didelphis virginiana*), Northern Raccoon (*Procyon lotor*), snakes and farm cats (Campbell and Campbell 1984, Matteson and Petersen 1988, Marti et al. 2005). Predation by Great Horned Owls is also known to contribute to the mortality of juvenile and adult Barn Owls in the region (R. Gould pers. comm. 2006).

Competing Species

Recent field observations in southern Ontario by the Ontario Barn Owl Recovery Team indicate that Red Squirrel (*Tamiasciurus hudsonicus)* and Eastern Gray Squirrel (*Sciurus carolinensis*), Virginia Opossum and Northern Raccoon probably compete with Barn Owls for natural cavity nest sites. European Starlings (*Sturnus vulgaris*) and Rock Pigeons (*Columba livia*) have frequently used Barn Owl nest boxes in Ohio and Ontario; however, Barn Owls will evict these species (D. Scott pers. comm. 1998). The recovery team has also documented American Kestrels (*Falco sparverius*) nesting in Barn Owl nest boxes and found evidence of Eastern Screech-Owls (*Megascops asio*) using the boxes for roosting.

The Barn Owl's chief avian competitors for voles and mice in southern Ontario are the Great Horned Owl, Red-tailed Hawk (*Buteo jamaicensis*), Northern Harrier (*Circus cyaneus*), and American Kestrel, as well as wintering Short-eared Owls (*Asio flammeus*) in some regions (McCracken 1998). Red Fox (*Vulpes vulpes*), Coyote (*Canis latrans*), cats, dogs and snakes also feed on small rodents. Although not documented, competition for food is apt to be strong only during winters when rodent populations are low and/or snow cover is deep. Under most conditions, interspecific competition for food is not a significant limiting factor.

The Ontario Barn Owl Recovery Team found Raccoon scat at more than 90 percent of the 240 barns surveyed in southern Ontario during nest box installation efforts from 1997 to 2002, and feral cats were at a majority of such sites. The presence of these predators at a nest site, or potential nest site, is an obvious threat and may serve as a deterrent to Barn Owl breeding in barns.

Disturbance and Harassment

Although Barn Owls, because of their close association with humans, are quite tolerant of activity near their nest sites, disturbance should be kept to a minimum during the nesting season to help prevent nest abandonment (Klaas et al. 1978, Hegdal and

Blaskiewicz 1984). Often Barn Owls will desert their nest if disturbed during the egg-laying or incubation phase (Andrusiak and Cheng 1997).

Road Mortality

In areas of high road density, road mortality is a major contributor to poor survivorship of Barn Owls (Smith and Marti 1976, Baudvin 1997, Newton et al. 1997). In France, 700 of nearly 1,600 dead birds picked up on roads were Barn Owls (Baudvin 1997). In a 23-year study of the mortality of over 1,100 Barn Owls in Britain, approximately 45 percent of deaths were attributed to collisions with motor vehicles, the most frequent cause of death (Newton et al. 1997).

This species is much more prone to being killed by motor vehicles than any other species of owl in France due to differences in habitat selection and foraging height (Massemin et al. 1998). In Iowa, telemetry revealed that many Barn Owls spend time along grassy roadside ditches where adjacent fence posts provide low perches from which to hunt. In that study, of 24 radio-tagged Barn Owls, 17 percent (4 individuals) died due to collisions with vehicles (Ehresman et al. 1988). In Ontario, 9 (or 35%) of the 26 sightings reported between 1999 and 2006 were of owls that collided with motor vehicles and airplanes or of owls observed in the headlight range of vehicles (R. Gould pers. comm. 2006). These observations suggest that road mortality may be a significant threat to the species in Ontario.

Use of Rodenticides

Rodenticide use around farmsteads may have an impact on the species, although poisoning from rodenticides has not been documented to any great extent in Barn Owls in North America. In Britain, poisonings were implicated in about 6 percent of Barn Owl deaths over a 23-year period (Newton et al. 1997). The higher toxicity and greater persistence of newer rodenticides (many of which are powerful anticoagulants that have largely replaced warfarin to control rodents) pose greater risks of secondary poisoning to Barn Owls. Most telemetry studies of Barn Owls in North America, however, indicate that Barn Owls tend to forage away from farmsteads and farm structures where rodenticides are normally used (Colvin 1984). The extent of secondary poisoning among Barn Owl populations in Ontario is not known.

Shooting

As was formerly the case for all raptors, deliberate shooting of Barn Owls was once a fairly common occurrence (see Campbell and Campbell 1984). In Ohio, about 200 Barn Owls were shot in 1917 alone (Earl 1934). In Britain, shooting accounted for 1 percent of documented Barn Owl deaths during the period from 1963 to 1996 (Newton et al. 1997). Due to public education and legal restrictions, shooting of raptors has undoubtedly declined in recent decades but may still occur occasionally, although it is unlikely to be reported.

Incidence of Disease or Pests

Several protozoan blood parasites (e.g., *Haemoproteus*, *Leucocytozoon* and *Trypanosoma*), an intestinal protozoan parasite (*Sarcocystis*), three species of lice (*Kurodaia subpachygaster* and *Strigiphilus aitkeni* and *S. rostratus*) and a parasitic fly (*Carnus hemapterus*) are known to infest Barn Owl chicks and adults (Marti et al. 2005). Whether these diseases can affect a population on their own, or only in combination with other stressors, is not known.

1.7 Recovery Actions Completed or Under Way

The Ontario Barn Owl Recovery Team was formed in October 1997 to address conservation and recovery needs for the Barn Owl in Ontario. The team consists of representatives from both Ontario provincial and federal government agencies, naturalist groups, land stewardship groups, fish and game clubs, a raptor conservatory, a conservation authority and a non-governmental bird conservation organization.

The recovery team has been active in a number of areas and has launched or completed the following initiatives intended to meet the goals and objectives of the recovery strategy for the Barn Owl in Ontario:

- **Nest box program** – The Ontario Barn Owl Recovery Team has implemented a Barn Owl nest box program in southern Ontario since 1997. To date, over 300 nest boxes have been built and installed in barns and silos in rural areas adjacent to grasslands, pastures and hayfields. Volunteers, including farmers and rural landowners, monitor and report on nest box activity on their property. The recovery team is maintaining a database of nest box locations, including global positioning system (GPS) coordinates for them, in partnership with the Aylmer District Ontario Ministry of Natural Resources. At this time, it is unknown how successful the nest box program is, as monitoring has been a limiting factor in determining its success. No success has been documented in those boxes that were monitored.
- **Sightings database** – The Ontario Barn Owl Recovery Team maintains a database of historical and recent Barn Owl sightings and forwards confirmed reports to the Natural Heritage Information Centre (NHIC).
- **Fact sheets** – Several information sheets have been developed for landowners and other interested parties, including *The Barn Owl in Ontario: Commonly Asked Questions for Landowners*; *Rodent Management on Farms to Prevent Accidental Poisoning of Raptors and Other Non-Target Wildlife;* and *A Stewardship Guide to Grasslands in Southern Ontario: An Introduction for Farmers and Rural Landowners* (800 copies produced in 2005).
- **Workshops** – In late 1999, two information workshops were held (one in Norfolk County and one in Haldimand County) for rural landowners, farmers who have nest boxes on their property and other interested members of the public. Over 100 people attended.

- **Grassland inventory** – The Southern Ontario Grasslands Inventory Project was initiated in partnership with the Ontario Ministry of Natural Resources in 2001. The purpose of the project was to identify and map rough grasslands, abandoned farmland, pastureland and hayfield concentrations along the north shore of Lake Erie. The data from this inventory will enable the recovery team to focus its efforts on identified priority sites (i.e., sites that best meet Barn Owl habitat requirements). It is expected that a number of other recovery groups (i.e., recovery teams, recovery implementation groups), conservation organizations and government agencies will also find these maps useful for their conservation efforts.
- **Presentations** – Between 2001 and 2005, as part of an education program about Barn Owls, 25 presentations and seminars on Barn Owls, their grassland habitats and recovery efforts were delivered to public audiences and interest groups (e.g., schools, conservation organizations, naturalist clubs, hunt clubs) across southern Ontario.
- **Website** – Bird Studies Canada (BSC) and its partner organizations created a website (http://www.bsc-eoc.org/regional/barnowl.html) to provide information on Barn Owls, nest box plans and installation suggestions.
- **Newsletter** – The annual newsletter *The Grasslands Flyer* (Solymár 2001, 2002, 2003, 2004, 2005) was produced and was mailed annually from 2001 to 2005 to nest box owners, government agencies and non-governmental organizations in southern Ontario.
- **Grasslands forum** – In September 2003, a Grassroots for Grasslands forum, which representatives from 20 non-governmental and government organizations attended, was hosted in Port Rowan, Ontario. The focus of this forum was to share strategic and technical information on the protection and recovery of a suite of grassland habitats and related flora and fauna. As a result, the Ontario Barn Owl Recovery Team has learned from other regions about successful grassland restoration and research techniques they have used.
- **Posters** – Three educational posters have been developed. A poster, *Wanted! Information on Barn Owls*, was distributed to naturalist and conservation organizations across southern Ontario and was posted in agricultural co-ops, hardware stores and other public locations. This poster provided a contact number and invited people who had information on Barn Owl sightings or nesting locations to call. The other two education posters, *Grasslands Fauna of Ontario* and *Grasslands Flora of Ontario*, were distributed to over 750 schools in southern Ontario, provincial parks, conservation areas, naturalist groups and other educational institutions.

1.8 Knowledge Gaps

Several gaps in our knowledge of the Barn Owl must be overcome to further develop specific actions to promote recovery of this species in Ontario (table 2). The thresholds of habitat quantity and quality needed to sustain individuals and breeding pairs with young are largely unknown. Owing to the scarcity of reports about this species, the

current range and number of Barn Owls, as well as the number needed to maintain sustainable populations, are not well understood. Although single individuals and evidence of breeding have been observed in recent years, the level of recruitment in and sources of recruitment to populations in Ontario are unknown. The potential effects of pesticide/rodenticide use in rural environments on prey populations and of bioaccumulation of toxins in Barn Owls are also unknown. A better understanding of small rodent population cycles is needed to more clearly understand Barn Owl population fluctuations. All these factors must be better understood to ensure that prescribed recovery methodologies and targets will be successful.

Table 2. Summary of knowledge gaps relating to Barn Owl recovery in Ontario

Subject Area	Gap	Value of Research
Distribution, abundance and population trends	Current Ontario population	To inform recovery efforts
	Population density	To inform recovery efforts
	Minimum viable population	To inform recovery efforts (relating to population target) To inform future status evaluations and designations
	Sources of recruitment	To contribute to understanding of influences on the Barn Owl population in Ontario, as part of a possible northern metapopulation (as suggested by Laycock 1985)
Habitat needs	Size of foraging habitat	To inform grassland protection and restoration initiatives
	Prey population density	To inform grassland protection and restoration initiatives
	Habitat requirements needed to support a pair of Barn Owls	To inform recovery efforts through habitat protection and restoration
	Distribution and status assessment of available habitat	To inform the selection of priority areas for conservation and management
Threats to survival and recovery	Effects of pesticides and rodenticides	To determine the individual biological effects of pesticides and rodenticides on Barn Owls
	Impact of pesticides and rodenticides	To inform management practices
Species biology	Territoriality	To inform recovery efforts regarding Barn Owl behaviour and area requirements
	Ecological role of Barn Owls in tallgrass prairie and agricultural ecosystems	To inform recovery efforts regarding Barn Owl response and tolerances to varying management regimes

2.0 RECOVERY

2.1 Recovery Goal

The recovery goal is to conserve, protect and restore the eastern population of the Barn Owl and the grassland habitat it depends on in Ontario. Evidence indicates that both loss and fragmentation of suitable habitat have resulted in the near extirpation of the eastern population of the Barn Owl in Ontario. As a result, the recovery goal to restore a stable, naturally sustainable (i.e. self-sustaining) population must recognize the species' dependence on the availability of grasslands and related prey.

2.2 Protection and Recovery Objectives

The population and distribution objectives are to restore a naturally reproductive and sustainable eastern population of Barn Owls within suitable climate ranges in Ontario. Table 3 shows the objectives that have been identified for achieving the recovery goal.

Table 3. Protection and recovery objectives

No.	Protection or Recovery Objective
1.	Assist with the assessment of the status of the Barn Owl population in Ontario by providing information to the Committee on the Status of Species at Risk in Ontario (COSSARO) on current distribution, abundance and trends.
2.	Increase availability of nest sites.
3.	Identify, protect, restore and improve conservation of suitable habitat and its functionality.
4.	Develop public awareness and support for Barn Owls and grassland habitat.

These objectives were developed to be initiated within five years and to continue for the long term.

2.3 Approaches to Recovery

In view of the goal and objectives for the recovery of the Barn Owl in Ontario, the broad strategies identified in table 4 are recommended to address the threats to this species.

Table 4. Approaches to the recovery of the Barn Owl in Ontario

Priority	Objective Number	Threats Addressed	Recovery Theme	Approach to Recovery
Urgent	1	• All	Population monitoring	• Develop an action response protocol for Barn Owl sightings and/or reports of active nest sites, and a population monitoring protocol • Maintain a central database of all sightings reports, site visits or survey results, and nesting site locations, and share it with the NHIC, BSC, the Royal Ontario Museum, and Environment Canada, Canadian Wildlife Service – Ontario • Produce annual reports summarizing information gained through Barn Owl action response and population monitoring protocols • Consult with other jurisdictions to share relevant information, and encourage cooperative programs
Urgent	1, 3	• All	Threat monitoring	• Explore the effects of factors limiting recovery (e.g., predators, use of rodenticides, road mortality) and possible mitigation
Urgent	3	• Loss of habitat, nest sites and prey availability • Nest depredation • Disturbance and harassment • Use of pesticides and rodenticides	Research	• Develop volunteer-supported grassland indicator species surveys and reporting systems, such as a Barn Owl sightings hotline and an NHIC tracking database, to assess the health of southern Ontario grasslands • Complete the grasslands inventory for the Lake Erie/southern Ontario region, and produce a map • Investigate the need to expand the inventory to other areas throughout the Barn Owl's historical range • Develop an evaluation system (i.e., set of criteria, methodology) to determine grassland habitat suitable for Barn Owls, to assist in legal and policy protection • Identify priority sites for conservation, restoration and protection efforts • Investigate the tolerance level of Barn Owls to winter severity
Urgent	3	• Loss of habitat and prey availability	Habitat securement and restoration	• Promote and monitor efforts to protect, restore and conserve habitats for the Barn Owl • Explore economic and environmental benefits of grassland habitat • Explore concepts such as incentives, land trusts and conservation easements to secure habitat
Urgent	1, 3	• Loss of habitat, nest	Communication and coordination	• Establish lines of communication with grassland and grassland species recovery teams, conservation organizations,

Priority	Objective Number	Threats Addressed	Recovery Theme	Approach to Recovery
		sites and prey availability • Nest depredation • Disturbance and harassment • Road mortality • Use of pesticides and rodenticides • Shooting		government, the private sector, rural landowners and farmers • Promote land trusts and conservation easements to secure habitat • Approach landowners of priority sites regarding the establishment of grassland reserves • Provide information on the Conservation Land Tax Incentive Program, Species at Risk Stewardship Fund and Species at Risk Farm Incentive Program to interested landowners • Identify, demonstrate and promote sustainable grassland management practices, and engage landowners and farmers in these practices • Provide rural landowners and farmers with contact information for funding agencies, organizations with expertise in grassland conservation, and sources of information about grassland species and habitat • Promote awareness of legal protection of Barn Owls under the ESA 2007
Necessary	1, 2, 3, 4	• All	Stewardship	• Develop, produce and distribute information pamphlets and reporting fact sheets to communicate protection, conservation and reporting messages to target audiences (i.e., farmers, rural landowners, the public) • Develop a best management practices information booklet for landowners who have Barn Owl nesting or roosting sites on their property • Provide presentations that include a live Barn Owl to school groups, conservation groups and the public • Maintain the existing Bird's Studies Canada Barn Owl website • Continue to produce the annual *Grasslands Flyer* newsletter • Publicize via the media the status and plight of the Barn Owl, other grassland species and grasslands
Beneficial	1, 2, 4	• Loss of habitat, nest sites and prey availability • Nest depredation	Maintenance of nest box installation and monitoring	• Continue to evaluate areas of potential Barn Owl habitat, and promote installation of nest boxes in barns and silos in these areas through the website and directed outreach • Conduct periodic monitoring of nest boxes to study their use by Barn Owls and potentially competing species

2.4 Performance Measures

Performance measures include the extent to which recovery goals and objectives have been met. Specific measures are detailed in table 5.

Table 5. Performance measures for evaluating recovery success

Recovery Objective	Performance Measures
1. Assist with the assessment of the status of the Barn Owl population in Ontario by providing information to COSSARO on current distribution, abundance and trends.	• Population and habitat monitoring protocol finalized • Action response protocol for sightings and active nests finalized • Baseline data and accurate, extensive, current data collected to inform future species status evaluations and designation • An up-to-date database of Barn Owl records in Ontario completed and maintained • Knowledge collected of Barn Owl biology, habitat requirements and causes of mortality
2. Increase availability of nest sites.	• Installation of nest boxes in areas evaluated as suitable habitat increased to one box per every 200–800 ha, depending on the presence of other suitable cavities • Participation in the nest box program increased by 10 landowners in each county known to support current or historical breeding pairs (if suitable habitat exists) • Improperly installed nest boxes in identified habitat areas replaced
3. Identify, protect, restore and improve conservation of suitable habitat and its functionality.	• An evaluation system to determine grassland functional quality and habitat suitable for Barn Owl finalized • First round of standardized rodent surveys in known and potential habitat completed, and surveys repeated every three to five years • Annual volunteer-supported grassland indicator species surveys and reporting systems finalized for assessment of grassland health • Nesting and roosting sites monitored to study habitat use and foraging range of the species in Ontario; ranges and related habitat areas identified • Securement and/or stewardship of priority sites initiated • Landowners of all active nest or roosting sites informed of provincial funding programs (e.g., Conservation Land Tax Incentive Program, Species at Risk Stewardship Fund, Species at Risk Farm Incentive Program) and federal funding programs (e.g., Habitat Stewardship Program, Aboriginal Capacity Building Fund, Aboriginal Critical Habitat Protection Fund)
4. Develop public awareness and support for Barn Owls and grassland habitat.	• Best management practices information booklet developed for landowners who have Barn Owl nesting or roosting sites on their property • Annual *Grasslands Flyer* newsletter produced • Communications strategy developed and implemented

2.5 Area for Consideration in Developing a Habitat Regulation

Under the ESA 2007, a recovery strategy must include a recommendation to the Minister of Natural Resources on the area that should be considered in developing a habitat regulation. A habitat regulation is a legal instrument that prescribes an area that will be protected as the habitat of the species. The recommendation provided below by the author will be one of many sources considered by the Minister when developing the habitat regulation for this species.

The Barn Owl is predominantly a bird of open country, favouring rough grasslands, pastures, hayfields, shallow marshes, field edges and hedgerows, wetland edges and other open grassy habitats that support adequate populations of voles and mice. Barn Owls will also occupy rural residential and even industrial areas, as well as nest around farms, wherever vole populations are plentiful (Birney et al. 1976, Hegdal and Blaskiewicz 1984, Colvin 1985).

Nesting Locations

It has been determined that Barn Owls depend on both natural and human-made nesting cavities for rearing of young (Campbell and Campbell 1984 citing Johnson 1974, Peck and James 1983, Campbell and Campbell 1984, Hegdal and Blaskiewicz 1984, Andrusiak and Cheng 1997, Ramsden 1998, Kirk 1999). The recovery team recommends that since nesting cavities and the feature or structure in which they occur, either natural or human-made, are critical to the survival of individuals and/or populations of the species, they should be prescribed as habitat in the habitat regulation. Figure 2 shows confirmed nesting occurrences in southern Ontario.

Roosting Locations

Considering that population density probably limits Barn Owl nesting in Ontario, the recovery team has also noted, through monitoring of Barn Owl reports in the province, that habitually used roosting sites of unpaired birds are likely to occur in areas of suitable breeding habitat. During a typical breeding season, unpaired individuals would probably use these roosting sites for nesting if mates were available. Roosting cavities, which provide shelter from the elements and predators, are important to the survival of individuals of the species (Campbell and Campbell 1984 citing Johnson 1974, Andrusiak and Cheng 1997). Therefore, it is recommended that regularly used roosting sites and the feature or structure in which they occur, either natural or human-made, should be prescribed as habitat in the habitat regulation.

Foraging Areas

Limited information has been published concerning the habitat requirements to support a pair of Barn Owls in northeastern North America, but site selection and success of Barn Owl nests are known to depend on the availability of prey and foraging habitat

(Campbell and Campbell 1984). The presence and function of foraging habitats within a Barn Owl nesting range are as critical for nesting as the presence of suitable nesting cavities.

Available scientific literature, including studies from Virginia, Texas and New Jersey, indicate that Barn Owls maintain a foraging range of between 308 and 953 hectares around the nest site, and that nest success depends directly on prey availability within this foraging range (Taylor 1994). Since Barn Owl foraging ranges can be highly variable in their size and shape (e.g., circular, elliptical or linear) and can include use of linear edge habitats up to 26.2 kilometres away from the actual nest (Taylor 1994), foraging habitats should be identified and their functional quality and suitability for the Barn Owl be assessed through monitoring on a site by site basis, rather than within a standard radial distance from the nest site.

Given that Barn Owl nesting success is highly dependent on the availability of suitable foraging habitat near a Barn Owl nest, the recovery team recommends that foraging areas identified through monitoring as being used by breeding Barn Owls be prescribed as habitat in the habitat regulation. Foraging habitat may be natural vegetation communities such as meadows, old fields, marshland or woodland edges, or areas of managed vegetation such as pasture, forage crops, drain banks and roadsides.

2.6 Existing and Recommended Approaches to Habitat Protection

Approaches for habitat protection to date have included promotion of grassland conservation and restoration to rural landowners, as well as outreach to encourage people to report Barn Owl sightings, on which to base habitat studies. The stewardship approach needs to be expanded to maintain sufficient habitat areas to recover Barn Owls in Ontario. Legal protection of habitat under the ESA 2007 provides an important tool for maintaining the species at known locations but may affect the number of Barn Owl sightings reported on private lands. Regulatory protection should be used in conjunction with stewardship approaches and incentives such as the Conservation Land Tax Incentive Program.

Specific habitat management and protection targets (e.g., size and quantity of habitat, priority sites) and requirements (e.g., successional stages, prey density) to direct and measure stewardship activities are yet to be determined, but habitat areas protected under the ESA 2007 should be identified on a site by site basis through monitoring. Mapping initiatives should be supported to complete a consistent and standardized inventory of grasslands/open habitats that can be used to target suitable habitat and potential foraging areas for monitoring. The first draft of the Ontario Barn Owl recovery plan (McCracken 1998) indicated a stewardship target of creating 400 hectares of grassland habitat over five years. This initial effort must be considered only as a localized starting point. Larger tracts of suitable habitat are required for this species to persist. In particular, contiguous grassland habitat with connecting corridors and plant diversity, spread throughout the historical range of this species in Ontario (primarily

along the north shore of Lake Erie), will be necessary to take into account the foraging, territorial and dispersal needs of the Barn Owl at a population recovery level. To best manage restoration, however, it is appropriate to determine and measure quantitative targets specific to local landscape scenarios and capacities.

Habitat management and protection that will benefit the Barn Owl over the long term will require a substantial and ongoing commitment on the part of landowners, private industry with rural land holdings, and the provincial government. Compared with other kinds of habitat (e.g., forests and marshes), however, areas of rough grassland (i.e., planted or naturally occurring areas of early successional habitat that are not aggressively maintained or managed) are relatively easy and inexpensive to create and maintain. Moreover, areas of rough grassland can easily be converted back to productive farmland, preferably under a suitable schedule of rotation.

The challenge in southern Ontario, an area of highly intensive agriculture, will be to raise appreciation for and awareness of grassland habitat and biodiversity. To accomplish this, partnerships with farmers and rural landowners, as well as government (regarding public lands), are required to remove marginal farmlands from agricultural use and implement best management strategies. These may include grassed field edges, grassy buffers along ponds and waterways, and minimal use of rodenticides on farms. An opportunity also exists to explore partnerships and linkages with those involved in conserving and restoring tallgrass prairies and oak savannahs.

The ESA 2007 protects the Barn Owl and also provides the means to protect habitat for this species through a regulation. If a habitat regulation is not developed for the Barn Owl, then its habitat will be protected under the general habitat provisions of the ESA 2007 as of June 30, 2013. Currently, “significant habitat” of the Barn Owl in Ontario is also protected from development under Ontario’s *Planning Act* through application of the Provincial Policy Statement. The species is also protected on federal lands under the federal *Species at Risk Act.*

2.7 Effects on Other Species

Negative impacts on other native species are not anticipated as a result of the completion of these recovery activities. The creation and maintenance of grassland habitat would undoubtedly benefit other wildlife species, including a host of grassland-dependent birds, nesting waterfowl and upland game, by providing habitat and natural erosion control and, in some cases, acting as a precursor to reforestation efforts. Any research and monitoring activities should be structured in such a way that they do not result in any modifications or damage to the site or its resident biota. The effects of the proposed recovery activities should be monitored to ensure that they result in tangible, positive benefits.

GLOSSARY

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The committee responsible for assessing and classifying species at risk in Canada.

Committee on the Status of Species at Risk in Ontario (COSSARO): The committee established under section 3 of the *Endangered Species Act, 2007* that is responsible for assessing and classifying species at risk in Ontario.

Conservation status rank: A rank assigned to a species or ecological community that primarily conveys the degree of rarity of the species or community at the global (G), national (N) or subnational (S) level. These ranks, termed G-rank, N-rank and S-rank, are not legal designations. The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by the letter G, N or S reflecting the appropriate geographic scale of the assessment. The numbers mean the following:

1 = critically imperilled
2 = imperilled
3 = vulnerable
4 = apparently secure
5 = secure

Endangered Species Act, 2007 (ESA 2007): The provincial legislation that provides protection to species at risk in Ontario.

Species at Risk Act (SARA): The federal legislation that provides protection to species at risk in Canada. This act establishes Schedule 1 as the legal list of wildlife species at risk to which the SARA provisions apply. Schedules 2 and 3 contain lists of species that at the time the act came into force needed to be reassessed. After species on Schedule 2 and 3 are reassessed and found to be at risk, they undergo the SARA listing process to be included in Schedule 1.

Species at Risk in Ontario (SARO) List: The regulation made under section 7 of the *Endangered Species Act, 2007* that provides the official status classification of species at risk in Ontario. This list was first published in 2004 as a policy and became a regulation in 2008.

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Authorities Consulted

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APPENDIX: SUBNATIONAL RANKS FOR THE BARN OWL IN NORTH AMERICA
(NatureServe 2008)

S Rank	State/province
S1 – Critically imperilled	District of Columbia, Michigan, Montana, Ontario
S1B – Critically imperilled breeder	Iowa
S1B, S1N – Critically imperilled breeder, critically imperilled non-breeder	Rhode Island, Vermont, Wisconsin
S1S2 – Critically imperilled to imperilled	Illinois, New York
S2 – Imperilled	Connecticut, Indiana, Ohio, Wyoming
S2B – Imperilled breeder	South Dakota
S2B, S2N– Imperilled breeder, imperilled non-breeder	Massachusetts, West Virginia
S2B, S3N – Imperilled breeder, vulnerable non-breeder	Arkansas
S3 – Vulnerable	Alabama, Delaware, Kansas, Kentucky, Maryland, Mississippi, Missouri, Nebraska, Oklahoma, Tennessee, Utah, British Columbia
S3B – Vulnerable breeder	New Jersey
S3? – Vulnerable (uncertain)	Idaho
S3?B – Vulnerable breeder (uncertain)	Navajo Nation (parts of Utah, Arizona and New Mexico)
S3B, S3N – Vulnerable breeder, vulnerable non-breeder	North Carolina, Pennsylvania, Virginia
S3S4 – Vulnerable to apparently secure	Georgia
S4 – Apparently secure	Nevada, South Carolina, Washington
S4B – Apparently secure breeder	Colorado
S4? – Apparently secure (uncertain)	Oregon
S4B, S4N – Apparently secure breeder, apparently secure non-breeder	New Mexico
S5 – Secure	Arizona, Louisiana
S5B – Secure breeder	Texas
SNR – Not yet ranked	California, Florida, Quebec