Peregrine Falcon
(Falco peregrinus) 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**

RECOMMENDED CITATION

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DECLARATION

The Ontario Ministry of Natural Resources has led the development of this recovery strategy for the Peregrine Falcon 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

The Peregrine Falcon (*Falco peregrinus anatum*) was regulated as endangered in 1978 under Ontario's original *Endangered Species Act*, as a result of a population collapse of the species in the 1950s and 1960s from exposure to dichlorodiphenyltrichloroethane (DDT) and its metabolites. There was no evidence of breeding activity by the mid-1960s and Peregrine Falcons were subsequently extirpated from Ontario.

After the restrictions imposed on the use of DDT in the late 1960s and early 1970s in North America and the establishment of a national captive rearing program, a release program was initiated in Ontario in 1977. The Ontario Peregrine Falcon population began to re-establish, and by 1986 one nest site was known in the province. The population has increased every year since that first release. Peregrine Falcons were downlisted from endangered to threatened in Ontario in 2006. This species is listed as threatened on the Species at Risk in Ontario (SARO) List under the *Endangered Species Act, 2007* (ESA 2007) because of the concern for its small population size, the potential effects of contaminants on it and its sensitivity to human threats and disturbances. The Ontario Peregrine Falcon Recovery Team was formed to develop a recovery strategy to meet the requirements of the ESA 2007.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) originally evaluated the Peregrine Falcon as three separate subspecies: *anatum* subspecies (endangered in 1978 and threatened in 1999 and in 2000), *tundrius* subspecies (threatened in April 1978 and special concern in April 1992) and *pealei* subspecies (special concern in 1978, 1999 and 2001). The National Peregrine Falcon Recovery Team was established, and a national recovery plan was published in 1988. In 2007, COSEWIC assessed the Peregrine Falcon as two separate units, *pealei* subspecies and *anatum/tundrius* subspecies, and designated the Peregrine Falcon *anatum/tundrius* as special concern in April 2007 (COSEWIC 2007). A nationwide survey of breeding pairs at five-year intervals was initiated in 1970; Ontario has participated in this survey since its inception.

The goal of the Ontario Peregrine Falcon recovery strategy is to ensure a viable and self-sustaining population of this species in Ontario, occupying the full extent of its current and historic range.

The objectives of this recovery strategy are as follows:

1. Identify and protect occupied and potential Peregrine Falcon habitat.
2. Identify and, where feasible, reduce and/or eliminate known threats to the Peregrine Falcon population and habitat in Ontario.
3. Monitor and inventory the population status of and trends related to the Peregrine Falcon through development of a comprehensive monitoring program.
4. Gain a better understanding of the Peregrine Falcon's use of habitat in its current and historic range, and, where feasible, encourage reoccupation of the species' historical habitat in Ontario.

5. Ensure that there is a consistent, comprehensive and up-to-date provincial Peregrine Falcon database so that population recovery and habitat can be monitored, assessed and re-evaluated as required.
6. Maintain and raise public awareness of and promote stewardship of Peregrine Falcons in Ontario.

It is recommended that historical, unoccupied, current and newly discovered cliff nests and nests located on human-created features be regulated as habitat. The nest cliff encompasses the entire cliff face on which the nest scrape is located. The habitat regulation should extend 3 kilometres from the nest cliff of current or newly discovered nests and extend 1 kilometre from the nest cliff of unoccupied and historical nests. The urban Peregrine Falcon nest site should be regulated as the full extent of the ledge on a building, bridge or any other human-created structure on which the nest scrape or nesting box is located.

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1.0 BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Peregrine Falcon

SCIENTIFIC NAME: *Falco peregrinus*

SARO List Classification: Threatened

SARO List History:
Falco peregrinus – Threatened (2008)
Falco peregrinus anatum – Threatened (2006), Endangered (2004)
Regulated as Endangered under the original *Endangered Species Act* in 1978

COSEWIC Assessment History:
Falco peregrinus anatum/tundrius – Special Concern (2007)
Falco peregrinus anatum – Threatened (1999 and 2000), Endangered (1978)
Falco peregrinus tundrius – Threatened (1978 and 1992)
Falco peregrinus pealei – Special Concern (1978, 1999, and 2001)

SARA Schedule 1: *Falco peregrinus anatum* – Threatened (June 5, 2003)

CONSERVATION STATUS RANKINGS:
Falco peregrinus anatum: GRANK: G4T4 NRANK: N3B SRANK: S2S3B
Falco peregrinus anatum/tundrius: GRANK: G4T4

The glossary provides definitions for the abbreviations above.

1.2 Species Description and Biology

Species Description

The Peregrine Falcon is a crow-sized bird with bluish grey upperparts, including the head and mustache, which contribute to a hooded or “helmeted” appearance. The bird is white below with a clear, unmarked breast and barred belly, flanks and underwings. The plumage of immature falcons, which are similar in size to adults, is initially a dark chocolate brown above and cream or off-white below with heavy, brown streaking. Sexes are best distinguished by size; females are 15 to 20

percent larger and 40 to 50 percent heavier than males. Males are 36 to 49 centimetres long and weigh about 600 grams, whereas females are about 45 to 58 centimetres long and weigh approximately 1 kilogram (White et al. 2002). Peregrines are superficially similar to and may be mistaken for the Merlin (*Falco columbarius*), which is smaller and has a faint or indistinct mustache, and the Gyrfalcon (*Falco rusticolis*), a much larger species that occurs throughout much of the province only as a rare transient and sporadic winter resident (Environment Canada 2007).

Species Biology

Reproduction

Peregrine Falcons typically form monogamous pair bonds that often last many breeding seasons (White et al. 2002), but cases of one male servicing more than one nest have been reported (M. Heaton, pers. comm.). Both males and females have a strong attachment to previous nesting sites, which may indicate monogamy over multiple breeding seasons, rather than attachment between individuals (White et al. 2002). Peregrines demonstrate a strong fidelity to nest sites and typically return to the habitat type in which they were raised (e.g., cliff vs. urban building) (Martin 1978, Holroyd and Banasch 1990, Cade et al. 1996, Tordoff and Redig 2003, Armstrong 2007).

As with other raptors, onset of breeding by the Peregrine Falcon is related to latitude and local conditions. Raptors in general tend to breed earlier and have longer breeding seasons at lower latitudes and in coastal areas, where weather is warmer and food is more readily available than in other areas (Newton 1977, Santana and Temple 1988, White et al. 2002). In southern Ontario, the Peregrine Falcon has been observed wintering in nesting territories and initiating nesting activity earlier than in northern Ontario (Ratcliff and Armstrong 2008). In northern Ontario, birds return to nest sites in late March, begin egg-laying in late April and disperse by October. In southern Ontario, the Peregrine Falcon is now known to return to nest sites in early March and begin laying eggs in mid to late March (M. Heaton, pers. comm.), a month earlier than previous records indicate (Peck and James 1983, Ratcliff and Armstrong 2008). A nesting Peregrine Falcon generally lays one egg every 48 hours, for a total clutch size of two to six eggs; the average clutch size for this species in Ontario is four eggs (Peck and James 1983, Peck and James 1993, White et al. 2002). The Peregrine Falcon lays its eggs in a nest high on a cliff or human-made structure (e.g., tall building). The nest, called a “scrape,” is a simple small depression the bird digs into sand, fine gravel or dirt. Sometimes Peregrine Falcons use nests that other birds, such as the Common Raven (*Corvus corax*), have built. Both male and female Peregrine Falcons incubate the eggs. The amount of time male birds tend to eggs in North America ranges from 33% in Alaska to 87% in New Mexico (White et al. 2002). Incubation lasts about 33 days, and nestlings hatch around late April in southern Ontario and from late May to early June in northern Ontario. After brooding ceases, the males and females roost away from the nest. Young fledge between late May and mid-July (Ratcliff and Armstrong 2008), approximately 35 to 42 days after hatching. Peregrine Falcons may lose their eggs to breakage, weather or other factors. If this occurs while the female is still laying eggs, the

pair may relocate to another ledge and attempt to complete the clutch there. Maturity (the age at which the bird first breeds) is typically reached at three years, although some birds reach maturity earlier. Maturity is usually earlier for females than for males, with at least some one-year-old females breeding, particularly in dense, expanding populations (White et al. 2002). This has been documented in Ontario (Ratcliff and Armstrong 2008).

The 2005 Ontario-wide survey showed a larger number of fledged young per nest in southern Ontario at urban sites, indicating that urban birds may have higher reproductive success than cliff nesting birds (Ratcliff and Armstrong 2008). Local volunteers keep constant watch at urban nest sites, and pick up fledglings that have fallen from the nest and return them to the top of the nest building. Tordoff and Redig (1997) examined first-year survival and found a higher survival rate for this type of hacked birds (19%) than for wild birds (12%).

Little is known about natal dispersal, or post-fledging (the period immediately following fledging of young birds) movements and survival (Powell et al. 2002, Burnham et al. 2003). Many research studies have shown that fledged females disperse twice as far as males (Mearns and Newton 1984, Restani and Mattox 2000), and many birds released in the midwest Unites States subsequently settled in the Great Lakes Basin (Tordoff and Redig 1997). The post-fledging period may be the most critical to the survival of juvenile Peregrine Falcons (Powell et al. 2002) without parental protection (Barclay and Cade 1983). In migratory populations, young become independent at the onset of migration, usually around five to six weeks after fledging. Young in non-migratory populations may be dependent for slightly longer (White et al. 2002).

Food Habits

Peregrine Falcons hunt for food by flying high or perching at high points along nest cliffs, giving the birds an advantage in attacking their prey in the air (Jenkins 2000). Feeding areas include productive wetlands or other open hunting areas (terrestrial and aquatic), and riparian habitats where prey species are abundant (Holroyd et al. 1995, White et al. 2002).

Peregrine Falcons feed mostly on medium-sized birds hunted in the air (White et al. 2002). The diet of this species varies by region, habitat, season and the individual (White et al. 2002). In Ontario, prey remains have been analyzed at various nest sites along Lake Superior over a 12-year period. The most common prey species were Rock Pigeon (*Columba livia*) and Ring-billed Gull (*Larus delawarensis*), and up to 72 other bird species and two mammal species have been recorded (Ratcliff 2007). Results of the 2000 Ontario survey indicated that Rock Pigeon was the most common prey at urban nest sites; other common prey are the European Starling (*Sturnus vulgaris*), Blue Jay (*Cyanocitta cristata*), Baltimore Oriole (*Icterus galbula*), House Sparrow (*Passer domesticus*) and Kinglet species (*Regulus* spp.) (Ratcliff and Armstrong 2002).

1.3 Distribution, Abundance and Population Trends

The Peregrine Falcon's status has changed dramatically in Ontario from rapidly declining populations in the 1950s and extirpation as a breeding species in the early 1960s to, more recently, re-establishment and recovery across the province (Armstrong 2007).

Hacking of Peregrine Falcons involves obtaining chicks bred in captivity when they are a few weeks old and raising them with minimal human contact in areas of suitable nesting habitat until they are ready to fledge. They are then released into potential habitat. Between 1977 and 2006, approximately 600 Peregrine Falcons were released in Ontario through projects managed by the Ontario Ministry of Natural Resources (OMNR), the Canadian Wildlife Service (CWS) and various naturalist organizations and corporations contributing to the re-establishment of this species across the province.

As part of the national recovery plan for the Peregrine Falcon, Ontario has participated in the nationwide Peregrine Falcon surveys conducted every five years since 1970. These surveys are used to determine site occupation and productivity, and to monitor population trends. In addition to the five-year surveys, Peregrine Falcon breeding activity is monitored annually throughout Ontario at a lower intensity (Ratcliff and Armstrong 2008). Project Peregrine, an intensive monitoring program of Peregrine Falcons, is conducted yearly within the Ontario portion of the Lake Superior Basin, and west to Atikokan (B. Ratcliff pers. comm. 2008).

Results from the most recent comprehensive province-wide survey in 2005 showed at least 78 occupied territories in Ontario – 67 pairs and 11 unpaired territorial individuals. There are two distinct sub-populations of Peregrine Falcon in Ontario; the northern population (53 territories) and the southern population (25 territories). The Lake Superior Basin alone supported 43 territories in 2005. While central Ontario had most of the documented historical nests, it is still essentially devoid of Peregrines. Central Ontario is considered to be south of the French River, south along the shoreline of Georgian Bay and east along the Canadian Shield to Kingston. For the purposes of this recovery strategy, northern Ontario is to the north of this area and southern Ontario is to the south.

The 2005 survey had the highest number of territories (see figure 1), successful nests and fledged young ever recorded in Ontario (Ratcliff and Armstrong 2008). Since the 2005 survey, new sites are being found every year, as the Peregrine Falcon population continues to increase across Ontario. Sites identified since 2005 are documented in the provincial database and will be surveyed in the 2010 province-wide survey.

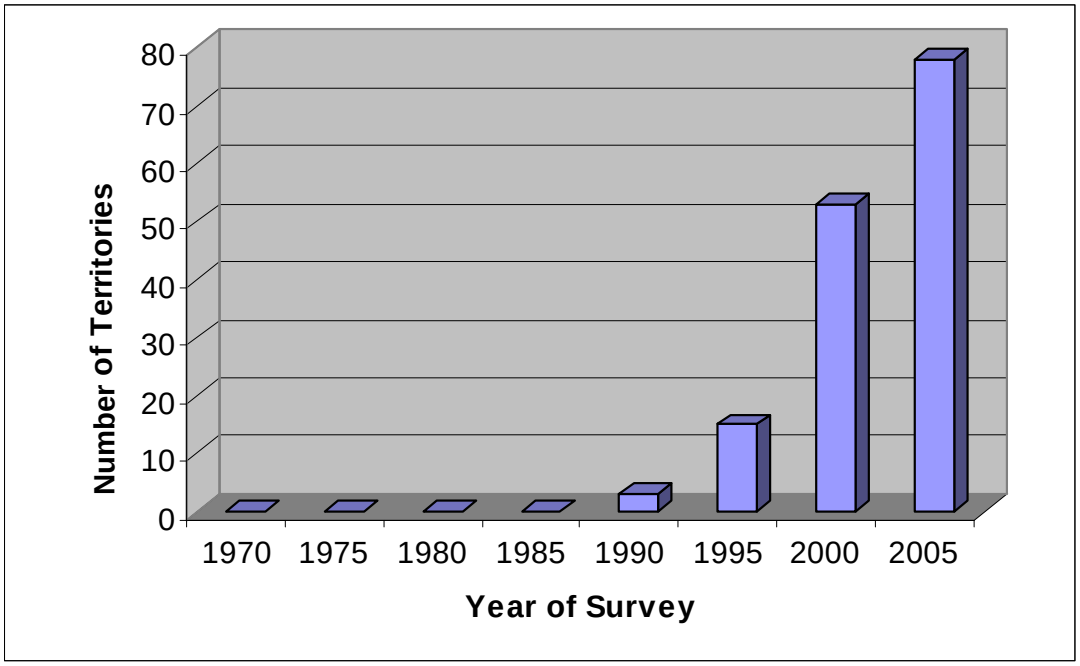

Figure 1. Number of Peregrine Falcon territories in Ontario, based on five-year surveys, 1970–2005 (Ratcliff and Armstrong 2008)

The total number of occupied territories in 2005 (78) exceeds the maximum number of documented historical sites (Greene 1978). Historical records (1848–1963) contained in the Natural Heritage Information Centre (NHIC) Element Occurrence database provide documentation for 45 Peregrine Falcon nest sites in Ontario. Determining from the nest records what the actual historical population may have been is difficult, as most sites were remote and not monitored regularly, and many nests may have gone undetected (Greene 1978).

Prior to the collapse of the Peregrine Falcon population in the 1950s and 1960s, there were a number of records of this species in central Ontario (figure 2). Although the number of occupied territories in the province has been increasing since the reintroduction of this species in 1977, it has not repopulated central Ontario (figure 3).

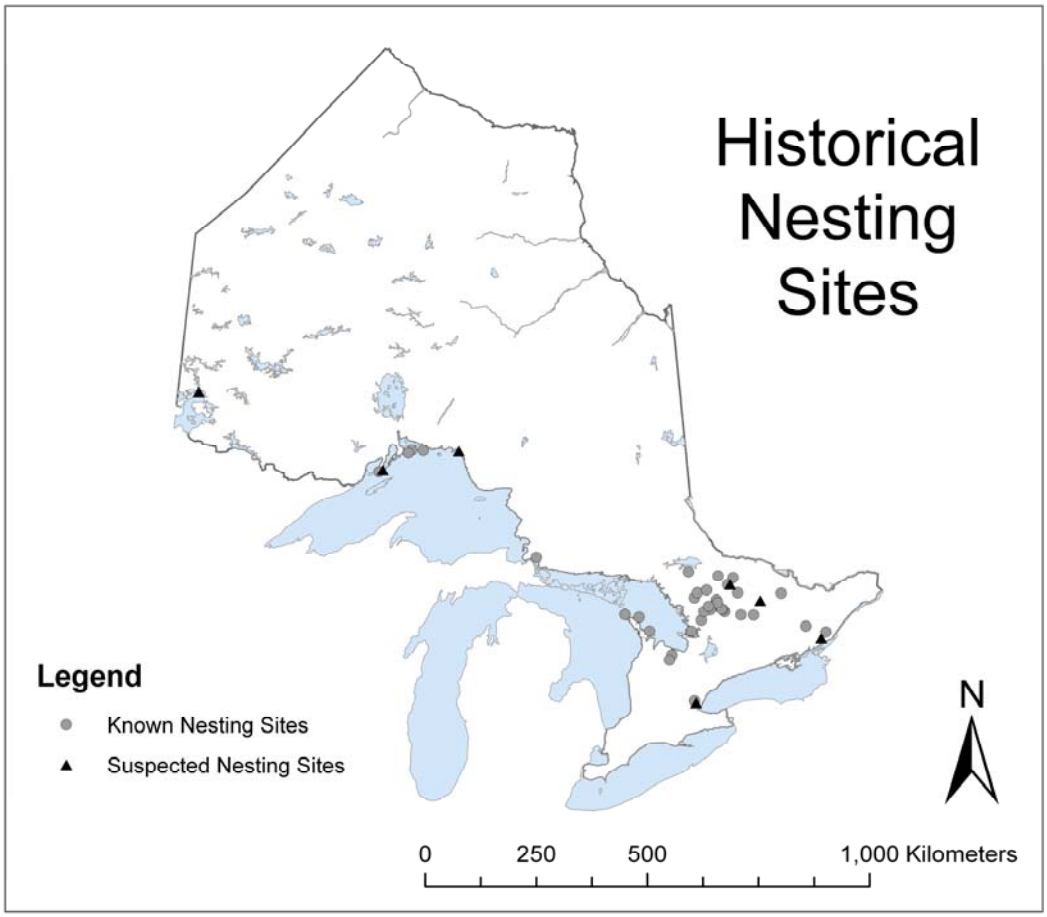

Figure 2. Peregrine Falcon nesting sites in Ontario prior to population collapse in 1963 (Ratcliff and Armstrong 2002)

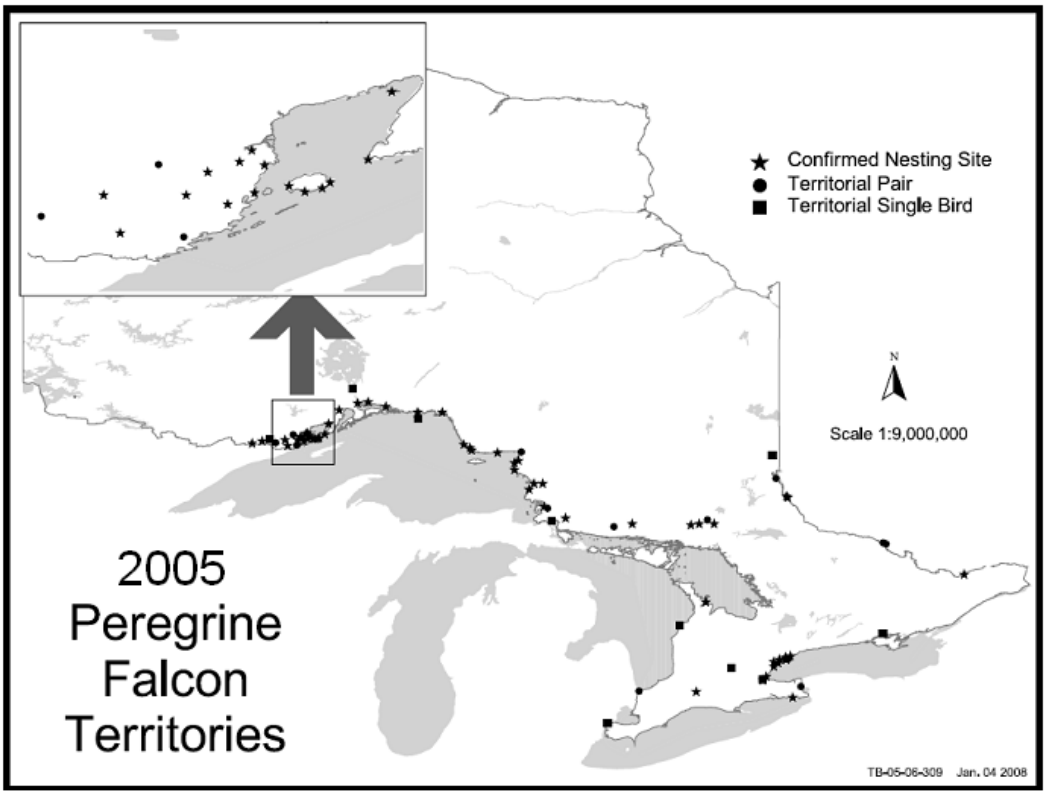

Figure 3. Peregrine Falcon territories, territorial pairs and confirmed nesting attempts in 2005 (Ratcliff and Armstrong 2008)

In 2007, there were 223 known territorial pairs throughout the U.S. Midwest and Canadian upper Great Lakes region, in 13 states (Michigan, Minnesota, Wisconsin, South Dakota, North Dakota, Iowa, Illinois, Indiana, Ohio, Kansas, Missouri, Kentucky) and two provinces (Manitoba and Ontario) (Redig et al. 2007).

1.4 Habitat Needs

Habitat Use

Habitat for the Peregrine Falcon exists at three major scales: a nest site with associated perching sites, a nesting territory and a home range. Nest sites are usually in one of two distinct habitats: on steep to vertical natural cliff faces in remote areas containing ledges suitable for nest scrapes, often overlooking water bodies (e.g., wetlands, rivers, lakes) (Bent 1938, Tordoff and Redig 1997, Armstrong 2007) and forested areas (MacLulich 1938, Peck and James 1983); and on ledges in urban areas, including ledges on tall buildings, bridges and other human-created structures (Martell et al. 2000, Tordoff and Redig 2001, Armstrong 2007, Ratcliff and Armstrong 2008), where habitat characteristics are comparable to those of natural cliff sites (Cade et al. 1996). In

addition, peregrines nest in quarries (Tordoff and Redig 2001) and open-pit mines in Ontario (Ratcliff and Armstrong 2008).

Peregrine Falcons have been reported nesting on cliffs at heights of 8 to 400metres, but typically occupy ledges at heights of 50 to 200 metres (White et al. 2002). Along Lake Superior in Ontario, Peregrine Falcons use vertical cliff faces at least 30 metres high that have ledges of various sizes, and tend to nest on the upper one-third of the face (B. Ratcliff pers. comm. 2008). This species also uses ledges along cliff faces for feeding and perching (Herbert and Herbert 1965). Perching sites near nest ledges are another important feature of nesting habitat (T. Armstrong, pers. comm. 2008). Characteristics of urban nests are often similar to those of natural cliff nests in that chosen nest sites are usually on one of the taller buildings in an area and within one block of other tall buildings and a reliable food source (T. Armstrong pers. comm. 2008). In Ontario, the average height of urban nests is between 9 and 52 metres, with most being 11 to 23 metres from the ground (Peck and James 1983, Weir 1987, Peck and James 1999). Increasing variation in site selection has been observed in Ontario as the population increases, and not all peregrines are selecting typical nest sites. Nests are typically located within 400 to 800 metres of water (Cade and Bird 1990, Tordoff and Redig 1997); however, nests in several urban centres (Mississauga, Etobicoke) in southern Ontario have been located as much as 5 kilometres from Lake Ontario, and a nest in London is not close to any major water body (B. Ratcliff pers. comm. 2008).

In southern Ontario, few active nests are on natural cliffs, and most Peregrine Falcons nest in urban habitats. The species has not recolonized the majority of natural cliff nest sites it used historically in central and southern Ontario (T. Armstrong pers. comm. 2008). Results from the 2005 Ontario-wide Peregrine Falcon survey indicate that 68 percent of territories were located in northern Ontario and 32 percent were in southern Ontario. Cliff nesting sites (53 territories) made up the majority of Peregrine Falcon territories in the province (Ratcliff and Armstrong 2008) and were concentrated along or near the shorelines of Lake Huron and especially Lake Superior (Armstrong 2007). The urban population (17 territories) was found in larger urban centres of southern Ontario (Armstrong 2007, Ratcliff and Armstrong 2008), and a small number of territories (8) were associated with bridges, smokestacks and open-pit mines (Ratcliff and Armstrong 2008).

Birds reared in either a cliff nest or on a ledge in an urban environment will rarely nest in the other habitat type (Holroyd and Banasch 1990). In Ontario, monitoring of both urban and cliff nesting Peregrine Falcons has revealed their fidelity to the nest site: once they have identified a nest site, they are likely to use either the same or another suitable nesting ledge nearby every year (OMNR 2008, Ratcliff and Armstrong 2008). Successive generations of these birds often use the same nesting cliff. For example, in Great Britain, of 49 nesting cliffs Peregrine Falcons were known to use between the 1500s and the 1800s, 42 were still occupied in the 1930s (Ferguson-Lees 1951).

The nesting territory of the Peregrine Falcon is the area around the nest site that the pair defends. These birds demonstrate strong territorial behaviour and will defend their

nesting territory to prevent other pairs from nesting within 1 kilometre or more (Cade 1960). Jenkins and Benn (1998) combined the terms “nest site” and “nesting territory” to represent the nest cliff, which included the nest ledge, perch sites and foraging areas. The term ”nest cliff” was also used to describe the area used by recently hacked juvenile birds for roosting, feeding and social interaction (Powell et al. 2002). Peregrine Falcon nesting territories vary in size and are actively defended, although the degree of aggressiveness individual birds exhibit varies widely. Peregrine Falcons are known to strike humans within the nesting territory; this behaviour has been observed during banding efforts in Ontario (B. Ratcliff pers. comm. 2008, M. pers. comm. 2008). Among Peregrine Falcon populations in North America that have some of the highest densities, the preferred distances between nests averaged between 3.3 and 5.6 kilometres, depending on the area (White et al. 2002). In urban areas, territories can be less than 1.0 kilometre apart; at least one instance of polygyny exists, whereby one male was simultaneously the mate of two females at nests on buildings separated by 0.6 kilometres in downtown Toronto (M. Heaton pers. comm. 2008).

Home range size can vary depending on the threats to the nest site and the stage in the breeding cycle. Home range size is probably influenced by prey distribution and abundance, and conditions favouring soaring, including open air to hunt prey (Enderson and Craig 1997). Females typically have larger foraging distances than males, but males have been found to have larger home range sizes than females (Enderson and Craig 1997, Jenkins and Benn 1998). Most of the daily activity is centred on nest cliffs, and a few distant locations which contribute to the home range size (Jenkins and Benn 1998). Home range sizes for Peregrine Falcons in Colorado have been estimated to be between 177 and 1,508 square kilometres, with 60 percent of sightings being within 8 kilometres of the nest (Enderson and Craig 1997). In South Africa, two males had territories of between 115 and 192 square kilometres, with average daily ranges of 22.3 and 22.8 square kilometres, whereas two females spent over half their time at the nest and had home ranges of between 90 and 95 square kilometres, with average daily ranges of 20 and 26 square kilometres (Jenkins and Benn 1998). Information about home range sizes in Ontario is lacking.

Radio-telemetry studies of Peregrine Falcons have provided information on both migration routes and daily movement patterns, which help to identify home range size; however, few studies have used radio telemetry to investigate foraging distance. Peregrine Falcons were found in some cases not to favour specific foraging sites within their home range (Enderson and Craig 1997) and in other instances were found to select specific foraging sites, often influenced by prey availability. The literature reports varying foraging distances. Peregrine Falcons have been reported to hunt up to 14 kilometres from a nest site, while the majority of foraging flights are within 3 kilometres of a nest site (Beebe 1974, Bird and Aubry 1982, Enderson and Kirven 1983, Hunter et al. 1988). Craighead and Craighead (1956) and White et al. (2002) found that males and females regularly hunt up to 5 kilometres from their nest site or territory, and Peregrine Falcons are also reported to forage as far as 15 to 43 kilometres from their nest (White and Nelson 1991, Enderson and Craig 1997).

Migration

Peregrine Falcons are known to migrate long distances, have broad migration routes and follow clearly defined landforms such as beaches, shorelines and along islands. These migration routes provide opportunities for hunting shorebirds, waterfowl and other birds (Snyder 1947, Hunt et al. 1975, Weir 1989).

Banding return data from Peregrine Falcons hacked in Ontario show that several birds returned from the Caribbean, Central America, northern South America and the southern United States (B. Ratcliff, pers. comm. 2008). Peregrine Falcons in Greenland demonstrated marked differences in migration patterns between the sexes and were dependent on areas where the prey abundance was high (White et al. 2002); males were found to winter in South America, and females in Central America and the Caribbean (Restani and Mattox 2000). In southern Ontario, many adult urban birds are non-migratory and maintain territories throughout the year (Ratcliff and Armstrong 2008). In their first year, the young tend to migrate away from their nest community after fledging (A. Gamble pers. comm. 2008). The size of territories and home ranges of Peregrine Falcons in overwintering areas is unclear. They occasionally stage during migration, however there do not appear to be any staging areas in Ontario.

First year urban Peregrine Falcons from southern Ontario have been tracked, using satellite transmitters, on their fall migration to the Dominican Republic, Columbia and other tropical areas, where they overwinter. Tracking indicates that, the following spring, they typically return to the Great Lakes Basin. A similar fall migration occurs in their second year (M. Heaton pers. comm. 2008).

1.5 Limiting Factors

Availability of Suitable Cliff Nest Habitat

The availability of suitable cliff nesting habitat is generally not a limiting factor in Ontario. In central Ontario, however, Peregrine Falcons have not yet reoccupied historical cliff nest sites as expected. These sites are generally lower and more vegetated than currently occupied cliff nests in northern Ontario (B. Ratcliff and T. Armstrong pers. comm. 2008). The central Ontario sites may always have been suboptimal habitat and were occupied only during a period when most suitable nesting habitat was already occupied (B. Ratcliff pers. comm. 2008).

While natural nesting sites are not yet a limiting factor, clearly cliff nesting sites are a finite resource in Ontario that eventually will limit the Peregrine Falcon’s recolonization of its range.

Inter-Specific Competition

Some otherwise suitable nest sites for Peregrine Falcon may be unsuitable due to the presence of predators and interspecific competition with raptors such as the Great Horned Owl (*Bubo virginianus*) and Bald Eagle (*Haliaeetus leucocephalus*), and to a lesser extent with the Common Raven, which nests earlier than the Peregrine Falcon and may occupy suitable cliff nesting ledges before it does.

Great Horned Owls are known to harass and kill Peregrine Falcons at some sites (Tordoff and Redig 1997) and apparently prevented hacked Peregrine Falcons from recolonizing historical nesting cliffs; however, at other sites both species nest in close proximity (Tordoff et al. 2000). Common Ravens may disrupt Peregrine Falcon breeding success if the nests of both species are in close proximity (White et al. 2002), although the two species have been known to nest successfully on the same cliff face (B. Ratcliff pers. comm. 2008). Peregrine Falcons occasionally nest in former nests of the Common Raven (White et al. 2002, T. Armstrong pers. comm. 2008).

Juvenile Mortality

Another biological factor limiting Peregrine Falcons in Ontario is juvenile mortality. The rate of first-year survival for this species is not well documented but is assumed to be 40 to 50 percent of fledglings (White et al. 2002). While there is no reliable estimate of first-year survival in any North American population of the Peregrine Falcon, the survival rate in the midwest United States is estimated, on the basis of re-sightings of marked birds, to be 23 percent (Tordoff and Redig 1997), but actual survival must be higher. This early mortality can be attributed to starvation due to lack of necessary hunting skills or sufficient prey, unsuccessful fledging from the nest and unsuccessful migration to wintering grounds. Juveniles in urban areas commonly collide with windows, vehicles, smokestacks and other structures (M. Heaton pers. comm. 2008).

Disease and Parasites

A wide range of diseases and parasites may affect the Peregrine Falcon (White et al. 2002), although their potential role as limiting factors is not well known. Those of significant concern to the species in Ontario include trichomoniasis, the blowfly and West Nile virus. Trichomoniasis (*Trichomoniasis gallinae*), also known as “frounce,” is a protozoan parasite that is transmitted by injesting infected prey species such as Rock Pigeons (Cooper et al. 1980). This parasite has been found in young Peregrine Falcons in southern Ontario; the parasite usually causes death, but in some cases juveniles have recovered following drug treatment. (M. Heaton, pers. comm. 2008). Ectoparasites such as *Protocalliphora avium* (Diptera: Calliphoridea) have been documented in many raptor species (Crocoll and Parker 1981, Tirrell 1978, Bortolotti 1985, Bohm 1978). Nine of 21 juvenile Peregrine Falcons banded in northwestern Ontario in 2008 had a large infestation of larvae in their aural cavities (B. Ratcliff, pers. comm. 2008.). The skin surrounding the ear openings was swollen and covered with scabs, although whether any permanent physical damage occurred is unknown. West Nile virus is known to have

infected one Peregrine Falcon in Virginia in 2003, although this species appears to be less affected than many raptors by the disease (P. Redig pers. comm. 2008.).

1.6 Threats to Survival and Recovery

Environmental Contamination

Peregrine Falcons are predators at the top of the food chain. Consequently, many of the contaminants to which they are exposed may accumulate and/or biomagnify in their tissues (e.g., eggs, blood, muscle, fat, brain). Some contaminants accumulate in concentration in the tissues of Peregrine Falcons as a result of their consumption of contaminated prey, while other persistent organic pollutants, such as polychlorinated biphenyls (PCBs) and dichlorodiphenyltrichloroethane (DDT), biomagnify in concentration at each trophic level of the food chain. This is a result of the persistence of the chemical within an individual and the food chain of which it is part, and the animal's metabolic processes which includes low or non-existent enzymatic degradation and/or excretion of the contaminant, often because the contaminant is water-insoluble. While the Peregrine Falcon has made significant gains toward recovery since the banning of particular chemical substances in North America in the early 1970s, and with 30 years of subsequent management (Rowell et al. 2003), new and emerging chemicals may pose a potential problem ~~threat to~~ and should be identified and monitored for possible effects on it.

The use of persistent organochlorine pesticides, specifically DDT, which was widely used in the 1950s and 1960s and caused the eggshells of the Peregrine Falcon to be abnormally thin, has been linked to the species' decline (Ratcliffe 1969, Court 1993). The thinning and subsequent breakage of eggshells resulted in reduced hatching success, brood size and overall breeding success (Hickey 1969, Ratcliffe 1969). While DDT levels have declined overall, high levels of dichlorodiphenyldichloroethylene (DDE), a lipophilic metabolite of DDT, continue to occur in biota. DDE is highly persistent over the long term, and Peregrine Falcons continue to be exposed to DDT in some of their migratory and overwintering grounds where this insecticide is still used. A number of prey species of Ontario Peregrine Falcons are birds that winter in areas of Central and South America (B. Ratcliff pers. comm. 2008). DDT continues to be used as a malarial control in Ecuador (World Health Organization 2008), and in Mexico this pesticide was not banned until 2000. Other Central and South American countries have all phased out the legal use of DDT.

Given the recent trend toward climate change, predictions are that malarial outbreaks will not only increase, but expand northward. If this prediction is valid, a resurgence of global interest in the use of DDT could occur (Environment Canada 2007). Current proposals, however, are to limit DDT application to the interior of human dwellings.

New and emerging chemicals and compounds of interest should be identified and, if necessary, monitored relative to Peregrine Falcons. Among these compounds are

brominated flame retardants, including polybrominated diphenyl ethers (PBDEs) which are a class of additive flame retardants. Over the past two decades, PBDE concentrations have increased in birds at the top of the food chain. These PBDEs are capable of disrupting normal endocrine function, behaviour and reproduction. Concentrations of PBDE congeners in wild birds may alter concentrations of thyroid hormone and vitamin A, glutathione metabolism and oxidative stress (Fernie et al. 2005). Environmentally relevant concentrations of PBDEs increase the size and growth rates and alter the immune function of nestling American Kestrels (*Falco sparverius*) (Fernie et al. 2005, 2006). In addition, such PBDE concentrations alter the timing and frequency of courtship behaviours (Fernie et al. 2008), which are important to the pair bond between adults and hence to reproductive success. Exposure of American Kestrels to environmentally relevant PBDE levels like those currently found in the eggs of Herring Gulls (*Larus argentatus*) on the Great Lakes and Peregrine Falcons in the northeastern United States (Chen et al. 2008) resulted in delayed egg laying, reduced fertility and thinning of eggshells (Fernie et al. 2009). In 2008, concentrations of PBDEs in Peregrine Falcon eggs in urban areas of southern California (K. Hooper pers. comm. 2008) and the northeastern United States (Chen et al. 2008) approached concentrations that reduced pipping in American Kestrels experimentally exposed to PBDEs (McKernan et al. 2009). While the full environmental implications of PBDEs and other flame retardants are not yet fully understood, this environmental contaminant is of significant concern because of its apparent stability and persistence in the environment.

Products used for the control of pigeons, starlings and house sparrows in urban centres could be a direct threat to the recovery of the Peregrine Falcon. The ingestion of prey contaminated with pesticides such as 4-amino-pyridine (Avitrol®), strychnine or fenthion (Rid-A-Bird®) may prove harmful to both adult and juvenile Peregrine Falcons. Between 2001 and 2005, 5 of 19 Peregrine Falcons that died of traumatic injuries in Canada were found to contain quantifiable amounts of Avitrol® (Campbell 2006). OMNR and the Ontario Ministry of the Environment (OMOE) annually distribute a pesticide memorandum to pest control agents, which requests that only non-chemical bird control methods be used within a 7.5 kilometre radius of locations identified as supporting a Peregrine Falcon territory (OMOE and OMNR 2008).

Although there is much literature on the above chemicals, other contaminants can probably affect Peregrine Falcons through exposure and bioaccumulation, particularly as this species is at the top of the food chain.

Disturbance

Peregrine Falcons using cliff nests and those using urban nests are faced with varying types and levels of disturbance. Peregrine Falcons nesting in remote locations tend to be more sensitive to human disturbance (Pyke 1997, White et al. 2002), whereas urban nesting pairs tend to be much more habituated to human activity. Disturbance at or near a nest site can negatively affect these birds. Given the fidelity of Peregrine Falcons to nest sites, the maintenance of these sites should remain a high management priority (Cade et al. 1996).

Human disturbances, such as recreational activity and industrial development, can easily affect Peregrine Falcons. Such activities can disrupt nesting birds and deter birds from nesting in an area (Fyfe and Olendorff 1976), and could also alter the quality of foraging habitat.

The effects of disturbance on nesting Peregrine Falcons depend on the time of year or the period during the breeding cycle in which the disturbance occurs. The behavioural responses of individual nesting pairs to disturbances in the nesting territory also vary. The periods most critical for the reproductive success of Peregrine Falcons are those when they are establishing territory and immediately before egg-laying (Fyfe and Olendorff 1976). During the early nesting period, disturbances could force an adult bird away from the nest for a prolonged period, resulting in undesirable cooling or heating of eggs or young chicks, and fewer opportunities for foraging and feeding of nestlings.

Peregrine Falcons are more sensitive to disturbance above the nest site than below it (Barclay 1996, Pyke 1997). Adult Peregrine Falcons generally will not tolerate people above them and may dive at intruders, especially while defending their nest and young (Barclay 1996).

Disturbance can come from various recreational activities such as rock climbing, hiking, bird watching, boating and use of all-terrain vehicles. Wildlife agencies often restrict areas that rock climbers frequent, and climbing associations may establish their own codes of conduct to facilitate the co-existence of nesting Peregrine Falcons with climbing activity (e.g., Pyke 1997, Cordes 2000). In Tettegouche State Park, Minnesota, during the falcon nesting season, public traffic is diverted away from nest sites by closing hiking trails and restricting rock climbers to cliff faces that are at least 100 metres away from a nest site (H.B. Tordoff pers. comm. 2005). In Big Bend National Park, Texas, protection measures have been implemented to offer protection for Peregrine Falcons during the breeding season. In certain areas in the park where rock climbing is allowed, signs are posted annually, from February 1 to May 31, prohibiting climbing within one-quarter mile of known peregrine eyries (National Park Service 2008). These prohibitions are intended to minimize direct human disturbance and reduce the amount of noise in the area while Peregrine Falcons are establishing nesting territories (National Park Service 2008).

Some industrial activities with the potential to disturb Peregrine Falcons are the construction and operation of wind farms, forestry, aggregate operations and mining, each of which has variable effects on Peregrine Falcons and their habitats. Activities that result in opening or disrupting the forest canopy may actually benefit the Peregrine Falcon by creating additional open country (B. Ratcliff pers. comm. 2008).

Peregrine Falcons nesting in urban environments, compared with those that nest on cliffs, generally are more habituated to and less disturbed by background human disturbance. Infrastructure development (e.g., subdivisions, condominiums, highways, bridges) and maintenance on nest buildings or nearby buildings disturb Peregrine

Falcons, but they seem to be able to habituate to certain activities, as their selection of nest sites under train trestles, on cooling towers or on tall buildings in crowded urban centres illustrates (Environment Canada 2007). However, human activity such as construction, window washing and roof-top maintenance close to urban nest sites can disturb Peregrine Falcons, Sometimes they desert a nest if facility maintenance occurs nearby.

While the effects of development are variable, both urban and industrial development is likely to increase in the future as human activities encroach on nesting areas and foraging habitat.

Collisions with Inanimate Objects

Urban Peregrine Falcons, particularly recently fledged birds, are occasionally injured or killed due to collisions with windows or buildings while learning to fly or chasing prey, and sometimes this species collides with automobiles and aircraft (White et al. 2002). Mortality of fledglings in urban areas has been attributed mostly to collisions with building windows and with vehicles when the young fledge prematurely and come to ground in a busy urban environment (M. Heaton pers. comm. 2008). In urban areas, pennants have been hung on reflective windows of buildings to help prevent Peregrine Falcons from colliding with them (E. Ticknor pers. comm. 2008).

Avian mortality is known to occur at wind energy facilities (Kingsley and Whittam 2001). Mortality due to collisions with wind turbines could have dramatic negative effects on raptor populations because they cannot absorb mortalities on an annual basis as easily as passerine populations can (Kuvlesky et al. 2007). In a study in the Altamont Pass Wind Resource Area in California, 65 percent of the birds killed were raptors. Studies have shown mortality rates to range from 0.15 to 0.24 birds per turbine per year (Kuvlesky et al. 2007). Fifty-five percent of raptors killed in the California study died as a result of striking a wind turbine, 18 percent from electrocution, 11 percent from collision with wires and 26 percent from undetermined causes (Orloff and Flannery 1992). Where raptor densities are low, mortality is generally lower. Studies conducted at other wind farm developments indicate that collisions with turbines had no or little impact on raptor populations (Kuvlesky et al. 2007). Accurately estimating bird mortality caused by wind turbines is difficult, since scavengers quickly learn to remove carcasses, limiting their detection (Smallwood 2007).

Persecution

While the *Endangered Species Act, 2007* mandates species and habitat protection for threatened and endangered species, some pigeon fanciers consider the Peregrine Falcon to be a pest. Wherever possible, persecution of Peregrine Falcons and other raptors should be discouraged through educational programs and fines.

Provincial planning guidance requires that municipal official plans ensure the identification and protection of habitat for endangered and threatened species on private

lands. Owners of private lands may fear that environmental protection areas, established under the *Planning Act* around Peregrine Falcon nest sites or suitable cliff sites, may devalue their property, and consequently such landowners may persecute or remove the species (B. Ratcliff pers. comm. 2008).

Capture for Falconry

There is concern over the potential capturing of Ontario-raised Peregrine Falcons during migration or overwintering for falconry purposes. The capture of a small number of first-year migrant Peregrine Falcons for falconry in the United States has been proposed (USFWS 2007). There is concern regarding the “take” of a species that is identified as “at risk” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and many provincial jurisdictions. The Canadian wildlife directors and the National Peregrine Falcon Recovery Team formally opposed any harvest until this species is no longer at risk. Ontario has opposed the take of young Peregrine Falcons for falconry because the species’ recovery occurred only recently, and uncertainty exists about the origin of the young birds that would be taken. OMNR encouraged the U.S. federal government to undertake further research on populations of this species, including banding of young and feather analysis to ensure that the take for falconry does not negatively affect populations. A supply of captive raised peregrines for falconry purposes is readily available in Ontario.

The national recovery team concluded that any take of young falcons may cause Peregrine Falcon populations to decline in some regions, especially those with small populations of this species (Environment Canada 2007). However, population modelling has suggested that the limited take proposed would not compromise the Peregrine Falcon population, that “available information on vital rates is sufficient to justify harvest rates of up to 5% for … Peregrine Falcons” (Millsap and Allen 2006).

Several states have approved the take of wild Peregrine Falcons from nests, including Montana, Alaska, Arizona, New Mexico, Utah, Colorado, Wyoming, Washington and Oregon. In Canada, Saskatchewan currently allows a very small take of Peregrine Falcons, and British Columbia is considering allowing a harvest of the *pealei* subspecies. Currently, the final environmental assessment of the passage peregrine (migrant) take in the United States is nearing completion (Bullen and Ferrier 2008). Final approval and publication of a U.S. federal regulation on falconry is anticipated in 2009.

Habitat Change or Loss

Natural processes and human activities can cause loss or alteration of Peregrine Falcon habitat. Climate change results in increasing storm frequency and severity and can contribute to the slumping of ledges, making a site unsuitable for nesting, roosting or perching. Human removal or alteration of nesting sites can also contribute to a decline in habitat.

While habitat is not believed to be a limiting factor at this time, it is prudent to realize that human activities can impose a large “footprint” on the landscape, which at some point may affect Peregrine Falcons. Habitat change or loss may already have occurred in central Ontario, an area that Peregrine Falcons once populated but have not recolonized. Records of Peregrine Falcon nesting activity in Ontario show instances of nest sites that are no longer being used after disturbance (B. Ratcliff pers. comm. 2008).

Weather and Climate

Climate change and the resulting predicted increase in erratic weather events may affect Peregrine Falcons, particularly if these events occur during sensitive periods, such as when the birds are incubating and brooding. Recovering populations could be severely affected if factors led to a reduction in productivity for several consecutive years. However, it is not unusual to have occasional years with lower productivity due to unfavourable weather conditions in Ontario (T. Armstrong pers. comm. 2008).

The degree to which factors such as global climate change and the increasing severity of storms, including heavy rains that can wash away nest sites and eggs, will affect Peregrine Falcon productivity are as yet unknown.

1.7 Knowledge Gaps

The following gaps exist in our knowledge about the Peregrine Falcon:

- Foraging distances and home range size of nesting pairs of Peregrine Falcon in Ontario
- Effects of wind power turbines on Peregrine Falcon nesting and migration
- Diseases and parasites, and their frequency and significance to Peregrine Falcon populations
- Long-term trends (spatial, temporal) and biological effects of contaminants on Peregrine Falcon individuals, nests and populations
- Occurrence and frequency of accidental/incidental death and its significance on Peregrine Falcon populations
- Effects of climate change on Peregrine Falcon populations and nesting success
- Key characteristics of habitat Peregrine Falcons select for breeding and foraging
- An understanding of the Peregrine Falcon’s tolerance levels for human activities adjacent to nest sites, and of the required size of buffers around nests to minimize the impacts of human disturbances
- The minimum population size required to constitute a viable population of this species

1.8 Recovery Actions Completed or Under Way

Actions Already Completed:

- The use of DDT was prohibited in the early 1970s in Ontario and Canada.
- Historical nesting sites of the Peregrine Falcon were documented by Greene (1978), and Ratcliff and Armstrong (2008) added to this information in an unpublished provincial nest atlas.
- Between 1977 and 2006, the Peregrine Falcon hacking release program, a partnership between OMNR, Environment Canada, CWS–Ontario and various naturalist organizations and corporations, released approximately 600 birds.
- In 2004 and 2005 CWS, examined levels of PBDEs and other contaminants in Peregrine Falcon nestling blood samples taken during banding efforts (Fernie 2004).
- The National Peregrine Falcon Recovery Team was formed in 1986 and a national recovery plan approved in 1988.
- The 1998 Guidelines for Mapping Endangered Species Habitats under the Conservation Land Tax Incentive Program were developed to include mapping of Peregrine Falcon habitat (OMNR 1998). A tax rebate was afforded to landowners with Peregrine Falcons on their property when the species was designated as endangered.
- Between 1999 and 2004, the Canadian Peregrine Foundation fitted 19 young Peregrine Falcons with satellite transmitters to help track them over the winter and learn more about migration patterns. Various partners and sponsors involved in this initiative have also helped with educational programs and Project Watch-'em, which is dedicated to ensuring that help is immediately available for fledgling Peregrine Falcons when they need it.
- A provincial atlas of historical and current nesting sites has been compiled.

Actions Under Way:

- Intensive province-wide surveys of the Peregrine Falcon have been conducted every five years since 1970, as part of the national recovery plan, to determine site occupation and productivity, and to monitor population trends (Ratcliff and Armstrong 2008).
- Less intensive surveys to monitor breeding activity and the banding of young have been conducted annually in Ontario (Ratcliff and Armstrong 2008) since 1994.
- In Ontario, the Peregrine Falcon is a provincially featured species for the purposes of forest management planning and habitat will be managed through the Forest Management Guides for Stands and Sites (OMNR 2008).
- OMOE and OMNR have issued a voluntary advisory to the structural pest control industry for a pesticides memorandum, requesting that bird toxicants not be used within a 7.5 kilometre radius of Peregrine Falcon recovery sites during the breeding season and the period that adult birds remain in the vicinity.

- Monitoring and banding of pre-fledging juveniles at a number of northern Ontario cliffs and southern Ontario cities began in 1994 and is ongoing with the assistance of local OMNR field offices and volunteer groups.
- An unpublished provincial nest atlas is updated annually.
- Significant habitat is identified and protected as environmental protection areas under the Planning Act.
- Area of concern prescriptions are developed for Peregrine Falcon cliff nesting sites near proposed forest allocation areas.
- Pukaskwa National Park has included monitoring of nesting behaviour of Peregrine Falcons as part of its long-term ecological integrity monitoring program, and will be monitoring Peregrine Falcons in perpetuity in accordance with provincial and national standards and protocols.

2.0 RECOVERY

2.1 Recovery Goal

The recovery goal of the Ontario Peregrine Falcon Recovery Strategy is to ensure a viable and self-sustaining Peregrine Falcon population in Ontario, occupying the full extent of current and historical range.

2.2 Protection and Recovery Objectives

Table 1. Protection and recovery objectives

No.	Protection or Recovery Objective
1.	Identify and protect occupied and potential Peregrine Falcon habitat.
2.	Identify and, where feasible, reduce and/or eliminate known threats to the Peregrine Falcon population and habitat in Ontario.
3.	Monitor and inventory the population status of and trends related to the Peregrine Falcon through development of a comprehensive monitoring program.
4.	Gain a better understanding of the Peregrine Falcon's use of habitat in its current and historic range, and, where feasible encourage reoccupation of the species' historical habitat in Ontario.
5.	Ensure that there is a consistent, comprehensive and up-to-date provincial Peregrine Falcon database so that population recovery and habitat can be monitored, assessed and re-evaluated as required.
6.	Maintain and raise public awareness of and promote stewardship of Peregrine Falcons in Ontario.

2.3 Approaches to Recovery

Table 2. Approaches to recovery of the Peregrine Falcon in Ontario

Relative Priority	Approach to Recovery	Threat (T) or Knowledge Gap (KG) Addressed
Objective 1: Identify and protect occupied and potential Peregrine Falcon habitat.		
High	**1.1** Compile existing habitat data across the province: – Analyze current known nest data to improve understanding of where peregrines are or may be nesting	KG – Characteristics of habitat KG – Required nest buffer sizes
High	**1.2** Improve understanding of Peregrine Falcon habitat needs: – Use existing nesting and fledging data and identify habitat trends over time – Characterize nest sites and territories, including average height of the nest from the ground and distance from water, aspect, and habitually used features, etc., using current and historical data – Support research to determine foraging distances and home range size of nesting Peregrine Falcon pairs in Ontario	KG – Characteristics of habitat KG – Foraging distances and home range sizes KG – Required nest buffer sizes
High	**1.3** Develop criteria and protocols for assessing, ranking and mapping potential habitat quality and suitability for breeding and foraging: – Survey and ground truth areas of potential habitat	KG – Required nest buffer sizes T – Habitat change or loss
High	**1.4** Protect Peregrine Falcon habitat through a habitat regulation and the use of the habitat protection provisions of the ESA 2007	T – Habitat change or loss T – Disturbance
Objective 2: Identify and, where feasible, reduce and/or eliminate known threats to the Peregrine Falcon population and habitat in Ontario.		
High	**2.1** Support the monitoring and evaluation of contaminants, including PBDEs and other contaminants, in Peregrine Falcons: – Continue the annual distribution of the provincial pesticide memorandum – Undertake blood sampling when banding juvenile Peregrine Falcons	KG – Trends and effects of contaminants T – Environmental contamination

Relative Priority	Approach to Recovery	Threat (T) or Knowledge Gap (KG) Addressed
	– Work with the Canadian Cooperative Wildlife Health Centre and CWS to collect, analyze and archive unhatched eggs and dead fledglings for contaminant sampling	
High	**2.2** Support research to improve understanding of the levels of tolerance among Peregrine Falcons of adjacent human disturbances and the cumulative impacts of multiple human activities, including this species' tolerance of: – acute disturbances such as construction and maintenance projects – chronic disturbances such as noise, mechanical infrastructure and permanent features (e.g., condominiums, apartment buildings, wind turbines)	KG – Required nest buffer sizes
High	**2.3** Develop guidelines for industrial, urban and recreational activity near Peregrine Falcon nests: – Evaluate and address mitigation techniques for windpower – Evaluate the effectiveness of the new direction in the Stand and Site Guide for the protection of Peregrine Falcon nest sites – Identify threats unique to urban sites and develop mitigation and best management practices – Ensure that any permits or agreements regarding activities in Peregrine Falcon habitat consider the cumulative impacts of the activities around the site – Discourage activities in Peregrine Falcon habitat during the breeding period (March 15 to September 1 for cliff nesting peregrines, and March 1 to September 1 for urban nesting peregrines)	KG – Impacts of wind power T – Disturbance T – Collisions T – Habitat change or loss
High	**2.4** Continue to prohibit the take of Ontario reared Peregrine Falcons from the wild for falconry, educational purposes and zoos in Ontario, and continue to discourage their take in other jurisdictions	T – Capture for falconry
Objective 3: Monitor and inventory the population status of and trends relating to the Peregrine Falcon through development of a comprehensive monitoring program.		
High	**3.1** Develop a standardized monitoring protocol and survey methodology for continued monitoring of peregrine nest sites: – Create data collection standards, including standards for the type of	KG- Impacts of wind turbines on nesting and migration

Relative Priority	Approach to Recovery	Threat (T) or Knowledge Gap (KG) Addressed
	data to be collected, and the form of the data recording and reporting system and procedures for annual updating of provincial databases	KG- diseases and parasites, frequency and significance KG- Long-trends and biological effects of contaminants KG- Effects of climate change on populations and nesting success KG- Key characteristics of habitat selected for breeding and foraging
High	**3.2** Continue to conduct province-wide population surveys: – Participate in the national five-year surveys; if those surveys are discontinued, the OMNR should continue with a five-year monitoring program – Continue to monitor nest sites annually as resources allow	KG- Key characteristics of habitat selected for breeding and foraging KG- Minimum population size
High	**3.3** Develop the best approach for conducting annual surveys: – Identify gaps in survey coverage across Ontario – Evaluate a sub-sample approach of Peregrine Falcon habitat to be surveyed annually – Increase capacity to allow for the filling of knowledge gaps	
Medium	**3.4** Promote volunteer monitoring and reporting: – Work cooperatively with non-governmental organizations and individuals sharing similar interests in Peregrine Falcon recovery	KG – Key characteristics of habitat selected for breeding and foraging
Medium	**3.5** Review results of the ongoing banding program to understand its effectiveness as a monitoring tool and how it may be enhanced	KG – Key characteristics of habitat selected for breeding and foraging
Objective 4: Gain a better understanding of the Peregrine Falcon's use of habitat in its current and historic range, and, where feasible, encourage reoccupation of the species' historical habitat in Ontario.		

Relative Priority	Approach to Recovery	Threat (T) or Knowledge Gap (KG) Addressed
High	**4.1** Evaluate the habitat of current (post-collapse) sites and historical sites	KG – Key characteristics of habitat selected for breeding and foraging
Medium	**4.2** Assess the suitability of habitat and the feasibility of reoccupation in the historical range of the Peregrine Falcon where it has not naturally reoccupied	KG – Foraging distance and home range size KG – Key characteristics of habitat selected for breeding and foraging
Objective 5: Ensure that there is a consistent, comprehensive and up-to-date provincial Peregrine Falcon database so that the population recovery and habitat can be monitored, assessed and re-evaluated as required.		
High	**5.1** Review the current approach to data storage and management, and reconcile the multiple data management systems [Natural Resources and Values Information System (NRVIS), NHIC, district specific, Peregrine Falcon nest atlas] that currently exist	
High	**5.2** Develop a data storage management system with standardized collection and reporting requirements	
Medium	**5.3** Improve reporting standards and subsequent management of data collected for contaminant samples	KG – Long-trends and biological effects of contaminants T – Environmental Contamination
Objective 6: Maintain and raise public awareness of and promote stewardship of Peregrine Falcons in Ontario.		
High	**6.1** Engage land owners, managers and users in private land stewardship for Peregrine Falcons: – Develop incentive programs to encourage landowners to maintain peregrine habitat and promote conservation of the species	T – Habitat change or loss

Relative Priority	Approach to Recovery	Threat (T) or Knowledge Gap (KG) Addressed
Medium	**6.2** Develop communication tools to support recovery objectives and broader conservation issues: – Develop promotional products and fact sheets, including those on best management practices for the Peregrine Falcon	T – Persecution T – Disturbance
Medium	**6.3** Engage stakeholders and the general public in Peregrine Falcon stewardship: – Promote stewardship of Peregrine Falcons through selected annual events such as viewing, banding, web cams, etc.	T – Persecution
Medium	**6.4** Raise awareness and understanding of the rationale for reliance on captive reared peregrines for falconry, educational purposes and zoos in Ontario	T – Persecution T – Capture for Falconry
Low	**6.5** Engage other Ontario government ministries in resolving potential conflicts regarding Peregrine Falcon conservation: – Investigate compatibility of the Mining Act and other legislation and associated licenses	T – Disturbance T- Environmental Contamination

2.4 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.

Peregrine Falcon habitat includes the nest site, nesting territory (defendable territory) and home range, and contains features such as cliff ledges and perches, as well as open air space. A habitat regulation would safeguard an area on which the Peregrine Falcon depends, directly or indirectly, to carry on its life processes, including reproduction, rearing, migration and feeding.

Ontario has two distinct populations of Peregrine Falcons: the northern population, which nests primarily on cliffs, and the southern population, which typically nests on human-created structures in urban settings. Cliff sites on open-pit mines should be treated as natural cliff sites. Since Some Peregrine Falcons use a different nest site each year, and new sites are being discovered, the regulation should be based on a description of nest site features.

The following five classifications of Peregrine Falcon nest sites should be regulated as habitat.

1. Historical nest sites that were populated prior to the population collapse in 1963
2. Unoccupied nest sites that have been used since 1986 but not documented in the last 10 years
3. Current nest sites that are occupied or have been documented within the last 10 years
4. Newly discovered nest sites that are currently occupied but for which there is no previous record of occupation
5. Potential cliff nesting habitat, as identified by an expert

The nest cliff (natural or human-created) encompasses the cliff face on which the nest scrape is located. It extends vertically from the base to the top of the cliff, and horizontally across the entire cliff face. Habitat should be regulated within 3 kilometres of the nest cliff of current or newly discovered nests and within 1 kilometre of historical nest sites and potential cliff nesting habitat. Peregrine Falcons have been reported to hunt up to 14 kilometres from the nest site, but the majority of foraging flights are within 3 kilometres of a nest site (Beebe 1974, Bird and Aubry 1982, Enderson and Kirven 1983, Hunter et al. 1988). The recommended distances from the cliffs would therefore protect most foraging habitat.

Peregrine Falcon nest sites on human created features should be regulated as the full extent of the building ledge, bridge ledge, or ledge of any other man-made structure on

which the nest scrape or nesting box is located. A building ledge is typically confined to one floor and one side of a four-sided building. A bridge ledge is typically confined to the extent of one horizontal "I" beam. Peregrine pairs have been known to cycle between nest sites in an urban environment over a five-year period (Heaton pers comm. 2009).

The habitat regulation should be written such that it is flexible enough to immediately protect newly discovered Peregrine Falcon nest sites in the same way as currently used sites. The habitat regulation should be sufficient to include the areas necessary to meet the biological requirements of the species.

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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