

# Management Plan for the Peregrine Falcon *anatum/tundrius* (*Falco peregrinus* *anatum/tundrius*) in Canada

## Peregrine Falcon *anatum/tundrius*



2017



**Recommended citation:**

Environment and Climate Change Canada. 2017. Management Plan for the Peregrine Falcon *anatum/tundrius* (*Falco peregrinus anatum/tundrius*) in Canada [Proposed final]. *Species at Risk Act* Management Plan Series. Environment and Climate Change Canada, Ottawa. iv + 27 pp.

For copies of the management plan, or for additional information on species at risk, including COSEWIC status reports, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk \(SAR\) Public Registry](http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1)<sup>1</sup>.

**Cover illustration:** © Raymond Ladurantaye

Également disponible en français sous le titre  
« Plan de gestion du Faucon pèlerin *anatum/tundrius* (*Falco peregrinus anatum/tundrius*) au Canada »

© Her Majesty the Queen in Right of Canada, represented by the Minister of Environment and Climate Change. 2017. All rights reserved.

ISBN

Catalogue No.

*Content (excluding illustrations) may be used without permission, with appropriate credit to the source.*

---

<sup>1</sup> <http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

## Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk](#)<sup>2</sup> agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c. 29) (SARA), the federal competent ministers are responsible for the preparation of management plans for listed species of special concern and are required to report on progress five years after the publication of the final document on the SAR Public Registry.

The Minister of Environment and Climate Change and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Peregrine Falcon *anatum/tundrius*, and has prepared this management plan as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the governments of British Columbia, Alberta, Northwest Territories, Yukon, Nunavut, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, and Newfoundland and Labrador, the Sahtu, Gwich'in and Wek'èezhii renewable resources boards, the Tłıchǵ Government, the Wildlife Management Advisory Council (NWT), the Ehdiitat Renewable Resource Council, the Wildlife Management Advisory Council (North Slope), the Nunavut Wildlife Management Board, and the Hunting, Fishing and Trapping Coordinating Committee.

Success in the conservation of this species depends on the commitment and cooperation of the many different constituencies that will be involved in implementing the directions set out in this plan and will not be achieved by Environment and Climate Change Canada, Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this plan for the benefit of the Peregrine Falcon *anatum/tundrius* and Canadian society as a whole.

Implementation of this management plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

---

<sup>2</sup> <http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2>

## Acknowledgements

This management plan was written by Mark Dionne and François Shaffer of the Canadian Wildlife Service of Environment and Climate Change Canada (ECCC) in the Quebec Region. The plan was improved by technical input, advice and comments from Andrea Norris, Pam Sinclair, Ian Parnell (ECCC-CWS, Pacific and Yukon Region), Randi Mulder (Yukon Conservation Data Centre), Geraldine Pope (Kluane First Nation), David Trotter (Ministry of Agriculture, Government of British Columbia), Michael J. Chutter (Ministry of Forests, Lands and Natural Resource Operations, Government of British Columbia), Todd Powell (Environment Yukon, Government of Yukon), John Elliott (ECCC-Science and Technology, Pacific and Yukon Region), Deborah Simmons and Catarina Owen (Sahtu Renewable Resources Board), Nataalka Melnycky (Gwich'in Renewable Resources Board), Boyan Tracz and Jody Snortland Pellissey (Wek'èezhìi Renewable Resources Board), Ryan Fisher, Mark Wayland, James Duncan, Donna Bigelow, Lisa Pirie and Samuel Haché (ECCC-CWS, Prairie and Northern Region), Diane Casimir (Parks Canada Agency), Joanna Wilson and Suzanne Carrière (Department of Environment and Natural Resources, Government of Northwest Territories), Gordon Court (Ministry of Environment and Sustainable Resource Development, Government of Alberta), Ken De Smet (Department of Conservation and Water Stewardship, Government of Manitoba), Robert Bellizzi and Rachel McDonald (Department of National Defence, National Capital Region), Kevin Hannah, Mike Cadman and Élizabèth Rezek (ECCC-CWS, Ontario Region), Jay Fitzsimmons (Ontario Ministry of Natural Resources and Forestry, Government of Ontario), Marie-José Ribeyron, Manon Dubé and Charles Clavet (ECCC-CWS, Quebec Region), François Fournier and Junior Tremblay (ECCC-Science and Technology, Quebec Region), Martin Chiasson and Élizabèth Boivin (The Jacques Cartier and Champlain Bridges Incorporated, Quebec Region), Pierre Bérubé, Jean Lapointe and Antoine Saint-Louis (Department of Forests, Wildlife and Parks, Government of Quebec), Christine Zachary-Deom (Mohawk Council of Kahnawake), the members of the Species at Risk Sub-committee of the Hunting, Fishing and Trapping Coordinating Committee, Maureen Toner (New Brunswick Department of Natural Resources), Jessica Humber (Department of Environment and Conservation, Government of Newfoundland and Labrador), Mark Elderkin (Nova Scotia Department of Natural Resources, Government of Nova Scotia), Peter Thomas and Jen Rock (ECCC-CWS, Atlantic Region).

The contribution of residents, non-governmental organizations, Aboriginal groups, scientists and various interest groups, in the form of views, comments and recommendations made during the consultation processes to improve this management plan, is also acknowledged.

## Executive Summary

The Peregrine Falcon *anatum/tundrius* is a medium-to-large falcon that breeds in Greenland and throughout continental North America as far south as northern Mexico. In Canada, this falcon breeds in all Canadian provinces and territories except Prince Edward Island. The species winters from southern Canada, throughout the United States and as far as South America. Its population in Canada has been increasing since 1970. The Peregrine Falcon *anatum/tundrius* was listed as Special Concern in Schedule 1 of the *Species at Risk Act* (SARA) (S.C. 2002, c. 29) in 2012.

The main threats to the species are the use of organochlorine pesticides and toxic chemicals.

The objective of this management plan is to maintain a self-sustaining<sup>3</sup> population of the Peregrine Falcon *anatum/tundrius* throughout its Canadian range for the next 10 years.

The broad strategies and conservation measures required to achieve the management objective are presented in Section 6. In addition to supporting existing measures, this management plan proposes a number of conservation measures aimed at reducing threats and evaluating their impacts, the conservation and, if possible, legal protection of nesting sites, improving knowledge of Peregrine Falcon *anatum/tundrius* populations, with an emphasis on populations located in northern regions, and participation of northern communities (Aboriginal and non-Aboriginal) in activities related to conservation of the species.

---

<sup>3</sup> A population that, on average, remains stable or demonstrates positive population growth, as found in 2010, and is large enough to withstand stochastic events and persist in the long term without the need for permanent active management intervention.

## Table of Contents

Preface.....	i
Acknowledgements .....	ii
Executive Summary .....	iii
1. COSEWIC Species Assessment Information .....	1
2. Species Status Information .....	1
3. Species Information .....	4
3.1 Species Description .....	4
3.2 Population and Distribution .....	4
3.3 Needs of the Peregrine Falcon <i>anatum/tundrius</i> .....	5
4. Threats.....	7
4.1 Threat Assessment .....	7
4.2 Description of threats .....	8
5. Management Objective .....	13
6. Broad Strategies and Conservation Measures.....	13
6.1 Actions Already Completed or Currently Underway .....	13
6.2 Broad Strategies .....	15
6.3 Conservation Measures .....	15
7. Measuring Progress .....	18
8. References.....	19
Appendix A: Effects on the Environment and Other Species .....	27

## 1. COSEWIC\* Species Assessment Information

**Date of Assessment:** April 2007

**Common Name (population):** Peregrine Falcon *anatum/tundrius*

**Scientific Name:** *Falco peregrinus anatum/tundrius*

**COSEWIC Status:** Special Concern

**Reason for Designation:** Continental populations of this species have shown continuing increases in population size since the 1970s, reaching near-historic numbers. Population thresholds for downlisting have been achieved for both the *tundrius* and *anatum* subspecies. This recovery has been the result of reintroductions across much of southern Canada, and natural increases in productivity following the ban in Canada of organochlorine pesticides (e.g., DDT). These compounds were the primary factor responsible for the historic decline. These pesticides continue to be used on the wintering grounds, and continue to be found in peregrine tissues, albeit at levels that do not significantly affect reproductive success. The unknown effects of new pesticides regularly licensed for use in Canada are also a concern.

**Canadian Occurrence:** Yukon, Northwest Territories, Nunavut, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, and Newfoundland and Labrador.

**COSEWIC Status History:** The Peregrine Falcon in Canada was originally evaluated by COSEWIC as three separate subspecies: *anatum* subspecies (Endangered in April 1978, Threatened in April 1999 and in May 2000); *tundrius* subspecies (Threatened in April 1978 and Special Concern in April 1992) and *pealei* subspecies (Special Concern in April 1978, April 1999 and November 2001). In April 2007, the Peregrine Falcon in Canada was assessed as two separate units: *pealei* subspecies and *anatum/tundrius*. Peregrine Falcon *anatum/tundrius* was designated Special Concern in April 2007.

\* COSEWIC – Committee on the Status of Endangered Wildlife in Canada

## 2. Species Status Information

Over 60% of the North American breeding range of the Peregrine Falcon *anatum/tundrius* is in Canada (Figure 1). The species was listed as a species of Special Concern on Schedule 1 of the *Species at Risk Act* (SARA) (S.C. 2002, c. 29) in 2012. The species is a member of the family Falconidae, which is not included in Article I of the Migratory Birds Convention. It is protected under all existing provincial and territorial wildlife legislation, but the scope of protection varies across the country. Table 1 presents the status of the species in those provinces and territories where the status is defined. Table 1 also provides the status rankings by NatureServe at the subnational

level. These rankings range from S1B (Critically Imperiled) to S3B (Vulnerable) (NatureServe 2015).



Figure 1. Breeding range of the Peregrine Falcon *anatum/tundrius* in North America (map: © modified from White et al. 2002; Chikoski and Nyman 2011; Tremblay et al. 2012; Government of the Northwest Territories 2014; R. Mulder, pers. comm. 2014).

Globally, the Peregrine Falcon *anatum/tundrius*, both species and subspecies, is ranked G4T4 (Apparently Secure). The species is ranked N3N4B in Canada, meaning that it is ranked between Apparently Secure and Vulnerable (NatureServe 2015).

Table 1. NatureServe rankings and Peregrine Falcon designations in each province and territory<sup>4</sup> (NatureServe 2015)

Province/ Territory	NatureServe Rank <sup>a</sup>			Designation by Province/Territory		
	<i>anatum</i>	<i>tundrius</i>	<i>anatum/ tundrius</i>	<i>anatum</i>	<i>tundrius</i>	<i>anatum/ tundrius</i>
British Columbia	S2?B	SUM		Red List <sup>b</sup>	Unknown <sup>b</sup>	
Alberta	S2S3	—	SNR	—	—	Threatened <sup>c, d</sup>
Saskatchewan	S1B, S4M, S2N	—	SNR	—	—	—
Manitoba	S1B	S1B	S1B	—	—	Endangered <sup>c, e</sup>
Ontario	S3B	SNA	S3B	—	—	Special Concern <sup>c, f</sup>
Quebec	S3	S3	S3S4B	Vulnerable <sup>g</sup>	—	—
Labrador	S3B	SNR	SNR	—	—	Vulnerable <sup>h</sup>
New Brunswick	S1B	—	SNR	—	—	Endangered <sup>i</sup>
Nova Scotia	S1B	—	SNR	Vulnerable <sup>j</sup>	—	—
Prince Edward Island	SNA	—	SNR	—	—	—
Island of Newfoundland	S2M	—	SNR	—	—	Vulnerable <sup>h</sup>
Yukon	S3B	S2B	SNR	—	—	Specially protected
Northwest Territories	S3S4B	SNR	S3S4B	—	—	—
Nunavut	SNR	SNR	SNR	—	—	—

<sup>a</sup> S1 – Critically Imperiled; S2 – Imperiled; S3 – Vulnerable; S3S4 - Vulnerable to Apparently Secure; S4 – Apparently Secure; S5 – Secure; SU – Unrankable; SNR – Unranked; SNA – Not applicable; B – Breeding population; N – Non-breeding populations; M – Migrant transient population; ? – Uncertain.

<sup>b</sup> A species is assigned to the Red List or Blue List based on the conservation status provincial rank (SRank), which is determined by the provincial conservation data centre. These lists can be used to designate official statuses under British Columbia's *Wildlife Act* (RSBC 1996, c. 488).

<sup>c</sup> Subspecies not specified.

<sup>d</sup> Alberta *Wildlife Act* (R.S.A. 2000, c. W-10).

<sup>e</sup> Manitoba *Endangered Species and Ecosystems Act* (C.C.S.M. c. E111).

<sup>f</sup> Ontario *Endangered Species Act, 2007* (S.O. 2007, c. 6).

<sup>4</sup> It is important to note that the assigning of the NatureService rank or designation by the territories and provinces, combining the *anatum* and *tundrius* subspecies, has not been done in all territories and provinces.

<sup>g</sup> Quebec *Act respecting threatened or vulnerable species* (R.S.Q., c. E-12.01)

<sup>h</sup> Newfoundland and Labrador *Endangered Species Act* (S.N.L. 2001, c. E-10.1).

<sup>i</sup> New Brunswick *Species at Risk Act* (S.N.B. 2012, c. 6, 2013-38 & 39).

<sup>j</sup> Nova Scotia *Endangered Species Act* (S.N.S. 1998, c. 11).

In Canada, the species is not protected under the *Migratory Birds Convention Act, 1994* (S.C. 1994, c. 22). In the United States, the *anatum* (USFWS 1999) and *tundrius* (USFWS 1994) subspecies were removed from the federal endangered species list. The species is protected under the U.S *Migratory Bird Treaty Act of 1918* (16 U.S.C. 703-712).

The Peregrine Falcon *anatum/tundrius* is protected under the *Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act* (WAPPRIITA) (S.C. 1992, c. 52). The purpose of WAPPRIITA is to protect Canadian and international plant and wildlife species threatened by overexploitation for illegal trade. It accomplishes its objectives by regulating international trade and interprovincial transportation of certain wild plants and animals, or their parts or derived products. This act is a product of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The Peregrine Falcon is listed in Schedule 1 of CITES, which means that international trade in Peregrine Falcons taken from the wild is permitted only in exceptional circumstances. Permits are required for exports and imports.

### **3. Species Information**

#### **3.1 Species Description**

The Peregrine Falcon is a medium-to-large falcon (comparable in size to a crow) with long, pointed wings. Adults have bluish-grey or darker upperparts, a variable-width blackish wedge extending down from the eyes, and whitish, greyish, or buff-coloured underparts, with variable amounts of blackish spotting and barring. The sexes are distinguished by size, with females being 15–20% larger and 40–50% heavier than males (White 1968; White et al. 2002). Juveniles resemble the adults but have light brown to slate brown or chocolate brown upperparts and blackish-barred buff underparts.

#### **3.2 Population and Distribution**

The Peregrine Falcon *anatum/tundrius* breeds in Greenland and across continental North America south to northern Mexico (White et al. 2002). In Canada, the species breeds in all provinces and territories except Prince Edward Island (COSEWIC 2007). It has a disjunct distribution, and its boundaries have yet to be described (COSEWIC 2007). The species winters from southern Canada and the United States (White et al. 2002) to South America.

National surveys of Peregrine Falcon breeding populations have been carried out every five years in Canada since 1970 (Holroyd and Banasch 2012). These surveys indicate that the number of sites occupied by the Peregrine Falcon *anatum/tundrius* has increased,<sup>5</sup> surpassing the size of the known historical population in some regions (COSEWIC 2007; Holroyd and Banasch 2012). In 2005, the Peregrine Falcon *anatum/tundrius* population occupied 556 sites, whereas in 2010 it occupied approximately 610 sites (Holroyd and Banasch 2012; A. Franke, pers. comm. 2013). Because the national surveys are primarily carried out at known breeding sites, the upward trend does not necessarily reflect the total Peregrine Falcon *anatum/tundrius* population in Canada (Holroyd and Banasch 2012). At a local scale, the trend may be different than that detected in national surveys, as in the case of inland Labrador (Brazil 2005). These population estimates are lower than the true population size since the breeding area extends over a vast northern landscape that is mostly unsurveyed, where there could be several thousand falcons (COSEWIC 2007; USFWS 2008a). These individuals likely constitute the majority of the Canadian population. In 1969, Fyfe (1969) estimated the population in northern Canada at 7,500 breeding pairs. Based on a recent analysis using mark-recapture data for banded Peregrine Falcons in northern North America and Greenland between 1970 and 2010, the northern breeding population has been estimated at more than 15,000 pairs (Franke 2016). In addition, there could be up to 30,000 non-breeding adults (Franke 2016).

The upward trend observed in national surveys between 1970 and 2010 is supported by data from migratory bird observatories in North America, which also show an increase in the Peregrine Falcon *anatum/tundrius* population from 1970 to the early 2000s (Farmer et al. 2008).

### 3.3 Needs of the Peregrine Falcon *anatum/tundrius*

The Peregrine Falcon *anatum/tundrius* breeds in a wide range of habitats, from Arctic tundra to coastal islands, and major urban centres (Cade 1982). Peregrine Falcons generally nest on cliff ledges or in crevices. Cliffs ranging from 50 to 200 m high are preferred (Cade 1960; White and Cade 1971). The species is highly adaptable in nest site selection. It can nest on top of pingos<sup>6</sup> on the tundra, on escarpments, in quarries, in trees and on various human-made structures (e.g., transmission towers, skyscrapers, churches, bridges, open-pit mines, industrial stacks) (COSEWIC 2007; Buchanan et al. 2014). It also successfully breeds in nest boxes installed in these habitats to create conditions conducive to nesting (Cade et al. 1996).

The Peregrine Falcon *anatum/tundrius* breeds in habitats with access to sufficient prey (White et al. 2002). Given that it feeds primarily on birds captured in the air, it prefers sites located near seabird colonies, shorebird and waterfowl staging or nesting areas, or sites with large numbers of pigeons or songbirds. It also feeds occasionally on

---

<sup>5</sup> These increases are primarily the result of the ban on DDT in Canada in the early 1970s and the success of the reintroduction program (COSEWIC 2007).

<sup>6</sup> Large hillock in the shape of a dome—generally 30 to 50 m high and 400 m in diameter—which forms under or in Arctic permafrost.

mammals (White et al. 2002). At the landscape level, suitable nest sites are patchily distributed, but can be common locally (COSEWIC 2007).

Peregrine Falcons are solitary breeders and highly territorial. Although the number of breeding pairs may be high in some locations (COSEWIC 2007), local density may be limited by the species' territorial behaviour. The species also demonstrates a high degree of breeding site fidelity (Beebe 1974; Ambrose and Riddle 1988).

Predation is not known to be a significant limiting factor for the Peregrine Falcon. Great Horned Owl (*Bubo virginianus*) and Northern Goshawk (*Accipiter gentilis*) are the main avian predators (COSEWIC 2007). The Red Fox (*Vulpes vulpes*) is also a known predator (Rowell 2002). Mammals can also have an impact on the food resources of the Peregrine Falcon. For example, the introduction of Norway Rats (*Rattus norvegicus*) to an island in British Columbia resulted in a reduction in the size of seabird colonies, on which the Peregrine Falcon feeds (Taylor et al. 2000).

## 4. Threats

### 4.1 Threat Assessment

Table 2: Threat assessment table

Threat	Level of Concern <sup>k</sup>	Extent	Occurrence	Frequency	Severity <sup>l</sup>	Causal Certainty <sup>m</sup>
<b>Pollution</b>						
Use of organochlorine pesticides <sup>n</sup>	High	Widespread	Historic	Continuous	High	High
	Medium	Localized	Unknown	Seasonal	Moderate	High
Use of toxic chemical products	Medium	Widespread	Current	Continuous	Moderate	Medium
<b>Use of biological resources</b>						
Legal harvesting for falconry	Low	Localized	Current	Recurrent	Low	Low
Poaching	Low	Localized	Unknown	Recurrent	Low	Low
<b>Disturbance or damage</b>						
Recreational activities	Low	Localized	Current / Anticipated	Seasonal	Low	Medium
Exploration and development of natural resources	Low	Localized	Current / Anticipated	Continuous	Low	Medium
Construction, renovation and maintenance of infrastructure	Low	Localized	Current / Anticipated	Continuous	Low	Medium
<b>Accidental death</b>						
Collision with infrastructure or means of transportation	Low	Localized	Current	Continuous	Low	Low
<b>Climate and natural disasters</b>						
Climate change	Low	Widespread	Current / Anticipated	Continuous	Moderate	Medium

<sup>k</sup> *Level of Concern: signifies that managing the threat is of (high, medium or low) concern for the conservation of the species, consistent with the management objectives. This criterion considers the assessment of all the information in the table.*

<sup>l</sup> *Severity: reflects the population-level effect (high: very large population-level effect, moderate, low, unknown).*

<sup>m</sup> *Causal Certainty: reflects the degree of evidence that is known for the threat (high: available evidence strongly links the threat to stresses on population viability; medium: there is a correlation between the threat and population viability, e.g., expert opinion; low: the threat is assumed or plausible).*

<sup>n</sup> *Given that the characteristics of this threat have changed considerably over recent decades, its assessment includes its historical characteristics followed by its current characteristics.*

## 4.2 Description of threats

Threats are presented in descending order of concern. The threats do not affect the entire Canadian Peregrine Falcon population uniformly. Birds that nest in the southern part of the breeding range are more likely to be affected by avicide use, recreational activities, construction and maintenance of infrastructure, and collisions with infrastructure or means of transportation.

### ***Use of organochlorine pesticides***

The use of organochlorine pesticides, most notably 1,1,1-trichloro-2,2-bis(p-chlorophenyl) ethane (DDT), from the late 1940s to the 1970s, with subsequent bioaccumulation<sup>7</sup> within the food chain, was the primary factor causing the collapse of Peregrine Falcon populations (White et al. 2002). DDT was banned in Canada and the United States in the early 1970s (COSEWIC 2007), but it is still allowed in some countries within the species' winter range, such as Venezuela (White et al. 2002; Van den Berg 2009; Stockholm Convention on Persistent Organic Pollutants 2014).

The current impact of residual organochlorine pesticides (which are present throughout the species's range) on Canadian Peregrine Falcon *anatum/tundrius* populations is not well known. In British Columbia's Okanagan Valley, a region where DDT was heavily used from the 1950s to the 1970s, residual concentrations remain high and could affect the reproductive capacity of the Peregrine Falcon (Elliott et al. 2005). In Alberta, DDT residues measured in Peregrine Falcon eggs show a downward trend (Alberta Peregrine Falcon Recovery Team 2005). Pressures to once again allow the use of DDT to control malaria and other insect-borne diseases (Raloff 2000; Stockholm Convention on Persistent Organic Pollutants 2014) make it a threat to the Peregrine Falcon and its prey that winters in South America and therefore will have to be monitored.

### ***Use of toxic chemical products***

The discovery of the assimilation of significant quantities of polybrominated diphenyl ethers (PBDEs)<sup>8</sup> by Peregrine Falcons and other raptors in the early 2000s raised concerns about the possibility of a new crisis similar to that created by dichlorodiphenyltrichloroethane (DDT) (Lindbergh et al. 2004; Guerra et al. 2012). Legislative measures designed to limit the impacts of these chemical compounds have

---

<sup>7</sup> Bioaccumulation means the capacity of a living organism to gradually absorb and concentrate a contaminant or toxic substance that is present in the environment.

<sup>8</sup> Brominated flame retardants.

since been adopted by the Government of Canada (*Polybrominated Diphenyl Ethers Regulations*, SOR/2008-218). In the United States, restrictions vary by state. Future research will make it possible to determine whether the implementation of these measures will lead to a reduction in PBDE concentrations in Peregrine Falcons.

With new chemical compounds and substances being developed and used across the range of the Peregrine Falcon *anatum/tundrius*, it is possible that Peregrine Falcons may be affected by bioaccumulation or biomagnification<sup>9</sup> of other contaminants. The toxicity of the products that will eventually be used to replace PBDEs will have to be monitored. There are also concerns about neonicotinoids,<sup>10</sup> neurotoxic insecticides known to have the potential to cause behavioural effects in birds (Hallmann et al. 2014).

The pesticides used to control species considered pests (e.g., pigeons, starlings, rodents) also pose a threat to the Peregrine Falcon *anatum/tundrius*. The ingestion of prey contaminated with pesticides such as 4-amino-pyridine (Avitrol®), strychnine or fenthion) may result in shock and death of adult birds and juveniles (Mineau et al. 1999; Campbell 2006).

Although legislation governing the use of pesticides exists, there are no specific regulations to reduce the risk to Peregrine Falcon *anatum/tundrius*. However, the Government of Ontario (Ministry of Natural Resources and Forestry and Ministry of the Environment and Climate Change) distributes a memorandum to pest bird control companies requesting that they avoid the use of chemical bird control methods within areas identified as supporting a Peregrine Falcon territory (OMOE and OMNR 2008).

Heavy metals can also pose a threat to the Peregrine Falcon, particularly mercury, which can adversely affect the nervous and reproductive systems (Wolfe et al. 1998; Bennett et al. 2009).

### ***Legal harvesting for falconry***

The harvesting of Peregrine Falcon *anatum/tundrius* for falconry is currently banned across Canada, except in Saskatchewan,<sup>11</sup> which has allowed a small harvest of passing juvenile migrants since 2001 (Rowell 2002). The recent de-listing of the *anatum* subspecies in the United States has resulted in the lifting of the ban on the harvesting of falcons in some parts of the country<sup>12</sup> (USFWS 2008a). An unknown number of falcons are also harvested for falconry in Mexico (G.L. Holroyd, pers. comm. 2009). Harvesting

---

<sup>9</sup> Biomagnification means the increase in the concentration of a pollutant in a living organism as it moves up the food chain.

<sup>10</sup> A group of insecticides with a chemical formula similar to that of nicotine that kill insects by their action on the central nervous system.

<sup>11</sup> Two Peregrine Falcons have been harvested under a permit authorized by the Government of Saskatchewan since 2005.

<sup>12</sup> Since 2009, the United States has allowed the capture of 130 chicks and first-year birds that are capable of flying during the nesting period until September 1, west of 100° longitude west, including Alaska. It is also permissible to capture 36 migrants in their first year from September 20 to October 20, east of 100° longitude west. The harvest applies to juvenile migrants from northern regions.

of Peregrine Falcon *anatum/tundrius* for falconry is prohibited in Greenland (K. Burnham, pers. comm. 2013).

Although the COSEWIC status report (2007) identifies the harvest for falconry as a threat, according to Millsap and Allen (2006) the current level of harvesting in North America is below the threshold that would be detrimental to the species. Population modelling results indicate that the allowed take in the United States does not have a significant impact on the size of the population and that available estimates of vital rates permit the harvest of a certain number of juvenile Peregrine Falcon *anatum/tundrius* (Millsap and Allen 2006). It is recommended that the model be validated to ensure that this harvest does not compromise the species' recovery. More recently, based on the USFWS harvest guidelines and the annualized estimate of hatch-year falcons, Franke (2016) concluded that a small harvest could take place without a negative impact on the breeding population.

### **Poaching**

The Peregrine Falcon may be the target of illegal poaching of eggs and chicks (COSEWIC 2007). It is difficult to assess the overall significance of this threat. A case reported in 2003 in northern Quebec suggests that this threat persists (A. Saint-Louis, pers. comm. 2014). The illegal shooting of Peregrine Falcons is a practice that still exists. For example, 9.1% (n=99) of Peregrine Falcons brought in to the Clinique des oiseaux de proie at the Université de Montréal's Faculty of Veterinary Medicine had been killed or injured by bullets (Desmarchelier et al. 2010).

### **Recreational activities**

All Peregrine Falcons, including *anatum/tundrius*, can be affected by disturbances caused by certain recreational activities, particularly rock climbing and, to a lesser degree, hiking, bird watching and all-terrain vehicle use. The effect of disturbance depends on its timing relative to the reproduction cycle and the proximity and frequency of its occurrence. The most critical periods for the reproductive success of Peregrine Falcons are those when they are establishing territory and immediately before egg-laying (Fyfe and Olendorff 1976). During incubation and chick rearing, disturbances can have an impact by forcing adult falcons away from the nest for prolonged periods, resulting in undesirable cooling or heating of the eggs or chicks, and in a reduction in the amount of time adults can spend foraging and feeding their young (Ontario Peregrine Falcon Recovery Team 2010). The impact of recreational activities is mostly localized in inhabited areas.

Some area managers have developed guidelines aimed at reducing the impact of recreational activities at certain sites where the risk of disturbing the species during nesting periods is high (Cade et al. 1996; Richardson and Miller 1997; Manning, Cooper and Associates 2003; Buissière 2010; Ministry of Environment 2013). Those measures include prohibiting certain recreational activities or imposing a minimum distance from nests (COSEWIC 2007; Ontario Peregrine Falcon Recovery Team 2010).

### ***Exploration and development of natural resources***

The exploration and development of natural resources (e.g., mining, forestry, wind energy development) could have negative impacts by disturbing Peregrine Falcon *anatum/tundrius* during nesting, destroying nests or discouraging the species from nesting in a particular area (Fyfe and Olendorff 1976; COSEWIC 2007). The conservation of Peregrine Falcon nesting sites must remain a high priority given the species' nest-site fidelity (Cade et al. 1996).

Peregrine Falcons that nest in areas where there is little human activity tend to be more sensitive to disturbances (Pyke 1997; White et al. 2002). The expansion and intensification of natural resource exploration and development in northern regions could therefore become a significant threat to the species, particularly given that the majority of the Canadian population of Peregrine Falcon *anatum/tundrius* may nest in these regions.

Various natural resources exploration and particularly development activities are subject to an environmental screening or environmental assessment before they can proceed. In many cases, it is thus possible to avoid—or where not possible minimize—adverse effects on the species. Several provinces have adopted legal or administrative measures to protect the nests or habitat of the Peregrine Falcon *anatum/tundrius*. Other jurisdictions encourage industry to follow best practice guidelines to minimize impacts on Peregrine Falcons and their nests.

### ***Construction, renovation and maintenance of infrastructure***

Construction, renovation and maintenance of infrastructure (e.g., bridges or buildings) can have negative impacts by disturbing Peregrine Falcons during nesting or by destroying nests (COSEWIC 2007). The effects of disturbances are comparable to those identified for recreational activities. The impact of infrastructure maintenance activities is mostly concentrated in inhabited areas or areas near them. In contrast, the construction of tall structures (buildings, pylons, communication towers) or the presence of quarries can benefit the species by providing suitable nesting sites.

Some managers of infrastructure on which the species nests regularly have developed management plans in order to minimize the negative impacts related to maintenance (e.g., installation of artificial nest boxes in the immediate vicinity, harvestings of eggs to hatch them in captivity and then release the young). By law, some construction, renovation and maintenance activities must undergo an environmental assessment under the *Canadian Environmental Assessment Act, 2012* or provincial or territorial legislation before they are carried out. In many cases, this process forces the proponent to avoid adverse effects on the species and, when this is not possible, to minimize the effects.

### ***Collision with infrastructure or means of transportation***

Peregrine Falcons are sometimes injured or killed when they strike human-made structures, such as building windows or wires. They can also collide with aircraft (Sherrod 1983; Stepnisky 1996; White et al. 2002). According to a study conducted in northeastern North America based on 160 documented cases, collisions with buildings, vehicles, aircraft and transmission lines account for 36%, 9%, 8% and 8% of the observed cases, respectively (Gahbauer et al. 2015a).

### ***Climate change***

Adult Peregrine Falcons *anatum/tundrius* present in the Arctic are vulnerable to extreme-weather-related environmental conditions encountered during fall migration (Franke et al. 2011). According to a study conducted using two climatic indices, the North Atlantic Oscillation and the Southern Oscillation,<sup>13</sup> the prevailing conditions in October and November were positively correlated with apparent adult survival and explained 14% of the variation in apparent adult survival. Conditions for the same months in the previous year were negatively associated with apparent adult survival and explained 11% of the variation. However, combined the effects of these indices explained 35% of the temporal variation in apparent survival (Franke et al. 2011). The chicks are also affected by weather conditions, as evidenced by the fact that between 2008 and 2010, over one-third of nestling mortality in the Rankin Inlet (Nunavut) study area was caused by rainfall. The increase in the frequency of heavy rain is an important factor in explaining the decline in productivity of that population (Anctil et al. 2013). This threat could become even more significant in the future since extreme weather events, such as heavy rainfall, are expected to increase with climate change (Min et al. 2011).

The species could also be indirectly affected by the effects of climate change on food availability or by natural changes in climatic conditions such as El Niño, if there is an increase in their frequency or intensity. Large-scale climate phenomena, such as El Niño and the North Atlantic Oscillation, can affect the survival and productivity of seabirds and shorebirds (Sandvik et al. 2012; Galbraith et al. 2014) on which the Peregrine Falcon *anatum/tundrius* preys.

Northern regions are likely to sustain the most significant impacts associated with climate change (Screen and Simmonds 2010). Given that a significant proportion of Canada's Peregrine Falcon *anatum/tundrius* population breeds in these northern regions, the effects on the species could become of greater concern.

Conversely, this species may also benefit from climate change. The warming observed in the Arctic could allow the Peregrine Falcon to expand its range. Over the last 20 to 25 years, the Peregrine Falcon has expanded its breeding range in northern Greenland as a result of more favourable weather conditions (Burnham et al. 2012). It also shows an ability to adapt by breeding earlier in the season in the Northwest Territories (Carrière and Matthews 2013).

---

<sup>13</sup> The North Atlantic Oscillation (NAO) refers to a phenomenon that affects the North Atlantic weather system. The Southern Oscillation affects the Pacific weather system.

## 5. Management Objective

The objective of this management plan is to maintain a self-sustaining<sup>15</sup> population of the Peregrine Falcon *anatum/tundrius* throughout its Canadian range for the next 10 years.

In general, Peregrine Falcon *anatum/tundrius* populations have made a remarkable recovery in the last two decades because of the ban on DDT and the success of reintroduction programs (Kiff 1988; Enderson et al. 1995; Millsap et al. 1998; Holroyd and Bird 2012). Although the observed increases can be partly explained by increased monitoring activity, the population appears to have reached and, in some cases, surpassed the historical pre-collapse numbers (COSEWIC 2007; Gahbauer et al. 2015b).

Natural nesting habitat is still available, and the species also has human-made structures for nesting that it already uses or that it may use in the future. It is therefore reasonable to believe that the population is self-sustaining and that Peregrine Falcon *anatum/tundrius* numbers could be maintained or even increased through existing and new conservation measures as well as through threat monitoring. Given that the last five-year Peregrine Falcon survey in Canada was conducted in 2010, it is used as a reference to assess achievement of the objectives. The 2010 surveys showed that at least 610 sites were occupied by the Peregrine Falcon. That number is more representative of the population that breeds in southern Canada, as few surveys are conducted in northern Canada. However, because the five-year survey is the only one conducted regularly and the only one that covers such a large territory, it is a valuable source of data for measuring progress toward achievement of the objectives. The results of bird counts performed by the raptor observatories in Canada and the United States can also assist in monitoring the status of the population.

## 6. Broad Strategies and Conservation Measures

### 6.1 Actions Already Completed or Currently Underway

The assessment of the Peregrine Falcon as a species at risk in Canada dates back to 1978 (Martin 1978). Since that time, many recovery activities have been carried out in all provinces and territories. The following list is not exhaustive, but is intended to illustrate the main areas in which work has been or is being done.

#### ***Monitoring and evaluation***

---

<sup>15</sup> A population that, on average, remains stable or demonstrates positive growth in the short term, as found during the last five-year survey in 2010, and is large enough to withstand stochastic events and persist in the long term without the need for ongoing active management intervention.

- Evaluation of the species' status in Canada by COSEWIC in 1978 (*anatum* and *tundrius* separately), 1992 (*tundrius* only), 1999 and 2000 (*anatum* only), and 2007 (*anatum/tundrius*) (COSEWIC 2007).
- Status reports produced by Quebec (Bird 1997), Alberta (Rowell and Stepnisky 1997) and British Columbia (Cooper and Beauchesne 2004).
- A national five-year Peregrine Falcon survey (1970–2010) of population trends and productivity (Rowell et al. 2003; Chikoski and Nyman 2011; Holroyd and Banasch 2012; Carrière and Matthews 2013; unpublished data from some provincial and territorial governments).
- In addition to the national five-year survey, a number of provinces, territories and protected areas carry out their own surveys in selected regions (COSEWIC 2007).

### **Conservation and management**

- DDT use gradually phased out in Canada in about the mid-1970s. Withdrawal of registration of all DDT uses in Canada in 1985. Today, the sale or use of DDT in Canada is an offence under the *Pest Control Products Act* (Environment Canada 2014).
- From 1975 to 1996, captive breeding and release of over 1,500 Peregrine Falcons at various locations in Canada (Holroyd and Bird 2012).
- Development and application of provincial recovery plans, including Quebec (Comité de rétablissement du Faucon pèlerin au Québec 2002), Ontario (Ontario Peregrine Falcon Recovery Team 2010), Alberta (Alberta Peregrine Falcon Recovery Team 2005) and Manitoba (Wheeldon 2003).
- Best practices guides developed in British Columbia (Manning, Cooper and Associates 2003; Ministry of Environment 2005, 2013), the Northwest Territories (Aboriginal Affairs and Northern Development Canada 2011), Alberta (Government of Alberta 2011) and Yukon (Energy Mines & Resources 2014), including minimum setback distances for raptor nests.
- Restrictions or a ban on rock climbing near known nesting sites, particularly in Quebec and British Columbia (EROP 2009; Del Degan, Massé et associés inc. 2010; M. Chutter, pers. comm. 2014).
- Administrative agreement on the protection of nesting sites located on public lands, particularly in Alberta, Saskatchewan, Manitoba and Quebec (FAPAQ and MRN 2002; K. De Smet, pers. comm. 2014).
- Recommendations by the Ontario government on the required setbacks from nests during the use of avicides to control pest birds (OMOE and OMNR 2008).
- Development of standardized guidelines for petroleum industry activities (Scobie and Faminow 2000).
- Involvement of a private company in the mitigation of the loss of a nest following the destruction of a human-made structure used as a nesting site. The company funded the captive rearing of young Peregrine falcons, followed by release to the wild and the creation of alternative nesting sites (G. Court, pers comm. 2014).

## 6.2 Broad Strategies

To meet the management objective, the conservation measures will be organized according to the following five general strategies:

- Reduce threats and assess their relative impacts.
- Conserve and, if possible, provide legal protection of the species' nesting sites.
- Improve the state of knowledge on northern populations of the species in Canada.
- Encourage the participation of northern communities (Aboriginal and non-Aboriginal) in conservation activities carried out in northern areas.
- Regularly assess the Canadian population trend and its productivity.

The reduction of threats to the Peregrine Falcon *anatum/tundrius* is key to achieving the management objective, along with the assessment of impacts of significant or lesser-known threats.

To ensure successful reproduction of the Peregrine Falcon, the implementation of conservation and stewardship measures at the various nesting sites must be promoted. Such measures can be implemented by various stakeholders (governments, land use managers, non-governmental organizations, citizens). In some cases, the competent authorities could consider legal protection measures.

Special attention should be given to northern regions, where some threats (e.g., climate change) give rise to concern, particularly as the majority of the Canadian population nests in these regions. Gaps in knowledge regarding northern populations, such as their distribution, abundance and productivity, as well as the relative importance of the threats affecting population dynamics, will also have to be filled.

The participation of northern communities (Aboriginal and non-Aboriginal) will have to be encouraged in order to benefit from their traditional knowledge of the environment and the species. Their involvement, both in monitoring activities and in the other planned conservation measures, will be a definite asset for the conservation of northern populations of the species.

Finally, regular monitoring of the Canadian population of the Peregrine Falcon *anatum/tundrius* is critical, particularly for assessing the effectiveness of the measures implemented and the progress made in achieving the management objective. Monitoring based on a rigorous and joint protocol should be carried out in as many regions of Canada as possible.

## 6.3 Conservation Measures

Proposed conservation measures and a schedule for implementing the recommended general strategies are presented in Table 3. This table also includes a number of conservation measures for which implementation is already in progress.

**Table 3: Conservation Measures and Implementation Schedule**

Conservation Measure	Priority <sup>o</sup>	Threats or Concerns Addressed	Timeline
<b>General strategy: Reduce threats and assess their impacts</b>			
Carry out research on the direct and indirect effects of toxic chemicals on Peregrine Falcon survival and reproductive success with the involvement of rehabilitation centres, banding stations, and other organizations likely to be able to provide samples.	High	Use of toxic chemicals.	2020
Support initiatives in Central and South America to ban the use of organochlorine pesticides.	High	Use of organochlorine pesticides.	2020
Promote specific control measures for the Peregrine Falcon on the use of pesticides in urban and agricultural environments.	High	Use of toxic chemicals	2020
Consider the Peregrine Falcon <i>anatum/tundrius</i> as a <i>valued ecosystem component<sup>p</sup></i> in various environmental assessment processes.	Medium	Exploration and development of natural resources; construction, renovation and maintenance of infrastructure.	In progress
Encourage research in order to gain a better understanding of the level of tolerance of Peregrine Falcons to human disturbance and to the cumulative impacts of human activities carried out near its nesting sites.	Medium	Exploration and development of natural resources; recreational activities; construction, renovation and maintenance of infrastructure.	2020
Continue to raise awareness among natural resources developers, owners and managers of species' nesting sites and prepare best practices guides to help infrastructure managers avoid impacts on the species during maintenance and repair of structures and during project development.	Medium	Exploration and development of natural resources; recreational activities; construction, renovation and maintenance of infrastructure.	In progress
Continue to raise awareness among outdoor recreation enthusiasts who could disrupt the Peregrine Falcon <i>anatum/tundrius</i> during the	Medium	Recreational activities.	In progress

nesting period and encourage them to participate in the species' conservation (e.g., identifying new breeding sites, finding alternative sites for recreational activities).			
Participate in the assessment of effects of authorized harvesting in the United States, Canada and Mexico on the North American Peregrine Falcon populations and work with stakeholders, provinces, territories and international authorities to maintain a harvest level that does not affect the achievement of the management objective.	Medium	Harvesting for falconry.	2020
<b>General strategy: Conserve and, if possible, legally protect the species' nesting sites</b>			
Promote the application of nest site protection measures included in existing legislation and regulations.	Medium	Recreational activities; exploration and development of natural resources; construction, renovation and maintenance of infrastructure.	In progress
Promote the implementation of nest site conservation measures and, if possible, legal protection measures, in places where this has not yet been done.	Medium	Recreational activities; exploration and development of natural resources; construction, renovation and maintenance of infrastructure.	2020
<b>General strategy: Improve knowledge regarding northern populations of the species in Canada</b>			
Fill knowledge gaps on the abundance and location of northern populations.	High	Knowledge gaps; climate change; exploration and development of natural resources.	2020
Assess the impacts of climate change on populations.	Medium	Knowledge gaps; climate change.	2020
<b>General strategy: Encourage participation of northern communities (Aboriginal and non-Aboriginal) in conservation activities carried out in northern areas</b>			
Develop and implement an information and outreach program for affected northern communities (Aboriginal and non-Aboriginal) and promote information exchange between government authorities and northern communities.	High	Climate change; exploration and development of natural resources.	2020

<b>General strategy: Regularly assess the trend of the species' Canadian population and its productivity</b>			
Reassess and modify, as needed, the survey methodology to support the National Peregrine Falcon Survey.	High	Monitoring of species management.	2019
Continue the National Peregrine Falcon Survey every 5 years, encouraging stakeholders from the provinces, territories, protected areas and non-governmental organizations to take part in it.	High	Monitoring of species management.	In progress
Design and implement the research that is required to develop population viability models to assess the self-sufficiency criteria.	Medium	Monitoring of species management.	2020

<sup>o</sup> "Priority" reflects the degree to which the measure contributes directly to the conservation of the species or is an essential precursor to a measure that contributes to the conservation of the species. High priority measures are considered those most likely to have an immediate and/or direct influence on attaining the management objective for the species. Medium priority measures may have a less immediate or less direct influence on reaching the management objective, but are still important for the management of the population. Low priority conservation measures will likely have an indirect or gradual influence on reaching the management objectives, but are considered important contributions to the knowledge base and/or public involvement and acceptance of the species.

<sup>p</sup> A valued ecosystem component is an environmental element of an ecosystem that is identified as having scientific, ecological, social, cultural, economic, historical, archaeological or aesthetic importance. Valued ecosystem components that have the potential to interact with project components should be included in the assessment of environmental effects.

## 7. Measuring Progress

The performance indicators presented below propose an approach for defining and measuring progress towards the achievement of the management objective. Success in implementing this management plan will be evaluated every five years on the basis of the following performance indicators:

- By 2026, the entire Peregrine Falcon *anatum/tundrius* population remains self-sustaining and has maintained or exceeded the population level reached in 2010.
- By 2026, the entire Peregrine Falcon *anatum/tundrius* population in Canada has maintained or increased its Canadian range as identified in 2010.
- By 2026, the number of young Peregrine Falcon *anatum/tundrius* produced annually in Canada is sufficient to maintain or increase the population throughout its Canadian range.

The population will be measured using the results of national surveys carried out every five years as well as the results from bird counts performed by raptor observatories in Canada and the United States.

## 8. References

- Aboriginal Affairs and Northern Development Canada. 2011. Northern Land Use Guidelines. Volume 09a: Northwest Territories Seismic Operations. [http://publications.gc.ca/collections/collection\\_2012/aadnc-aandc/R2-226-9-1-2011-eng.pdf](http://publications.gc.ca/collections/collection_2012/aadnc-aandc/R2-226-9-1-2011-eng.pdf) (accessed November 8, 2016).
- Alberta Peregrine Falcon Recovery Team. 2005. Alberta Peregrine Falcon Recovery Plan 2004-2010. Alberta Sustainable Resource Development, Fish and Wildlife Division. Alberta Species at Risk Recovery Plan No. 3. Edmonton, Alberta, 16 p.
- Ambrose, R.E. and K.E. Riddle. 1988. Population dispersal, turnover, and migration of Alaska peregrines. In T.J. Cade, J.H. Enderson, C.J. Thelander and C.M. White [eds]. Peregrine Falcon Populations: their management and recovery. The Peregrine Fund, Inc. Boise, ID. 947 p.
- Anctil, A., A. Franke and J. Bêty. 2013. Heavy rainfall increases nestling mortality of an arctic top predator: experimental evidence and long-term trend in peregrine falcons. *Oecologia*: DOI: 10.1007/s00442-013-2800-y.
- Beebe, F.L. 1974. Field studies of the Falconiformes of British Columbia. Vultures, hawks, falcons, eagles, Occasional Paper Series No. 17, BC Provincial Museum, Victoria, British Columbia.
- Bennett, R.S., J.B. French Jr., R. Rossmann and R. Haebler. 2009. Dietary toxicity and tissue accumulation of methylmercury in American kestrels. *Archives of Environmental Contamination and Toxicology* 56:149-156.
- Bird, D.M. 1997. Rapport sur la situation du faucon pèlerin (*Falco peregrinus*) au Québec. Ministère de l'Environnement et de la Faune, Direction de la faune et des habitats, 76 p.
- Brazil, J. 2005. 2004-05, Nest survey for Peregrine Falcons in Labrador. Unpublished report. Department of Environment and Conservation, Government of Newfoundland and Labrador. 4 p.
- Buchanan, J.B., K.A. Hamn, L.J. Salzer, L.V. Diller and S.J. Chinnici. 2014. Tree-Nesting by Peregrine Falcons in North America: Historical and Additional Records. *Journal of Raptor Research* 48(1): 61-67.
- Buissière, F. 2010. Escalade et conservation. Guide de gestion des parois d'escalade pour la protection des oiseaux de proie. Regroupement QuébecOiseaux. 24 p.

Burnham, K.K., W.A. Burnham, I. Newton, J.A. Johnson and A.G. Gosler. 2012. The History and Range Expansion of Peregrine Falcons in the Thule Area, Northwest Greenland. Museum Tusculanum Press. University of Copenhagen.

Burnham, K.K. pers. comm. 2013. Email correspondence to Mark Dionne, December 2013. President and CEO High Arctic Institute.

Cade, T.J. 1960. Ecology of the Peregrine and Gyrfalcon populations in Alaska. University of California Publications in Zoology 63: 151-290.

Cade, T.J. 1982. The falcons of the world. Cornell Univ. Press, Ithaca, New York.

Cade, T.J., J.H. Enderson and J. Linthicum. 1996. Guide to management of Peregrine Falcons at the eyrie. The Peregrine Fund, Boise, Idaho, 97 p.

Campbell, D. 2006. Common toxicological problems of Ontario wildlife – Avitrol. Canadian Cooperative Wildlife Health Centre, Wildlife Health Centre Newsletter 12 (1): 10-11.

Carrière, S. and S. Matthews. 2013. Peregrine Falcon Surveys Along the Mackenzie River, Northwest Territories, Canada. File Report No. 140. Environment and Natural Resources, Government of the Northwest Territories. 55 p.

Chikoski, J. and L. Nyman. 2011. The 2010 Ontario Peregrine Falcon Survey – A Summary Report. Unpublished report, Ontario Ministry of Natural Resources, Thunder Bay. 36 p.

Chutter, M. pers. comm. 2014. Information received by Canadian Wildlife Service, Quebec Region through jurisdiction review. Biologist, Ministry of Forests, Lands and Natural Resource Operations, Government of British Columbia.

Comité de rétablissement du Faucon pèlerin au Québec. 2002. Plan d'action pour le rétablissement du faucon pèlerin *anatum* (*Falco peregrinus anatum*) au Québec. Société de la faune et des parcs du Québec, 28 p.

Cooper, J.M. and S.M. Beauchesne. 2004. Status of the Peregrine Falcon in British Columbia. Wildlife Working Report, Biodiversity Branch, Ministry of Water, Land and Air Protection, Victoria, British Columbia.

COSEWIC. 2007. COSEWIC Assessment and Update Status Report on the Peregrine Falcon *Falco peregrinus* (*pealei* subspecies - *Falco peregrinus pealei* and *anatum/tundrius* - *Falco peregrinus anatum/tundrius*) in Canada – Update. Committee on the Status of Species at Risk in Canada. Ottawa. viii + 45 p.

Court, G. pers. comm. 2014. Information received by the Canadian Wildlife Service, Quebec Region, during the consultation of authorities. Ministry of Environment and Sustainable Resource Development, Government of Alberta.

Del Degan, Massé et Associés inc. 2010. Gatineau Park Ecosystem Conservation Plan. Report presented by Del Degan, Massé et Associés inc. to the National Capital Commission. 120 p. + annexes.

Desmarchelier, M., A. Santamaria-Bouvier, G. Fitzgérald and S. Lair. 2010. Mortality and morbidity associated with gunshot in raptorial birds from the province of Quebec: 1986 to 2007. *Canadian Veterinary Journal* 51: 70-74.

De Smet, K. pers. comm. 2014. Information received by Canadian Wildlife Service, Quebec Region through jurisdiction review. Biologist, Department of Conservation and Water Stewardship, Government of Manitoba.

Elliott, J.E., M.J. Miller and L.K. Wilson. 2005. Assessing breeding potential of peregrine falcons based on chlorinated hydrocarbon concentrations in prey. *Environmental Pollution* 134: 353-361.

Enderson, J.H., W. Heinrich, L. Kiff and C.M. White. 1995. Population changes in North American peregrines, *Transactions of the North American Wildlife and Natural Resources Conference* 60: 142-161.

Energy Mines & Resources. 2014. Yukon Forest Resources Act, Wildlife Features Standard.  
[http://www.emr.gov.yk.ca/forestry/pdf/Wildlife\\_Features\\_Standard\\_final\\_2014.02.27.pdf](http://www.emr.gov.yk.ca/forestry/pdf/Wildlife_Features_Standard_final_2014.02.27.pdf) (accessed November 8, 2016).

Environment Canada. 2014. Dichlorodiphenyltrichloroethane. List of Toxic Substances Managed under CEPA (Schedule 1) [Online]. <https://www.ec.gc.ca/toxiques-toxics/Default.asp?lang=En&n=98E80CC6-1&xml=13272755-983C-4DF5-8EA2-E734EFC39869> (accessed November 8, 2016).

EROP (Équipe de rétablissement des oiseaux de proie du Québec). 2009. Bilan du rétablissement du faucon pèlerin de la sous-espèce *anatum* (*Falco peregrinus anatum*) pour la période 2002-2009. Ministère des Ressources naturelles et de la Faune, Faune Québec. 22 p.

FAPAQ (Société de la Faune et des Parcs du Québec) and MRN (ministère des Ressources naturelles). 2002. Protection des espèces menacées ou vulnérables en forêt publique – Le faucon pèlerin *Falco peregrinus*. Société de la faune et des parcs du Québec, Direction du développement de la faune and Ministère des Ressources naturelles et de la Faune, Direction de l'environnement forestier. 9 p.

Farmer, C.J., L.J. Goodrich, E.R. Inzunza and J.P. Smith. 2008. Conservation status of North America's birds of prey. *In*: K.L. Bildstein, J.P. Smith, E.R. Inzunza and R.R. Veit (eds.). State of North America's birds of prey. Series in Ornithology No. 3. Nuttall Ornithological Club. Cambridge, MA and American Ornithologists' Union, Washington, DC, U.S.A. p. 303-419.

Franke, A., J.-F. Therrien, S. Descamps and J. Bêty. 2011. Climatic conditions during outward migration affect apparent survival of an arctic top predator, the peregrine falcon *Falco peregrinus*. *Journal of Avian Biology* 42: 544-551.

Franke, A. pers. comm. 2013. Email correspondence to Mark Dionne. December 2013. Adjunct Academic, Canadian Circumpolar Institute, University of Alberta.

Franke, A. 2016. Population estimates for Northern Juvenile Peregrine Falcons with implications for harvest levels in North America. *Journal of Fish and Wildlife Management* 7(1) 36-45.

Fyfe, R. 1969. The Peregrine Falcon in Northern Canada. *In*: Peregrine Falcon Populations: Their Biology and Decline (J.J. Hickey, ed.). University of Wisconsin Press, Madison, Wisconsin, USA. p. 101-114.

Fyfe, R.W. and R.R. Olendorff. 1976. Minimizing the dangers of nesting studies to raptors and other sensitive species. Canadian Wildlife Service Occasional Paper 23. Edmonton. 17 p.

Gahbauer, M.A., D.M. Bird, K.E. Clark, T. French, D.W. Brauning and F.A. McMorris. 2015a. Productivity, mortality, and management of urban peregrine falcons in northeastern North America. *Journal of Wildlife Management*, 79 (1): 10-19.

Gahbauer, M.A., D.M. Bird and T.E.R. Armstrong. 2015b. Origin, growth, and composition of the recovering Peregrine Falcon population in Ontario. *Journal of Raptor Research* 49(3): 281-293.

Galbraith, H., D.W. DesRochers, S. Brown and J.M. Reed. 2014. Predicting Vulnerabilities of North American Shorebirds to Climate Change. *PLoS ONE* 9(9): e108899. doi:10.1371/journal.pone.0108899.

Government of Alberta. 2011. Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta. <http://aep.alberta.ca/fish-wildlife/wildlife-land-use-guidelines/documents/WildlifeLandUse-SpeciesHabitatGrasslandParkland-Apr28-2011.pdf> (accessed November 8, 2016).

Government of the Northwest Territories. 2014. NWT Species at Risk: Peregrine Falcon. Available at: <http://www.nwt-species-at-risk.ca/species/peregrine-falcon-anatum-tundrius-complex> (accessed November 8, 2016).

Guerra, P., M. Alae, B. Jiménez, G. Pacepavicius, C. Marvin, G. MacInnis, E. Eljarrat, D. Barceló, L. Champoux and K. Fernie. 2012. Emerging and historical brominated flame retardants in Peregrine Falcon (*Falco peregrinus*) eggs from Canada and Spain. *Environment International* 40: 179-186.

Hallmann, C.A., R.P.B. Foppen, C.A.M. van Turnhout, H. de Kroon and E. Jongejans. 2014. Declines in insectivorous birds are associated with high neonicotinoid concentrations. *Nature* 511: 341-343.

Holroyd, G.L. and D.M. Bird. 2012. Lessons learned during the Recovery of the Peregrine Falcon in Canada. *Canadian Wildlife Biology & Management* 1(1): 3-20.

Holroyd, G.L. and U. Banasch. 2012. The 2005 Canadian Peregrine Falcon survey. *Canadian Wildlife Biology & Management* 1(1): 30-45.

Holroyd, G.L. pers. comm. 2009. Information contained in a draft Recovery Strategy for the Peregrine Falcon (*anatum*). Emeritus researcher. Environment Canada. Edmonton.

Kiff, L.F. 1988. Commentary—changes in the status of the Peregrine in North America: an overview. *In*: T.J. Cade, J.H. Enderson, C.G. Thelander and C.M. White (eds.). *Peregrine Falcon populations: their management and recovery*. The Peregrine Fund, Inc., Boise, Idaho. p. 123-139.

Lindbergh, P., U. Sellström, L. Häggberg and C.A. de Wit. 2004. Higher brominated diphenyl ethers and hexabromocyclododecane found in eggs of Peregrine Falcons (*Falco peregrinus*) breeding in Sweden. *Environmental Science and Technology* 38: 93-96.

MacKinnon, C.M., J. Dulude, A.C. Kennedy, S.J.E. Surette and P.W. Hicklin. 2008. Cliff roosting by migrant Semipalmated Sandpipers, *Calidris pusilla*, at Farrier's Cove, Shepody Bay, New Brunswick. *Canadian Field-Naturalist* 122(3): 274-276.

Manning, Cooper and Associates. 2003. Best management practices for raptors in the urban/rural landscape of MWLAP Region 1. B.C. Ministry of Water, Land and Air Protection, Nanaimo, British Columbia.

Martin, M. 1978. COSEWIC status report on the Peregrine Falcon *Falco peregrinus anatum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 48 p.

Millsap, B.A. and G.T. Allen. 2006. Effects of falconry harvest on wild raptor populations in the United States: Theoretical considerations and management recommendations. *Wildlife Society Bulletin* 34(5): 1392-1400.

Millsap, B.A., P.L. Kennedy, M.A. Byrd, G. Court, J.H. Enderson and R.N. Rosenfeld. 1998. Review of the proposal to de-list the American peregrine falcon. Wildlife Society Bulletin 26: 522-538.

Min, S.-K., X. Zhang, F.W. Zwiers and G.C. Hegerl. 2011. Human contribution to more-intense precipitation extremes. Nature 470: 378-381.

Mineau, P., M.R. Fletcher, L.C. Glaser, N.J. Thomas, C. Brassard, L.K. Wilson, J.E. Elliott, L.A. Lyon, C.J. Henny, T. Bollinger and S.L. Porter. 1999. Poisoning of raptors with organophosphorus and carbamate pesticides with emphasis on Canada, U.S. and U.K. Journal of Raptor Research 33: 1-37.

Ministry of Environment (MOE). 2005. Best Management Practices for Raptor Conservation during Urban and Rural Land Development in British Columbia. Prepared by Mike W. Demarchi and Michael D. Bentley. LGL Limited environmental research associates. Prepared for B.C. Ministry of Environment Ecosystem Standards and Planning Biodiversity Branch. March 2005.

Ministry of Environment (MOE). 2013. Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia. Available at: [http://www.env.gov.bc.ca/wld/documents/bmp/raptor\\_conservation\\_guidelines\\_2013.pdf](http://www.env.gov.bc.ca/wld/documents/bmp/raptor_conservation_guidelines_2013.pdf) (accessed November 8, 2016).

Mulder, R. pers. comm. 2014. Email sent to François Shaffer on October 9, 2014. Data Manager, Yukon Conservation Data Centre, Government of the Northwest Territories, Whitehorse.

NatureServe. 2015. NatureServe Explorer: An Online Encyclopedia of Life [Web application]. Version 7.1. NatureServe, Arlington, Virginia. Available at: <http://www.natureserve.org/explorer> (accessed November 8, 2016).

OMOE (Ontario Ministry of the Environment) and OMNR (Ontario Ministry of Natural Resources). 2008. Pesticide Memorandum. Pest Bird Control and the Peregrine Falcon Recovery Program in Ontario. 3 p.

Ontario Peregrine Falcon Recovery Team. 2010. Recovery Strategy for Peregrine Falcon (*Falco peregrinus*) in Ontario. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. viii + 36 p.

Pyke, K. 1997. Raptors and climbers: guidance for managing technical climbing to protect raptor nest sites. The Access Fund, Boulder, Colorado. 27 p.

Raloff, J. 2000. The case for DDT: What do you do when a dreaded environmental pollutant saves lives? Science News 158: 12-14.

- Richardson, C.T. and C.K. Miller. 1997. Recommendations for protecting raptors from human disturbance: a review. *Wildlife Society Bulletin* 25(3): 634-638.
- Rowell, P. 2002. COSEWIC status report on Anatum Peregrine Falcon *Falco peregrinus anatum*. Committee on the Status of Endangered Wildlife in Canada. 29 p.
- Rowell, P. and D.P. Stepnisky. 1997. Status of the Peregrine Falcon (*Falco peregrinus anatum*) in Alberta. Alberta Environmental Protection, Wildlife Management Division, Wildlife Status Report No. 8, Edmonton, Alberta. 23 p.
- Rowell, P., G.L. Holroyd and U. Banasch. 2003. The 2000 Canadian peregrine falcon survey. *Journal of Raptor Research* 37: 98-116.
- Saint-Louis, A. pers. comm. 2014. Phone conversation. October 2014. Biologist. Department of Forests, Wildlife and Parks, Government of Quebec.
- Sandvik, H., K.E. Erikstad and B.-E. Sæther. 2012. Climate affects seabird population dynamics both via reproduction and adult survival. *Marine Ecology Progress Series* 454: 273-284.
- Scobie, D. and C. Faminow. 2000. Development of Standardized Guidelines for Petroleum Industry Activities that Affect COSEWIC Prairie and Northern Region Vertebrate Species at Risk. Ghostpine Environmental Services, 42 p.
- Screen, J.A. and I. Simmonds. 2010. The central role of diminishing sea ice in recent Arctic temperature amplification. *Nature* 464: 1334-1337.
- Sherrod, S.K. 1983. Behavior of fledgling Peregrines. The Peregrine Fund, Inc, Ithaca, New York.
- Stepnisky, D. 1996. Summary report of the Alberta Hack Program, 1992-1996. Unpubl. rept., Alberta Natural Resources Service, Edmonton, AB. 42 p.
- Stockholm Convention on Persistent Organic Pollutants. 2014. Register of DDT pursuant to paragraph 1 of part II of annex B of the Stockholm Convention. <http://chm.pops.int/Implementation/Exemptions/AcceptablePurposesDDT/tabid/456/Default.aspx> (accessed November 8, 2016).
- Taylor, R.H., G.W. Kaiser and M.C. Drever. 2000. Eradication of Norway Rats for recovery of seabird habitat on Langara Island, British Columbia. *Restoration Ecology* 8: 151-160.
- Tremblay, J. A., P. Fradette, F. Shaffer and I. Gauthier. 2012. Inventaire quinquennal 2010 du faucon pèlerin au Québec méridional : état de la population québécoise. *Naturaliste canadien* 136: 88-93

UNESCO. 2012. Falconry, a living human heritage.

<http://www.unesco.org/culture/ich/en/RL/falconry-a-living-human-heritage-01209> (accessed November 8, 2016).

USFWS (U.S. Fish and Wildlife Service). 1994. Endangered and Threatened Wildlife and Plants; Proposed Rule to Remove the Peregrine Falcon in North America from the Federal List of Endangered and Threatened Wildlife. Federal Register 59 (192): 50796-50805.

USFWS (U.S. Fish and Wildlife Service). 1999. Final Rule to Remove the American Peregrine Falcon from the Federal List of Endangered and Threatened Wildlife, and to Remove the Similarity of Appearance Provision for Free-flying Peregrines in the Conterminous United States. Federal Register 64 (164): 46542-46558.

USFWS (U.S. Fish and Wildlife Service). 2008a. Final Environmental Assessment and Management Plan – Take of Migrant Peregrine Falcons from the Wild for Use in Falconry, and Reallocation of Nestling/Fledging Take. Division of Migratory Bird Management. Arlington, Virginia. 55 p.

USFWS (U.S. Fish and Wildlife Service). 2008b. Take of Migrant Peregrine Falcons in the United States for Use in Falconry. Federal Register 73 (236): 74508-74509.

Van den Berg, H. 2009. Global status of DDT and its alternatives for use in vector control to prevent disease. Environmental Health Perspective. 117(11): 1656-63.

Wheeldon, R. 2003. A Recovery Plan and Strategy for the Peregrine Falcon in Manitoba: A Parkland Mews–Manitoba Conservation Partnership Project. [www.parklandmews.com/pdf/recoveryplan.pdf](http://www.parklandmews.com/pdf/recoveryplan.pdf) (accessed November 8, 2016).

White, C.M. 1968. Biosystematics of the North American Peregrine Falcons. Doctoral thesis, University of Utah, Salt Lake City, Utah.

White, C.M. and T.J. Cade. 1971. Cliff-nesting raptors and ravens along the Colville River in arctic Alaska. Living Bird 10: 107-150.

White, C.M., N.J. Clum, T.J. Cade and W.G. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*). In: Poole, A. and F. Gill (eds.). The Birds of North America, No. 660. The Birds of North America, Inc., Philadelphia, Pennsylvania.

Wolfe, M., F.S. Schwarzbach and R.A. Sulaiman. 1998. Effects of mercury on wildlife: a comprehensive review. Environmental Toxicology and Chemistry 17:146-160.

## Appendix A: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the [Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals](#).<sup>16</sup> The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or achievement of any of the [Federal Sustainable Development Strategy](#)'s<sup>17</sup> (FSDS) goals and targets.

Conservation planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that implementation of management plans may inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the management plan itself, but are also summarized below in this statement.

While this management plan promotes the conservation of the Peregrine Falcon *anatum/tundrius*, it will clearly benefit the environment. The Peregrine Falcon is a symbol of species at risk conservation, and its gradual recovery is an oft-cited example of the feasibility of species-at-risk recovery. The information gathered and the conservation measures implemented could also be used to conserve other birds of prey. As well, since the Peregrine Falcon is a top predator, it could also act as an indicator of the effects of pollution. Information collected on the impacts of climate change in northern regions on the Peregrine Falcon *anatum/tundrius* could also benefit other species in these regions. Lastly, the Peregrine Falcon could contribute to the control of overabundant birds in urban areas. An increase in the Peregrine Falcon population could have a local adverse effect on its prey populations, including songbirds, colonial seabirds, shorebirds and small mammals (MacKinnon et al. 2008). An increase in the population could also have an adverse effect on other raptor species, such as the Prairie Falcon, with which it competes for nesting sites. Given that the Peregrine Falcon *anatum/tundrius* is a generalist species that feeds on a wide range of prey, predation pressure should be spread among all available prey. In addition, the local impact of an increase in predation by this species is limited, in part, by the availability of nesting sites and its territorial behaviour during the breeding period.

---

<sup>16</sup> <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

<sup>17</sup> <http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1>