

Alberta's Species at Risk Program

Alberta Peregrine Falcon Recovery Plan



Alberta Species at Risk Recovery Plan No. 38

MAY 2021



Alberta Peregrine Falcon Recovery Plan
Published by Alberta Environment and Parks

Cover photo: Gordon Court
May 2021
ISBN: 978-1-4601-5101-3
ISSN: 1702-4900
© 2021 Government of Alberta.

This publication is issued under the Open Government Licence – Alberta (<http://open.alberta.ca/licence>).

For more information regarding this content visit: <https://open.alberta.ca/documentation/pubguidedraft>

This publication may be cited as:

Alberta Environment and Parks. 2021. Alberta Peregrine Falcon Recovery Plan. Alberta Species at Risk Plan No. 38. Edmonton, AB, 33pp.

This publication is available online at <https://open.alberta.ca/publications/alberta-peregrine-falcon-recovery-plan-2021>

Table of Contents

Acknowledgments	6
Recovery Planning in Alberta	7
Executive Summary	8
1.0 Introduction	9
2.0 Process for Revising the Plan	10
2.1 Alberta Peregrine Falcon Advisory Group Composition	10
2.2 Recovery Plan Development	10
3.0 Implementation Progress Review	11
4.0 Situational Analysis	12
4.1 Biology of the Peregrine Falcon	12
4.1.1 Breeding Biology	12
4.1.2 Population Distribution and Trends in Alberta	13
4.1.3 Habitat	16
4.2 Provincial and Federal Status	16
4.3 Population Trends	17
4.4 Threats	17
4.1.4 Pesticide Pollution	17
4.5 Knowledge Gaps and Research Priorities	20
5.0 Recovery Goal and Objectives	21
6.0 Habitat Needed to Support Recovery	22
7.0 Recovery Strategies and Actions	23
7.1 Strategy 1: Reduce human disturbance at nest sites	23
7.1.1 Desired Outcome	23
7.1.2 Progress Measures	23
7.1.3 Recovery Actions	24
7.2 Strategy 2: Manage Nesting Pairs to Reduce Loss of Young	24
7.2.1 Desired Outcome	24
7.2.2 Progress Measures	24
7.2.3 Recovery Actions	24
7.3 Strategy 3: Monitor Population Size	25
7.3.1 Desired Outcome	25

7.3.2	Progress Measures	25
7.3.3	Recovery Actions	25
7.4	Strategy 4: Monitor Pesticide Residues	25
7.4.1	Desired Outcome	25
7.4.2	Progress Measures	25
7.4.3	Recovery Actions	25
8.0	Implementation Plan.....	26
9.0	Socio-Economic Scan	28
10.0	Effects On Other Species At Risk.....	30
11.0	Literature Cited.....	31

List of Figures

Figure 1. Historical nesting distribution for peregrine falcons in Alberta prior to 1970 (from Rowell and Stepnisky 1997).	14
Figure 2. Total number of occupied peregrine falcon territories in Alberta, 1970–2016.....	15
Figure 3. Geometric mean levels of DDE in addled peregrine falcon eggs, representing 187 different clutches, collected in Alberta between 1965 and 2015.	18
Figure 4. Peregrine pairs nesting in urban settings often produce well, but have high levels of fledgling mortality. At this site, a hatch of five young is not unusual, however, less than one young bird, on average, survived fledging for more than a decade.....	20

List of Tables

Table 1. Peregrine falcon implementation and action table — current action status	11
Table 2. Alberta peregrine falcon implementation table.	26
Table 3. Anticipated socio-economic impacts of peregrine falcon recovery actions.	29

Acknowledgments

This recovery plan was prepared by the Alberta Peregrine Falcon Advisory Group: Gordon Court, Alberta Environment and Parks (Team Leader); Geoffrey Holroyd, Beaverhill Bird Observatory; Steve Schwartze, Alberta Falconry Association; Rhona Kindopp, Parks Canada; Alastair Franke, University of Alberta; and Peter and Beverly Fullbrandt, FledgeWatch Edmonton.

The Alberta Peregrine Falcon Advisory Group thanks its respective organizations for providing in-kind support for the preparation of this plan. Funding from the Species at Risk Program of Alberta Environment and Parks supported the preparation of the *Alberta Peregrine Falcon Recovery Plan*. Tom Thompson of Alberta Agriculture and Forestry provided the analysis of DDT residues in peregrine eggs from 2010–2017. We are also grateful to Samantha Stamler of Alberta Environment and Parks for assistance with egg sample preparation.

Recovery Planning in Alberta

Albertans are fortunate to share their province with an impressive variety of wild species. Populations of most species of plants and animals are healthy and secure. However, a small number of species are either naturally rare or are now imperilled because of human activities. Alberta Species at Risk recovery plans establish a basis for cooperation among government, industry, conservation groups, landowners and other stakeholders to ensure that these species and populations are restored or maintained for future generations of Albertans.

Alberta's commitment to the federal/provincial Accord for the Protection of Species at Risk and the National Framework for the Conservation of Species at Risk, combined with requirements established under Alberta's *Wildlife Act* and the federal *Species at Risk Act*, has resulted in the development of a provincial recovery program. An overall goal of the recovery program is to restore species identified as *Threatened* or *Endangered* to viable, naturally self-sustaining populations within Alberta. The policy document *Alberta's Strategy for the Management of Species at Risk (2009–2014)* provides broader program context for recovery activities.

Recovery plans are developed with the involvement of affected stakeholders. The level and type of involvement depends on socio-economic and conservation issues. Draft recovery plans undergo review by the Fish and Wildlife Policy Branch and are then posted online for public comment for at least 30 days; additional opportunities for review by the public may be provided. Following public review, Alberta's Endangered Species Conservation Committee reviews draft plans and provides recommendations on their acceptability to the Minister of Environment and Parks (hereafter "the Minister"). Plans accepted and approved for implementation by the Minister are published as a provincial government recovery plan. Approved plans are a summary of the Ministry of Environment and Parks' commitment to work with involved stakeholders to coordinate and implement conservation actions necessary to restore or maintain vulnerable species.

Recovery plans include two main sections: (1) a situational analysis that highlights the species' distribution and population trends, threats, and conservation actions to date; and (2) a recovery section that outlines goals, objectives, associated broader strategies, and specific priority actions required to maintain or recover *Threatened* or *Endangered* species. Each approved recovery plan undergoes regular review and at that time progress on implementation is evaluated. Implementation of each recovery plan is subject to the resource availability from both inside and outside of government.

Recovery plans will be systematically reviewed every five years. Where there are large changes in the goals, objectives or strategy sections due to a new understanding or circumstance, a plan may need to be redrafted, consulted on, and reviewed by the Endangered Species Conservation Committee, and the changes approved by the Minister.

Executive Summary

The peregrine falcon formerly nested along the banks of most major rivers in Alberta. Like most populations in North America, Alberta peregrines suffered reproductive failure and population declines in the 1950s and 1960s associated with the widespread and indiscriminate use of organochlorine pesticides, most notably dichloro diphenyl trichloroethane (DDT). However, a North American ban on the use of DDT by 1972, followed by captive-breeding programs reintroductions and a global decline in DDT use, has resulted in a rebound in populations.

In 2000, the peregrine was down-listed from *Endangered* to *Threatened* in Alberta in recognition of an increasing population, a measured reduction in pesticide residues in peregrine falcon tissues, and demonstrated improvements in reproductive performance. Along with this change in listing, the Minister of Environment (now Environment and Parks) accepted an Initial Conservation Action Statement from the Endangered Species Conservation Committee that recommended further recovery actions in the province. This included the formation of a multi-stakeholder recovery team whose role is to advise the minister on all matters relating to peregrine falcon conservation in the province, and preparation of a recovery plan. The *Alberta Peregrine Falcon Recovery Plan* was produced to embrace the objectives of the ministerial Initial Conservation Action Statement.

Recovery goals for Alberta are based on population, pesticide contaminant, and productivity targets derived from historical data and on an understanding of threshold levels for “healthy” peregrine populations. These goals are:

- (1) To achieve a well-distributed, average population of 70 territorial pairs of peregrine falcons in Alberta by 2020;
- (2) To monitor pesticide contaminants in non-viable peregrine falcon eggs in the province to ensure that geometric mean levels of the residue DDE (a metabolite of DDT) remain below 7.5 mg/kg (parts per million) over the long-term; and
- (3) To employ all management techniques possible to achieve a mean fledging rate of greater than 1.25 young/territorial pair/year in the province over the long term.

The overall cost of the actions detailed in the recovery plan is no more than \$10,000 per year, including both cash and “in-kind” support. Costs during the National Survey Year (2020) will be higher. A variety of agencies will be invited to participate in the funding and implementation of recovery initiatives.

1.0 Introduction

In Alberta, peregrine pairs are widely dispersed, but occur in two main populations. The Northern Population occurs north of Lake Athabasca and west into Wood Buffalo National Park. The South/Central Population is generally considered to consist of pairs nesting south of 56 degrees north latitude. Key breeding sites within the South/Central Population include: Edmonton, Calgary, Wabamun Lake, the North Saskatchewan River (and tributaries), and the Red Deer River. Ten major surveys for the species have been conducted since 1970. In 2015/16, 28 territories were occupied in the South/Central Population and 39 territories were occupied in the Northern Population (Corrigan 2000, Rowell *et al.* 2003, Court and Holroyd 2017).

In November 1999, the Minister of Environment (now Environment and Parks), on recommendation from Alberta's Endangered Species Conservation Committee (ESCC), approved the down-listing of the peregrine falcon from *Endangered* to *Threatened* in Schedule 6 of the Wildlife Regulation (AR 143/97). The status revision was based on documented increases in the provincial peregrine population, increases in natural rates of productivity, and reduction in the average body burden of organochlorine pesticide residues (most notably those of DDT) in falcons nesting in Alberta. The action statement specified that a recovery plan would be prepared and that all those with a stake in peregrine issues should be invited to participate in recovery planning, and that sufficient new resources should be made available to support essential conservation actions. The ensuing plan, the *Alberta Peregrine Falcon Recovery Plan 2004–2010*, outlined the strategies and actions needed to guide the recovery of peregrine falcons.

Presently, the peregrine falcon is listed as a *Threatened* species in Alberta, and as a Species of Special Concern in Canada following review by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2007 and legal down-listing by the federal Minister of Environment also in 2007. In November of 2017, COSEWIC re-evaluated the status of *Falco peregrinus anatum* in Canada and recommended to the federal Minister of Environment and Climate Change Canada that the species be listed as Not at Risk (COSEWIC 2017).

The current recovery plan is intended to build on the conservation achievements of the inaugural plan, and to continue momentum on peregrine falcon recovery moving forward.

2.0 Process for Revising the Plan

2.1 Alberta Peregrine Falcon Advisory Group Composition

The inaugural *Alberta Peregrine Falcon Recovery Plan 2004–2010* was developed by the Peregrine Falcon Recovery Team, composed of individuals knowledgeable about the species, organizations influential in the management and recovery of the species, and stakeholders who might be affected by recovery actions for the species. The Recovery Team has transitioned in to a Recovery Advisory Group, with the following members:

- Gordon Court, Alberta Environment and Parks (Team Leader);
- Geoffrey Holroyd, Beaverhill Bird Observatory;
- Steve Schwartz, Alberta Falconry Association;
- Rhona Kindopp, Parks Canada;
- Alastair Franke, University of Alberta; and
- Peter and Beverly Fullbrandt, FledgeWatch Edmonton.

2.2 Recovery Plan Development

Because of the multi-stakeholder nature of recovery issues, Recovery Advisory Group membership will remain dynamic and strive for the best representation of all affected parties.

Over the course of the initial plan re-development, the team lead had the luxury of communication with members of the advisory team on multiple occasions on multiple issues. A draft of the plan was distributed to team members for comment before the document was released for publication. Because the team was very small and the goals of the plan relatively simple, no formal meetings of the team were arranged.

Progress on recovery activities will be assessed regularly, and if major revisions are required to the plan, the Recovery Advisory Group may be reconvened at that time.

3.0 Implementation Progress Review

The *Alberta Peregrine Falcon Recovery Plan 2004–2010* outlined recovery strategies and actions necessary for the recovery and conservation of the peregrine falcon in Alberta. Progress has occurred on many recovery actions outlined in the plan, either through project-specific initiatives for the peregrine falcon or as part of larger provincial initiatives. Recovery-related actions and initiatives are described in Table 1.

Table 1. Peregrine falcon implementation and action table — current action status

Action	2015–2018	Current Status
Informed and educated property owners with peregrine falcons nesting on their facilities. Scheduling human activities on and around these structures makes disturbance of nesting pairs inevitable and can also involve potential hazards to personnel. Managing this disturbance/safety issue is a growing priority at urban nest sites in Alberta.	Continued through open dialogue with property owners.	In Progress
Initiated positive stewardship actions, such as removing young peregrines from urban nest sites with unacceptable levels of fledgling mortality and fostering them to other wild nests or releasing these young at hack (controlled release) sites in rural locations.	Continued through partnership with industry to fund releases.	In Progress
When possible, maximized the number of young fledged in Alberta by supplementing the population with captive-raised young released at hack sites located at, or near, historically occupied peregrine nesting cliffs.	Continued through partnership with industry to fund releases.	In Progress
Completed survey of historically occupied nesting sites and suitable habitat for peregrine falcons in Alberta in 2020.	Last survey was completed with funding and from AEP in 2015/16.	Planned for 2020
Collected large sample of addled eggs (50) from pesticide residue analysis. Collections collected 2011–2017 were analysed for residues by the provincial lab of Agriculture and Forestry.	Assembled samples collected since 2011 and arranged for analysis.	Recently completed, collections continue
Recovered injured peregrine falcons from licensed wildlife rehabilitators and arranged for disposal to zoos or falcon breeders, or engaged falconers to re-condition birds and then release to the wild.	One sub-adult returned to wild in 2016-17. Four juveniles sent to a zoo 2017. Two birds sent to rehabilitation 2018.	In Progress

4.0 Situational Analysis

The biology of the peregrine falcon is described in detail in the provincial status report titled *Status of the Peregrine Falcon (Falco peregrinus anatum) in Alberta* (Rowell and Stepnisky 1997). While the scope of this plan is to identify recovery strategies and actions, an understanding of some key aspects of the species' biology is a necessary prerequisite to knowledgeable and wise decisions.

4.1 Biology of the Peregrine Falcon

4.1.1 Breeding Biology

The peregrine falcon (*Falco peregrinus*) is a sleek, compact and powerful bird of prey; males are roughly the size of an American crow (*Corvus brachyrhynchos*) while females are slightly smaller than a common raven (*Corvus corax*). Three subspecies are recognised in North America; two of which, *F.p. anatum* and *F.p. tundrius*, occur in Alberta. *Tundrius* peregrines migrate through Alberta in the spring and fall; only birds recognised as *F.p. anatum* breed in the province. Alberta breeding birds have been recovered during winter as far south as Brazil. Other band returns and recent satellite telemetry data (Stepnisky 1998, G. L. Holroyd, unpubl. data) indicate that Alberta peregrines usually winter as far north as Mexico. Although mid-winter records of peregrine falcons exist from Red Deer and Calgary (Fish and Wildlife Division, unpubl. data), only on one occasion has a peregrine been documented spending the entire winter in Alberta: an adult female over-wintered at a nest site in Edmonton in 2001 (Fish and Wildlife Division, unpubl. data).

In Alberta, peregrine falcons arrive on the breeding territories in late March and early April. Arrival time is independent of sex. Pairs advertise their territory and pair bond through a combination of aerial and nest ledge displays. Territorial defence against conspecifics is usually sex-specific and can involve violent combat and occasionally fatality of combatants. Clutches usually contain four eggs, but clutches of five have been recorded on several occasions in Alberta (Fish and Wildlife Division, unpubl. data). The earliest recorded date for clutch initiation is April 26; the latest clutch initiation for Alberta was estimated to be 12 to 14 June (Fish and Wildlife Division, unpubl. data). Incubation of eggs is shared by both sexes and lasts 28 to 33 days (Ratcliffe 1993). Young fledge at 40 to 46 days of age (Cade 1982), with juvenile males usually fledging before females. Most birds leave the Canadian prairies for wintering grounds by the end of the first week in October (Fish and Wildlife Division, unpubl. data).

Females are capable of breeding at one year of age, but most often recruit as breeding birds at two years of age. Most males begin breeding at age three (Stepnisky 1998). Reproductive success of peregrine falcons in Alberta is highly variable from year to year; severe weather events appear to exert the greatest influence on annual reproductive success. An average fledging success of about 1.5 young/pair has been recorded in Alberta over the last two decades, and estimates of recruitment rates range between 8 and 11% (Court 1994, Stepnisky 1998). Management of pairs (fostering captive-raised young) over the last two decades has bolstered productivity to over 2.0 young/pair in some years; the populations both in southern Alberta and northern Alberta have experienced strong growth under such management. Natural productivity goals for most peregrine recovery plans in the United States and Canada range between 1.25 and 1.5 young per territorial pair (Millsap *et al.* 1998).

Estimates of annual mortality for adult peregrines range from a minimum of 16% to a maximum of 32% (Court 1994, Stepnisky 1998). Pre-breeding mortality of young peregrines is considerably higher, and recruitment rate for the South/Central Population has been estimated at 11% (Stepnisky 1998). Young birds have been known to disperse from Alberta to sites over 1800 km away (Fish and Wildlife Division, unpubl. data); conversely, birds fledged from as far away as 1200 km have settled at breeding territories in Alberta (Stepnisky 1998).

4.1.2 Population Distribution and Trends in Alberta

In Alberta, peregrine falcon breeding sites are widespread, with most natural nest sites confined to the banks of rivers throughout the province, or on cliffs overlooking lakes in the Canadian Shield region. Historically used nest sites (i.e., documented prior to 1970) are very rare in the Rocky Mountain and Foothills regions (one record, Fish and Wildlife Division, unpubl. data) and rare on the prairies (fewer than 10 records, Court 1993a) (Figure 1). Most historically used nest sites and presently occupied sites occur in the Parkland, Boreal and Canadian Shield regions. A total of 55 natural nesting locations were documented for Alberta before the species was virtually extirpated in 1970 (Court 1993a). However, it is important to note that an inventory of breeding pairs on potential nesting habitat was never performed in a systematic manner before the species disappeared from most of the province in the 1960s (Fish and Wildlife Division, Canadian Wildlife Service, unpubl. data), so it is impossible to know the size of the Alberta population in pre-pesticide times.

Peregrine falcons have bred at 26 urban/industrial sites in Alberta (Fish and Wildlife Division, unpubl. data); all such records were made after the re-introduction of captive-raised birds (i.e., after 1975, see below). For management purposes, two populations are now recognised in Alberta. The Northern Population occurs north of Lake Athabasca and west into Wood Buffalo National Park; the South/Central Population is generally considered to consist of pairs nesting south of 56 degrees north latitude. Centres of concentration for the South/Central Population include Edmonton, Calgary, Wabamun Lake, the North Saskatchewan River (and tributaries) and the Red Deer River.

Following widespread concern over the decline of peregrine falcon populations in North America and elsewhere (Hickey 1969), efforts were made to systematically inventory peregrine falcon populations in Canada and the United States every five years. Upon the completion of the first of these surveys in 1970 (Cade and Fyfe 1970), only a single productive peregrine falcon pair was found in Alberta. The second such inventory (Fyfe *et al.* 1976) was to document the extirpation of the peregrine falcon in Canada south of the boreal forest and east of the Rocky Mountains; in that survey year only three pairs made up the Alberta population. Eight major peregrine falcon surveys have been conducted in Alberta since 1975; results of these surveys are summarized in Figure 2.

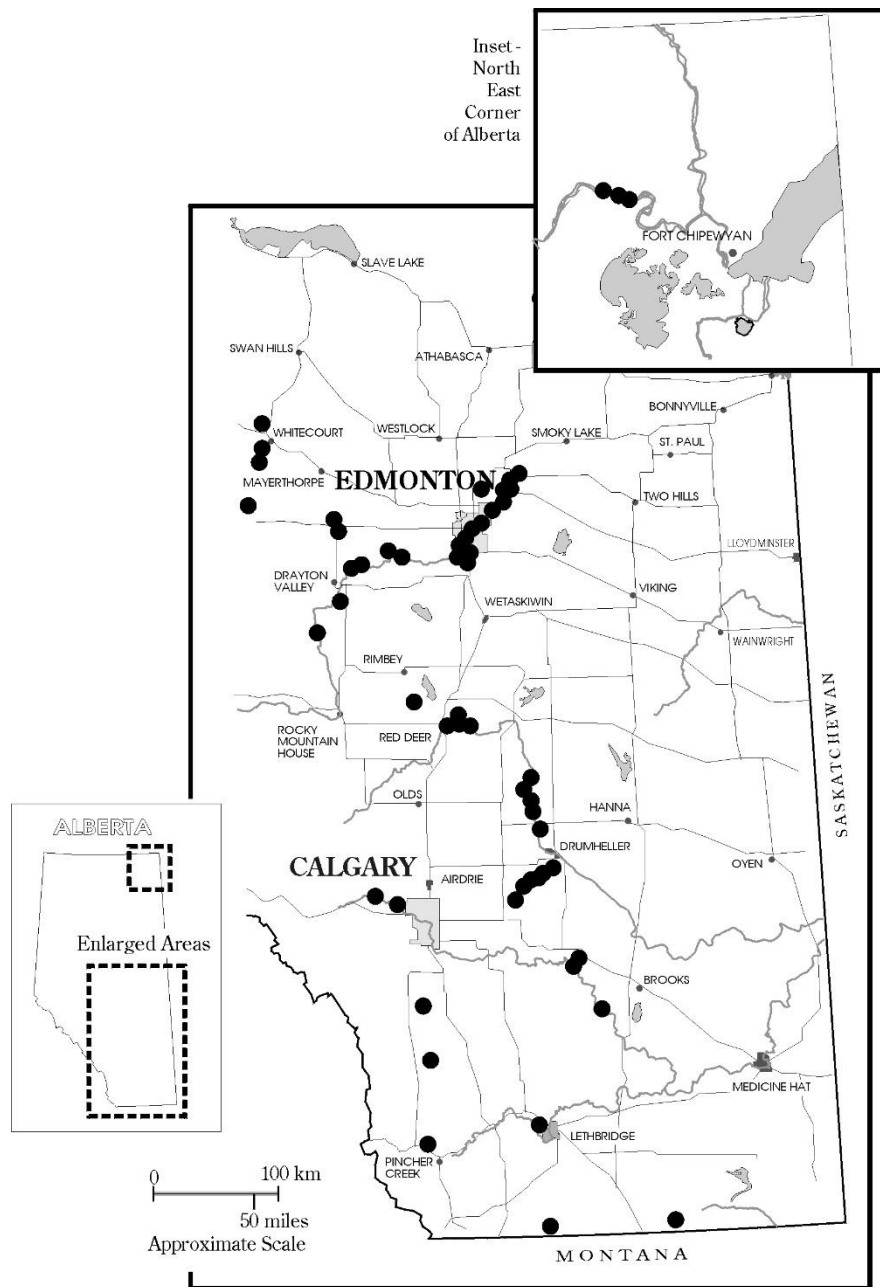


Figure 1. Historical nesting distribution for peregrine falcons in Alberta prior to 1970 (from Rowell and Stepnisky 1997).

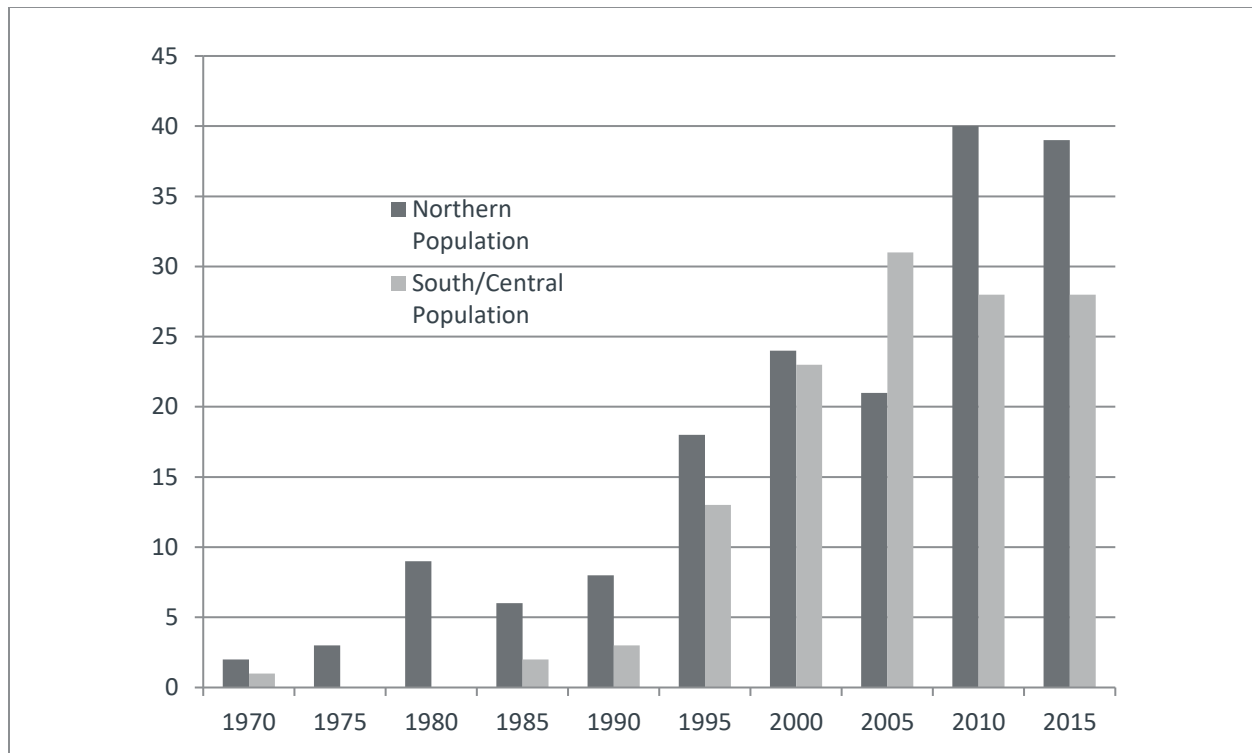


Figure 2. Total number of occupied peregrine falcon territories in Alberta, 1970–2016.

The Canadian Wildlife Service initiated active management of *anatum* peregrine falcons in Canada in the early 1970s, with the assembly of captive breeding stock at Wainwright, Alberta (Fyfe 1976). Re-introduction of captive-raised young, either by fostering to wild pairs or by hack releases, was initiated in the mid-1970s and continued in Alberta until the late 1990s (Holroyd and Banasch 1990, Rowell and Stepnisky 1997, Stepnisky 1998). Despite release efforts in the 1970s and 1980s, the Alberta population did not experience strong recovery until the early 1990s (Rowell and Stepnisky 1997, Stepnisky 1998) (Figure 2). A detailed status report produced in 1997 (Rowell and Stepnisky 1997) documented 19 territorial pairs in the South/Central Population and 15 pairs in the Northern Population in that year. Of the birds in the south, 65% were known to have originated as captive-raised released birds (Rowell and Stepnisky 1997). Data on origin were poorer for the Northern Population, but an estimate of the proportion of captive-raised birds in the breeding population in 1997 was approximately 20%. The proportion of unbanded birds in the population suggested that the effects of immigration on the recovery of this population were significant (Rowell and Stepnisky 1997). Recent analysis of the banding status of adult peregrines in Alberta’s South/Central Population has shown that approximately 95% of the genetic diversity that existed in the founding (i.e., captive breeding) population still exists in the re-established wild population (Stepnisky 2000); a similar analysis for the Northern Population has not been attempted.

The last province-wide survey for peregrine falcons was performed in 2015/16. In that survey, a maximum of 28 territorial pairs were located in the South/Central Population and 39 territorial pairs were counted in the Northern Population (Corrigan 2000, Rowell *et al.* 2003) (Figure 2). Since 2000, monitoring of known breeding pairs in the South/Central Population has occurred on an annual basis (Fish and Wildlife

Division, Alberta Conservation Association, unpubl. data); breeding performance of pairs in the Northern Population is no longer monitored.

4.1.3 Habitat

The peregrine falcon is one of most widely distributed avian species in the world (Cade 1982). The species has been successful in establishing breeding populations in habitats as varied as the tropics, deserts and tundra and it has nested on sites on the ground in the Arctic, to cliffs throughout its range, to man-made structures in the cores of some of the largest cities in the world. This flexibility is also matched in terms of diet, where the limits to the use of avian prey in any area are set only by size; arthropods and mammals are also used when abundant (White *et al.* 2002).

In Alberta, the peregrine has nested on cutbanks of major rivers and streams, stone cliffs in the Foothills and Canadian Shield areas of the province, and on man-made structures. Therefore, nesting habitat must be considered abundant. The degree to which prey abundance may have changed in core habitat areas in recent decades is extremely difficult to evaluate. Peregrine falcons show such flexibility in prey use that it is impossible to say whether measured declines in some avian species would have an impact on peregrine numbers; this falcon species tends to use whichever prey species are the most abundant in any given area (Ratcliffe 1993).

Considering the above, and the fact that the peregrine falcon did not decline because of habitat loss, it is challenging to attempt to define “critical habitat” for the peregrine falcon in Alberta, especially in the context of the federal *Species at Risk Act* or SARA (Statutes of Canada 2002). This topic was discussed by the National *Anatum* Peregrine Falcon Recovery Team during their 2003 meeting; the team arrived at the following conclusion: “**The team members present reviewed peregrine habitat requirements throughout the breeding season and found that only the peregrine’s residence is easily defined with critical habitat being difficult to impractical to define**” (National *Anatum* Peregrine Falcon Recovery Team 2003). This conclusion applies equally in Alberta. Historically used nesting sites in the province (at least those that still exist) can be defined as “residences” under SARA. However, in terms of protections afforded to the species, there can be little gained from attempting to define “critical habitat” for this species, except to acknowledge that any habitat used by this species must be largely free of perpetual sources of organochlorine compounds (most notably DDT) if viable populations of the peregrine falcon are to exist.

4.2 Provincial and Federal Status

The peregrine falcon is a *Threatened* species as designated in Alberta’s *Wildlife Act*. The *Threatened* designation required development of a recovery plan and periodic updates to that plan. The ministerial approval also identified that policy and management would be implemented to protect the current population and that the Fish and Wildlife and Lands divisions would work together to monitor regulated activities on crown lands to ensure no resulting loss of individuals, nests or populations.

Nationally, the peregrine falcon is listed as a *Species of Special Concern*; this is not a legal listing but reflects the sensitivity of the species to human activities or natural events. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) commissioned a new status report in 2015 to enable a

national status review of the species. In November of 2017, COSEWIC recommended that the species down-listed listed to *Not At Risk* under Canada's *Species at Risk Act*. Canada's Environment Minister is currently reviewing this recommendation. The Canadian Wildlife Service has already drafted a management plan for the peregrine falcon in Canada. To ensure that the recovery processes between the federal and provincial governments is cooperative, Alberta assisted the Government of Canada in the development of the Peregrine Falcon Management Plan. Additionally, the federal government is a member of the Alberta Peregrine Falcon Recovery Team, with representation from Parks Canada.

4.3 Population Trends

The last province-wide survey for peregrine falcons was performed in 2015/16. At that time, a maximum of 28 territorial pairs were located in the South/Central Population and 39 territorial pairs were counted in the Northern Population (Figure 2), thus making the current provincial population estimate between 65 and 75 territorial pairs (Court and Holroyd 2017, Alberta Fish and Wildlife unpublished data). Since 2000, monitoring of known breeding pairs in the South/Central Population has occurred on an annual basis (Fish and Wildlife Division, Alberta Conservation Association unpubl. data); breeding performance of pairs in the Northern Population is no longer monitored each year.

4.4 Threats

Limiting factors are considered to be those conditions that decrease nesting success of adult peregrines once they are established at a nesting territory, or those that reduce survivorship of young or adults. From a management standpoint, an understanding of these factors is important because they identify mechanisms through which peregrine falcon recovery can be sustained. The following limiting factors have been identified as affecting Alberta populations of peregrine falcons (Court 1993b, Court 1994, Rowell and Stepnisky 1997); management actions that have been used to mitigate some of these factors are also listed. However, not all actions may be applicable or practical for peregrine falcon recovery in Alberta.

4.1.4 Pesticide Pollution

The primary factor responsible for the decline of peregrine falcon populations in Alberta and elsewhere was reproductive failure following exposure to organochlorine pesticide pollutants. The link between eggshell thinning in birds of prey and organochlorine pollutants (primarily 1,1,1-trichloro-2,2-bis (p-chlorophenyl) ethane or DDT) is unequivocal (synthesis in Cade *et al.* 1988 and Ratcliffe 1993). Pollutant status and reproductive dysfunction in peregrine falcons is well documented for populations in Canada in general (Berger *et al.* 1970, Court *et al.* 1990, Peakall *et al.* 1990, Johnstone *et al.* 1996) and in Alberta specifically (Court 1993b, Court *et al.* 1996). Data on DDE (a metabolite of DDT) levels in peregrine eggs from Alberta show a clear downward trend over the last three decades (Court 1993b, Court *et al.* 1996) (Figure 3), and improving reproductive success associated with declining pesticide pollutant residue levels is also well documented in the province (Stepnisky 1998). Peregrine populations in Alberta (Rowell and Stepnisky 1997) and elsewhere have demonstrated sharp recovery as natural productivity has increased (Kiff 1988, Enderson *et al.* 1995, Millsap *et al.* 1998).

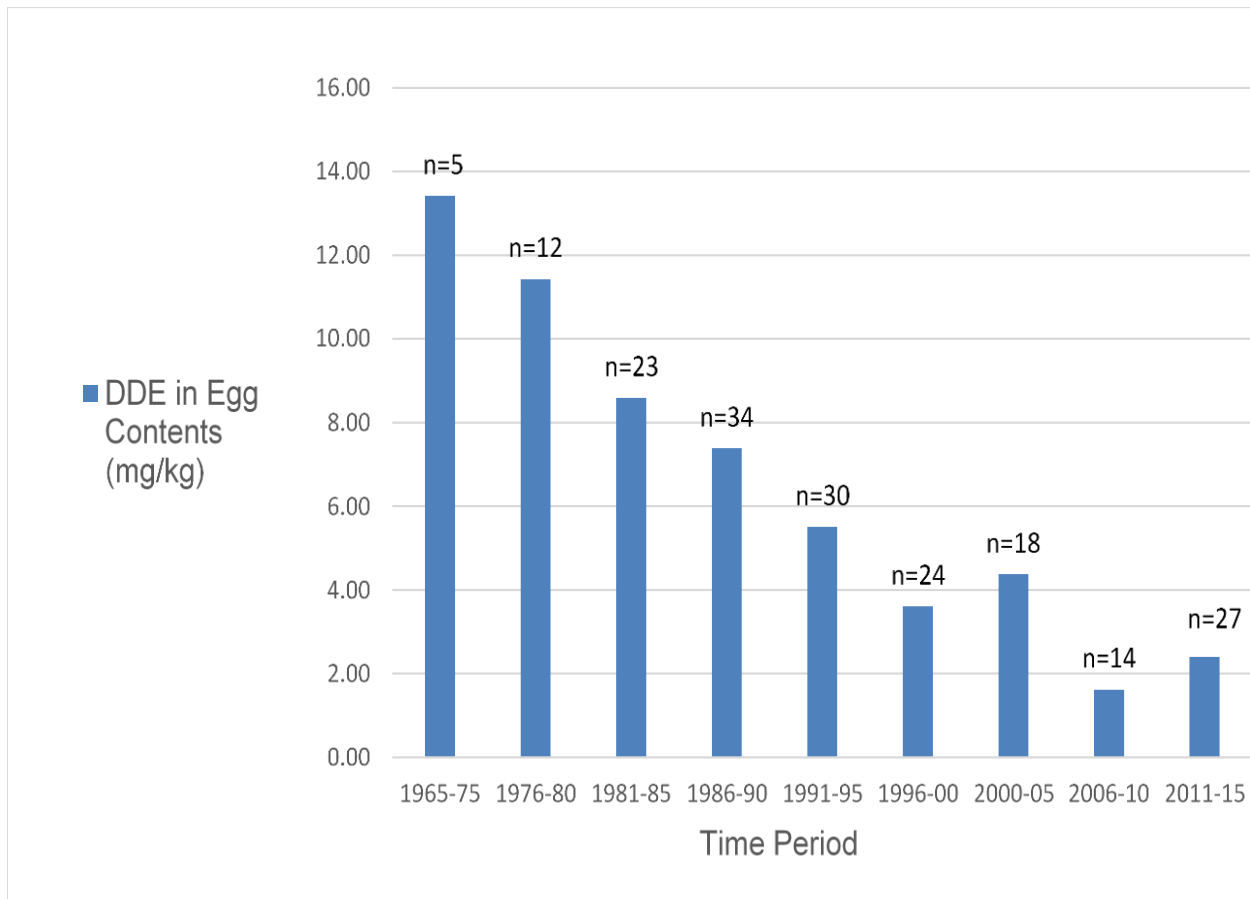


Figure 3. Geometric mean levels of DDE in addled peregrine falcon eggs, representing 187 different clutches, collected in Alberta between 1965 and 2015.

Declining levels of organochlorine residues in Alberta peregrines and their prey leave little room for complacency. Although there are global initiatives in place to eliminate the manufacture and use of many of the most environmentally damaging compounds in this group, there exist strong lobbies that aim to resurrect chemicals like DDT as a short-term measure to control malaria and other insect-borne diseases in developing nations (Raloff 2000). It is important to note that DDT is among the few persistent organochlorines that were not subject to a voluntary ban on manufacture under the Stockholm Convention 2004 (i.e. Annex B as opposed to Annex A).

As many of the peregrines in Alberta spend a large portion of their year in countries that may choose to use DDT for disease vector control, any move to resume use of this compound on a large scale will be to the detriment of these birds. Also, many new biocides are licensed for use each year in Canada and it is possible that there will be some that have unforeseen, negative effects on wildlife. It remains important for wildlife agencies to continue to monitor the reproductive success of peregrines and to encourage routine residue scans of unhatched eggs to detect any sharp changes in either hatching success or chemical residues over time.

4.4.2 Falconry Harvest

Shortly after the proposal to remove the *anatum* peregrine falcon from the List of Endangered Species in the United States (Mesta *et al.* 1995), there arose proposals for re-instatement of regulations that would make it legal to harvest migrant peregrines (*tundrius* and *anatum*) for “traditional” falconry use. This proposal was prepared by the U.S. Fish and Wildlife Service (Allen 2000). Subsequently, a document was commissioned to investigate whether such a harvest was biologically sustainable, and to recommend acceptable biological and implementation criteria for this harvest (Taubert *et al.* 1999).

This document has been reviewed by the Canadian *Anatum* Peregrine Recovery Team and was found wanting in several areas; it was not endorsed by the national team. The primary problem with proposed harvest of passage (i.e., peregrines on their first migration) of “northern” peregrines, at least from an Alberta standpoint, is that there exists no way to guarantee that harvested birds are not taken from managed, recovering populations like those in Alberta, rather than from large, apparently stable populations from farther north. Until such assurances can be granted to jurisdictions like Alberta, it is unlikely that such provinces would endorse a harvest of passage birds. Notwithstanding, the United States Fish and Wildlife Service has undertaken an extensive review of isotope (Franke *et al.* 2017) and harvestable surplus data (Franke 2016) and have endorsed a take of 144 passage (migrating) peregrine falcons in the continental United States each year (Alastair Franke, pers. comm.).

4.4.3 Human Disturbance

Peregrine falcons have proven remarkably adaptable to urban environments and, even when nesting in industrial settings (Figure 4), rarely experience enough disturbance from humans to cause reproductive failure. In most cases, the opportunity for serious nest disturbance of peregrines at both urban and rural sites will be obvious and requires relatively simple measures to avoid. Property managers at urban/industrial sites have been informed of critical times for nesting falcons (e.g., egg laying and fledging), when special attention may be necessary to avoid losses through disturbance. To date, education programs for such facility managers have been informal, yet very effective. However, as the number of pairs using man-made structures increases in the province each year, the resources required by the Alberta Environment and Parks to address issues at such nest sites will grow. There is considerable interest from the public in addressing any compromise to peregrines nesting on man-made structures, especially where nest site monitoring is available via the Internet.



Figure 4. Peregrine pairs nesting in urban settings often produce well, but have high levels of fledgling mortality. At this site, a hatch of five young is not unusual, however, less than one young bird, on average, survived fledging for more than a decade.

Disturbance of peregrine nests in rural situations, serious enough to cause nesting failure, is a relatively rare event in Alberta.

4.5 Knowledge Gaps and Research Priorities

No specific areas of research on peregrine falcons in Alberta were identified by the team in the *Alberta Peregrine Falcon Recovery Plan 2004–2010*. Research on the species in Alberta is similarly a low priority in this updated plan.

5.0 Recovery Goal and Objectives

There have been ten population estimates done over the past 30 years. These data show that the Alberta peregrine falcon population reached a low level of three pairs in 1970 (only one productive). A significant population increase has been documented in the province through nine subsequent provincial inventories.

There is potential for recovery of the peregrine falcon in Alberta. Both the proximate and ultimate causes of the peregrine falcon population decline are known conclusively. Based on the situational analysis and knowledge of the species, the Alberta Peregrine Falcon Recovery Team has determined that the peregrine falcon population will recover, given recent trends in population size, pesticide residues, and productivity.

Recovery goals for Alberta are based on population, pesticide contaminant, and productivity targets derived from historical data, and on an understanding of threshold levels for “healthy” peregrine populations. These goals are:

- (1) To achieve a well-distributed, average population of at least 70 territorial pairs of peregrine falcons in Alberta by 2020;
- (2) To ensure that geometric mean levels of the residue DDE remain below 7.5 mg/kg (parts per million) over the long-term; and
- (3) To achieve a mean fledging rate of greater than 1.25 young/territorial pair/year in the province over the long-term (this will be measured as an index calculated using representative sample of the population).

6.0 Habitat Needed to Support Recovery

Some habitat is considered necessary for the recovery or survival of the species. It is therefore important to know what comprises Habitat Needed to Support Recovery (HNSR). HNSR is not “Critical Habitat” as defined in Canada’s *Species at Risk Act*. Habitat Needed to Support Recovery is not a legally defined term under Alberta’s *Wildlife Act*, and therefore should not be treated as a legal term. Habitat Needed to Support Recovery instead prioritizes the landscape for the implementation of recovery actions and management of the species. For the peregrine falcon, nesting and foraging habitat are necessary for survival of the species; however, no ongoing significant potential threats to either exist. Given the considerable flexibility that this species demonstrates in terms of nesting habitat and foraging preferences, habitat change is not considered an immediate threat.

7.0 Recovery Strategies and Actions

The Alberta Peregrine Falcon Recovery Team identified strategies to achieve the Alberta Recovery Goal and Objectives outlined in this plan. These strategies are linked directly with the associated threats to the peregrine falcon.

There are four strategies identified for the recovery of the Alberta peregrine falcon population:

1. Reduce human disturbance at nest sites.
2. Manage nesting pairs to reduce the loss of young.
3. Monitor population size.
4. Monitor pesticide residues.

For each of these strategies a desired outcome, progress measures and associated recovery actions are detailed. The effectiveness of the strategies and actions for the peregrine falcon will be assessed through the progress measures identified within each individual strategy and through the general indicators identified for recovery.

The recovery strategies and actions identified in this plan are achievable with focused efforts and resources from government, private industry, conservation groups, agricultural organizations and producers, and local stewardship groups.

7.1 Strategy 1: Reduce human disturbance at nest sites

7.1.1 Desired Outcome

Minimize the impacts of human disturbance, including industrial development, on peregrine falcon nesting and rearing sites. This is to be achieved through the implementation of best management practices developed by the government in consultation with industry, based on sound scientific evidence. In circumstances where development may be proceeding at industrial or urban building sites and a chance exists of long- or short-term impacts on peregrine falcons, government, industries and property owners need to apply acceptable mitigation measures.

7.1.2 Progress Measures

- Number of calls to AEP each year regarding reducing conflict between peregrine falcons and industry.
- Nest productivity of peregrine falcons at industrial and building sites.

7.1.3 Recovery Actions

7.1.3.1 Consultation with AEP

Provide information on current and historical locations of peregrine falcon nests to property owners to ensure understanding of the thresholds desirable to reduce disturbance of nesting pairs.

7.1.3.2 Application of Recommended Mitigation Strategies

Human activities on and around peregrine falcon nests on man-made structures makes disturbance of nesting pairs inevitable and can also involve potential hazards to personnel. Work with building owners and industry to offer nesting boxes that can be installed on sites to attract breeding pairs away from areas of human activity.

7.2 Strategy 2: Manage Nesting Pairs to Reduce Loss of Young

7.2.1 Desired Outcome

Initiating positive stewardship actions, such as removing young peregrines from urban nest sites with chronically high levels of fledgling mortality and releasing these young at hack sites in rural locations.

7.2.2 Progress Measures

- Total number of young peregrines fledged in the monitored population each year (an index of productivity measured in an adequate sub-sample of the population).
- Percentage of young peregrine falcons known to have died post-fledging as a percentage of all young peregrine falcons known to have fledged in the monitored population each year.

7.2.3 Recovery Actions

7.2.3.1 Removal of Young from Nests with Chronically High Fledgling Mortality

Identify those nest sites suffering chronically high level of fledgling mortality and remove young to be released by hack or fostered to other sites. In order to maintain territorial pairs at all nest sites, at least one young peregrine falcon would be left in any nest in Alberta.

7.2.3.2 Education and Awareness

Provide key peregrine falcon conservation and recovery messages through extension programs of Alberta Environment and Parks and through opportunities with key stakeholders to celebrate the role of non-government agencies in the recovery of the species.

7.3 Strategy 3: Monitor Population Size

7.3.1 Desired Outcome

It is entirely possible to provide an exact count of the peregrine population (+/- 5%) in each survey year. This would be the desired outcome of any subsequent provincial peregrine falcon inventory.

7.3.2 Progress Measures

- Annual records of site occupancy and productivity of most peregrine nesting sites in the South/Central Population.
- Survey and records for occupancy of Northern Population every five years.

7.3.3 Recovery Actions

7.3.3.1 Annual Monitoring

Gather all available information to allow estimate of site occupancy and productivity of peregrine sites in South/Central Population each year.

7.3.3.2 Five-year Surveys

Continue to work with government and industry to carry out an inventory of the entire provincial peregrine falcon population every five years.

7.4 Strategy 4: Monitor Pesticide Residues

7.4.1 Desired Outcome

Analyze an adequate sample of addled peregrine eggs each year to provide a geometric mean of the amount of p'p'- DDE mg/kg wet weight in peregrine egg contents every five years.

7.4.2 Progress Measures

- Number of addled peregrine eggs collected each year.
- Funds procured to analyze up to 50 eggs in a five-year period.

7.4.3 Recovery Actions

7.4.3.1 Chemical Residue Analysis

Undertake analysis of the contents of addled peregrine eggs periodically to gauge residues of p'p'- DDE in the Alberta breeding population of peregrine falcons. Note: in the past, commitment to these analyses involved a considerable commitment of funds and the chemical test involved, high performance liquid chromatography (HPLC), was relatively expensive. However, far more cost-effective tests involving enzyme-linked immunosorbent assay (ELISA) are now available.

8.0 Implementation Plan

The implementation table summarizes each action, the strategy that action is delivering and the priority (Table 2).

Priority codes are:

1 = High priority for immediate species conservation, initiate as soon as possible;

2 = Medium priority for long-term species conservation.

Costs to the AEP-Fish and Wildlife Species at Risk Program are estimated. The term “In-kind” is used where there are costs associated but they are absorbed within the normal operating costs of government or provided by another organization or industry.

Table 2. Alberta peregrine falcon implementation table.

Action	Priority	2018	2019	2020	2021	2022	2023
7.1.3.1 Contact and education of property owners having peregrine falcons nesting on their facilities or land holdings.	1	In-kind Ongoing	In-kind Ongoing	In-kind Ongoing	In-kind Ongoing	In-kind Ongoing	Evaluate
7.1.3.2 Removal of young peregrines from nest sites of chronically high fledgling mortality and release by fostering or hack release	1	In-kind Ongoing	In-kind Ongoing	Strategy 1: Reduce human disturbance at nest sites	In-kind Ongoing	In-kind Ongoing	Evaluate

7.1.3.3 Complete survey of historically occupied peregrine nesting sites and suitable nesting habitat throughout Alberta	2	In-kind Ongoing in targeted portions of range	In-kind Ongoing in targeted portions of range	In-kind Survey entire provincial range	Evaluate	In-kind Ongoing in targeted portions of range	In-kind Ongoing in targeted portions of range
7.1.3.4 Collect addled eggs for pesticide residue analysis	2	In-kind Ongoing	In-kind Ongoing	In-kind Ongoing	In-kind Ongoing	In-kind Ongoing	Evaluate

9.0 Socio-Economic Scan

The recovery actions for peregrine falcon in Canada were implemented more than four decades ago (Holroyd and Banasch 1990). Major expenditures by both government and non-government organizations on programs to effect recovery in Alberta, and elsewhere in the country, continued until the mid-1990s (Rowell and Stepnisky 1997, White *et al.* 2002). Fortunately, such actions met with considerable success, and provincial and national recovery actions for the species now consist largely of monitoring efforts. Apart from the funding required of the government of Alberta to perform such work, there are few outstanding socio-economic issues in the province that need to be considered. Issues such as avoiding disturbance of nesting pairs at industrial/urban sites have been addressed successfully for more than three decades in Alberta.

Table 3. Anticipated socio-economic impacts of peregrine falcon recovery actions.

Strategy	Action	Socio-economic Impacts (-) is a cost (+) is a benefit
Reduce human disturbance at nest sites	Consultation with AEP	(+) increased efficiency and coordination (+) increased understanding of interaction between human activities and the species (+) improved communication between industry and provincial government (+) improved access to information for industrial proponents and government.
	Application of recommended mitigation strategies	(-) cost of including in-development plans (e.g., setback distances, timing) (+) healthy biodiversity (-) cost of implementing mitigation strategies (+) reduced disturbance for other wildlife species
Manage nesting pairs to reduce loss of young	Removal of young from nests with chronically high fledgling mortality	(+) improved survival of fledglings (-) disturbance to birds during sensitive nesting season
	Education and awareness	(+) improved knowledge of peregrine falcon conservation by the general public (-) cost of producing educational materials
Monitor population size	Annual monitoring; five-year surveys	(+) improved knowledge of population status and dynamics that provide valuable information for the environmental policy cycle (-) cost of conducting surveys
Monitor pesticide residues	Chemical residue analysis	(+) increased knowledge on the status of environmental contaminants provides valuable information for design of best management practices (-) cost of conducting analyses

10.0 Effects On Other Species At Risk

Efforts should be made by all species' recovery team leads to inform other potentially affected species' recovery team leads of intended recovery actions to prevent conflicts and to facilitate collaboration. As of February 2019 there was only species at risk recovery plan whose actions had the potential to conflict with peregrine falcon recovery actions:

- Piping Plover

Agencies delivering recovery actions for peregrine falcon will consider all impacts to other species at risk before implementing the recovery actions. This is of particular importance in areas where the Critical Habitat of more than one species overlaps.

11.0 Literature Cited

- Allen, G.T. 2000. Draft environmental assessment: falconry take of migrant peregrine falcons in the contiguous United States and Alaska. Unpublished report prepared for the U.S. Fish and Wildlife Service. 28 pp.
- Berger, D.D., D.W. Anderson, J.D. Weaver and R.W. Risebrough. 1970. Shell thinning in eggs of Ungava peregrines. *Canadian Field-Naturalist* 84:265-267.
- Cade, T.J. 1982. *The falcons of the world*. Collins, London. 191 pp.
- Cade, T.J., and R.W. Fyfe. 1970. The North American Peregrine Falcon Survey. *Canadian Field-Naturalist* 84:231-245.
- Cade, T.J., J.H. Enderson, C.G. Thelander and C.M. White. 1988. *Peregrine Falcon Populations: their management and recovery*. The Peregrine Fund, Inc., Boise, Idaho. 949 pp.
- Corrigan, R. 2000. Survey of the peregrine falcon (*Falco peregrinus anatum*) in Alberta. Alberta Species at Risk Report No. 2. Alberta Sustainable Resource Development. 17 pp.
- COSEWIC. 2017. Press release status assessment meeting Ottawa, November 2017. Committee on the Status of Endangered Wildlife in Canada. 2 pp.
- Court, G.S. 1993a. A review of historical nesting records for the American peregrine falcon (*Falco peregrinus anatum*) in Alberta south of 56°N: priorities for surveying a recovering population. Unpublished report, Department of Environmental Protection, Fish and Wildlife Division, Government of Alberta. 70 pp.
- Court, G.S. 1993b. A toxicological assessment of the American peregrine falcon (*Falco peregrinus anatum*) breeding in Alberta Canada — 1968 to 1992. Occasional Paper No. 10. Department of Environmental Protection, Fish and Wildlife Division, Government of Alberta. 28 pp.
- Court, G. S. 1994. Population dynamics of American peregrine falcons (*Falco peregrinus anatum*) breeding in Northeastern Alberta, Canada — 1971 to 1993: an evaluation of the need for continued management. Occasional Paper No. 14. Department of Environmental Protection, Fish and Wildlife Division, Government of Alberta. 25 pp.
- Court, G.S., S. Brechtel, G. Erickson and B. Treichel. 1996. The future of the peregrine falcon (*Falco peregrinus anatum*) population in Alberta. Pp. 257–267 in Willms, W.D., and J.F. Dormaar (eds). *Proceedings of the 4th Annual Prairie Endangered Species Conference*. Lethbridge 1995. 337 pp.
- Court, G.S., C.C. Gates, D.A. Boag, J.D. MacNeil, D.M. Bradley, A.C. Fesser, J.R. Patterson, G.B. Stenhouse and L.W. Oliphant. 1990. A toxicological assessment of peregrine falcons (*Falco peregrinus tundrius*) breeding in the Keewatin District of the Northwest Territories, Canada. *Canadian Field-Naturalist* 104(2):255–272.
- Court, G.S., and G.L. Holroyd. 2017. Survey of the Northern Alberta Peregrine Falcon (*Falco peregrinus anatum*) population. Alberta Environment and Parks internal report. 14pp.

- 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.
- 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; e1944-687X. doi: 10.3996/062015-JFWM-050
- Franke, A., J. Duxbury, H. Qi, T.B. Coplen, G. Holroyd and B.A. Millsap. 2017. U.S. Fish and Wildlife Service final report: stable hydrogen-isotope analysis of peregrine falcons in the United States. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C. U.S.A.
- Fyfe, R.W. 1976. Rationale and success of the Canadian Wildlife Service peregrine breeding project. *Canadian Field-Naturalist* 90:308–319.
- Fyfe, R.W., S.A. Temple and T.J. Cade. 1976. The 1975 North American Peregrine Survey. *Canadian Field-Naturalist* 90:228–273.
- Hickey, J.J. (ed). 1969. Peregrine falcon populations, their biology and decline. University of Wisconsin Press, Madison. 596 pp.
- Holroyd, G.L., and U. Banasch. 1990. The reintroduction of the peregrine falcon, *Falco peregrinus anatum*, into southern Canada. *Canadian Field-Naturalist* 104(2):203–208.
- Johnstone, R.M., G.S. Court, A.C. Fesser, D.M. Bradley, L.W. Oliphant and J.D. MacNeil. 1996. Long-term trends and sources of organochlorine contamination in Canadian tundra peregrine falcons, *Falco peregrinus tundrius*. *Environmental Pollution* 93:109–120.
- Kiff, L.F. 1988. Changes in the status of the peregrine in North America: an overview. Pages 123–139 in Cade, T.J., J.H. Enderson, C.G. Thelander and C.M. White (eds). *Peregrine Falcon populations — their management and recovery*. The Peregrine Fund, Inc., Boise, Idaho. 949 pp.
- Mesta, R.T., T. Swem and S. Lawrence. 1995. Advance notice of a proposal to remove the peregrine falcon from the list of endangered and threatened wildlife. *Federal Register* 60:34406–34409.
- Millsap, B. A., P.L. Kennedy, M.A. Byrd, G.S. Court, J.H. Enderson and R.N. Rosenfield. 1998. Review of the proposal to de-list the American peregrine falcon. *Wildlife Society Bulletin* 26:522–538.
- National Peregrine Falcon Recovery Team. 2003. Minutes of the 2003 meeting. Nova Scotia.
- Peakall, D.B., D.G. Noble, J.E. Elliot, J.D. Somers and G.L. Erickson. 1990. Environmental contaminants in Canadian peregrine falcons *Falco peregrinus*: a toxicological assessment. *Canadian Field-Naturalist* 104:223–244.
- Raloff, J. 2000. The case for DDT: What do you do when a dreaded environmental pollutant saves lives? *Science News* 158:12–14.
- Ratcliffe, D. 1993. *The peregrine falcon* (second edition). Poyser, London. 454 pp.

Rowell, P., and D. Stepnisky. 1997. Status of the peregrine falcon (*Falco peregrinus anatum*) in Alberta. Alberta Status Report Number 8. Wildlife Management Division, Government of Alberta. 24 pp.

Rowell, P., G.L. Holroyd and U. Banasch. 2003. The 2000 Canadian peregrine falcon survey. Occasional Paper. Journal of Raptor Research 37:98–116.

Statutes of Canada. 2002. Bill C-5: an act respecting the protection of wildlife species at risk in Canada. Communication Canada-Canadian Government Publishing, Ottawa, Ontario, K1A 0S9.

Stepnisky, D. 1998. Demographic features of a recovering peregrine falcon (*Falco peregrinus anatum*) population in southern Alberta: 1980–1997. Alberta Environmental Protection, Wildlife Management Division, Occasional Report Series. No. 15. 27 pp.

Stepnisky, D. 2000. An evaluation of genetic concerns in a re-introduced population of American peregrine falcons (*Falco peregrinus anatum*) in southern Alberta. Thesis submitted for the Diploma in Endangered Species Management. Durrell Wildlife Conservation Trust International Training Centre, Jersey. 28 pp.

Taubert, B., J. Enderson and B. Millsap. 1999. Biological criteria for a limited falconry harvest of peregrine falcon in the United States. Unpublished report prepared by the International Fish and Wildlife Agencies working group. Washington, D.C. 10 pp.

White, C.M, N.J. Clum, T.J. Cade and W.G. Hunt. 2002. Peregrine falcon: The Birds of North America No. 660. Cornell Laboratory and the Academy of Natural Sciences. 48 pp.