

Management Plan for the Band-tailed Pigeon (*Patagioenas fasciata*) in Canada

Band-tailed Pigeon



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¹ www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)² 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 within 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 Band-tailed Pigeon and has prepared this management plan, as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the Province of British Columbia, as per section 66(1) of SARA.

Success in the conservation of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this plan and will not be achieved by Environment and Climate Change Canada, the 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 Band-tailed Pigeon 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.

Acknowledgments

A draft management plan was prepared by Canadian Wildlife Service (CWS) Atlantic Region. Greg Ferguson, Holly Middleton, Megan Harrison, and Eric Gross of Environment and Climate Change Canada, CWS Pacific Region, finalized the management plan with input from the Province of British Columbia (Trudy Chatwin, Myke Chutter, and Peter Fielder), and a regional species expert (Andre Breault).

² <http://registrelep-sararegistry.gc.ca/default.asp?lang=En&n=6B319869-1%20>

Executive Summary

The Band-tailed Pigeon (*Patagioenas fasciata*) is similar to the familiar Rock Pigeon (*Columba livia*), but it has a faster, more direct flight, a white crescent on the back of the head, and a dark tail with a grey terminal band. The species is listed as Special Concern under Schedule 1 of the *Species at Risk Act*.

The Canadian breeding range is restricted to southern British Columbia, mainly on southern Vancouver Island and along the mainland coast. The Canadian population is estimated very roughly at 43,000-170,000 individuals, which is about 5% of the global population. At the time of the last COSEWIC status report in 2008, its population may have declined by 11.2% over the preceding three generations. However, more recent data suggest that numbers may be stabilizing, particularly for the entire Pacific Flyway where the aggregated data are more robust.

Primary threats to the Band-tailed Pigeon include forestry practices, urban and industrial development, and climate change.

The management objective for the Band-tailed Pigeon is to maintain the Canadian population at its current population size and distribution.

The broad strategies and conservation measures required to achieve the management objective are presented in Section 6. Conservation measures in this management plan fall under three broad strategies: population monitoring and surveys, habitat conservation and stewardship, and research.

Table of Contents

Preface.....	I
Acknowledgments	I
Executive Summary	II
1. COSEWIC Species Assessment Information.....	1
2. Species Status Information	1
3. Species Information	2
3.1. Species Description	2
3.2. Species Population and Distribution.....	2
3.3. Needs of the Band-tailed Pigeon.....	3
4. Threats.....	4
4.1. Threat Assessment	4
4.2. Description of Threats	5
5. Management Objective	9
6. Broad Strategies and Conservation Measures.....	9
6.1. Actions Already Completed or Currently Underway	9
6.2. Broad Strategies	9
6.3. Conservation Measures	10
6.4. Narrative to Support Conservation Measures and Implementation Schedule ..	11
7. Measuring Progress	12
8. References.....	12
Appendix A: Effects on the Environment and Other Species	14

1. COSEWIC* Species Assessment Information

Date of Assessment: November 2008

Common Name: Band-tailed Pigeon

Scientific Name: *Patagioenas fasciata*

COSEWIC Status: Special Concern

Reason for Designation: This large pigeon has suffered long-term declines throughout its range in the western mountains of North America, due in part to overhunting. Harvest has been severely limited in Canada for the past 16 years. Although population surveys (e.g. Breeding Bird Survey and mineral site counts) have low precision, they do suggest a stabilization of the population in the last decade. The species is long-lived (up to 22 years) and has a slow reproductive rate; females typically lay only one or two eggs per year. Forestry may negatively affect habitat in the long term, creating dense second-growth forests with few berry-producing shrubs; the pigeons also are susceptible to disturbance at isolated mineral sources needed for their nutrition.

Canadian Occurrence: British Columbia

COSEWIC Status History: Designated Special Concern in November 2008.

* COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

2. Species Status Information

The Band-tailed Pigeon (*Patagioenas fasciata*) is listed as Special Concern³ under the *Species at Risk Act* (SARA). The species also is listed as Least Concern by the International Union for Conservation of Nature (IUCN) (2014). NatureServe ranked the species as G4⁴ (2000) globally, N3N4⁵ (2018) in Canada and S3S4B⁶ (2009) in British Columbia (B.C.). The species is Blue-listed by the British Columbia Conservation Data Centre (B.C. CDC 2009). The entire Canadian population resides in British Columbia and comprises approximately 5% of the global population.

³ Special Concern (SARA): A wildlife species that may become a threatened or endangered species, because of a combination of biological characteristics and identified threats.

⁴ G4: Global status apparently secure

⁵ N3N4: National status vulnerable and apparently secure

⁶ S3S4B: Provincial status vulnerable and apparently secure

3. Species Information

3.1. Species Description

The Band-tailed Pigeon is a large dark pigeon (length 40 cm, weight 350 g). It is superficially similar to the familiar Rock Pigeon (*Columba livia*), but it has a faster direct flight, a purple-grey head, a white crescent on the back of the neck, a dark tail with a grey terminal band, and a yellow bill and feet. Six morphologically and geographically distinct subspecies are recognized, but only one of these subspecies occurs in Canada, *P. f. monilis*.

3.2. Species Population and Distribution

The Band-tailed Pigeon breeds from British Columbia to northern Argentina (Figure 1). In Canada, they breed only in B.C.'s mainly on southern Vancouver Island and along the mainland coast north to Alta Lake. Their population density in B.C. is highest on the south coast of the mainland and Vancouver Island with smaller numbers stretching as far north as Hazelton and Fort Saint James and eastward into the Kootenay Region. Most birds breeding in Canada winter in the U.S. Pacific Coast states, especially California. A few remain in B.C. year-round. The accuracy of current population estimates, based on Breeding Bird Surveys, is considered poor; the Canadian population may be 43,000-170,000 individuals (COSEWIC 2008). The population appears to have declined historically. In the 18 years (3 generations) preceding the last COSEWIC status report, it had declined by 11.2% (COSEWIC 2008). However, analysis of more recent data (collected using improved population monitoring techniques) suggests that numbers may be stabilizing (COSEWIC 2008), particularly for the entire Pacific Flyway (Seamans 2018) where the aggregated data are more robust.



Figure 1. North American range of the Band-tailed Pigeon (COSEWIC 2008).

3.3. Needs of the Band-tailed Pigeon

The Band-tailed Pigeon eats mainly grain, fruit, acorns, pine nuts, and the flowers and new buds of shrubs and trees, with the relative amounts of each varying seasonally (Neff 1947, Jarvis and Passmore 1992, Keppie and Braun 2000). Oak (*Quercus* spp.), Pacific Madrone (*Arbutus menziesii*), *Rubus* spp., *Prunus* spp., cascara (*Rhamnus purshiana*), and elderberries (*Sambucus* spp.) are important food sources for breeding and wintering birds in Canada (Campbell et al. 1990, Keppie and Braun 2000). They usually feed in small flocks, mostly in early morning. They deplete one food source before moving to the next, and usually roost for prolonged periods afterward (Braun 1976, Keppie and Braun 2000). Feeding areas can be far removed from nesting areas (Keppie and Braun 2000). They averaged 5 km apart to a maximum of 50 km in one U.S. study (Leonard 1998). Food availability affects the timing of breeding (Gutierrez et al. 1975) and likely affects nesting success (Braun 1994).

During the breeding season (March through September) (Keppie and Braun 2000), the Band-tailed Pigeon uses a variety of habitats in coastal B.C., including forest edges and openings, urban backyards, urban parks, bushland, golf courses, and orchards (Campbell et al. 1990). Farther from the coast, they mainly breed in coniferous

rainforest up to 300 m elevation (Keppie and Braun 2000). In the interior of B.C., they also occur in montane forest (Campbell et al. 1990). Proximity to food sources (particularly oak and madrone) appears to be an important habitat requirement (Keppie and Braun 2000). Studies in the U.S. suggest that mature, closed-canopy conifer stands are preferred for breeding (Carey et al. 1991, Manuwal 1991, Leonard 1998).

Mineral sites are an important habitat feature. On rangeland, this may be satisfied by salt licks (Packard 1946) and, in the interior of B.C., by strongly basic grit (Braun 1994). The essential mineral appears to be sodium, which is needed to counteract an overload of potassium that the birds gain from feeding on fruit (Sanders and Jarvis 2000). Mineral sites for the Band-tailed Pigeon usually occur where underground springs come to the surface. Along B.C.'s coast this usually occurs in estuaries (COSEWIC 2008). Favoured mineral sites tend to have nearby perches, trees and shrubs for cover, low disturbance from humans, and historical use by large numbers of Band-tailed Pigeons (Sanders and Jarvis 2000, Casazza 2006).

During winter and migration, the Band-tailed Pigeon uses open areas with food supplies, including backyard bird feeders. Winter habitat includes open woodland and edges with berries and acorns. Fall migrants use open coniferous habitat near farmland, shorelines with mineral sites, riparian habitat, railways, farmyards, and regenerating clearcuts (Campbell et al. 1990, COSEWIC 2008).

A limiting factor for Band-tailed Pigeons is their low annual reproductive rate. While they can be long-lived (up to 22 years), they lay single-egg clutches with one or sometimes two broods per year, so populations are slow to recover from declines (COSEWIC 2008).

4. Threats

4.1. Threat Assessment

The Band-tailed Pigeon threat assessment is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system. Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational). In carrying out the threat assessment, only present and future (within a 10-year timeframe) threats are considered. Threats are characterized here in terms of scope, severity, and timing. The overall threat “impact” reflects a reduction of a species population or decline/degradation of the area of an ecosystem and is calculated from scope and severity. See the table footnotes for details on how the values are assigned (Table 1). Historical threats, indirect or cumulative effects of the threats, or any other relevant information that would help understand the nature of the threats are presented in the Description of Threats section. Limiting factors are not considered during this assessment process.

Table 1. IUCN Threats Summary for the Band-tailed Pigeon in Canada

Threat No.	Threat Description	Impact ^a	Scope ^b	Severity ^c	Timing ^d
1	Residential & commercial development	Low	Small	Moderate	High
1.1	Housing & urban areas	Low	Small	Moderate	High
1.2	Commercial & industrial areas	Low	Small	Slight	High
2	Agriculture & aquaculture	Low	Small	Slight	High
2.1	Annual & perennial non-timber crops	Low	Small	Slight	High
2.4	Marine & freshwater aquaculture	Negligible	Negligible	Slight	High
5	Biological resource use	Low	Restricted	Moderate	High
5.1	Hunting & collecting terrestrial animals	Negligible	Negligible	Negligible	High
5.3	Logging & wood harvesting	Low	Restricted	Moderate	High
6	Human intrusions & disturbance	Low	Small	Slight	High
6.1	Recreational activities	Low	Small	Slight	High
8	Invasive & other problematic species & genes	Low	Small	Slight	Moderate
8.1	Invasive non-native/alien species	Negligible	Negligible	Slight	High
8.2	Problematic native species	Low	Small	Slight	Moderate
9	Pollution	Low	Small	Slight	High
9.3	Agricultural & forestry effluents	Low	Small	Slight	High
11	Climate Change & Severe Weather	Low	Restricted	Moderate	High
11.1	Habitat shifting & alteration	Low	Restricted	Moderate	High

^a **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

^b **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).

^c **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or 3-generation timeframe. For this species a generation time of 6 years (COSEWIC 2008) was used resulting in severity being scored over a 18-year timeframe. Usually measured as the degree of reduction of the species' population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

^d **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

4.2. Description of Threats

Although no single threat to the Band-tailed Pigeon scores above a low impact level, the cumulative score is medium as a result of a large number of low-level threats. The most important of the threats listed below are those associated with land use activities that have the potential to impact habitat availability and quality at a large scale.

IUCN Threat 1. Residential & commercial development

Threat 1.1 - Housing & urban areas; Threat 1.2 - Commercial & industrial areas

In the last few decades of the last century, urbanization and industrialization resulted in the loss of second-growth mixed forest along the Fraser River and on southeastern Vancouver Island (Cooper 2002). The Band-tailed Pigeon is found in urban environments, particularly in older neighbourhoods that have abundant trees and shrubs, but they are rare in newer developments where most of the trees have been removed (A. Breault, pers. comm, 2014). Industrial activities, in particular road paving and associated traffic, have caused disturbance at mineral sites in British Columbia (COSEWIC 2008). As a result of the small scope of development, these two threats are considered low concern to the recovery of the Band-tailed Pigeon.

IUCN Threat 2. Agriculture & aquaculture

Threat 2.1 Annual & perennial non-timber crops

Crop cover in the agricultural lands of the eastern Fraser Valley has resulted in the loss of hedgerows and shrubby areas where the Band-tailed Pigeon feeds and in an increase in berry production (primarily blueberries). The use of noise cannons at some blueberry farms to deter fruit-eating birds might adversely impact foraging and mineral site use near these farms (A. Breault, pers. comm., 2014). This threat impacts a small proportion of the B.C. population and is considered to be of low concern to the recovery of the Band-tailed Pigeon.

Threat 2.4 Marine & freshwater aquaculture

The Baynes Sound area of Vancouver Island supports the highest concentration of aquaculture operations in B.C. Aquaculture intertidal leases are tended (i.e., put into operation) at regular intervals and there is one report of disturbance associated with aquaculture operations that has kept the Band-tailed Pigeon from accessing an intertidal mineral site (A. Breault, pers. comm., 2014). Information on the distribution and abundance of mineral sites in intertidal areas is insufficient to assess potential interactions between aquaculture operations and the Band-tailed Pigeon. This threat is considered to be of low concern to the recovery of the Band-tailed Pigeon given the footprint of aquaculture operations in southwestern B.C., the broad range of the Band-tailed Pigeon on the B.C. Coast, and the fact that aquaculture operations are not tended on a daily basis..

IUCN Threat 5. Biological resource use

Threat 5.1 Hunting & collecting terrestrial animals

The Band-tailed Pigeon is hunted in both Canada and the U.S. Although hunting is currently at a sustainable level in both countries, historically overhunting likely was a causal factor of severe population declines. The species is particularly easy to overhunt because of its propensity to flock, even in areas where they are hunted, and even when shot at (COSEWIC 2008). Moreover, hunting may have a particularly strong population-level effect on this species because of its slow reproductive rate, with high adult survival rate but low clutch size (COSEWIC 2008). The restrictions implemented on the Band-tailed Pigeon hunt in B.C. since 2002 (i.e., shortened season from 30 to 15 days, delayed season opening date from September 1 to September 15, and reduced bag limit from 10 to 5 daily) and the low number of active hunters (mean of 80 hunters from 2002 to 2013) has resulted in a low estimated harvest (mean of 117 from 2002 to 2013) for the species (B.C. Wildlife Branch, unpubl. data). The current harvest is sustainable and is considered to be of little concern to the recovery of the Band-tailed Pigeon, but it will continue to be monitored by the Canadian Wildlife Service.

Threat 5.3 Logging & wood harvesting

The Band-tailed Pigeon likely benefitted from past logging practices of the 19th century which resulted in forests with varied seral⁷ stages. Conversely, recent replacement of structurally complex old growth forest with more even-aged stands is thought to have contributed to recent population declines, especially in the U.S. (COSEWIC 2008). Herbicide use on deciduous vegetation to promote conifers probably also degrades habitat by killing fruit-bearing shrubs and trees (eg. cascara) (Braun 1994, Mathewson 2005). As this threat impacts up to 30% of the B.C. population and can have a moderate level of severity on the population, this threat is among those of highest concern for the recovery of the Band-tailed Pigeon.

IUCN Threat 6. Human Intrusions & disturbance

Threat 6.1 Recreational activities

In Oregon, 20% of mineral sites likely were abandoned because of human disturbance (Overton et al. 2006). Recreational use of hot springs appears to account for decreases in pigeons at adjacent mineral sites (Overton 2003, Overton et al. 2006). Forms of human disturbance noted at British Columbia mineral sites include the regular presence of joggers, vehicle traffic, and photographers (COSEWIC 2008). As a result of the small scope of disturbance, this threat is considered low concern to the recovery of the Band-tailed Pigeon.

⁷ An intermediate stage found in ecological succession in an ecosystem advancing towards its climax.

IUCN Threat 8. Invasive & other problematic species & genes

Threat 8.1 Invasive non-native/alien species

Although unproven, it seems likely that rats (*Rattus* spp.), domestic cats (*Felis catus*), and Grey Squirrels (*Sciurus carolinensis*) may prey upon Band-tailed Pigeon nests. This unconfirmed threat likely impacts a small proportion of the B.C. population and is considered low concern to the recovery of the Band-tailed Pigeon.

Threat 8.2 Problematic native species

The parasite *Trichomonas gallinae* infects the Band-tailed Pigeon (Stabler and Braun 1979). Large outbreaks killed tens of thousands of Band-tailed Pigeons in California in 1988 (Braun 1994) and 2007 (Girard et al. 2014). Trichomoniasis outbreaks are undocumented in Canada and are expected to be infrequent in timing. Native hawks and falcons are suspected to kill adult birds, and Common Raven (*Corvus corax*), Steller's Jay (*Cyanocitta stelleri*), and tree squirrels (*Sciurus* and *Tamiasciurus* spp.) are likely the main predators of eggs and nestlings. The threat from trichomonas and native predators is considered low concern to the recovery of the Band-tailed Pigeon.

IUCN Threat 9. Pollution

Threat 9.3 Agriculture & forestry effluents

The Band-tailed Pigeon has been poisoned with avicides, and is exposed to various agricultural chemicals because it relies heavily on agricultural areas for foraging. Many mineral sites are in estuaries, which concentrate agricultural and industrial chemicals, such as heavy metals, hydrocarbons, and PCBs (COSEWIC 2008). Exposure to pollutants is expected to be of a small scope and slight severity to the population. Therefore, this threat is considered low concern to the recovery of the Band-tailed Pigeon.

IUCN Threat 11. Climate change & severe weather

Threat 11.1 Habitat shifting & alteration

Climate change could benefit the Band-tailed Pigeons in Canada if Pacific Coast summers become longer and warmer, and coastal forests develop higher densities of fruiting shrubs used by the pigeon as food source plants (COSEWIC 2008). However, increases in the frequency and severity of droughts could offset that benefit by reducing food availability seasonally. Overall, the impact of climate change is considered low.

5. Management Objective

The management objective for the Band-tailed Pigeon is to maintain the Canadian population at its current size and distribution.

The species was designated as Special Concern because, while it appears to have been stable recently, it still faces several potential threats from which it may be slow to recover. Also, although the longevity of individuals is high, their overall reproductive rate is low. Thus, this management objective is selected to guard against possible future declines.

6. Broad Strategies and Conservation Measures

6.1. Actions Already Completed or Currently Underway

Population and trend assessment:

- 1- Monitoring mineral sites is currently believed to be the most effective means of assessing Band-tailed Pigeon trends at the population level. The Canadian Wildlife Service (CWS) started identifying mineral sites in British Columbia in 2001 and will continue to do so on an ongoing basis. CWS has monitored three to four mineral sites annually since 2002 (COSEWIC 2008) and a fifth mineral site since 2013 to determine regional trends and contribute to the Pacific Flyway trend assessment (A. Breault, pers. comm. 2018).
- 2- The Canadian Wildlife Service's National Harvest Survey (NHS) (which consists of the Harvest Questionnaire Survey and the Species Composition Survey) annually assesses the number of active hunters and the Band-tailed Pigeon harvest. The NHS will continue to be conducted annually to ensure that hunting is kept at a sustainable level. CWS and the B.C. Ministry of Forests, Lands, and Natural Resources Operations work together to ensure that hunting limits are set to reflect population status and threats. The Province of B.C. also estimates harvest and supplies this data to CWS.
- 3- The Canadian Wildlife Service will continue to monitor band returns of birds hunted to determine population trends, demography, and population connectivity.

6.2. Broad Strategies

In order to achieve the management objective, conservation measures will be organized under the following three broad strategies:

1. Population monitoring and surveys
2. Habitat conservation and stewardship
3. Research

6.3. Conservation Measures

Table 2. Conservation Measures and Implementation Schedule

Conservation Measure	Priority ^a	Threats or Concerns Addressed	Timeline
Broad strategy: Population monitoring and surveys			
Develop population monitoring plan	High	All	2019-2021
Identify new and used mineral sites	High	All	2019-2021
Conduct counts at mineral sites at regular intervals	High	All	2019-2025
Use mark-recapture methods at mineral sites to refine population estimates	Medium	All	2019-2025
Continue to monitor harvest and regulate at sustainable levels	High	IUCN Threat 5.1	2019-2025
Broad strategy: Habitat conservation and stewardship			
Identify the ownership and conservation status of known mineral sites	High	IUCN Threats 1.1, 2.4, 6.1	2019-2021
Examine approaches to the conservation of mineral sites on private lands, including: conservation easements, donations, and acquisition	High	IUCN Threats 1.1, 2.4, 6.1	2019-2021
Contact land managers and owners at known mineral sites and engage them in stewardship activities	Medium	IUCN Threats 1.1, 2.4, 6.1	2019-2025
Broad strategy: Research			
Determine effects of forestry practices, particularly seral diversity, on breeding habitat	High	IUCN Threat 5.3	2019-2025
Identify set-back distances, vegetative cover, and perch availability needed to minimize disturbance at mineral sites	Medium	IUCN Threat 1.1, 2.4, 5.3, 6.1	2019-2021
Determine impact of parasitism and identify approaches to mitigate future outbreaks	Medium	IUCN Threat 8.2	2019-2025
Identify levels of contaminants in the Band-tailed Pigeon in representative habitats, and determine physiological and population effects	Medium	IUCN Threat 9.3	2019-2025
Determine whether predation is a concern at the population level	Low	IUCN Threat 8.1 and 8.2	2019-2025

^a "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 likely will have an indirect or gradual influence on reaching the management objective, but are considered important contributions to the knowledge base and/or public involvement and acceptance of the species.

6.4. Narrative to Support Conservation Measures and Implementation Schedule

A population monitoring plan will be developed to track whether the management objectives are being met. Identification of unknown mineral sites used by the pigeons will contribute to better population estimates and also will help to direct stewardship and conservation efforts. Counts at mineral sites appear to be the best available method for monitoring population trends, provided they are applied consistently (Casazza 2006, Sanders and Koch 2017). Banding large numbers of birds can provide an index of population size, survival, and harvest rate, and marking a subset of birds with satellite transmitters at mineral sites will allow for a better characterization of habitat use and home range of the species. Current population estimates based on Breeding Bird Surveys are considered poor (COSEWIC 2008).

Habitat conservation and stewardship efforts should focus on mineral sites because these are particularly important and sensitive locations for this species (COSEWIC 2008). The objective will be to minimize fragmentation, pollution, and disturbance of these mineral sites. Land ownership and existing conservation measures varies at each site. Therefore, identifying the most appropriate conservation approach for each site is important. A separate, but equally important, conservation measure is hunting regulation; overhunting in the U.S. has led to population declines in the past, so the successful current restrictive harvest regulations and monitoring of hunting should be maintained.

Research is needed to fill knowledge gaps so that further conservation measures can be identified. Particularly pressing are the needs for better characterization of the forest and land use types that support the species, and forestry practices that improve or degrade breeding habitat. Evidence from U.S. studies (reviewed in COSEWIC 2008) suggests that replacement of more structurally variable old-growth forests by even-aged stands can lead to declines in habitat, including the fruit bearing shrubs and trees that are important food sources for the species. However, documented evidence is scarce. The effects of disturbance on mineral site use is well documented, but research is needed to establish appropriate set-back distances for human activity, and retention targets for vegetative cover and perch features (COSEWIC 2008). Recurring trichomoniasis outbreaks are likely. Research into population level impacts of outbreaks and the efficacy of parasitism mitigation measures are warranted. The impacts of pollution and introduced predators are poorly understood. Key research activities will include measuring contaminant levels and their physiological and population effects on the Band-tailed Pigeon across representative habitats and measuring predation rates and their effects on the viability of the Canadian population.

7. Measuring Progress

The performance indicators presented below provide a way to define and measure progress toward achieving the management objectives for the Band-tailed Pigeon. Success of the implementation of this management plan will be evaluated every five years against the following indicators:

- the population size of Band-tailed Pigeons is maintained;
- the distribution of Band-tailed Pigeons is maintained.

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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](#)⁸. 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 any of the [Federal Sustainable Development Strategy](#)'s⁹ 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 also 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 also are summarized below in this statement.

This management plan will clearly benefit the environment by promoting the conservation of the Band-tailed Pigeon. The potential for the management plan to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this plan will clearly benefit the environment and will not entail any significant adverse effects. The reader should refer to the Species Information and the Conservation Measures and Implementation Schedule sections of the document.

⁸ www.canada.ca/en/impact-assessment-agency/programs/strategic-environmental-assessment/cabinet-directive-environmental-assessment-policy-plan-program-proposals.html

⁹ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1